

The Market and the Environment: Friend or Foe?

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Abstract

An important implication of our cultural mandate, to develop the world as God's steward, is that we must be sensitive to environmental degradation and seek to "maintain" God's creation so that we and succeeding generations-- and creation itself-- can glorify God. Although there is significant debate about the degree to which we have been deficient in meeting this responsibility, there is no doubt that the environment is under strain.

*It is generally recognized that the market, if left to operate freely in the self-interest of its participants, will contribute to environmental degradation--it will be a **foe** of the environment. The market's negative implications on the environment are a well-known market deficiency. Unless constrained in some way, producers will pollute the surrounding air and water since they are not forced to pay the cost of this externality. The cost of environmental degradation is, thus, not reflected in production or consumption decisions. In fact, this paper shows, that even profitable environmentally friendly investments are not always voluntarily undertaken by businesses.*

*The normal response to this situation is that "government must do something". The question is, however, "what must government do?" This paper argues that instead of stepping in and directing market activity, e.g. through regulation, government should harness the creativity of the market to make it more environmentally friendly. The use of appropriate policy instruments--adequate pricing and green taxes, tradeable pollution permits, limited incentives, property rights--has the potential to turn the market from environmental **foe to friend**. Moreover, letting market prices of natural resources rise freely to reflect the scarcity of natural resources will ensure that we do not abruptly run out. The market has a significant role to play!*

The Market and the Environment: Friend or Foe?

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The cultural or creation mandate is an essential principle to guide our thinking when we seek to develop a Christian perspective on our discipline. We must, as God's stewards, develop the world to enable man to glorify God.¹ Our stewardship role, in fact, defines the true meaning of Christian economics, "oikonomia." As stewards, we merely have the temporary use of God's property which we must use to carry out His mandate. One implication of being God's steward is that we must be sensitive to environmental degradation and seek to "maintain" God's creation.

John Calvin, in his commentary on Genesis 2, already drew this conclusion:

Let him who possesses a field, so participate of its yearly fruits, that he may not suffer the ground to be injured by his negligence; but let him endeavor **to hand it down to posterity as he received it**, or even better cultivated.²

When we seek to develop a Christian perspective on economics, we appear to be faced with a dilemma. On the one hand, good stewardship and other Christian principles suggest that Christians should have a preference for the free market—albeit a conditional preference.³ On the other hand, a recognized deficiency of the free market is that it does not adequately take the cost of environmental degradation into account—an externality problem. As such, the market may be considered to be a **foe** of the environment. The most common reaction to this market deficiency has been that, therefore, the government must step in and implement a myriad of regulations so that the market is adequately controlled to ensure that the environment is maintained. The objective of this paper is, however, to demonstrate that although government action is definitely required, that role must be exercised in such a way that the market participants are involved as much as possible. That is, the market, when the right policy instruments are used, can also be motivated to be a **friend** of the environment.

Before beginning that analysis, the paper first expands on the importance, from a Christian perspective, of protecting creation and the importance of "counting the cost" in this regard. The negative effects that an uncontrolled market would have on the environment are then discussed. As part of this section, the role of altruistic voluntary action is reviewed. Subsequently the paper reviews the various policy instruments that may be used by government to turn the market from enemy to friend of the market—regulations, adequate prices and green charges, tradeable permits, subsidies and tax incentives. Finally, the depletion of natural resources will be considered.

1. Maintaining God's Creation and Economics

Our cultural mandate as God's stewards implies, then, that we must be sensitive to environmental degradation and seek to "maintain" God's creation. Many Christians have made that point based on various Biblical givens.⁴ It, of course, is also important for economics and business. Tiemstra, et.al., for example, set out conservation as an explicit goal of political economy:

The government should encourage conservation...Christians should encourage resource conservation out of concern for future generations and out of belief that our plans and demands are shortsighted and reflect impatience when compared with God's plan.⁵

Similarly, Vickers lists "the preservation of a healthy ecological environment"⁶ as one of his explicit economic objectives. In fact, he characterizes the notion of "conservation" (correlated to stewardship) to be the formative principle from which the study of economics can be approached.⁷ Firmly following the cultural

mandate, he concludes that:

there continues to rest upon man the responsibility of using all the resources of created reality...in such a way that the totality of his resource endowment is conserved, firstly for the proper development of his own potential for the service of God and the dedication of all things to God, and secondly...for the God-honoring unfolding of the potentialities of all things existent within the reality which man inherits.⁸

Creation is important even apart from our role in it.⁹ Creation itself gives glory to God: "The heavens declare the glory of God; the skies proclaim the work of His hands" (Ps. 19:1).

It is, however, well recognized that we have been not been successful in meeting this responsibility--in spite of the fact that, in many respects, progress has been made in combating some pollutants. "Acid rain" is still part of our vocabulary. In fact, it creates a major strain in relations between Canada and the United States--and no doubt between other bordering countries--since the winds fail to recognize international borders. While Canada continues to export acid rain to the U.S., it receives back more than its share from coal-burning power plants and industries in the north midwestern and eastern states. Plant and animal species continue to be threatened by pollution and loss of habitat. Our fresh water is being depleted; 2.3 billion persons currently face water shortages¹⁰. Tropical forests are being destroyed at the rate of 25 million acres a year¹¹. The possibility of global warming is an ongoing matter of debate. Habitable land continues to be lost in the process of desertification due, at least partly, to overgrazing, cultivation of marginal land and deforestation.¹² Air quality in our cities continues to deteriorate so that even in Canada those with respiratory problems are frequently warned to stay indoors. In fact, mortality rates in Canadian cities appear to be higher on bad smog days than on the average day.¹³ Deaths are only the worst effects of smog. Other effects include the suffering and health costs of asthma and other related lung conditions. Municipalities are torn with strife as we struggle to determine how to dispose of our garbage. A bumper-to-bumper convoy of garbage trucks filled with the 202 million tons of municipal solid waste generated by the United States in one year would extend around the planet eight times!¹⁴

Taking the environment as a whole, Lester Brown, the president of Earth Policy Institute, argued in his 2003 book, Plan B, that we are currently in a state of environmental crisis that will require an "unprecedented degree of international cooperation to stabilize population, climate, water tables, and soils--and at a war time speed".¹⁵ He claimed that we are

cutting trees faster than they can regenerate, overgrazing rangelands and converting them into deserts, over pumping aquifers, and draining rivers dry. On our crop land, soil erosion exceeds new soil formation...taking fish from the ocean faster than they can reproduce ..releasing carbon dioxide (CO₂) faster than nature can absorb it, creating a greenhouse effect. As atmospheric CO₂ level rise, so does the earth's temperature. Habitat destruction and climate change are destroying plant and animal species...¹⁶ The sector of the economy that seems likely to unravel first is food. Eroding soils, deteriorating rangelands, collapsing fisheries, falling water tables, and rising temperatures are converging to make it more difficult to expand food production fast enough to keep up with demand.¹⁷

In his 2006 sequel, Plan B 2.0¹⁸ he paints a similar picture. Although he notes positive changes in that we can see glimpses of how the "throw-away economy" will be replaced by a "comprehensive reuse/recycle economy," his prognosis seems almost more dire as he warns of increasing consumption expectations in China, India and other countries."¹⁹

Such dire predictions must be taken with a grain of salt. Others have pointed out that, for example, Americas' forests, contrary to popular perception, have been growing steadily for the past fifty years

while Japan's have increased by 85% over the last 100 years.²⁰ Moreover, "agricultural scientists have estimated that if the rest of the world could achieve the level of efficiency and care for the land exhibited by the average farmer in the developed world, then ten billion people..almost twice the current population...could be fed on half the land."²¹ Critics also deny that there is "a 'population bomb' ready to go off. The predictions of alarmists on this score in the 1960s and 1970s proved false." Certainly, many developed countries are currently more concerned with the problems that an aging population will bring. Impending scarcity also seems to be belied by data which suggests that "the long-term inflation-adjusted price trend of every significant resource we extract from the earth—mineral, vegetable, and animal—is downward."²² The extent of the threat of global warming is certainly debatable. Moreover, there appears to be a lack of sound data to support claims of serious species extinction.²³ In addition, contrary to the predictions of imminent food shortages that have been repeatedly falsified, Lomborg claimed in 2001 that "On practically every count, humankind is now *better* nourished. The Green Revolution has been victorious, Production in developing countries has tripled. The calorie intake per capita has here increased by 38 percent."²⁴ Finally, air quality in the developed world may not be as bad as it seems A 2005 Fraser Institute study, using government data finds that the majority of the air pollutant problems in Canada have been improving for decades. In fact, they argue, "things are improving dramatically in the developed world as improvements in technology, higher incomes, and democratic systems have created an ever-increasing ability to protect the environment."²⁵

Whether or not we accept that the situation is as dire as Brown pictures it, we must recognize that maintenance of the environment, of God's creation, is a central component of our cultural mandate. We must, as God's stewards, seek to hand our "field" on to posterity as we received it--if not better.

Now many of those who are concerned with the environment--including Christians, are quick to reiterate the problems and even solutions in general terms. It may, for example, be true that to raise energy productivity we need to redesign urban transport systems. "Most systems, now automobile-centered, are highly inefficient, with the majority of cars carrying only one driver. Replacing this with a more diverse system that would include a well-developed light-rail system complemented with buses as needed and that was bicycle and pedestrian-friendly, would increase mobility, reduce air pollution and provide exercise."²⁶ The question is, how do we get from the old to the new? What policy instruments must be used? Must government do it all or does the market have a part to play? Before getting to those questions, we will first look at the negative effects that the market can have on the economy.

However, first a word of caution is in order. Our task, as God's stewards, is to develop the world to enable man to glorify God. Maintaining the environment is not an end in itself but part of that overall mandate. We must not make nature an idol. As Schneider argues cogently, the Christian notion of stewardship "rejects the notion that humans are on a level equal with--or even beneath--the various elements of nature."²⁷ God has given creation to mankind to use so that man can glorify Him. We are not interested in the environment for sake of environment as an end in itself. Christians cannot wholly accept an ethics of ecology in which all animals and plants have rights and must therefore be preserved for their own sake. Rather as Gen. 9:3 teaches, creation may be used as sustenance for us all.²⁸

Everything that lives and moves will be food for you. Just as I gave you the green plants, I now give you everything.

That means that if, in the short run, there is a tradeoff between man's sustenance and the environment, man should have priority. Thus, maintenance of jobs may occasionally be more important than the environment; similarly, starving people in the Third World may have to be given priority over some environmental concerns. In fact, tradeoffs will frequently be necessary in deciding on environmental policies. There is likely to be some point at which we say, "to go further, to achieve pristine conditions, is too costly in terms of required resources--whether that is money or lost jobs, etc." Or, putting it another way, rather than cleaning up a lake completely, we'll use some of our scarce resources to clean up a dump-site. As Beisner has written, the choice is not "How much pollution would we like to have, if getting rid of it cost us nothing?"

Rather, it is, “What is the appropriate combination of environmental purity and all the other desirable things we enjoy, given that we can have more of one only at the cost of sacrificing some of the others?”²⁹ Choices have to be made.

