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***The Environmental Responsibility of Business is to Increase its Profits (by
Creating Value within the Bounds of Private Property Rights).***

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Abstract:

Proponents of corporate social responsibility (CSR) typically consider “business as usual” unsustainable. Building on historical evidence that long predates the modern environmental movement, the contrary case is made that the interplay of voluntary exchange, private property rights and self-interest has generally resulted in the so-called “triple bottom line” (economic, social and environmental) through more efficient use of materials and the continual creation of higher quality resources. However, because market processes continually eliminate less competitive firms and tend to concentrate business activities geographically, political pressure brought to bear by adversely affected vested interests often results in the creation of policies that cause greater environmental harm than would otherwise be evident. Environmental CSR proponents often misinterpret these government failures as market failures, and characteristically advocate policies that further distract firms from their core objective and resulting triple bottom line. The essay concludes by arguing that the most promising path towards truly sustainable development lies in the unwavering pursuit of profitability within the bounds of well-defined and enforced private property rights.

Introduction

Much thinking on corporate social responsibility (CSR) is based on a perceived trade-off between “business as usual” and environmental protection.¹ According to this perspective, the search for increased profitability results in unmanageable pollution problems, the depletion of non-renewable resources, habitat and species destruction, and a regulatory “race to the bottom” among competing jurisdictions (Hay et al. 2005). Historical evidence that long predates the modern environmental movement and can therefore avoid charges of “greenwashing,”² however, suggests a different reading. In short, it is the interplay of voluntary exchange, private property rights and self-interest that typically generates the so-called “triple bottom line” (economic, social and environmental) while CSR proposals that distract business from its traditional objective of increased profitability very often prove incompatible with truly sustainable development.³

The paper is structured as follows. The first section elaborates on the insight of economist and demographer Mikhael S. Bernstam (1990) that changes in the amount of wastefully used resources, rather than increased production and consumption levels, ultimately determine the relationship between economic growth and pollution. Next, the essay strives to establish why traditional market incentives, such as the profit motive and private property rights, have long promoted increased efficiency in the handling of inputs and the continual creation of higher quality resources out of raw natural substances and industrial residuals. This invisible hand’s “green thumb” has, in turn, ultimately reduced environmental pressures even when there was no conscious effort to this end, resulting in what engineer and policy analyst Indur M. Goklany (2007: 10-11) has termed an “environmental transition” (ET).

The second section explains that many seemingly unsustainable business practices can ultimately be traced back to widespread governmental failures towards the environment - such as the mismanagement of publicly owned resources and ecologically damaging subsidies - that are in the end politically motivated responses to two frequent consequences of market processes: 1) the constant disappearance of less productive firms (and the parallel rapid growth of successful firms); and 2) the geographical concentration of economic activity. Since innovative business behavior subverts the status quo, defenders of the status quo - both in the business and political spheres - typically exert pressure on elected officials

1 Vanberg (2007) identifies three versions of CSR-demands: 1) “soft” (concerned with how socially responsible corporations ought to play the market game within existing rules); 2) “hard” (concerned with how the rules of the market ought to be changed in order to induce ‘socially responsible’ corporate behavior); 3) “radical” (which rejects the compatibility of CSR and market incentives and calls for the adoption of some alternative economic regime). Common to all three, however, is a lack of faith in the capacity of free markets to generate wealth equitably and sustainably. In modern parlance, CSR advocates typically argue that an enterprise has more stakeholders than shareholders, and that existing market institutions do not spontaneously incorporate the interest of stakeholders in their everyday decisions. The predominant importance of environmental issues in the CSR literature is documented by Lockett et al. (2006), among others.

2 As commonly understood, “greenwashing” refers to an organization that advertises positive environmental practices, while acting in the opposite way.

3 As such, the main premise of this article differs from the benefits usually attributed to better environmental performance, such as lower compliance costs, new “green technology” market opportunities, increased bargaining power for government subsidies, better employee motivation and recruiting opportunities, preferential treatment from customers and investors, and improved risk management (Hay et. al 2005; Porter and Kramer 2006; Wagner and Schaltegger 2003). For a broader critique of CSR from a market-oriented perspective, see Henderson (2001; 2004).

in order to counteract these consequences. In the spirit of economist Milton Friedman's (1970) classic (but often misunderstood) essay, a case is made that the most promising path towards sustainability lies in the constant pursuit of profitability within the rules of law (here defined as the bounds set by properly defined and enforced private property rights) and ethical custom.

1. Profitability, Markets and Corporate Environmental Performance

The fact that increased wealth can be compatible with improved environmental indicators is often conveyed through inverted U-shaped "environmental Kuznets curves" (EKC) illustrating that the emissions and/or concentrations associated with many pollutants first rise with economic development, but then fall as income exceeds a threshold level. The most common explanation for EKCs is that: 1) a sufficiently high standard of living allows people to attach increasing value to environmental amenities, which in turn leads to more stringent environmental standards and stricter enforcement of environmental laws. Other possible explanations include: 2) an economy-wide structural change to service and information-based economic activities which are less pollution intensive than physical production; 3) the displacement of dirty industries from advanced to less developed economies; and 4) the growing ecological efficiency of production and consumption by means of a 'greening' technical progress (Pasche 2002; Dinda 2004).

While a proper discussion of the first hypothesis is beyond the scope of this paper, the second seems questionable in light of the significant growth of manufacturing output in the most prosperous advanced economies over the last three decades (Pilat 2006; Ikenson 2007).⁴ The third, long considered invalid principally because of the small fraction of total costs represented by pollution abatement regulations, has gained some credence in recent years, although the econometric evidence supporting it has remained elusive (Levinson 2009). The fourth hypothesis, however, remains virtually unexplored, as virtually all environmental improvement in the EKC framework is attributed to economic development and resulting pressures for greater environmental quality from a wealthier population.⁵ One attempt to address this shortcoming is Goklany's (2007) "environmental transition" hypothesis.⁶ Unlike EKC theorists, this author postulates that economic growth *and* technological change acting in conjunction initially cause environmental degradation, but that it is later reversed as quality of life improves beyond a certain point. In the first stage, individuals are able to meet their basic needs (such as food, clean water, sanitation, basic medical and public health services, education, etc.). Once this is achieved, they address environmental concerns resulting from both previous poverty (such as deforestation, indoor

4 While manufacturing employment might have declined in absolute terms in recent years, manufacturing output nonetheless increased significantly in advanced economies in recent decades. For example, in dollar value of production adjusted for inflation, the United States' share of global manufacturing over the last few decades has hovered around almost one-fourth of global manufacturing despite the contraction of its manufacturing workforce from a high of 19 million workers in 1979 to about 14 million today. Despite its recent spectacular growth, China still represents only about one-tenth of world manufacturing (Goodman, 2007).

5 The EKC literature pays much lip service to the notion that, as income grows, production and consumption patterns, along with political governance, become increasingly "green," but it remains vague on how this is actually achieved in practice. An exception is Yandle's (2004) discussion of "[institutional] stories about turning points" based on principles compatible with free-markets.

6 The term "environmental transition" seems to have surfaced in the published literature around 1995 in the work of Goklany (1995) and Antle and Heidebrink (1995)

air pollution, etc.) and later industrialization (such as outdoor air and water pollution, etc.). While long on a large array of data and time-series illustrating the results of technological change (such as, for example, increased crop yields over time), Goklany's contribution is less detailed regarding the incentives and social processes that facilitated or hindered the spontaneous "greening" of industry. The remainder of this paper will address these issues by looking at the impact of basic market incentives on economic production behavior and the recurring political patterns of outcome they triggered.

Profits, Growth and the Environment

Resources are limited while human needs and desires are not. In a free-market, the interaction of supply and demand results in prices that reflect the relative scarcity of physical and intellectual resources. Profits and losses are then generated by individuals' relative ability to combine scarce inputs in order to provide products and services that consumers value more than available alternatives. Over time, goods that are more valuable than the sums of the inputs taken separately get produced, while goods worth less than the sum of their inputs are not. In this context, the appropriate measure of a firm's success in creating value is long-term profitability.

Some theorists and many environmental activists, however, argue that market incentives foster a short-term perspective in which production costs can be reduced and/or profitability increased through overexploitation of natural resources and polluting emissions that are not properly factored into the costs of production activities. The theologian John B. Cobb Jr. (undated) for example argues: "Keeping costs low often requires actions that are environmentally destructive," while failure "to take such actions when similar ones are taken by competitors can have severely detrimental effects on a corporation." Physiologist and geographer Jared Diamond (2005, p. 483) suggests that, "depending on the circumstances," a firm "really may maximize its profits, at least in the short term, by damaging the environment and hurting people."⁷ This perspective is also shared by leading environmental economist Robert Stavins (2004, p. 12) who argues that "[i]f the market is left to itself, too many pollution-generating products get produced," a point summed up in the following way by economists Marie-François Calmette and Isabelle Péchoux (2006, p. 184): "It is well known that polluting agents need to be induced to internalize the social cost of pollution damage, otherwise they will engage in excessive levels of emission of pollutants." Management professors Roland Geyer and Tim Jackson (2004, p. 56) further argue that traditional supply chains are based "on a linear production paradigm which relies on constant input of virgin natural resources and unlimited environmental capacity for assimilation of wastes and emissions." In their opinion, "there is general agreement that this is causing environmental costs on a large scale and of a

⁷ While a growing number of writers have suggested that improvements in resource use can reduce waste and increase profitability, most of them assume that such behavior wasn't typical of past corporate practices. For example, Hawken et al. (1999, p. 5) argue that business and environmental interests increasingly overlap, but that traditional capitalism was a "financially profitable [but] unsustainable aberration in human development" rooted in wasteful practices that resulted in ecological strain causing, among other things, loss of forests, topsoil, fisheries and freshwater. Despite their description of numerous economic and environment "win-win" cases, Porter and van der Linde (1995, p. 99) write that we are currently in "a transitional phase of industrial history where companies are still inexperienced in dealing creatively with environmental issues" and where, because the environment "has not been a principal area of corporate or technological emphasis," knowledge about environmental impacts "is still rudimentary in many firms and industries, elevating uncertainty about innovation benefits."

systematic nature, which cannot be fully addressed by traditional supply chain management.”

This alleged market failure is nonetheless hard to reconcile with the fact that a firm’s survival is directly dependent upon the capacity of its owners and employees to create as much value as possible from costly inputs. In the words of businessman Charles G. Koch (2007: 104): “It is easy to fall into the trap of a single-minded emphasis on cost reduction. Cost is only one component (although a critically important one) of value creation. If your goal is to lose weight, you could accomplish this by cutting off your leg, but that is hardly beneficial. Cost-cutting for its own sake can be just as shortsighted and can seriously damage future profitability. It is more appropriate to focus on eliminating waste.” As scientist Jesse Ausubel (1998, p. 39) puts it: “Pollution and waste usually indicate inefficiency. In an economy of competing companies, inefficiency is for losers. So, over the long run, successful companies are going to be green and clean.”

Building on this commonsensical insight and on his comparative work on the diverging environmental performance of market economies and centrally-planned economies (with the former becoming wealthier and cleaner over time, while the latter stagnated or regressed while becoming increasingly polluted), Bernstam (1990, p. 348) suggests that the elimination of waste, rather than increased production or consumption, ultimately determines the impact of economic growth on the environment. In this perspective, “waste” includes not only “economically useless production” such as slag, refuse, scrap, spills, discards and other processing losses, but also “destroyed primary resources” and “losses of intermediary and final output in transportation and storage.”⁸ Thus when the growth in output exceeds the growth in resource input required, increased material wealth will be created while pollution levels decline. On the other hand, a poorer economy that uses a smaller amount of resources less efficiently will experience greater environmental damage. In 1987, for example, industrial and domestic air pollutant concentrations were five times higher in the USSR than in the USA, despite the fact that the former’s GDP was only half that of the latter.⁹ Similarly, more tropical rainforests will be felled when livestock production, processing and distribution is less efficient than it could be. Greater livestock production can thus be perfectly compatible with more benign environmental repercussions when more efficient methods are used. In other words, the impact of human activity on the biosphere is not a function of the amount of resources produced from it in the first place, but of the amount released from the economic sphere back into the biosphere. As will now be argued, the concomitant fear of resource exhaustion is similarly debatable.

8 This distinction has a long history and, interestingly in light of Bernstam’s work, was often used as a key argument in favor of central planning by authors who argued that it would, among other things, eliminate the unnecessary duplication of productive units, the production of unnecessary goods and minor variations in finished goods in the same industry that were said to be endemic in market economies (Spooner 1918; Chase 1925).

9 To be more explicit as to the causes of this divergence, while resource pricing in the West is a function of supply/demand, both the impressive levels of growth (as opposed to development) achieved and the durability of the Soviet system owed much to the (wasteful) mobilization of huge volumes of inputs (labor and natural resources) that were essentially free goods.

Resource Creation and Utilization

According to what is sometimes referred to as the “resourceship” paradigm (McDonald 1995; Bradley 2007), “resources are not, they become” in that they are neither fixed nor finite, but are created by renewable human intellect in an economic context where businesses transform and manipulate a variety of otherwise valueless inputs to generate saleable outputs (Zimmermann 1951/1933; De Gregori 1987; Simon 1995, 1996; Bradley 2007; Brätland 2008).¹⁰ Historical evidence suggests that the profit motive has long acted as a powerful incentive to progressively increase the efficiency of material use. This is accomplished in two ways: Firstly, by changing the material resources used by developing valuable inputs out of previously worthless raw materials, and, secondly, by transforming industrial wastes into sought-after intermediate products. Each of these processes resulted in significant environmental improvements, even when no priority was given to the issue. In turn, the same practices incidentally promoted sustainable development, which is here defined as wealth creation through innovative activities with net economic, social and environmental benefits.¹¹ I now turn to a more detailed examination of these fundamental processes.