2. The Market: Environmental Foe

As a starting point, it must be recognized that if the market is left to operate unrestrained, bad neighborhood effects (externalities) are going to negatively affect God’s creation—a generally recognized imperfection of the market. Sinful market participants (individuals and companies), motivated only by their own interests, will frequently ignore the harm they do to the environment. Unrestricted use of private property, e.g., in a manufacturing process which spews toxic chemicals into the air or water, may unjustly injure the “neighbors” who receive no benefit from the goods produced and leave God’s creation less fit for the future. Moreover, if the true costs are not included in production decisions, they will also not be included in the final price of the product. Consequently, these costs are also not considered in the buying decisions. Consumers will buy more of the polluting product and less of the more environmentally friendly alternatives than they would otherwise. To rectify this situation, we must “get the market to send signals that reflect reality”—“the ecological truth.” That is, businesses must be forced to recognize the true costs of pollution, etc. in their production and marketing decisions. If not, consumers, corporate planners, and government policy makers will continue to make faulty decisions.³⁰ Unfortunately, in this sinful world, many companies in the market have, in fact, done their utmost to resist efforts to force them to bear the costs of such externalities. They have been partially successful at this because they form a relatively small interest group and they have the financial resources to fight for government action.³¹

Of course, it is not only market economies that negatively affect the environment. History shows that the former Communist countries were among the worst polluters and most reckless environmental regimes in history.³² While competition in a market economy forces producers to efficiently use the minimum amount of resources possible, such an incentive is missing in a socialist economies.³³ Furthermore, wealth-creating, free market countries are more able to generate the necessary capital to prevent and fix environmental degradation.³⁴

Moreover, a free market does not restrict its participants to working in their own selfish interests. The self-interest that drives the market may well be altruistic³⁵ and, voluntarily, include the interest of others and of the environment. Individual voluntary action and restraint can be an important part of environmental stewardship. Most people are, for example, aware of the three R’s of conservation—reduce, reuse, recycle. However, when we recognize man’s sinful nature, we will understand that voluntary action will never be adequate by itself. Business activities guided solely by altruistic motivation are likely to remain in the minority.

An influential recent book, Natural Capitalism, by Paul Hawken, Amory Lovins and Hunter Lovins,³⁶ provides an example of over-optimistic expectations in this regard. While these authors argue that virtually every aspect of our society is wasteful—e.g. overly wide roads, fuel guzzling cars, inadequately insulated homes and poorly designed office buildings—they appear to be overly optimistic about voluntary solutions. They imply that technical fixes through “hyper” green cars, super-efficient appliances and retrofitting of homes and office buildings with “closed loop” concepts can be readily adopted. They argue that the “din of daily existence,” the waste and noise, the signs of inefficiency “will disappear as surely as did the manure from the nineteenth-century streets of London and New York.”³⁷ While everyone—and business managers, in particular—can certainly benefit from a study of their book, their characterization of it as a “portrayal of opportunities that if captured will lead to no less than a transformation of commerce and of all societal institutions”³⁸ seems overblown. The key phrase here is “if captured.” Why have these opportunities not yet been captured? Although, there *are*, no doubt, opportunities for businesses to profit from installing pollution controlling and energy conservation techniques, the likely answer to the lack of progress is that the bulk of the proposed solutions “involves huge investments and questionable payoffs.”³⁹ Consequently, some doubt

exists that, as the authors claim, the move to natural capitalism “is beginning to feel inevitable”⁴⁰ and that the “changes described here could come about in the decades to come as a result of economic and technological trends already in place.”⁴¹

Natural Capitalism includes various examples of companies that have voluntarily adopted energy efficient designs.⁴² A predecessor of the Dutch ING bank, for example, in 1987 already built a visionary office complex—an “organic” design that would “integrate art, natural and local materials, sunlight, green plants, energy conservation, quiet and water.” The money spent to put the energy savings systems in place is said to have paid for itself in the first three months. The complex used 92 percent less energy than an adjacent bank constructed at the same time—a saving of \$2.9 million per year.⁴³ The question is, if such savings are available, why are such buildings still the exception rather than the norm?

In theory, companies in a free market system have every incentive to voluntarily adopt such energy saving opportunities and pollution control technology that generate such profits. Possibly, the claimed rewards are overstated. However, imperfections in the way businesses operate and lack of knowledge may also be part of the explanation. Hawken et. al. note various impediments.⁴⁴ Managers, for example, tend to pay little attention to such seemingly small items as energy use (which may only be one or two percent of most industries’ costs) but rather concentrate on increasing output and market share.⁴⁵ Potential energy savings may, however, prove to have significant profit potential. An apparent small saving of \$3.50 per square foot of plant space per year for one Fortune 100 company, translated to a boost of 56 percent of the year’s profits when extended to all the company’s worldwide facilities.

Every business student is educated in proper capital budgeting techniques which recognize that an investment now may well be significantly less than the present value of the future savings to be generated from an investment. Yet, Hawken et. al. argue,⁴⁶ many firms make routine “small” purchases on the basis of the initial purchase cost alone. They note, for example, that 90 percent of the 1.5 million electrical distribution transformers bought in the U.S. every year are bought on the basis of the lowest initial first cost alone. Purchase of these less expensive and less efficient transformers, passes up the chance to earn an after-tax return of at least 14 percent a year after tax plus many operational advantages—a nationwide misallocation of \$1 billion a year. They claim, moreover, that when future savings **are** considered, energy saving technology is frequently evaluated by a firm’s engineers using the simple—but inadequate—pay-back method.⁴⁷ They normally look for a very quick payback period. On average, they set a target of getting the initial investment back in less than two years. Thus, they tend to reject projects which do not meet their low payback target although these projects may, in fact, generate very significant returns—when measured according to the proper net present value methodology. On the other hand, large utility companies have generally been satisfied to recover power plant investments over the course of twenty to thirty years. Thus, the net result is that, in a free market society, we tend to invest significantly more in new energy generating capacity than in energy savings—although the latter tend to be much less risky.

A further problem that Hawken et. al. draw attention to is a problem they label as “infectious repetitis.” Given the need to meet deadlines and to avoid taking chances, factory designers tend to copy old drawings rather than use newer energy-saving technology. To illustrate, they describe the case of a chief engineer for a firm designing plants for microchips who was advised by phone of a technology that “uses manifold less energy yet performs better, costs less, and builds faster.” Facing a \$100,000-an-hour penalty if the drawings for the next plant were not completed on time, he could not even find the time to discuss the new opportunity.⁴⁸ Another problem is that most projects are developed by architects, engineers, landscapers, etc. working on their individual parts quite separately. Green builders, on the other hand, need to use a highly integrated process in which all stakeholders collaborate in a teamwork approach to ensure that key synergies between design elements are captured to yield energy and resource savings at the lowest cost.⁴⁹ However, such an approach is riskier and more time consuming than the standard process. Moreover, architects and engineers are generally paid as a percentage of the overall cost of the building and have little incentive to eliminate costly equipment since this will reduce their fees.

Of course, such impediments to implementing environmentally friendly technologies that do, in fact, create major cost savings cannot persist in the market. Eventually a competitor will adopt the technology and gain an advantage. In 1997, for example, a factory producing hard-disk-drives was using \$7 worth of electricity per drive while a competing plant used only 13.5 cents' worth. The inefficient plant went bankrupt two months later!⁵⁰ To avoid such an end, companies must give energy conservation and environmental stewardship a much higher profile in their ongoing operation and management training.

A celebrated example of increasing the profile of environmental stewardship was 3M's "Pollution Prevention Pays" program. Between 1973 and 1990, 3M identified 3,000 different projects which saved \$537 million while achieving substantial reductions in solid waste, waste water and air pollution. Similar examples have been noted.⁵¹ Such high profile special programs may help to overcome normal impediments. In the study of management control systems, for example, it is generally recognized that if managers are evaluated and rewarded on the basis of profits, they are motivated to take actions—such as foregoing necessary maintenance or dumping pollutive materials—which add to current profits but are detrimental to the long-run health of the company. To mitigate this tendency, managers must be evaluated also on other goals such as quality, employee relations, and ethics. One way to do so, is to use a "balanced scorecard" in which other goals are explicitly set out and measured.⁵² Adding specific goals concerning energy saving and pollution abatement and/or tying the results to environmental audits⁵³ may be one way to provide more impetus to this area. Similarly, building designers can be offered incentives that reward energy savings—both up front and over a period of years.⁵⁴ Internal transfer prices between profit centers must also be carefully set to reflect environmental costs. A European Chemical producer, for example, attempted to identify all environmental costs included in overhead, such as legal fees incurred or expected and relevant insurance premiums and charge them to the products that really generated them.⁵⁵ Moreover, decentralized operations must include codes of ethics which include detailed environmental provisions. A European agro-chemical business, for example, set a standardized procedure that certain pesticides would not be sold to specific markets and buyers when the company could not be assured that they would be used safely.⁵⁶ Of course, such provisions must be accompanied by adequate training and monitoring.

All in all, it must be realized that competitive free markets do motivate companies to implement money-saving environmental⁵⁷ measures; as such, they **can** be environmentally friendly. Nevertheless, there are many practical impediments which slow down the rate of implementation. When it comes to environmental actions that are not profit-generating, the motivation for a company to be a good corporate citizen is even less; many of the market participants will remain environmental foes—if it is left up to them. Thus, a degree of skepticism is certainly warranted concerning an inevitable voluntary resolution of our problems. As a minimum, considering the sinful nature of humankind, voluntary action has obvious limits. Even a conscientious Christian businessperson may, for example, find it impossible to install the best pollution-control technology unless competitors incur similar costs. While voluntary agreements may occasionally be possible at an industry level, the good steward may have no alternative but to lobby for government action.⁵⁸ In fact, if Christians are going to make a serious impact in improving our environment, our major efforts should probably be directed at developing and agreeing on necessary government policy options and lobbying to have them implemented. However, as we seek to determine the best options, we will see that the market is not an unmitigated enemy of the environment but can, if properly directed, be its friend. Thus, we can agree with Natural Capitalism, that we should "vigorously employ markets for their proper purpose as a tool for solving the problems we face, while better understanding markets' boundaries and limitations."

3. Regulations to Tame the Foe

Although a preference for the market can be biblically justified, such a preference should by no means be interpreted as opposing all government regulation. Regulation and the threat of potential regulation can help to motivate the market in the right direction. As Chwening has pointed out, regulations "exist

because we need direction, we are unrighteous, and they foster justice...fundamentally, the unrighteous hate restrictions."⁵⁹ It is therefore, "utterly naive to think that we can be surrounded by people who are dead in sin, self-centered in their focus, and infected with greed, materialism, and covetous attitudes and not need a goodly amount of regulation."

If we recognize that, as God's stewards, our property rights are limited, we should have no difficulty in accepting such necessary regulation. William Wood has expressed this as his biblical principle 3: "Ours is a fallen and imperfect world in which good intentions by imperfect men and women will not by themselves lead to good stewardship."⁶⁰ Consequently, Christians may well encourage regulations that would improve economic stewardship—regulations, for example, to ensure that God's creation is protected. Regulations will help to ensure that those who seek to do business in a stewardly manner will not be disadvantaged at the hands of those who left to their own devices would engage in practices that Christians could not follow.⁶¹

In fact, government regulation, also referred to as "command and control," has probably been the most common method to deal with bad environmental neighborhood effects. Regulators can set acceptable limits as to the amount of harmful pollutants that may be emitted or, in serious cases, simply ban them. They can even specify the mandatory use of specific pollution control devices such as catalytic converters in cars. In the remainder of this section we will first recognize that some regulation is required in order to make the market friendlier to the environment. However, it will also be seen that there are problems of government regulation which should lead us to accept this alternative only as a last resort.