Increased Efficiency - Dematerialization

One of the most forceful statements on the social benefits of more efficient material use belongs to Jonathan Swift (1727, non-paginated, book II, chapter 7) who, through his fictional King of Brobdingnag in his classic *Gulliver's Travels*, argued that whoever “could make two Ears of Corn, or two blades of Grass to grow upon a Spot of Ground where only one grew before, would deserve better of Mankind, and do more essential Service to his Country than the whole Race of Politicians put together.” The French economist Nicolas Baudeau (1910 [1767], p. 46, my translation) reported efforts in this direction a few decades later by observing that the goal of large agricultural operations was “firstly to double, triple, quadruple, or increase tenfold if possible the harvest on a particular piece of land; secondly to reduce the amount of labor employed to one half, one third, one fourth, or one tenth, whatever possible.”

Despite his belief in decreasing returns to additional agricultural investments, the economist John Stuart Mill (1848, non-paginated, Book I, chapter 12) also described advances that enabled “the land to yield a greater absolute produce, without an equivalent increase of labour,” but also others that “have not the power of increasing the produce, but have that of diminishing the labour and expense by which it is obtained,” in the process liberating them for other valuable uses. Examples of the first included the abandonment of

¹⁰ The perspective adopted in this essay, of course, in no way implies that other life forms only have a right to exist inasmuch as they are of some use to human beings.

¹¹ Although there are various takes on the issue, “sustainable development” is usually defined as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” As Beckerman (2002; 2007) points out, however, this definition is problematic on many counts. First, “needs” is a subjective concept which will be interpreted differently by people with different wealth and cultural backgrounds. It therefore provides no clear guidance as to what needs to be preserved for the future. Furthermore, whatever concept of “needs” is used, no generation has ever fulfilled all of them. As Beckerman further argues, and as will be discussed in more detail in the main text, the common understanding of sustainable development further rests on two related and indefensible propositions, i.e., the fear of resource exhaustion and the resultant implication of intergenerational justice “obligations.”

fallows, their replacement by crop rotations, and the introduction of new elements into the rotation, such as turnips and fertilizers. Examples of labor-saving technologies included better tools, instruments and “a more skilful and economical application of muscular exertion,” such as the introduction of a new plowing technique requiring two horses and one man to achieve results that had previously required three or four horses and two men.

A few years earlier, the polymath Charles Babbage (1832, non-paginated, Part I, chapter 9) had observed how advances in mechanical precision and mass production resulted in “a degree of economy in the consumption of the raw material which is, in some cases, of great importance.” For example, in the printing industry “large hemispherical balls stuffed and covered with leather” had been replaced by “cylindrical rollers of an elastic substance” which, with the later addition of steam engines to printing presses, had reduced the volume of ink needed to complete a given task by almost 65% without any visible change in the quality of the final product. Crory (1876) similarly describes numerous efficiency-improving technologies in his journalistic survey of a wide range of manufacturing activities in East London. For example, a building firm manager had supervised the construction of a timber drying-house following the best Norwegian practices to which he had added new ideas of his own. Among other improvements, the heat used to dry the timber was delivered through underground pipes in such a way as “to render safety, economy, and efficiency at once practicable and certain.” The driving machinery was similarly built underground, which again minimized the risk of accidents and economized space that, “even in such a wide area as that occupied by these Works,” was valuable (p. 87). The sharpening of saws by the use of emery instead of files was also “a great improvement” that resulted, “in a place where so much sawing is done,” into a considerable saving of money (p. 88). A contemporary of Crory similarly observed in an essay on progress that improvements depend on inventions that help humans “obtain greater effects with less expenditure of space, of time, of materials and forces” (Gore 1882: 151).

While the evidence provided by past writers might have been mostly anecdotal, numerous studies on the increased efficiency of material use over time have demonstrated the validity of their analysis (Sanbach 1978; Bernstam 1990; Rosenberg 1994a; Simpson 1999). As Ausubel (1998, p. 39) writes, “the wheels of history [have long been] rolling in the direction of prudent, clean use of resources,” whether one looks at energy, land (for agricultural and timber production), water and materials. For example:

- The US economy has averaged about one percent less energy to produce a good or service each year since about 1800;
- In the last three hundred years, the efficiency of generators has gone up from one percent of their apparent limit to about fifty percent;
- In the last two centuries, the ratio of weight to power in industrial boilers has decreased almost 100 times;
- In 1860, globally, about 1.1 tons of carbon went into the primary energy produced by the energy equivalent of one ton of oil then in the fuel mix; this amount had decreased to about 0.7 tons in 1990;

- Since the late 1960s, per capita water use in the United States has fallen at an annual rate of 1.4 percent, while absolute water withdrawals peaked around 1980 (Ausubel 1998).

Scarcity-induced price increases effectively dissuade any inefficient use of resources and encourage reductions in the quantity of inputs needed to maintain the same amount of output. The concept of *dematerialization* is now often used to characterize the decline over time of the weight of materials used in industrial end products (Chadwick 1997; Wernick et al. 1996; Cleveland and Ruth 1998; Scarlett 1999; De Bruyn 2002; Labys 2002). While it has also long been observed that increased efficiency in the use of a resource often results in a greater aggregate use or consumption of that resource (Jevons 1865; Rosenberg 1994a; Alcott 2005),¹² a case will now be made that this “rebound effect,” even if coupled with a growing population, is rarely problematic because higher quality resources are continually being created from both natural substances and production residuals.

Resource Creation - Transmaterialization

In a market economy a sustained price increase for any resource not only encourages individuals to use it more efficiently, but also to look for more of it and to develop substitutes. As a result, despite the physical finiteness of the earth, most resources for which there is a sustained demand over time have become more plentiful and affordable (Barnett and Morse 1963; Simon 1995; Lomborg 2001; Goklany 2007). The scarcity/price stimulus also provides the incentive for human ingenuity to substitute smaller volumes of higher quality or technologically more sophisticated materials for the larger volumes of lower quality materials utilized by mature industries, a process sometimes referred to as *transmaterialization* (Labys 2002). In the former case, economic incentives reward the development of innovative resource extraction processes that open up newly profitable deposits (e.g. offshore drilling, less concentrated ores). In the latter case, similar economic incentives stimulate the development of new inputs with some combination of advantages over earlier alternatives, such as being more powerful and/or abundant; stronger and/or lighter; and/or easier to produce, handle, transport and/or store.¹³ For example, whale oil was supplanted by coal gas and kerosene, which were themselves eventually displaced by electricity and the incandescent light bulb. Most energy needs in Western societies were originally supplied by wood and hay, which were eventually supplanted by coal, hydroelectric and nuclear power, oil and natural gas (Ausubel 1991; Smil 1994). Nitrogen for agricultural production was originally provided by the recycling of organic waste (such as straw and manure), the rotation of nitrogen-fixing leguminous grains (including peas, beans, lentils, and soybeans) and the plowing under of leguminous cover crops (such as clover and vetches). In time, however, better (i.e., more cost effective) substitutes were developed, including guano (desiccated sea bird excrement), superphosphates (prepared mostly by digesting powdered bones with dilute sulfuric acid), Chilean sodium nitrate,

12 For more detailed discussions of the topic, see the special issues of *Energy Policy* (Volume 28, Numbers 6-7, 2000) and *Journal of Industrial Ecology* (Volume 9, Numbers 1-2, 2005).

13 In turn, the existence of new processes and new resources, developed to meet a particular need, inevitably gives rise to other applications (e.g. aluminum and aircraft, and the internet and its myriad consequences) that were not previously envisaged.

ammonia recovery (mostly ammonium sulfate) from the coking of coal, and ammonia synthesis from the atmosphere (Smil 2001).

One aspect of transmaterialization that so far seems to have escaped the attention of most analysts, however, is that it often involved the development of new by-products out of formerly wasted industrial residuals.¹⁴ This process will now be examined in more detail.

Transmaterialisation through By-Product Development

Commenting upon Swift's classic observation, a prominent Philadelphia engineer, John Birkinbine (1899, p. 240), observed a century and a half later that "without detracting from the credit deservedly given to the person who causes 'two blades of grass to grow where one had thrived before'... prominent places among the benefactors of mankind may be claimed for those who utilize what is or what has been considered as waste." Although not as well documented, a significant historical trend towards the creation of valuable by-products out of production residuals can nonetheless be identified. For example, a scientific retrospective published in 1887 highlighted "the utilization of waste materials and by-products" as a "leading feature of the Victorian epoch" (Anonymous 1887: 299). A year earlier, an encyclopedia entry described how "in the earlier days" of many manufacturing branches "certain portions of the materials used have been cast aside as 'waste,'" but over time "first in one branch and then in another, this 'waste' material has been experimented upon with a view to finding some profitable use for it; and in most instances the experiments have had a more or less satisfactory results" (Price 1886: 464). Perhaps the best concise evidence on the topic can be found in detailed surveys written from the mid-nineteenth century onward (Table 1).¹⁵

Table 1: Main English Language Surveys on Industrial Waste Recovery, 1862-1963.

Author, Profession, Nationality	Title	Year, last edition, number of pages; earlier editions	Publisher(s), City(ies)
Simmonds, Peter Lund, (technical journalist), Danish-born British citizen	Waste Products and Undeveloped Substances: A Synopsis of Progress Made in Their Economic Utilisation During the Last Quarter of a Century at Home and Abroad.	1876, 3 rd edition, 491 pages (1862; 1873).	Hardwicke and Bogue (London)
Koller, Theodor	The Utilization of Waste	1918, 3 rd revised	Scott, Greenwood &

¹⁴ The fact that domestic wastes were widely recycled in the past is more appreciated. For example, in his discussion of the development of the southern portion of the Canadian province of Ontario, McIlwraith (1997, 316) observes: "In the farm-making era Ontarians recycled everything. Every brick, skillet, spoon, pickle crock, millstone, and drive shaft was a treasure coveted and used over and over. People sifted through the ruins of burned houses gathering up the nails; they awaited anxiously the passage of the itinerant potmender. Unwanted field stones were piled up into useful field walls; unmerchantable tree brush was burned to produce saleable potash. Ontario started without refuse, and with barely the concept of it."

¹⁵ Perhaps the best compendium ever written on the topic, however, was the work of the French Engineer Paul Razous (1937/1921/1905).

(chemist), German	Products: A Treatise on the Rational Utilization, Recovery, and Treatment of Waste Products of all Kinds	edition, 338 pages (1902; 1915; German ed. 1880, 1900, 1921)	Son (London); D. Van Nostrand Company (New York)
Kershaw, John Baker Cannington (chemical engineer), British	The Recovery and Use of Industrial and Other Waste.	1928, 212 pages	Ernest Benn Limited (London)
Lipsett, Charles S. (specialized journalist and publisher), American	Industrial Wastes and Salvage: Conservation and Utilization.	1963, 2 nd revised edition, 407 pages (1951)	Atlas Publishing Co. (New York)

While the numerous cases described in these overviews and more specialized technical books and periodicals cannot be discussed in any detail here,¹⁶ their main conclusion was perhaps best summarized by the journalist Frederick Talbot (1920, p. 17-18), who wrote: “To relate all the fortunes which have been amassed from the commercialization of what was once rejected and valueless would require a volume. Yet it is a story of fascinating romance and one difficult to parallel in the whole realm of human activity.” Indeed, as a former President of the Federation of British Industries in the early 20th century observed: “In the days of my childhood, ‘waste not, want not’ was a lesson inculcated upon all young people. Whether there was at once a suitable response in the nursery I am now too old to remember, but the same wise saying has had the constant consideration of every progressive manufacturer for at least a century” (in Kershaw 1928, p. vii). A similar assessment was offered in 1931 by another British industrial leader, Sir Harry McGowan (in Miall 1931, p. iii), Chairman of Imperial Chemical Industries, Ltd: “No one can read of the early days of chemical manufacture without being struck by the extravagance and wastefulness of its methods. It is difficult to visualize to-day the possibility of great tracks of lovely country being laid waste by fumes. These same fumes have now been caught and snared to become valuable money-making products.”

One can also get a glimpse of some useful substances manufactured from industrial residuals in a 1919 figure drawn by the American biologist (and often described as the “father” of animal ecology in this country) Victor E. Shelford (**Figure 1 – around here**).

By-product development often reduced both polluting emissions and harvesting pressures on living organisms. For example, synthetic dyes manufactured from coal tar - a thick black residual liquid once considered the “abomination and nuisance” (Anonymous 1881) of coal gas production because it polluted rivers foully when discharged or destroyed the surrounding vegetation when buried (Playfair 1892) - supplanted dyeing matters previously extracted from plants, roots, berries, leaves, barks and animals (mostly insects and shellfish) (Travis 1993). Plastics developed from once highly problematic petroleum residuals eventually displaced wood, ivory, bones, horns, leather and vegetable fibers in the manufacture of countless objects (Fenichell 1997). Cottonseed, which typically accounted for between two-thirds and three-fourths of the weight of the cotton as it was picked in 19th century America, was originally considered an unmitigated nuisance whose only marketable uses were as cattle feed or fertilizer on depleted cotton and corn fields located close enough to production sites to cover transportation costs. According to the historian Lynette Wrenn (1995, p. xvi), rotting cottonseed “produced an offensive odor that people

¹⁶ Desrochers (2007) provides a more detailed overview of this literature.

considered unhealthy,” while it “killed hogs and other nonruminants when eaten in large quantities.” This residual was so problematic that in the early nineteenth century its disposal was regulated in Alabama, Georgia, and Mississippi. In the latter case, the legislature “passed a law to compel cotton gins to remove promptly or to destroy all cotton seed, so that the same might not become a prejudice to the health of the community” for the general practice at the time was “dumping it into running water or letting it rot” (Edmonds 1904, p. 164). In time, however, it became a basic input in countless products. According to Kittredge (1902, p. 18): “Cottonseed was a garbage in 1860, a fertilizer in 1870, a cattle food in 1880, and a table food¹⁷ and many things else in 1890.” These by-products proved so lucrative that in the late nineteenth century “nothing but the utilization of the cotton-seed waste saved the industry from bankruptcy [as many] a cotton grower secured enough extra for the cotton seeds just to make both ends meet” (Walsh 1902, p. 457) (**Figure 2 – around here**).