For the most toxic pollutants, however, outright bans are the only possibility. Bans may also be required in particularly sensitive areas. The Chinese government, for example, banned all tree cutting in the flood-prone Yangtze basin because "trees standing are worth three times as much as trees cut" because of the flood control service provided by the forests.⁶² In other cases, such as mandatory minimum efficiency standards for appliances, simple regulation is likely to prove most effective. When, for example, in 2001, the Bush administration called for the construction of 1,300 new power plants by 2020, an NGO, the Alliance to Save Energy, claimed that improving efficiency standards for appliances in the U.S. would eliminate the need for 127 power plants and improved requirements for air conditioners another 93.⁶³ Direct requirements are a practical way to quickly implement such a change. Similarly, improved standards are likely to be required for housing. Nevertheless, as will be seen in the next section, green taxes which increase the price of energy can lead to similar results.

Detailed government regulation is also required when the interests of parties in the marketplace conflict. For example, in 1990, European governments were concerned with the reduction of emission of volatile organic compounds (VOCs) which escaped when cars were being refueled. The problem could be addressed either by installing a carbon canister on the cars that would absorb the vapor or, alternatively, by installing a vapor balancing system on the pumps. Obviously, the oil companies and the automobile manufacturers could not agree on the choice. The German government finally had to make the decision in favor of the pump system.⁶⁴

Regulation is also necessary to specify conditions for companies to operate in particularly environmentally sensitive areas, e.g., drilling for oil and gas. Even then, however, the market can be used to supplement the regulations by requiring 'environmental performance bonds' (an insurance to be bought by companies who undertake environmentally sensitive actions such as building a pipeline through nature reserves). The market determined price of the bond will reflect the potential liability and force the companies to consider that cost.⁶⁵ Moreover, in case of actual damage, the money from the bond can be used to rehabilitate the environment and compensate victims.

In any case, the need for regulation continues. Regular review is, however, a necessity—if only to ensure the regulations do not become obsolete. Where regulation is deemed to be necessary, we must be prepared to devote adequate resources to establish and enforce them. That brings us, however, to the problems

of regulation. Enforcement has often proven to be difficult or weak. While there are differences among countries and the type of environmental problem, Barde⁶⁶ concludes that “it is generally acknowledged that lack of staff to carry out controls and enforcement makes the probability of being caught rather small.” Moreover, non-compliance fines tend to be too low to function as a real deterrent. The low fine and low probability of getting caught is less than the cost of pollution abatement. In addition, regulations tended to require very rapid compliance schedules providing inadequate time for learning-by-doing and no time to develop and refine novel techniques thus steering industry to quick-fix, end-of-pipe solutions since those are more likely to be available “off the shelf”.⁶⁷

Furthermore, “appropriate” emission standards must be set. Since the affected companies are those that have the best information,⁶⁸ it is essential that their input be obtained; negotiation as to what is doable is obviously necessary. In the process, however, it is only natural that the companies do all in their power to have the standards reduced and to delay implementation.⁶⁹ Moreover, like all regulations, environmental regulations provide scope for bureaucrats and politicians to relax enforcement for local companies in exchange for significant campaign contributions or outright bribes.⁷⁰ In fact, one can speak of a “policy failure”, that was prevalent particularly in the formerly centrally planned economies, of imposing requirements too strict to be taken seriously. As Żylicz has noted, the result is not only a lack of compliance, but also “a much more long-term effect...of undermined authority of environmental administrators and disrespect for the law.”⁷¹ Thus, excessive regulation motivates us to disobey the authorities God has put over us. Żylicz suggests that although imposing unrealistic standards may be simply a matter of poor judgment, it may also represent mere green rhetoric of politicians—an excuse for not adopting any sincere measures to solve the problem.

Regulation also entails the problem of obsolescence.⁷² Regulations and standards that have been laboriously negotiated are unlikely to be rapidly adjusted to reflect technical progress. Moreover, regulated minimum standards are likely to become the norm. For example, in the U.S., the National Electrical Code sets a minimum size for electrical wire to be used in buildings in order to prevent fires. Since the lowest cost electrical contractor is usually chosen, contractors will normally use only the least cost minimum size. To save energy and cost over time, wire one or two sizes thicker should, however, be selected to reduce electrical resistance. In a typical office lighting circuit, the next larger wire size yields about a 193 percent-per-year after tax return on its additional cost.⁷³ Few electricians or contractors are aware of or care about this. After all, the people that choose the wire are not the ones who will pay the operating cost.

Even regulations that are intended to protect the environment have the potential to make the situation worse. Desrochers, for example, argues that in the U.S. the regulations established to deal with hazardous waste are so onerous that any reuse of such by-products is prevented even though a substance may be chemically identical and less hazardous than the “virgin” product. He notes that the automotive industry’s anticorrosion process used to protect cars typically creates wastewater rich in zinc. In the past, producers of the sludge from this wastewater sent it to a smelter that recovered the zinc for reuse. However, once this residual was designated by government regulations as “hazardous”, the regulatory requirements became so stiff that the smelter could not accept it anymore. Instead the zinc now ends up in a landfill while saddling the producers with significantly increased handling costs. Overall, “the regulations governing hazardous waste management impose onerous burdens and responsibilities on those who generate, handle, treat and dispose of such materials...Many analysts therefore view environmental regulation as the single greatest deterrent to the innovative use of by-products.”⁷⁴

For various reasons then, regulation has significant problems and should be limited as much as possible. Setting limits on the amount of pollutants, for example, is preferable to the specifying the required technologies since companies are left free to choose the specific technology.⁷⁵ Recently, there has, in fact, been an increasing move away from regulations towards economic instruments (charges, taxes and tradeable permits) to be discussed below. Costanza et. al., for example, noting that in the U.S. the Environmental Protection Agency (EPA) has, since its establishment in 1969, focused primarily on the regulatory approach.

While concluding that this approach has achieved a great deal, they note that many who have studied the issues would agree that this approach is inadequate to deal with the growing problems and that better policy instruments can be designed.⁷⁶

Not only may regulations intended to improve the environment be less than satisfactory, government regulations intended to solve other problems may also affect the environment adversely. Electrical utilities, for example, are frequently in a monopoly position and must be, therefore, be regulated to prevent gouging of the customer. However, their regulating agencies frequently reward the utilities for selling as many kilowatt-hours as possible.⁷⁷ Moreover, even publicly owned utilities, such as those in Ontario, provided customers the wrong incentive. Instead of encouraging electricity conservation, large volume users received discounts so that they would use more instead of less.⁷⁸ Similarly, some water users in the western U.S. (and elsewhere in the world) continue to face a disincentive to conserve water. Their contracts include a 'use it or lose it' principle which causes them to lose future water allocations if their needs temporarily drop.⁷⁹ City building regulations have also misguidedly encouraged the use of cars—with attendant pollution and congestion. Developers are required to provide parking space—frequently as much parking for each shop, office or apartment as people would demand if parking were free. Moreover, current zoning mandates land-use patterns that maximize distance and dispersion contributing—to the urban sprawl⁸⁰ that necessitates the use of the automobile. Such misconceived rules also divert investment from buildings into parking spaces and makes affordable housing scarcer.

All in all, regulation—while necessary in certain situations—is not the best instrument to correct the negative tendencies of the market.

4. Adequate Pricing and “Green Charges”

There has, in fact, been a movement away from “command and control” to ways which leave more discretion to individuals and industries to choose the most feasible methods.⁸¹ A very important economic principle that has been accepted, in theory, by most industrialized countries since the 1970's, is to seek to “**make the polluter pay the cost**” or putting it differently, make the user pay the “full” cost. This principal would seem to be in accordance with the biblical concept of personal responsibility. In economic terms, it means that the producer must be forced to “internalize” the “externalities”. To the extent that this can be done, the cost will be reflected in production and buying decisions—the market price will reflect the full cost in the final price. Thus, consumers will be motivated to buy less of the polluting product or scarce resource. Pollution will be reduced and/or the scarce resource will be used up more slowly. Rather than considering the market as a foe that must be controlled, this approach harnesses the market to act as a friend of the environment.

Consider, for example, the production of gasoline. While the actual cost of production is reflected in the price of gasoline, various indirect costs are excluded: e.g., the cost of treating respiratory illnesses and the deaths caused by breathing polluted air, the cost of repairing acid rain damage to lakes, forests, crops and buildings caused by the emissions as well as the potential costs of climate change—ice melting, more destructive storms and relocation of refugees from rising sea levels. To the extent that these costs are not currently reflected in the price of gasoline through taxes, the consumer uses more gasoline than is economically warranted. If the gasoline were to fully reflect these environmental neighborhood effects, the price would, no doubt, increase.⁸² At the higher price, consumers would use less (by reducing driving, purchasing more fuel efficient cars etc.). That is, the market's mechanism for efficiently allocating resources now “counts the cost” of pollution and the value of the resource!

One way to make the polluter internalize the cost is by charging so-called “**green taxes**” on the pollutants, on the products made with polluting processes, or on the scarce non-renewable resources. Several countries have raised gasoline taxes for this purpose. Sweden taxes batteries. Various countries are taxing emissions of carbon dioxide, the main greenhouse gas. Some charge households by the volume

of garbage set out for collection.⁸³ Denmark's landfill taxes increased the reuse of construction debris from 12 to 82 percent in less than a decade.⁸⁴ A stiff surcharge on irrigation water use in excess of a standard amount contributed to cutting water use in one California district by 17 percent.⁸⁵ In fact, even the long-standing taxes on cigarettes can be seen as a way to make the user pay some of the indirect costs for medicare⁸⁶ and second-hand smoke.

Variable toll rates for highways with higher charges during rush hours can provide incentives to travel at non-peak hours and thus reduce congestion. Similarly, higher rates for electricity during peak periods will permit reduction of excess capacity (which frequently is provided by older, more polluting, sources). As an example, prosperous Singapore is rarely congested because it taxes cars heavily, auctions the right to buy them, imposes a daily user charge on anyone driving downtown—and channels that money into an excellent transit system. Just the morning-rush-hour fee cut the number of cars entering the city by 44 percent and solo trips by 60 percent! London, England, introduced a similar charge in 2003 which immediately reduced the number of vehicles by 24 percent⁸⁷, traffic delays were down 30 percent, and accidents were way down—an estimated £22-million a year benefit in reduced travel time, fuel costs and accidents.⁸⁸ By 2005, expansion of such schemes were started or planned in Jakarta, Tel Aviv, Washington, D.C., Denver as well as state-wide efforts in California and Oregon.⁸⁹ Tolls are preferable to gasoline taxes since they reflect which roads are used and when. Modern toll roads now being built can send intelligent economic signals to drivers by charging vehicles more at peak times, and by charging cars much less than trucks, which cause most of the roads' wear and tear. Moreover, as transportation costs increase, companies will gradually adjust by producing closer to the market and employees will move closer to their work.⁹⁰

Making the polluter pay in a way that the bad neighborhood effects are internalized has major advantages over specific government regulations. Such regulations may, as noted previously, set out specifically how a company must deal with pollution, e.g. build a higher smokestack or install specified pollution control equipment. With charges, companies are left free to innovate and choose the most cost-effective way of reducing pollution. Given that they are spending their own money, they have every incentive to do so. Better solutions can, moreover, be adopted as soon as they become available. On the other hand, if bureaucrats have to specify the solution, those who make the decision are not the ones who pay the costs and may not possess all the relevant information. The process becomes cumbersome and time-consuming as all affected parties have to be given opportunity to provide input and comment. The final choice may be based on political impact and becomes difficult to change. Moreover, once specific regulations are put in place they may stay in place for a long time. There is little incentive for governments to reopen this arduous process when new technology becomes available. The process also reduces the motivation for companies to keep searching for better solutions. Finally, pollution charges can be introduced gradually and increased over time so that companies' activities are not halted abruptly and their employees thrown out of work in one fell swoop. Increases according to a predetermined schedule will permit industry to adjust.⁹¹

Pollution charges require government only to specify pollutants and charges. The market is then free to decide how best to reduce the pollution. Competition will motivate companies to continue to improve and keep looking for improved technology. If regulation mandates the installation of certain pollution control devices, once the requirement is implemented no further improvement in pollution abatement is likely. However, if a company is taxed on its emissions, they will be motivated to continue to seek better and lower-cost abatement methods regardless of how much they have already done in this regard. As the cost of waste disposal rises and hazardous waste is increasingly properly identified and appropriately charged for, companies will have economic incentives to take waste-reducing measures and make more efficient use of their materials. Moreover, leaving companies to decide how to deal with the issue also reduces the problem of information bias. For competitive and negotiating reasons, companies will tend to overstate cost estimates presented to regulatory agencies. The most cost-effective alternatives

are, therefore, likely to be obtained using the market (leaving companies to make choices) rather than by a regulating agency.⁹²

Whether or not such "green taxes" significantly reduce use of polluting products depends on how sensitive the demand for the polluting product is to increased prices. A major increase in the price of oil during the years 1979-86, the second "oil shock", for example, created significant impetus to reduce oil consumption. The U.S. obtained nearly five times as much "new energy" from savings as from expanding the supply. Moreover, the country got 14 percent more energy from sun, wind, water and wood and 10 percent less from oil, gas, coal and uranium. Although the economy grew 19 percent, total energy use shrank 6 percent.⁹³ The first price shock in 1973 cut the U.S. rate of growth in consumption by 58 percent; the second in 1979 caused consumption to actually decrease.⁹⁴ Price increases do matter. To the extent that increasing prices through "green" charges do not totally eliminate the output of the polluting product, the revenue from such taxes can provide the funds to rectify the damage.

Care must be taken to ensure that charges are levied appropriately. A charge levied, for example, at the retail level on automobile tires to reflect the cost of subsequent disposal will at least ensure that the cost of driving reflects this disposal cost. However, if that money merely goes into the government's general revenues, there is still no assurance that the tires will be disposed off in an environmentally friendly way. If, however, the charge were considered to be a deposit and all tire sellers (retailers and manufacturers) were forced to refund these deposits when tires are returned, the tires would end up back in the hands of the relatively few manufacturers. These manufacturers would then be forced to look after the disposal—which could be more easily controlled and monitored—and the estimated costs would have to be reflected in the selling price. Deposit refund systems are, in fact, a standard policy alternative used in many countries; the Netherlands, for example, uses deposits for many types of bottles which are collected back through most grocery stores. In Canada, while it was more prevalent in the past, it is now used most commonly in the beer industry. The benefits of reductions in the waste stream, reduced litter and reduced material use must be considered against the high operating costs (handling, storage, energy and transport).⁹⁵ Addition of a complete ban of non-refillable beverage containers, as has been done in Canada's Prince Edward Island, can make such deposit schemes even more effective.⁹⁶

Not that "green taxes" are sufficient in themselves. They are, obviously, not appropriate for substances that are so toxic that a ban is in order. Nor, will they be adequate in cases where quick changes are required—e.g. when certain plants should be shut down during extreme weather conditions (smog, etc.).⁹⁷ As with regulation, a system of monitoring the emissions is required. Moreover, it is not always easy to pinpoint who the polluter is in all cases of environmental degradation. Nor, is it necessarily easy to assign an appropriate charge to reflect the external effect although some charge will be better than no charge.⁹⁸ Moreover, care must be taken that the poor do not bear an unfair burden. They must, however, not be exempted from the charges since they also must be motivated correctly. Rather, offsetting compensation must be given through, for example, a refundable tax credit.⁹⁹ Alternatively, "lifeline" rates can be set as was done in South Africa for water. Each household receives a fixed amount of water for basic needs at a low price. Usage in excess of this amount comes at escalating prices.¹⁰⁰ Basic needs can be met while wasteful use is still discouraged. Finally, the unintended consequences must be considered. Charging households in proportion to the amount of garbage that they put out for collection, for example, may (given the prevalence of sin) increase the illegal disposal on the sides of deserted country roads, etc. Thus, while green taxes will vary in their effectiveness and appropriateness, they are, where applicable, likely to be a step in the right direction.

Green taxes do not have to represent an increase in the total tax bill. In the first place, sales or value-added taxes on environmentally friendly goods can be reduced (abolished) and those on environmentally unfriendly goods increased.¹⁰¹ The authors of *Natural Capital*, among others,¹⁰² make the case that our tax and financial systems should be creatively restructured to switch the tax load onto polluting activity and away from people, e.g. income and indirect employment taxes. Costanza et. al., in

fact, argue that “there is a growing consensus...concerning the need to reform tax systems to tax “bads” rather than “goods”. Increased taxes on waste, toxins and primary resources will permit reduction in labor related taxes so that businesses can hire less expensive labor and create jobs.¹⁰³ Such an approach was used by Sweden when in 1990 it introduced new eco-taxes but reduced existing taxes—particularly those on income.¹⁰⁴ In 2003, prominent economist, N. Gregory Mankiw, wrote, “Cutting income taxes while increasing gasoline taxes would lead to more rapid economic growth, less traffic congestion, safer roads, and reduced risk of global warming—all without jeopardizing long-term fiscal solvency. This may be the closest thing to a free lunch that economics has to offer.”¹⁰⁵ Moreover, although the employment impact of “green taxes” must be considered, it is not obvious that unemployment will increase by definition—particularly if other taxes are reduced simultaneously. In the 1990's, countries such as Germany and Japan with relatively high environmental charges had strong economies. The higher charges motivated industries in these countries to operate more efficiently using less energy and less resources and, consequently, remaining competitive.¹⁰⁶

Moreover, taxation on automobiles needs to focus on use rather than ownership only. Increasing the use of tolls on privatized modes of transportation will, for example, achieve this. Automated electronic billing now permits drivers to be more easily charged for these social costs and reduce other types of taxes that subsidize the building of the necessary infrastructure. In particular, it is now possible to readily charge differential rates. One could, for instance, visualize converting Ontario's highway 401, the major East-West corridor across the province, to a toll route for trucks only with passenger cars going free or at very low rates. International trade provides extremely important benefits to society by permitting the most efficient producers to provide goods at the lowest cost and provide us with a wide variety of products. Nevertheless, the decisions as to whether or not we import goods produced far away should properly reflect the cost of transportation. If highways are subsidized from general revenues, the true cost is not reflected in the freight. Moreover, the pollution effects of the truck emissions and the continuing loss of good farmland that is paved over,¹⁰⁷ should not be ignored.

Modern technology apparently makes it possible to charge automobile users even more directly for pollution. Foldvary and Klein have suggested that exhaust sensors can be installed at roadsides that would monitor the exhaust of passing automobiles. If the sensors are coupled with electronic license plate readers, the system can identify polluting drivers and send them “pollution bills”. In this way the actual polluter will be directly targeted.¹⁰⁸

The use of “green charges”, then, is an effective way for government to force the market to bear the cost of environmental neighborhood effects while leaving market participants free to decide how best to adjust to the increased costs. Green charges motivate the market to be environmentally friendly.

5. Tradeable permits

The theoretically ideal way¹⁰⁹ to harness the incentives of the market to become more environmentally friendly is the concept of **transferable pollution permits**. Southern California, for example, introduced a comprehensive system called RECLAIM (Regional Clean Air Incentives Market) in 1994.¹¹⁰ In such a system allowable limits for each pollutant, e.g. nitrogen oxides, are set for each company--based on current levels.¹¹¹ These limits--rights to pollute--may, however, be bought and sold and, thus, become valuable property rights. Company A, for example, would be permitted to release X tonnes of pollutant Y. If it is able to reduce its emissions to less than X, it can sell its unneeded rights to some other company. A new incentive is, therefore, provided for A to reduce its pollution. Over time, the amount of permitted pollution can be reduced by the regulating authority. Under RECLAIM, for example, every company was required to reduce emissions annually by 5 to 8 percent per year.¹¹² Thus, it was estimated that the right to emit a ton of pollution could rise from \$600 to as much as \$11,000 over five years.

Not only does every company have a financial incentive to reduce its pollution, with tradeable

rights, the market will also ensure that the overall cost to society of pollution reduction will be as low as possible¹¹³ and that the burden will be borne equally. Those companies which can reduce their emissions relatively inexpensively will do so first and have rights to sell. That is, their cost to reduce their pollution will be less than the price of the pollution rights; they, therefore will have an incentive to reduce pollution and sell the rights that they do not need. Companies with more difficult problems can, in the first instance, buy up the available rights to pollute. As these rights become more expensive, the incentive to find technological solutions will increase. While the government enforces the overall permitted amounts, the market decides the most cost-effective way to reduce. In fact, the market price of the traded permits also serves as price signal. The higher the market price for the permit, the more incentive there is for innovators to devise new remedial technology or processes. A final benefit of the system is that environmentalists (or governments) can speed up the clean-up process by getting together and purchasing--and not using--the pollution rights. In Cleveland, for example, a group called INHALE sprung up to buy and bid up the price of sulphur-dioxide credits so that U.S. utilities would be forced to clean up their own emissions.¹¹⁴ Such action reduces pollution immediately and, by increasing the price of rights, increases the incentive for others to reduce pollution.