Market Incentives and By-Product Development

According to most analysts, two main incentives rewarded by-product development. The first - and most significant - was the desire for increased or constant profitability. Babbage (1832, non-paginated, Part 2, chapter 22) thus wrote: “Amongst the causes which tend to the cheap production of any article [is] the care which is taken to prevent the absolute waste of any part of the raw material.” The business and technology journalist Peter Lund Simmonds, perhaps the most knowledgeable person on the topic in the second half of the nineteenth century, observed a few decades later that “as competition becomes sharper, manufacturers have to look more closely to those items which may make the slight difference between profit and loss, and convert useless products into those possessed of commercial value” (Bethnal Green Branch of the South Kensington Museum 1875, p. 4).

Two generations later, Rudolf Alexander Clemen (1927, p. vii), the leading economic expert of the American meatpacking industry of his era, viewed “the development of by-products in industry [as] one of the most outstanding phenomena in our economic life” and credited the fear of being overwhelmed by competitors in the same or other industrial sectors as the main force in this respect. Modern conditions, he argued, made it “almost impossible materially to cut production and distribution of expense for the majority of commodities.” In this context, “one of the most important opportunities for gaining competitive advantage, or even for enabling an industry or individual business to maintain its position in this new competition,” was to reduce manufacturing expenses “by creating new credits for products previously unmarketable.”

Interestingly, Karl Marx (1894, non-paginated, Volume III, Part I, Chapter 5) similarly observed that the “capitalist mode of production extends the utilisation of the excretions of production and consumption” and that the “so-called waste plays an important role in almost every industry.” Like other analysts, he observed that this reworked waste “reduces the cost of the raw material to the extent to which it is again saleable, for this cost always includes the normal waste, namely the quantity ordinarily lost in processing,” which ultimately “increases *pro tanto* the rate of profit.” Indeed, Marx viewed industrial waste

¹⁷ One of the better known food items is the vegetable shortening CRISCO, short for “crystallized cottonseed oil.”

recovery as “the second big source of economy in the conditions of production,” after production efficiencies arising from economies of scale.¹⁸

The second incentive that stimulated by-product development was the necessity of preventing damage to the property of others. Although rarely emphasized in the sustainability literature, market economies were not only based on voluntary exchange and prices, but also on a system of privately “owned” property rights. This system of inalienable rights not only entitled individuals to sell a resource (more accurately, to sell rights in the resource) and to capture the proceeds of the sale, but also subjected them to legal sanctions based on the common law doctrines of trespass (any entry on the property of another) and nuisance (indirect or intangible invasions, such as odors and noises, or any unreasonable interference with another’s use or enjoyment of his property). In this context, polluting someone else’s property was no more acceptable than vandalizing it and could result in damages being awarded or even an injunction (an order requiring the cessation of an offensive activity or specifying corrective action) (Meiners and Morriss 2000; Meiners and Yandle 1999).

As numerous commentators observed, private property rights not only forced polluters to internalize their externalities (in other words, to assume the full costs of remediation), but sometimes triggered creative thoughts that culminated in the development of lucrative outputs. For example, Simmonds (1876, p. 39-40) observed that the stench resulting from the blood and offal at large pork-packing establishment “had become such an offense to the neighbourhood, that the proprietors were threatened with a perpetual injunction.” Shortly afterwards, however, they developed a method through which they dried the entire refuse, including the blood. The parts containing sufficient fat to make the operation economical were first treated in a rendering tank where the clean fat was converted into lard and the refuse into grease and grease-oil. The scrap left in the process, consisting of the bones of the head and feet and considerable meat, was then thoroughly mixed with the blood, dried and converted into “a valuable article of commerce.” The whole process resulted in a smell that was comparable to that of a pot of boiled cabbage.

According to Perry (1908, p. 73-74), at one point in time employees of the Standard Oil Corporation didn’t know what to do with a “sticky” and “slimy” refining residual. It was at first disposed of in a river, but “soon the authorities complained because of the pollution it produced.” It was then thrown into a deep trench and set on fire. Unfortunately, it created “such a furious flame that the heat became unendurable and the strongest wall could not resist it.” Company executives then sought the help of chemists to develop a satisfactory disposal method. Almost simultaneously, however, a process was being developed through which this refuse could be converted into paraffin, in the process becoming, alongside

18 Attributing any quote from volume III of *Capital* solely to Marx is, however, problematic. As is well-known, Friedrich Engels had underwritten Marx’s labors on the first volume of *Capital* but, as Muravchik (2002, p. 89) points out, “was [later] shocked to discover the unfinished state of the notes that Marx had left for the remaining parts. Engels took these in hand, and from them produced volume two in 1885 and volume three in 1894.”

some three hundred other by-products, “one of the mines of wealth to the Standard Oil Company.”¹⁹

The American chemist and explosive specialist Charles E. Munroe (1910, p. 572) similarly reported the then well-known case of the Ducktown (Tennessee) copper smelters that had for years been notorious polluters and the cause of a number of legal actions. In time, however, their “devastating sulphurous fumes [had] been converted into valuable merchandises.” In his opinion, cases such as this illustrated “the operation of a wholesome law in economies” according to which “frequently an urgent reason for saving waste is to suppress a nuisance, for... the existence of a public nuisance is evidence of the existence of an economic waste” (p. 571).

While competitive pressures and, to a lesser extent, the need to internalize externalities played the key roles in the widespread development of by-products, this process was further facilitated by some characteristics inherent to most industrial residuals. Firstly, their value was often initially low or nonexistent, while their disposal costs were sometimes significant. Secondly, unlike domestic waste, industrial residuals were uniform in nature and typically available in large quantities. Lastly, they were often produced in industrialized regions, thus reducing transportation costs. In this context, several manufacturers and their chemists followed a few logical steps described as follows by the French engineer Paul Razous (1905). Residuals were first thoroughly analyzed and broken into their basic components. If any of these had significant value, it was isolated. If this was not the case, the composition of the residual was compared to the components of similar products such as fuels, fertilizers, animal food or building materials. Two scenarios were then possible. If the residual components were similar to those of a given commercial input, the residual could probably be used for the same purpose. If one or a few components were missing, it was often possible to add whatever was necessary to turn the residual into a suitable substitute.

All this is not to say, of course, that the development of by-products from polluting waste was always and everywhere a profitable proposition. As Koller (1918: 1) observed, however, while it was not uncommon to see some waste product “accumulating in such quantity as to injure and retard the continuous progress of a branch of industry,” it was also often the case that “the rational treatment and utilization of such waste products either increases very considerably the general profits of an industry or even forms a separate and not inconsiderable source of gain.” Kershaw (1928: ix) further suggested that even if all industrial waste recovery processes that had survived the laboratory stage had not proved permanently successful when tried on a larger scale, past experience showed a “larger number of recovery processes which have attained success.”

Far from being a response to the modern environmental movement, dematerialization and transmaterialization were logical outcomes of market incentives that unintentionally benefited the environment. This latter effect will now be illustrated through a short

19 Of course, the most prominent in this respect was gasoline, which was originally discarded as a waste product as early oil producers were mostly interested in the kerosene fraction of petroleum as a substitute for whale oil.

discussion of trends in air quality and forest cover in advanced economies, as well as some developing economies.²⁰

The Invisible Hand's Green Thumb: Trends in Air Quality and Forest Cover in Advanced Economies before the Modern Environmental Era

Air Quality

Contrary to popular environmental opinion, there is a steadily growing body of evidence that suggests that air quality improved significantly in many American cities for decades prior to the passage of the 1970 *Clean Air Act*. For example, suspended particulates in Cincinnati declined between 1946 and 1951. Similarly, atmospheric visibility markedly improved in Pittsburgh between 1946 and 1955 (Goklany 1999). In the late 1960s, the atmospheric sulfur dioxide content in some American cities was only one-third or one-fourth what it had been before World War II (Crenson 1971). Although the rate of pollution reduction in the 1970s might have been less than the one observed in the 1960s (Crandall 1983), this was likely due to the enormous improvements in air quality already achieved in the 1960s. Indeed, according to Goklany (1999), by the 1960s the smoke problem was virtually solved in most American urban areas. Similar changes were also observed in London and in other places, with turning points sometimes occurring as early as the beginning of the twentieth century (Brimblecombe 1987). As was pointed out earlier, these improvements can be mostly attributed to the transmaterialization of energy sources, i.e., fuel switches from coal to heavy oil, natural gas, hydro-electricity and nuclear power generation, which took place mostly as a result of economic competition.²¹ Some of this progress, however, can also be attributed to increased efficiencies of control of smoke and dust pollution in industries and power plants, a process which was sometimes accelerated through public policy interventions.²² For example, nationwide estimates of overall dust

20 While there is much anecdotal evidence in terms of the development of new industrial practices adopted for purely economic reasons that resulted in reduced water pollution, this issue is much more complex than the evolution of air quality and the forest cover because of the lack of comprehensive data on water quality and the historical importance of sewage releases in terms of overall water pollution. Interestingly, sewage was historically given a higher priority by public health officials than industrial water pollution. This emphasis on organic pollution can be explained by the spreading influence of the germ theory of disease in the late 19th century which focused the attention of public health officials and sanitary engineers on sewage as a much more serious health threat than inorganic industrial discharges. Of course, as Cumbler (1995) points out, this emphasis might have also been in part a result of political expediency. One can nonetheless find evidence for improved water quality before the modern environmental era. For example, Freeman (1995/1990: 114), referring to the EPA's first National Water Quality Inventory conducted in 1973, points out that there had been substantial improvement in water quality in major waterways in the 1950s and 1960s, at least in regard to organic wastes and bacteria, much of which could be attributed to the construction and/or modernization of sewage systems and used water treatment plants. For a more detailed discussion of the issue see, among others, Adler (2002).

21 While the issue of nuclear power is more debatable, it cannot be denied that much original support for this technology was grounded in economic arguments. While some regulatory mandates played a role (such as the mandatory use of electric locomotives in some locations), in most cases technological developments typically preceded policy initiatives.

22 In his study of the American case, Goklany (1999) argues that there was far more state and local regulatory activity before 1970 than is now commonly thought to have been the case and that the main explanation for sub-optimal emissions control policies prior to 1970 is that scientists came rather late to the conclusion that nitrogen oxides and other substances were truly pollutants worth worrying about.

collection efficiency for power plants, which had been 40% pre-1940, had climbed to 75% by 1940, over 80% by 1950, 90% by 1960 and 95.5% by 1966 (Goklany 1999).

Forest Cover

A common environmental misconception is that deforestation is a recent occurrence, with the bulk of it taking place in the tropical regions of the world during the last five decades. As Williams (2002) suggests, however, it is possible that as much as nine-tenths of all deforestation caused by human beings since the emergence of civilization occurred before 1950. This is due to the fact that the emergence of civilized societies required people to clear massive amounts of forested land in order to provide themselves with shelter, food, warmth and a multitude of implements. However, a reversal of these trends began in the middle of the nineteenth century in certain European countries through a process that has since been labeled a “forest transition.”²³ In France, for example, the forest area expanded by one-third between 1830 and 1960, and by a further quarter since 1960. Similar processes, although of varying intensity and scope, have been occurring in all major temperate and boreal forests and in every country with a per capita Gross Domestic Product now exceeding US \$4,600 (roughly equal to the GDP of Chile) and in some developing economies (most notably China and India) (Kauppi et al. 2006). While in some (and especially the latter) cases, some reforestation and afforestation can be attributed to aggressive governmental policies,²⁴ the current forest transition would have been unthinkable without market-induced changes in agricultural and forestry productivity,²⁵ fuel transition away from wood, increased efficiency in the transformation of wood into various products and the development of new substitutes for wood (Ausubel 2000; Kauppi et al. 2006; Wernick et al. 1997; Williams 1989, 2002). Rudel et al. (2004) also point out that economic development and urbanization created more lucrative non-farming jobs in urban areas, causing a number of agricultural workers to abandon their land.

As will now be argued, however, while free and open competition led to a gradual “greening” of industrial operations, the process was and is often postponed, slowed or prevented by poorly defined or inexistent property rights or systematic political intervention in markets.

23 The term *forest transition* as used in this essay is based on the Scottish geographer Alexander Mather’s concept of a reversal or turnaround in land-use trends for a given territory from net deforestation to net reforestation in times of economic and population growth. As such, it differs from the notion of forest transition commonly used by, among others, biologists and physical geographers that describes landscape changes between different ecosystems (such as grassland or tundra and forest). Rudel et al. (2004), Kauppi et al. (2006) and Perz (2007) are recent studies and critical discussions of this issue.

24 In places with stable or growing populations and little ability to import forest products, continued declines in forest cover spur increases in prices of forest products, causing landowners to plant trees instead of crops or pasture grasses. Disastrous floods in deforested watersheds have also motivated government officials in developing, but now prosperous, countries to implement reforestation programs.

25 Increased forest productivity might have resulted in the development of monoculture or “fiber farms,” but this process considerably reduced harvesting pressures in many other locations thus contributing to increased biodiversity (Matson and Vitousek 2006). Meanwhile, increased agricultural productivity resulted in widespread abandonment of pastureland and cropland which were then reforested or afforested. For a more detailed examination of the US case, see, among others, Goklany and Sprague (1992) and Wernick et al. (1997).

2. Profitability, Politics and Unsustainable Development

Although one can find countless historical examples of “win-win” innovations that were developed without any public policy interventions, the infliction of significant environmental damage brought about by various industrial and commercial activities is also an undeniable fact. However, as the following section will attempt to illustrate, this environmental damage was typically much more significant in the absence of markets, where private property rights were either absent or poorly defined, and/or when economic agents engaged in rent seeking, i.e., when they expend scarce resources through the political process to achieve returns in excess of those they would achieve by offering their products or services for sale in a free market.

Open Access and Public Ownership

Since the publication of the ecologist Garrett James Hardin’s (1968) influential article, the “tragedy of the commons”²⁶ has been widely invoked to argue that the pursuit of self-interest in a free access context will ultimately result in resource depletion. While this concept has much explanatory power for issues ranging from the destruction of fisheries, the degradation of water resources and the over-harvesting of timber, it is a common misconception to blame the pursuit of self-interest for these outcomes rather than the free and unrestricted commercial access to resources without clearly defined and enforced (whether individually or communally) property rights. Evidence for this statement is twofold. First of all, there are numerous historical examples of commons that have been managed successfully through local community oversight (Ostrom 1999; 2000). Secondly, the privatization of commons turns the pursuit of self-interest from an apparent vice into a social virtue as private owners have strong incentives to maintain and increase the value of their assets for future sale (Anderson and Leal 2001; Block 1998; Henderson 2004).