The use of trade-able pollution rights has also illustrated that, in some instances, the cost of pollution abatement has been vastly overestimated. In 1990, when the U.S. Congress was debating the institution of a trading system for reducing sulphur dioxide, environmentalists predicted that sulfur reductions would cost about \$350 a ton. Government models predicted a cost of \$500-750 while industry models estimated \$1,000-1,500. In fact, the sulfur-allowance market opened in 1992 at about \$250 a ton; by 1996, it fell to \$66 and by 1999, it had been bid back up to \$207. In the process, sulfur emissions fell by 37 percent in just one decade. This efficient trading mechanism put the U.S. well ahead of its reduction target at a fraction of the projected cost by harnessing the genius of the market rather than using government regulation.¹¹⁵

Of course, the effectiveness of tradeable quotas will depend on the extent of the permitted emission amounts.¹¹⁶ Such allocations must also take account of regional levels. If national trading is permitted, it is possible that regional pollution might increase over original levels. That could, however, be corrected by reducing overall permitted levels or by specifying that individual large-scale polluters would not be permitted to exceed original levels at all or not by more than a given percentage. Since such caps for individual large emitters would, in essence, defeat the benefits of tradeable quotas, they should, however, be avoided if at all possible. Instead, overall permitted levels should be set low enough to prevent increases by individual polluters. For more local pollutants, such as sulphur dioxide, the tradeable rights can be set for specific regions. Obviously, the intent of the whole process is to reduce emission levels over time--not merely to reallocate them. The details of specific policies will have to be tailored to specific regional problems and will no doubt vary for specific pollutants with some being traded nationally or even internationally while others being traded only locally. It is, of course, not argued that tradeable permits will be appropriate to all pollutants. They can, for example, not be applied to car exhausts which emit various pollutants (CO₂, SO₂, VOCs and Nox) in combination. Other policies will have to be used to deal with those.

Tradeable rights can also apply to scarce resources such as water. When Morro Bay, California, for example, ran short of water in the late 1980s, it required any developer wanting a building permit to save, at some other site in town, twice as much water as the new building would use. An efficient market for "saved" water quickly developed.¹¹⁷ One-third of the houses in Morro Bay got retrofitted in the first two years! Several states now have replaced their anti-conservation 'use it or lose it' water laws with laws that allow saved water to be sold or leased--thus providing necessary incentives to conserve. Similarly, electrical utilities have auctioned off electricity "savings" as an alternative to new generation. When the efficiency savings were allowed to bid against new supply, they almost always won, permitting valuable "decongestion" of crowded grid capacity.¹¹⁸

Where appropriate, then, tradeable permits or rights to pollute, are the most ideal way to deal with environmental problems. It ensures that environmental improvements will occur at the lowest cost and leaves maximum scope for companies to decide how best to deal with the problems. Permitted levels of emissions, etc, can be gradually reduced over time so that incentives to improve remain while generating the least amount of disruption (e.g. unemployment). This policy alternative, then, also provides a means to harness the power of the market so that it becomes more environmentally friendly.

6. Subsidies/Incentives

Subsidies and incentives are also an effective way in which the government can encourage the market to deal with the environmental problems. They are, obviously, more attractive than taxes to companies and consumers--although more costly to the taxpayers. Subsidies can be helpful to encourage individuals or companies to take desirable environmental action. In Canada, partial subsidies have, for example, been available to reduce the cost of home insulation and thus encourage home owners to lessen their energy use. In 1988, British Columbia Hydro provided a temporary subsidy to distributors so that they would stock more efficient motors required for in the mining and pulp and paper industry. Without the subsidy, distributors were loath to carry the more expensive items which might not sell. Subsidies can, and should, as much as possible leave the private sector free to make its own responsible decisions. Subsidies are particularly helpful for the development of environmentally friendly technology. In the U.K., for example, the government provides grants of up to 50 percent for the development of new technologies in the areas of cleaner production, recycling, waste treatment and environmental monitoring.¹¹⁹ Similarly, U.S. government funding played a significant role in developing clean coal technology.¹²⁰

Subsidies are, however, not as good as green taxes to achieve a socially desirable outcome. An adequate green tax will ensure that the bad external costs are "internalized"--reflected in the production decisions and in the final cost of the product. On the other hand, if a company is subsidized to install, for example, pollution abatement technology, then the final cost of the product produced will be less than it would be if the company had to bear the full cost. Thus, more of the product might be produced than is desirable and more companies might be attracted into the industry.¹²¹ Subsidies are, thus, inconsistent with the "polluter pay principle" since the general tax-payer rather than the polluter will bear the cost of the subsidy.

An intriguing extension of subsidies described by Hawken et. al. is the use of "feebates"--a judicious combination of charges and subsidies. To encourage the sale of more energy efficient and less polluting cars, the customer would either be charged a fee or be provided a rebate--depending on the efficiency of the new vehicle. The rebate could also be related to the increase in efficiency of the old car that was actually turned in and scrapped. The net effect would be no cost to the government since, on average, the rebates on efficient vehicles would be offset by the fees charges on the new gas guzzlers.

Subsidies appear to be necessary to speed up favorable environmental activity and to avoid an excessive burden on certain market participants--particularly, those who can least afford it. Programs to halt erosion and desertification, for example, by planting trees in highly erodible areas will no doubt require subsidies.¹²² Moreover, subsidies may be required in order to speed conversion to more energy saving devices. Brown notes,¹²³ for example, that in the U.S. 20 percent of all electricity is used for lighting. If each household replaced its commonly used incandescent bulbs with new energy saving compact fluorescent bulbs, electricity for lighting would be cut in half. World-wide, such replacement would save enough electricity to close hundreds of coal fired plants. Yet, the increased cost to the consumer (even though they may pay for themselves in the long-run) has proved to be a major impediment to such a conversion. A subsidy of the new bulbs may be helpful to make this switch--although a tax on the old type and an eventual ban on them would be as effective and less costly to the taxpayer.

Similarly, subsidies on pollution free wind energy¹²⁴ and solar installations¹²⁵ may be useful. The Danish government's tax incentives for wind-generated electricity have contributed to making that country of only 5 million people, the world's leading manufacturer of wind turbines.¹²⁶ A newer variation of wind generation that could be subsidized is the invention of the Australian engineer, Bryan Roberts, called Flying Electric Generators-- windmills 30,000 feet high and tethered to the ground by power lines. These windmills would capture the plentiful power in the strong, steady winds that blow in the jet stream while creating less aesthetic problems.¹²⁷

While subsidies are likely to be necessary, continuing analysis and monitoring will be required to ensure that subsidies are still required and attain the desired goal. Moreover, existing subsidies provided for other purposes must be evaluated for their environmental impact. In many cases, subsidies designed to promote other societal goals, such as employment, have had a perverse environmental effect. Germany, for example, has paid \$6.7 billion annually (\$73,000 per worker) to subsidize the Ruhr Valley coal regions.¹²⁸ This subsidized high-sulfur coal contributes to air pollution, acid rain, lung disease, etc. Fortunately, these subsidies are now being reduced and are intended to be phased out by 2010. Subsidizing roads (by providing free or below cost road transportation) increases pollution, urban sprawl and urban decay.¹²⁹ The U.S. oil and gas industry receives significant tax breaks.¹³⁰ Other oil producing nations are even worse. Iran, for example, prices its oil for internal use at one tenth the world price. If this subsidy were phased out, Iran's carbon emissions would be reduced by an estimated 49 percent. Similarly, removing energy subsidies would reduce carbon emissions by 26 percent in Venezuela, 17 percent in Russia and 14 percent in India.¹³¹ In farming, the U.S. government subsidizes "agricultural production, agricultural nonproduction, agricultural destruction, agricultural restoration ...and crops that cause death and disease, by giving over \$800 million a year to tobacco farmers." It also heavily subsidizes the "3,400 gallons of water it takes to produce one dollar's worth of California sugar beet."¹³²

Similarly misguided incentives apply in transportation. In the U.S. the heavily subsidized interstate highway system, enables food to be transported great distances--averaging 1,300 miles--and processed in ever more elaborate and costly ways.¹³³ While consumers benefit from the cheaper produce, that benefit comes at the price of higher taxes and bad environmental effects. As noted before, these bad effects must be reflected in the market decisions that lead to such long-distance transportation. Removal of subsidies and increasing tolls is necessary to rectify this situation.

Lawrence Solomon, Executive Director of Urban Renaissance Institute, goes so far as to argue that Canada could quite reasonably meet its Kyoto commitment by simply abolishing subsidies on environmentally negative industries--oil and gas, mining, logging, pulp and paper, agriculture, all corporate subsidies (particularly for outdated smoke stack industries such as steel), ports that ship our raw materials etc.¹³⁴ While he recognizes that ending subsidies would create dislocations and one-time costs, he probably gives inadequate weight to the human costs of, at least temporary, unemployment. Nevertheless, a gradual movement in this direction (as well as the increase in toll highways that he also recommends) is certainly in order.

Just as direct subsidies can have disastrous consequences for the environment, so can tax incentives. Thus, the German policy of providing those who travel to work with an income tax allowance¹³⁵ is obviously misguided and has been estimated to increase both accident cost and air pollution by about 1 billion DM per year. Similarly misguided is the situation in the UK where about 2 million cars (10 percent of the total) are 'company cars' purchased with tax concessions.¹³⁶ As noted previously, instead of taxing drivers for ownership of vehicles (e.g. annual license renewals), the focus should be to discourage use (e.g. taxes on gasoline). In addition, all fuels should be taxed. Currently, airline fuel is the cheapest in the world, as the industry is exempted from fuel taxes. Although at this point, airplane travel accounts for only 3 percent of global carbon emissions, it is expected to account for 15% of all carbon emissions in 2050.¹³⁷

A review of the environmental impact of all subsidies is, definitely, in order. As a minimum, just as we need to shift from taxing the “goods” to taxing the “bads”, subsidies need to be shifted from environmentally bad to environmentally good.

7. Natural Resources

Although we have referred to natural resources, e.g. oil, water and forests, at various times above, some additional points need to be made. With regards to the depletion of natural resources, the market can actually play a very beneficial part. Well before resources are used up, the price of an increasingly scarce resource such as oil will rise in price—if it is traded in a free market. The increasing price will motivate users to use less and search for substitutes; it will also motivate the extractive industries to improve techniques for discovering and removing previously unknown (or inaccessible) deposits. If prices are allowed to reflect true scarcity, the market has an amazing capacity to encourage the utilization of the potential God has provided. Even, a potential food shortage may be ameliorated by the market. As food becomes relatively scarce, products that use the most grain to produce, e.g. feed-lot grown beef, will become more expensive and consumers will switch to grain products or pork and poultry which are less grain intensive to produce. Global beef production, for example, grew less than 1 percent a year from 1990 to 2002. Pork, on the other hand grew by 2.5 percent annually, poultry by nearly 5 percent and aquaculture by 10 percent (fish being the most efficient in converting feed into protein).¹³⁸

When the market is not free but significantly controlled by unstable foreign governments (i.e. OPEC), it may make sense, however, for the governments of other countries, e.g. the U.S., to build up certain strategic reserves. Those stocks should, however, be released in real emergencies—not merely to keep prices from rising. After all, it is precisely that rising price which will force the necessary adjustment as well as possibly reducing the emission of pollutants (as, for example, people drive less or cars become more efficient).

It is, in fact, this beneficial effect of increasing prices that is often missing when governments, rather than the markets, are the providers of the scarce resource or control the price set by utilities. Stapleford notes, for example, that water prices in water-short San Diego, where annual precipitation averages less than 10 inches per year, were lower than those in Philadelphia, with average annual precipitation of 41 inches. In Tunisia water costs one-seventh of what it costs to pump.¹³⁹ Similarly, the Ontario government for a few years capped the price of electricity although the province was already facing potential shortages. It may be possible to introduce markets for some of these scarce resources so that prices will rise to reflect the true scarcity. If not, governments must be encouraged to set prices at the opportunity cost—the cost required to replace the scarce resource.

Of course, increasing prices of “necessary” items such as water or electricity is not politically attractive and hurts those with low incomes the most. None of us like higher prices and politicians are frequently ready to solicit electoral gain by, for example, keeping the price of electricity low. Such cheap political action must be rejected. If those in need really need to be helped, then alternative mechanisms must be chosen. Providing offsetting grants or tax-credits are preferable to providing low-priced energy to the poor. The grants can be directed at helping only those who need it while, even they, will still be motivated save energy as much as possible. A resource that is provided free or at low cost will inevitably be wasted.

Although the market, has a part to play, we may have to decide that the market does not reflect the scarcity quickly enough in higher prices. If so, governments can increase the charges on the scarce resource. For example, if our forests are being used up faster than they can be renewed, an increased charge on newly harvested timber will redirect the balance. Since our forests provide benefits beyond the timber “priced” by the markets (e.g. removing carbon dioxide from the air), a charge to reflect these lost

benefits will be justified. With an increased harvesting charge, wood will become more expensive and manufacturers will be motivated to use more of the currently wasted parts of trees to produce various types of “manufactured” wood product. A charge on the output of paper mills will increase the price of “virgin” paper and reduce its use. At the same time, it will increase the demand for recycled used paper and agricultural residues that can also be used for paper making.¹⁴⁰ In fact, increased charges are likely to slow down the increase in paper use which has continued to soar in spite of the supposedly “paper-less” computer society.¹⁴¹

Overall, allowing the market price of scarce natural resources to rise to reflect its scarcity will encourage the market to find alternative sources or substitute products. Economic activity will not come to a sudden halt as our resources are used up. A tax on the scarcest resources (offset by reduced taxes elsewhere) can contribute to necessary adaptation as well as internalize the cost of pollution. Christians, also, must be prepared to accept the higher prices. To lobby against higher gasoline prices, for example, is contrary to good environmental stewardship.

8. Private Property and Preserving the Elephants

Another way, the market can be made more friendly towards the environment is by encouraging judicious use of private property in preserving wildlife species. If property, is owned individually the owners have incentives to manage the land for future use—since they will be the ones receiving the benefits. If property is held in common no one has an incentive to do so--the “tragedy of the commons”.. For example, if buffalo are raised on a private ranch, the owners have every incentive to defer harvesting of animals to ensure that the herd will grow. On the other hand, on the American frontier, were no one held exclusive rights to the buffalo, the only way a hunter could be assured of rights to a specific animal was to shoot it. Live buffalo belonged to everyone; dead ones belonged to the person that killed them—a system of property rights that led to the buffalo’s near extinction!¹⁴² Private property rights, on the other hand, has the potential to improve the situation. If fishers, for example, are assigned property rights to a specific portion of the fish stock, they will also be motivated to preserve the stock so that it can grow.¹⁴³ Long-term transferable rights to forests will also motivate forestry companies to log in such a way that the forests will be renewed for the future.

In that light, “The Ivory Bandwagon”, Chapter 10 of Rethinking Green, Kaempfer and Lowenberg provides a fascinating exposition of an October 1989 decision by the Convention on International Trade in Endangered Species of Wild Fauna and Flora to classify the African elephant as an endangered species and make trade in ivory illegal.¹⁴⁴ That blanket ban on ivory trading remained in effect until 1997 at which time it was partially lifted to permit limited trading of existing ivory stockpiles. This ban, although opposed by many knowledgeable conservationists, was instituted based on strong lobbying from Western environmental groups in order, supposedly, to prevent further illegal poaching of elephants.

Unfortunately, in a form of modern imperialism, this ban effectively placed the full social cost of conservation onto the African range states who received few of the apparent benefits. Elephants, for all their environmental appeal, do a considerable amount of damage to livestock and crops and are extremely dangerous to humans. A herd of elephants can range over an area of three thousand square kilometers and devastates an area like a small tornado, snapping off branches and uprooting trees. It is no wonder that Africans who compete with them for land and food have strong incentives to kill them! In fact, rural Africans have traditionally hunted elephants using their hides for clothes, shields and containers and ivory for ornamental carvings and jewelry. By the 1950s East Africans engaged in widespread commercial hunting to supply meat and skins to a growing population and to trade ivory abroad. Africans who considered wild animals as potentially life-threatening liabilities escalated the hunting in post-independence Africa.

The European powers with African colonies had begun to institute wild life parks which sought to

preserve wildlife in pristine national heritage parks—primarily for the benefit of foreign visitors. Human populations were relocated to areas outside the parks, often resulting in disruption of their agricultural economies and consequent impoverishment. However, elephants proved notoriously difficult to confine and, by roaming around areas outside the designed parks, became pests to African farmers and ranchers who were then even more inclined to shoot them. Moreover, the East African countries cannot afford the necessary game wardens to enforce laws against hunting and poaching. A far from adequate number of severely underpaid wardens are easily bribed to ignore, and even assist, poachers. In countries where poaching was a serious problem—Tanzania, Kenya, Congo and Zambia—government officials at the highest levels have been involved in the ivory trade.

With communal ownership of the parks, all the usual problems of government ownership apply. Officials who have no personal financial interest in the outcome must manage the parks for the general social benefit of the nation and foreign visitors. Although the parks generate large tourist revenues, pervasive corruption siphons off revenues at all levels of government and few of the benefits trickle down to the rural Africans living in the area. Unless they become poachers themselves, rural Africans receive little benefit from wildlife conservation. Yet they pay the price of living with the wildlife; their personal security and property are constantly threatened by marauding wildlife. Preserving wildlife through separation in parks has not adequately counted all the costs involved!

A more successful approach appears to be one of consumptive utilization in which the rural Africans in the area receive some of the benefits of ownership of the wildlife—although indirectly. This approach recognizes that people cannot realistically be separated from wildlife and that the future of the wildlife depends on the willingness of the people to tolerate the wildlife. Thus the people must be compensated for damages caused by the elephants and they must gain tangibles benefits. The most successful programs provide certain community rights to the local people who live among or adjacent to the wildlife. Some of the commercial revenue that comes from tourism, hunting or sale of animal products such as meat, hides or ivory accrues to the community. They, thus, have an incentive to protect them from poachers.

As an example, Kaokeveld in Namibia experienced large-scale poaching in the mid-1970s. Garthh Owen-Smith, a Kaokeveld conservationist devised a “consumptive utilization” plan in which the local pastoral people who faced extreme poverty as drought devastated their livestock were hired as volunteer rangers and villagers were encouraged to make crafts for sale to tourists. A local Conservation and Development Committee was established which received a tax of \$10 per tourist—paid by tour companies, safari operators and game lodges. The volunteer auxiliaries were far more successful in identifying and tracking poachers and the program succeeded in curbing poaching. Utilization of the resource with significant benefit to those immediately affected—giving them an ‘ownership’ interest—was successful. A significant portion of the proceeds must accrue to the affected locals instead of the major part of the revenues going to the national treasury. In addition, some utilization of elephants and sale of ivory-- rather than a complete ban-- is necessary to provide revenue for conservation. Some elephants must die to protect the many! An outright ban on ivory sales, on the other hand, had the effect of exacerbating the decline of the African elephant!

Ownership rights are also at issue when government seeks to protect species on private land. The U.S. Endangered Species Act (ESA) gives the U.S. Fish and Wildlife Service (FWS) wide responsibilities and the “authority to preserve each listed species without cost.” Any habitat, public or private declared important to threatened or endangered species can be placed under use restriction by FWS bureaucrats without regard to costs to the owner—whether private or other weighing of costs and benefits; no trade-offs need to be made.¹⁴⁵ There is, thus, no limit to the amount of land that may be devoted to protecting habitat. In these decisions, the cost of land (and the opportunity cost of other uses) is then considered to be zero. Obviously, other alternative, less costly conservation measures such as professional services and education appear more expensive in the FWS calculations and are ignored. Society as a whole and FWS project managers benefit while the landowner, like the rural people living among the elephants, pay the price. Is that justice?

An unintended consequence of such policies is that, in this sinful world, private landowners have an incentive to manage their land in such a way that listed species will not find the land attractive. Landowners can gain by cooperating with their neighbors to learn and teach techniques for preemptive habitat destruction—even though these species would normally be welcomed on the land were it not for the uncompensated financial harm imposed by the ESA. For example, if listed red-cockaded woodpeckers are seen in the neighborhood, landowners have harvested their forests before normal harvest age in order to make their forests unattractive to other colonies of these birds which prefer old-growth forests for their nests. Such unintended negative effects have been observed for some time.¹⁴⁶

The solution to the problem would, of course, be to require the government to compensate the landowner for the restrictions or to acquire the property. In that way, these costs would at least be considered in the species preservation decision. However, government ownership does not force any recognition of trade-offs unless they are made explicit. Governments are subject to lobbying by environmentalists who expect all wildlife to be protected at all costs. Environmental groups, for example, categorically reject any drilling for oil on sensitive publicly owned land. When they themselves own the land, they are, however, prepared to be less absolute. The Audubon Society, for example, owns a 26,000-acre preserve in Louisiana that provides a home for fish, shrimp, crab, deer, ducks and wading birds while providing a resting and feeding stopover for more than 100,000 migrating snow geese each year. The sanctuary also contains commercially valuable reserves of natural gas and oil. One would expect the Audubon Society to exercise its ownership rights to ensure no drilling in the sanctuary. Ownership, however, has given them a different perspective. It has, in fact, permitted drilling and collected more than \$25 million in royalties. Faced with a trade-off, the Society decided that some drilling was worth the extra money which it could use better in other ways to reach its environmental objectives such as purchasing additional wildlife habitat.¹⁴⁷

Policies to preserve endangered species should, therefore, recognize the unintended consequences of unjust, uncompensated encroachment on private property. They should also be open to considering ways to make those affected receive the benefits of environmental protection, e.g. the rural Africans in and around game preserves, so that they have an ownership interest in “preserving the elephant”.

9. Conclusion

Overall then, the impact of bad neighborhood effects on the environment means that the use of private property cannot be left without controls. Without such controls, the market is definitely a foe of good environmental stewardship. Christian also must consider how government can best deal with this deficiency of the market. This paper has, however, made the point that such government action does not necessarily mean that the government must regulate and control in detail. Rather, government action should be aimed at motivating market participants to use their ingenuity so that the market becomes a friend of the environment rather than its foe.

Endnotes

1. See, for example, John Boersema, Political-Economic Activity to the Honour of God, Premier Publishing, Winnipeg, 1999, Chapter 2, for the Biblical derivation and implications of this principle.

2. John Calvin, Commentaries on the First Book of Moses called Genesis, translation by J. King, Eerdmans, Grand Rapids, 1948, p.125.

3. See e.g. Boersema, op. cit. Chapter 7.

4. See, for example. Steven Bouma-Prediger, For the Beauty of the Earth, Baker Academic, Grand Rapids, 2001; The Oxford Declaration on Christian Faith and Economics, Jan. 1990. para. 1-12; Calvin DeWitt, Caring for Creation: Responsible Stewardship of God's Handiwork, Baker Books, 1998, Chapters 2 & 3; .Michael Barkey, Ed., Environmental Stewardship in the Judeo-Christian Tradition: Jewish, Catholic, and Protestant Wisdom on the Environment, Interfaith Council for Environmental Stewardship and Acton Institute for the Study of Religion and Liberty, 2000; Loren Wilkinson, Ed., Earthkeeping in the '90s: Stewardship of Creation, Eerdmans, 1991.