Of course, much land falls in neither category as it is owned by the state and managed by government employees without any explicit profit considerations. While sustainable development activists and theorists often view such “public” ownership favorably, much evidence suggests that it fosters a more shortsighted perspective than a market system. Perhaps the most incriminating evidence in this respect is the severe and widespread ecosystem degradation in soviet-style economies. This is despite the contention made by many adherents of Marxist ideology that their approach to life would prevent the environmental disruptions and pollution that is supposedly characteristic of capitalist societies (Feschbach and Friendly, Jr. 1992). As Bernstam (1990, p. 334) pointed out, however, the amazing divergence in the trends of resource use and pollution between market and planned economies, with the latter becoming ever less efficient over time, probably constituted the “most important reversal in economic and environmental history since the Industrial Revolution.” While Bernstam mostly attributes this outcome to central planning’s incentive structure which rewarded managers for the amount of inputs used rather than operational efficiency,²⁷ the economist Randall Holcombe (1995, p. 29)

26 As generally understood, the tragedy of the commons refers to a situation of free access and high demand for a finite resource that ultimately dooms the resource through over-exploitation. This situation, however, would be better characterized as the “tragedy of open access.”

27 In fairness, Bernstam’s argument is more complex and builds on the theory of market socialism of the Hungarian economist Janos Kornai who argued that socialist planners regularly and routinely plowed resources into failing enterprises even when they exceeded their budgets. This “soft budget constraint” stood in sharp contrast to the “hard” constraint of bankruptcy in market economies.

observes more generally that “the problem with government ownership of a resource is that nobody actually has clear ownership rights, and no assignment of rights can be assumed to be permanent. What politics grants, politics can later take away.” In short, the uncertain, unclear or ill-defined property rights that result from public ownership inevitably impose a short-term perspective on resource management, and also open the door to political manipulation, intimidation and corruption.

The environmental problems associated with central planning can also be attributed to other inherent shortcomings, as the following case study of centrally planned industrial waste recovery illustrates.²⁸ During state socialism in Hungary (1948-1989), economic planners tried to institute a preventative approach to industrial wastes that bore striking similarities to proposals made in recent years to encourage so-called sustainable development. In the 1950’s, the main emphasis was on waste reuse and resulted in the creation of an elaborate hierarchical input and output quota systems for waste registration, collection, distribution and reuse, including 34 central regulations on the collection, storage, delivery and price of waste materials. Waste also became a key issue around which the population was mobilized to innovate.

As the Hungarian-born sociologist Zsuzsa Gille (2000) points out, these policies led to three unintended consequences. Firstly, the reuse of waste materials required additional raw materials, energy and labor, which, along with most products, were in short supply. As a result, collected wastes were often left rotting and rusting in factory yards. Secondly, the reuse of materials, even when it occurred, did not prevent recovered wastes from becoming trash because these “supply-driven” recycled goods were in many cases not needed, and even chronic general shortages could not increase their appeal. And thirdly, this policy also “strengthened the tendencies of the centrally planned economy towards wasteful production” because the waste quotas “created an added incentive for workers and managers to produce with even higher waste ratios” (p. 209).²⁹ Together, these unintended consequences eventually led to the revocation of the waste quotas.

From the mid-1970s, a new approach was implemented in which waste was seen as a cost of production, and new policies were then put in place. Among these were price increases for wastes, which made the collection of wastes more worthwhile, and a new opportunity for firms to calculate prices for recycled products as if they had used new raw materials for them. The reuse of waste also became the object of cost-benefit analysis. Funds were established to motivate firms to apply waste-conscious technologies and the state financed at least two-thirds of the costs of reuse facilities. According to Gille, however, this ambitious program failed to achieve its goals and was later abandoned with the fall of the Iron Curtain.

Reviewing the available evidence in light of arguments put forward by so-called “Austrian economists”, Desrochers (2004) suggests that a number of problems, contradictions, inconsistencies and obstacles await any such comprehensive planning scheme. Three factors stand out, in particular: 1) the lack of incentives for individuals to invest their

28 For a more detailed treatment of this issue, see Desrochers (2004).

29 As such, this case can be considered a prime illustration of the “success indicators” problem that frequently attracted the attention of Sovietologists during the Cold War era.

energies and talents in producing goods that other people are willing to pay for; 2) the difficulty of allocating resources rationally in the absence of a price mechanism or when prices have been distorted by various policies; and 3) the inability of a centrally planned system to take advantage of the information that individuals possess about the special productive characteristics of the people and equipment with which they work, as well as information about the demands for goods and services.

The lessons derived from the main problems identified in centrally-planned economies help illustrate some of the more obvious shortcomings of political intervention in an 'extreme' scenario of state control. However, it is still valuable to analyze and discuss environmentally harmful patterns of political behaviour that are constantly recurring in mixed economies, as well.

Rent-Seeking and Unsustainable Development

While alleged market failures receive considerable attention in the sustainable development literature, patterns of political interventions and actual government failures attract much less interest. This is despite the fact that many high-profile public interventions have been shown to cause numerous problems. For example, it has been estimated that perhaps up to two thirds of the 1000 billion dollars spent on subsidies related to agriculture, water, fishery, energy production, forestry and transport are in the end counterproductive and damage both the economy (through increased budget deficits, unemployment and trade distortions) and the environment (through increased pollution and mismanagement of natural resources) (Kjellingbro and Skotte 2005; OECD 2006).

While some of these interventions may be the result of legitimate concerns and doubts as to market actors' willingness to tackle them, most can probably be explained by a political reluctance to tolerate two recurring outcomes of market processes. The first is that many firms and/or inputs are continually being eliminated by more efficient (and typically rapidly growing in size) competitors and/or alternatives. As the economist Erich Zimmermann (1933, p. 9) put it: "Progress always means a net gain but seldom a pure gain. Creating the better, we must often destroy the good," and further added that economic waste elimination is often heavily dependent on "the [increased] size of the plant which in turn depends on the size of the market" (p. 768). Munroe (1910, p. 572) similarly observed that "in urging the abating of a nuisance or advising the saving of waste or the conserving of resources, we should not fail to point out that it can usually be accomplished only with added expense, and that a profit can rarely be realized unless the operations are carried out on a quite considerable scale." In his opinion, reducing waste in manufacture and conserving resources necessarily implied "the use of great aggregations of capital and the carrying on of large scale operations under a single management" (idem). This is not to say, of course, that large size automatically generates greater efficiency, for many large organizations suffer from bureaucratic inefficiencies and are not particularly receptive to innovative behavior. On the other hand, innovative and successful firms will, by implication, grow rapidly as they outperform their competitors in everything from greater economies of scale in production to better logistics systems, generating much resentment in the process.