5. John P. Tiemstra, ed., W. Fred Graham, George N. Monsma Jr., Carl J. Sinke and Alan Storkey, Reforming Economics: Calvinist Studies on Methods and Institutions, Edwin Mellen, 1990, p.259.

6. Douglas Vickers, Economics and Man, Craig Press, Nutley, N.J. 1976, p.173.

7. Ibid, p.1. See also Douglas, Vickers, A Christian Approach to Economics and the Cultural Condition, Exposition Press, 1982, p.28. and J.Douma, Milieu en Manipulatie [Environment and Manipulation], Van den Berg, Kampen, 1989, p.39,47.

8. Vickers, op. cit. 1976, p.52. See also John Jefferson Davis, Your Wealth in God's World, Presbyterian and Reformed, Phillipsburg, New Jersey, 1984, p.100, for further biblical support.

9. See Peter J. Hill, "Biblical principles applied to a natural resources/environment policy", in Richard C. Chewning, ed., Biblical Principles & Public Policy, Christians in the Marketplace Series, Vol. 4, Navpress, Colorado Springs, 1991., p.170.

10. John E. Stapleford, Bulls, Bears & Golden Calves: Applying Christian Ethics in Economics, InterVarsity Press, Downers Grove, Illinois, 2002, p.134.

11. Bouma-Prediger, op. cit., p.47.

12. Ibid, p.52.

13. Martin Mittelstaedt, "Smog pushes death rates up in Canada's cities," The Globe and Mail, May 31, 1998, p.1. In June 2005, researchers for the Toronto Board of Health found 822 smog-related deaths annually in Toronto, 818 in Montreal, 368 in Ottawa and 258 in Windsor; see James Cowan, "Smog kills 800 a year in Toronto", National Post, June 7, 2005. The Ontario Medical Association claimed 6,000 Ontarions die each year from air pollution. These estimates are, unfortunately, fraught with uncertainty and, like many other environmentally related statistics, in dispute. See Joel Schwartz, "Smog and Mirrors", Laura Green "Speculative 'results'", and Lise Tole, "Limited Relevance", National Post, June 22, 2005, p.FP23. While the seriousness of the problem may be in dispute, the disputants do not deny that we have a problem.

14. Bouma-Prediger, op. cit. p.54.

15. Lester R. Brown, Plan B: Rescuing a Planet under Stress and a Civilization in Trouble, W.W. Norton & Co. Ltd.. New York, 2003 See also John E. Stapleford, Bulls, Bears & Golden Calves: Applying Christian Ethics in Economics, InterVarsity Press, Downers Grove, Illinois, 2002, p.133ff; Calvin DeWitt, Caring for Creation: Responsible Stewardship of God's Handiwork, Baker Books, 1998, p.17ff., Steven Bouma-Prediger, For the Beauty of the Earth, Baker Academic, Grand Rapids, 2001, Chapter 2; Barend A. De Vries, Champions of the Poor: The Economic consequences of the Judeo- Christian Values, Georgetown University Press, Washington, 1998; Paul Hawken; Amory Lovins and L. Hunter Lovins, Natural Capitalism: Creating the Next Industrial Revolution, Little, Brown and Co., Boston, 1999, p. 2 and details in the introduction of each chapter and their web-site, www.natcap.org; Henk Folmer, H. Landis Gable and Hans Opschoor, editors; Principles of Environmental and Resource Economics: A Guide for Students and Decision-Makers, Edward Elgar, Aldershot, UK & Brookfield, US., 1995; Robert Costanza, John Cumberland, Herman Daly, Robert Goodland and Richard Norgaard, An Introduction to Ecological Economics, St. Lucie Press, Boca Raton, 1997, Chapter 1. Loren Wilkinson, Ed., Earthkeeping in the '90s: Stewardship of Creation, Eerdmans, 1991, Section I.

16. Brown, op. cit. p.3.

17. Ibid, p.7.

18. Brown, Lester R., Plan B 2.0, Updated and Expanded, Rescuing a Planet under Stress and a Civilization in Trouble, W.W. Norton & Co. Ltd.. New York, 2006.

19. Ibid, pp.10, 11.
20. On the other hand, Australia's, most of Africa's, Asia's and S. America's are shrinking. The issue may well be regional or local rather than world-wide.
21. Michael Barkey, Ed., Environmental Stewardship in the Judeo-Christian Tradition: Jewish, Catholic, and Protestant Wisdom on the Environment, Interfaith Council for Environmental Stewardship and Acton Institute for the Study of Religion and Liberty, 2000, p.45. That is not to say that environmentally speaking the American standards should be totally attained; others are concerned that there are serious issues with modern farming techniques, e.g., over reliance on fossil fuels and pesticides, loss of topsoil and degradation of soil quality due to chemical fertilizer use.
22. Ibid, pp.81ff.
23. Ibid, pp.97ff.
24. Wilfred A., Beckerman., A Poverty of Reason: Sustainable Development and Economic Growth, The Independent Institute, 2003, p.15. One of my colleagues, characterizes this as "an incredibly optimistic view". He noted "Global stores of grain have shrunk for 6 or 7 years in a row and are at their lowest in over 30 years." See Lester R. Brown. "World Grain Stocks fall to 57 days of consumption", www.earthpolicy.org/Indicators/Gran/2006. Certainly, there is no denying that in many poverty stricken countries many are starving and undernourished. But, is that caused by the world inevitably running out of food or the (nevertheless, critical) problem of individual country/regional scarcities that can, and should, be dealt with by better agricultural, economic and political policies (locally and internationally)?
25. Jeremy Brown and Milagros Palacios, The State of Urban Air in Canada, digital publication at <http://www.fraserinstitute.ca/admin/books/chapterfiles/UrbanAirXsumIntBios.pdf#>. They note:
- Ambient levels of sulphur dioxide decreased 72.2 percent from 1974 to 2001
 - Ambient levels of particulate matter decreased 50.7 percent from 1974 to 1999.
 - carbon monoxide levels decreased by 30 percent from 1974 to 2001
 - lead levels fell 94 percent from 1974 to 1998
 - nitrogen oxide levels decreased 34.4 percent from 1974 to 2001
- Why then, are "smog alerts" increasing?
26. Brown, op. cit. p.156.
27. John R. Schneider, The Good of Affluence, Eerdmans, Grand Rapids, 2002, p.49 ff. That is not at all intended to down play the importance of the environment. On p. 53, Schneider, for instance, writes "while insisting on the supremacy of human beings, the dominion-theology of Christians must ...also be a rich source of energy for a fierce, but theologically well-formed environmentalism.
28. See also Hill op. cit., p.172; Douma, op. cit. p.39, 45.
29. E. Calvin Beisner, Prospects for Growth: A Biblical View of Population, Resources, and the Future, Crossway, Westchester, Ill. 1990, p.132.
30. Brown, op. cit. p.200.
31. See Stapleford, op. cit., p. 77 re the U.S. Clean Water Act of 1972 as an example; François Lévêque and Alain Nadaï, "A firm's involvement in the policy-making process" in Folmer et. al., p.307 re firms' obstructive action in Europe. Not all such resistance is, necessarily, driven strictly by greed—to generate huge profits for managers and shareholders. Maintaining existing employment and even business survival may be at stake.
32. Barkey, ed. p.48.
33. Ibid, p. 74.
34. Robert D. Sopuck, "Free-market environmentalism works?", National Post, Oct. 21, 2005, A17. Sopuck is Director of the Rural Renaissance Project for the Frontier Centre for Public Policy.

35. See, for instance, Boersema, op. cit., p. 162ff.

36. Hawken; et. al., op. cit. See, particularly, p.78ff. for recycling to generate “born-again materials”.

37. Op. cit. p. 13.

38. Op. cit. p.xi.

39. Dinesh D’Souza, The Virtue of Prosperity, Free Press, New York, 2000, pp.121, 147. Nevertheless, we reiterate that Natural Capitalism makes a very significant contribution. However, there is much that appears overly optimistic. We note, in particular, another theme that is debatable at least—the focus on service and flow. That is, they suggest an increasing beneficial trend to leasing rather than ownership. Manufacturers retain ownership of the capital goods, the photocopier, the furnace and even carpets and charge for the service—warmth, beauty and comfort—provided. Theoretically, the manufacturers then will be responsible for continuous repair, reuse and remanufacture/recycle. The problem is, however, that in the process the advantages of ownership are lost. There is less incentive to take care of the product and make it last. Moreover, automobile leasing, for example, (see Hawken et. al. p.19) does not really encourage continued use. Rather, automobile dealers still have every incentive to sell new cars with a new lease.

40. Hawken, et. al., p. xiii.

41. Op. cit. p.2.

42. As well as examples of companies that have actively sought to innovate in others ways. See also p. 317.

43. Op. cit. p.82. See also rest of this chapter for further examples.

44. Op. cit. p.266.

45. See also Skea, in Folmer et. al., op. cit. p.396.

46. Op. cit. p.267.

47. This use of a short payback is not necessarily limited to engineers. This bias is valid when a great deal of uncertainty exists as to the life of a product, e.g. for auto parts manufacturers who build a part for a specific car model, but is easy to overdo. See also Hawken et. al. p.111ff. for further deficiencies in the education of engineers.

48. Op. cit. p.270. Yet major savings appear to be available; see p. 63.

49. Op. cit. p. 90,91.

50. Hawken et. al. p.271.

51. Skea in Folmer, et. al., op. cit. p.396.

52 .See Robert N. Anthony and Vijay Govindarajan, Management Control Systems, McGraw-Hill Irwin, 11th Ed., 2004, p.496.

53. See H.Landis Gabel and Bernard Sinclair-Desgagné, “Corporate responses to environmental concerns”, in Folmer et. al., p.350 and Corbett and Van Wassenhove in Folmer, et. al., op. cit. p. 434.

54. Op. cit. p.92.

55. Gabel & Sinclair-Desgagné, op. cit. p.351.

56. Ibid, p. 354.

57. Corbett and Van Wassenhove in Folmer, et. al., op. cit. p.416, 417 suggest that pollution abatement expenditure can be categorized in three groups. The first group are those situations in which pollution prevention pays; the benefits of pollution reduction are large and easy to justify economically under current conditions. In other cases, the economic benefits of improving environmental performance are significant but less obvious. Education and training is required to ensure that managers are made aware of the latter group. The third type are those which cannot be justified economically under current conditions. For these,

government will need to provide additional incentives or requirements to have them implemented. One wonders, whether at this stage many of the first group, the “low-hanging fruit” have now been implemented.

58. See Hoover, op. cit. p.56.

59. Chewning, op. cit., p.147.

60. Ibid, p.154.

61. See Hoover, op. cit., pp. 67-68. We must, however, count the cost of all such regulations; the minimum wage, for example, which Hoover suggests we should support in order to “remove competitive advantage from those who have no concern or compassion for their workers” is questionable since it is likely to increase the problem of unemployment. Hoover appears to consider this acceptable since it will move those who lose their job to “unemployment compensation and retraining”. Would we not be better to provide supplementary compensation and keep them employed?

62. Brown, op. cit. p.209.

63. Ibid. p.153.

64. Lévêque and Nadaï, in Folmer et. al., p.317.

65. Zylicz, op. cit. p. 166. Costanza et. al. p.211.

66. Barde, op. cit., in Folmer et. al. p.207.

67. Jim Skea, “Environmental technology”, in Folmer et. al. p.393.

68. Lévêque and Nadaï, in Folmer et. al., p.301,303.

69. Barde, op. cit., claims that industry often prefer to be subject to direct regulations rather than taxes and charges since the latter are much more difficult to negotiate and evade.

70. Stapleford, op. cit., p. 140.

71. Zylicz, op. cit. p.171.

72. See Hawken et. al. p.104ff., Barde op. cit. p.207.

73. Ibid, p.274.

74. In Higgs & Close, op. cit. p.314ff.

75. That is not always the case since timing may be an issue. François Lévêque and Alain Nadaï, in Folmer et. al., p.306 & 318 describe the case when in 1984 Germany pre-empted an ongoing debate on clean car technology by specifying emission standards so stringent that only the catalytic converters developed by German industry could meet them. The French industry, on the other hand, had been working on clean engine technology which had not yet reached the same level of certainty. The German standard was subsequently adopted in the EU context giving the German companies a significant first entry advantage.

76. Costanza et. al. p.193,196.

77. These regulations need to be restructured so that the utilities are motivated to reduce their customers’ energy use. Such a properly structured system allowed Pacific Gas and Electric Company, the U.S.’ largest investor-owned utility to increase its 1992 profits by \$40 million while saving customers nine times that much. In California alone, efficiency investments encouraged by a restructured incentive system permitted customers to save a net present value of \$2 billion during the period 1990-1993. See Hawken et. al. p.273.

78. See also Hawken, op. cit. p.278.

79. Zylicz, op. cit. p. 171.

80. Hawken et. al, op. cit. p.46,84,106.

81. Skae, op. cit. p.305

82. It would be impossible to determine these costs exactly but that is not necessary. Rough approximations will suffice to justify setting relevant charges. See Brown, op. cit. p. 208 for some estimates.

83. See R. Kerry Turner, "Waste Management" in Folmer, et. al., op. cit. p. 456. He notes, p.462, that waste disposal may require a large combination of economic instruments. The policy package to reduce packaging and package waste, for example, includes "a packaging waste tax, landfill disposal levy/tax, tax concessions for increased use of recycled materials in the product, deposit refunds, tax on virgin materials, household waste charges, recycling credits and credits to encourage energy recovery from waste schemes."

84. Ibid.

85. Hawken et. al. p.218. See also Brown p. 114 & 115. Charging higher prices will motivate users to improve water productivity by, reducing seepage from irrigation canals by, for example, lining them with plastic sheeting or using more efficient irrigation technology and even to encourage the use of waterless toilets (p.127) and reusing water through closed systems (p.128).

86. Brown, op. cit. p. 212.

87. Hawken et. al. p.43. See p. 167 for further examples of possible green taxes; Brown, p.211.

88. Lawrence Solomon, "London's Green Streets", National Post, Feb. 19, 2004, FP11.

89. Lawrence Solomon, "Tolls gather speed", National Post, May 28, 2005, FP19.

90. See also Lawrence Solomon, "How meeting Kyoto goals can save Canada money", National Post, Sept. 4, 2002--
<http://www.urban-renaissance.org/>

91. Indexation for inflation of the agreed amounts may be necessary to ensure that the severity of the charge is not eroded. Barde, op. cit., in Folmer et. al. p.214.

92. Zylicz, op. cit. p.161.

93. Hawken et. al., op. cit. p.249.

94. Op. cit. p.253. Hawken et. al. argue that in spite of the attention grabbing effect of such large price increases, protecting the environment does not require higher energy prices. While that is an attractive conclusion, their justification is not totally convincing. While, no doubt, the ability to respond to increasing prices is important, the creation of an "informed, effective, and efficient market in energy-saving devices" will hinge on adequate price signals. The higher the price of oil, the more likely it is that a market for energy saving devices will emerge. In any case, as oil becomes scarcer the price will inevitably rise.

95. Barde, op. cit., in Folmer et. al. p.221.

96. Brown, op. cit. p.154. Prince Edward Island has a reported return rate of 97% (based on report on the web site www.bottlebill.org), meaning that most bottles are returned an average of 30 times for potential refilling.
<http://greenyes.grn.org/2002/03/msg00290.html>

97. Karl-Gustaf Löfgren, "Markets and externalities", in Folmer, et. al. p.26.

98. Hawken et. al. pp. 278, 321 note that "while there may be no "right" way to value a forest, a river, a child, the wrong way is to give it no value at all". In any case, such charges can, and should, be instituted in a gradual manner to avoid major disruption. Beginning with a small charge, it can be gradually increased over time until the desired goal is reached.

99. Barde, op. cit., in Folmer et. al. p.215.

100. Brown, p. 114.

101. L. Hordijk in W.G. Rietkerk et. al., De Schepping in Schone Handen [Creation in Clean Hands], GSEV, De Vuurbaak, Barneveld, 1996.

102. Brown, op. cit. p.213 argues that 2,500 economists have endorsed the concept of tax shifts.
103. Hawken et. al. pp.165, 166; Costanza et. al. p.216; Brown, p.174,210.
104. Barde, op. cit., in Folmer et. al. p.217.
105. See Brown op. cit. p. 214.
106. Hordijk, op. cit. p.43.
107. See Brown, op. cit. p. 49 for statistics on land used for roads and parking.
108. Fred E Foldvary and Daniel B. Klein, "Public policy must keep pace with technology", Financial Post, Apr. 23, 2003. FP17.
109. See Robin Kendrick Klay, Counting the Cost: The Economics of Christian Stewardship, Eerdmans, Grand Rapids, 1986, Chapter 6; Beisner, op. cit., p.217; Hill op. cit, p.176ff; Bob Goudzwaard and Harry de Lange, Beyond Poverty and Affluence: Towards a Canadian Economy of Care, University of Toronto Press, Toronto, 1994, p.137; Barde, op. cit. in Folmer et. al. p.220, Costanza et. al.p.205.
110. Timothy Appleby, "Polluters Cough up Cash," The Globe and Mail, Dec. 31, 1993.
111. As an alternative to an initial allocation of rights to each company, the initial permissible rights can be auctioned off.
112. If the rights are auctioned off, the total amount available for auction can be reduced over time.
113. Löfgren in Folmer et. al p.30ff.
114. Robert Sheppard, "How much am I bid for a pair of carbon-dioxide credits?" The Globe and Mail, Jan 17, 1998.
115. Hawken et. al. p.258.
116. The ability to trade pollution rights between countries entailed in the Kyoto Protocols to reduce the emission of "green-house" gasses illustrates a rather ineffective initial distribution. Given the reduction in economic output caused by the demise of the Soviet Union, Russia has excess quota to sell. If Canada, for example, purchases these rights to meet its Kyoto commitments, a significant transfer of money will occur without any actual impact on the environment. Without growing economies such as China, India and Russia being subject to at least a modicum of reduction, the protocol appears unfair.
117. Ibid, p.279.
118. Hawken et. al., p.280.
119. See Skea in Folmer et. al., op. cit. p. 404 for this and other examples.
120. Ibid, p.409.
121. Folmer et. al. p.26.
122. See Brown, p.148 for examples.
123. Ibid p.155.
124. See Brown, op. cit. p. 158, for discussion of the potential of wind-energy. An essential part of encouraging wind energy will also require a regime in which ready buyers are assured for the generated power (possibly using two-way or "net metering", p.174). Back-up facilities also need to be available; wind, unfortunately, does not blow continuously. The Canadian Federal Government in its 2005 Budget provided more incentives and faster tax write-offs for "Emerging Renewable Energy" including wind generation.
125. Ibid p.162ff.
126. Ibid p.213.

127. Lawrence Solomon, "Flying windmills", National Post, March 19/2005 (posted at <http://www.urban-renaissance.org>)
128. Ibid p 160. See also Brown, p. 78 who notes that at its peak, the subsidy was as much as \$90,000 per worker.
129. Ibid p. 161,162.
130. Brown, op. cit. p.78.
131. Ibid, p. 215.
132. Ibid. See also pp.192, 206, 215. Another examples of misguided subsidies was India where in 1997, the government of Punjab provided free electricity to farmers for irrigation. With no incentive to curb power use, farmers expanded the acreage devoted to water-intensive crops and ran their pumps indiscriminately, seriously depleting groundwater reserves (Brown, op. cit. p.116. The Tunisian government tried to protect herders from wide income fluctuations during drought by subsidizing feed imports. This allowed herders to increase their herds continually while, without the subsidy, herd sizes contract during droughts. The continually increasing herds put pressure on the limited grazing land and contributed to land degradation. Subsidizing the herders directly instead of the feed imports would have prevented the problem. See Mohan Munasinge, Wilfrido Cruz and Jeremy Warford, "Are Economywide Policies Good for the Environment?" Finance and Development, September 1993, p. 41. Other examples are also provided.
133. Hawken et. al, op. cit. p. 192. See also p. 200. A cup of yogurt consumed in Germany required 5,650 miles of transportation. See also Zylicz, op. cit. p. 172.
134. Lawrence Solomon, "How meeting Kyoto goals can save Canada money", National Post, Sept. 4, 2002--<http://www.urban-renaissance.org/>
135. Zylicz, op. cit. p. 172.
136. Barde, op. cit., in Folmer et. al. p.217.
137. <http://www.globalpolicy.org/soecon/glotax/aviation>, Hawken et. al. p.167.
138. Brown, op. cit. p.139. Note that, while some aquaculture, e.g. salmon in ocean pens has received a bad name, the increase noted by Brown relates for a large part to fish such as carp, catfish and tilapia grown in inland ponds.
139. Op. cit. p.141.
140. Hawken et. al suggest that in 1984 agricultural residues available exceeded 280 million tons a year—equal to the entire world consumption of paper.
141. Op. cit. p.172.
142. Ibid, p.102.
143. Jari Kuuluvainen and Olli Tahvonen, "The economics of natural resource utilization", in Henk Folmer et. al. p.121.
144. William H. Kaempfer and Anton D. Lowenberg in Higgs & Close, op. cit., Chapter 10. See also Barkey, ed., op. cit., p.56.
145. Richard L. Stroup, "Free Riders and Collective Action Revisited", in Higgs & Close, op. cit. p.215. John Brätland makes similar points concerning offshore drilling. He argues that government is not even able to adequately consider the opportunity costs involved. He concludes, among other alternatives, that property rights be strengthened by tort law be reapplied to all externalities possibly caused by off-shore drilling—i.e. let those victimized sue for redress
146. Ibid, p.216 & Barkey, ed., p.106.
147. Dwight R. Lee, "To Drill or Not to Drill; Let the Environmentalists Decide", in Higgs & Close, op. cit. p. 245ff.