The second politically undesirable consequence of market processes is that increasingly productive economic activities tend to cluster geographically. For example, while

Simmonds (1876, p. 4) had observed that large factories were at an advantage over their smaller competitors as a result “of the larger quantity of residues at their command, and which necessitate special machinery for working up or utilizing,” he added that “in great industrial centres, too, the waste products of a large number of works may be easily collected.” Talbot (1920, p. 303) would later expand on this insight by commenting that, in order to be successful, “co-operative and individual methods [of resource recovery]... can only be conducted upon the requisite scale in the very largest cities where the volume of material to be handled is relatively heavy” because “waste must be forthcoming in a steady stream of uniform volume to justify its exploitation, and the fashioning and maintenance of these streams is the supreme difficulty.” In short, market processes have long tended to create larger corporations and larger geographical concentrations of economic activities where smaller and more specialized firms can thrive.³⁰

The trend toward industry consolidation and the geographic concentration of economic activities, however, is frequently unpalatable to elected officials with strong ties to long-established and well-organized local interests. A case in point is the emergence of the American anti-trust movement. Although commonly associated with unethical “robber barons,” a case has been made that businesses such as the Chicago meat-packers and the Standard Oil Corporation owed much of their success to large-scale by-product development and/or the geographical concentration of manufacturing operations. Perry (1908, p. 74-75) thus commented that it was a common mistake “to attribute the financial success of some of these moneyed corporations to cheat and chicanery in business methods,” for if there had no doubt been some dishonest dealings along the way, “to say that all this phenomenal accumulation of wealth has resulted from shrewd trickery that enabled a few to cheat their fellows of their dues is a false representation of the true workings of a system of savings that has done as much as anything else to make possible the extraordinary prosperity of our nation during the past century.” In his opinion, “men of great business capacity and of untiring energy have been gathering up the fragments that nothing might go to waste” and this had been “the chief source of the unprecedented fortunes of our times.” What follows is a brief discussion of the Chicago packers and the trampling of private property rights by statutory law.³¹ This will hopefully serve to illustrate a recurring pattern of perverse outcomes that are the result of politically motivated subsidies and regulations.

Geographical Concentration and By-product Development

American meatpacking was a widely decentralized industry until the second half of the nineteenth century. In time, the advent of a national railway network and artificial refrigeration helped pave the way to the rise of the Chicago packers whose strength lay not only in their ability to cut down costs by integrating forward in marketing, backward in purchasing and by obtaining their own materials directly, but also in an unparalleled potential to turn by-products into valuable commodities. As the economist D. A. Wells (1889, p. 98)

30 Such “agglomeration economies” have long been studied by economic geographers, urban economists and so-called regional scientists, although the particular topic of by-product linkages has been neglected in this literature.

31 In the United States, the body of law that specifies the assignment of rights is the product of court decisions (common law), legislative enactments (statutory law, including constitutions) and administrative decrees (administrative law).

put it, in these great establishments “economies are effected which are not possible when this industry is carried on, as usual, upon a very small scale.” Among other things, animal parts such as hide, hoofs, horns, bones, blood, and hair which in the hands of small butchers were “of little value or a dead loss” became profitable inputs in the manufacture of outputs ranging from glue and bone-dust to fertilizers.

The integration of these operations, however, was not entirely under the control of the largest firms. As Clemen (1927, p. 27) observed, while many products were manufactured by the national packers or their subsidiaries (such as leather and fertilizer companies), “in many instances by-products processed to a certain degree within the packing industry proper are transferred to other subsidiary industries over which individual packers have no control, for further elaborate and expensive processing into final, highly finished articles.” Among other linkages, large refineries took the non-uniform steam-rendered lard from packers, refined and bleached it, and sold it on the open market. Glue works made glue from bones, sinews, and various other packing plant materials. Butterine manufacturers used neutral lard and oleo oil from packing plants to manufacture oleomargarine. Fertilizer plants carted off the pressed tankage and raw or pressed blood, dried and sold it as such, or manufactured mixed fertilizer. Soap factories bought various grades of tallow (Edmonds 1904; Talbot 1920; Clemen 1927).

As a result of widespread and systematic by-product recovery, Chicago packers could afford to pay more for cattle than their smaller competitors and to receive less from the sale of dressed-beef carcass than the amount paid for the live animal. The revenue derived from formerly waste materials thus led to higher slaughter cattle prices and a significant decline in the retail price of meat, both of which hurt local butchers and retailers unable to compete with larger operations (Clemen 1927; Unfer 1951; Talbot 1920). Not surprisingly, this increased competition soon led local butchers to call for boycotts. The protest movement became more organized in 1886 with the formation of the Butchers' National Protective Association in Saint-Louis. As the environmental historian William Cronon (1991, p. 242) points out, however, while the stated goal of the association was to “secure the highest sanitary condition” for consumers, public health was in fact “a convenient way of putting the best face on a deeper and more self-interested economic issue.” According to economists Donald Boudreaux and Thomas DiLorenzo (1993), the most plausible explanation for the adoption of the first antitrust legislation in Missouri in 1889 is to view it as an attempt by politically powerful local producer groups, mostly independent retail butchers, to shield themselves from intense competitive pressures. Interestingly, large meatpacking concerns would face similar organized opposition from dairy producers calling for measures ranging from special taxes to outright ban when they diversified into oleomargarine production in United States (Young 1979), the United Kingdom (Hardy 1993), France (Stanziani 2007) and Canada (Heick 1991).

Regulatory Capture and Barriers to Innovation

Another way in which elected officials have systematically perpetuated less sustainable practices is through the use of regulations and, perhaps most importantly, through the creation of statutory laws that increasingly superseded private property rights. Although usually justified by the need to remedy some deficiencies of property rights, such as when multiple air polluters were inflicting low levels of damage individually (and were therefore almost impossible to identify individually), while inflicting significant harm in the aggregate, they often purposefully ended up “legalizing” pollution by stripping nuisance

claims of their deterrent ability and by preventing injunctions (Brubaker 1995; Block 1998; Meiners and Yandle 1999; Meiners and Morris 2000). As summarized by legal scholar Marshall Breger, “most people who are at least somewhat familiar with the issue see that regulation is a license to pollute, and a license to pollute for free” (Breger et al. 1991, p. 470). For instance, beginning in the middle of the nineteenth century, many American rivers legally became “industrial streams” where common law rights were suspended “for commercial purposes and the disposal of industrial waste” (Adler 2002, p. 95). It has thus been argued that one major factor in explaining the state of the Cuyahoga River³² in the middle of the twentieth century was that it was treated “as an industrial stream, and state permits inhibited local clean up efforts. Public nuisance actions and enforcement of local pollution ordinances, in particular, were precluded by state regulation” (Adler 2002, pp. 95-96).

Another problem is that regulators are prone to suffer from “tunnel vision” based on the medium (air, water, land) or problems they are assigned to monitor (Davies and Mazurek 1998). A case in point is the fact that, unlike the common law, modern “command-and-control” environmental regulations often mandate the use of specific technologies to deal with particular problems which, apart from preventing the development of better alternatives, frequently establishes an arbitrary distinction between a useful material and a waste (Environmental Law Institute 1998). Policy analysts Marc Landy and Loren Cass (1997, p. 218) thus explain that present-day American industrialists do not usually view anything for which some productive use can be found as waste, while environmental regulators typically consider that a waste occurs “any time a stream of inputs divide and some are cast aside.” If the cast off matter is considered toxic, its further use can be forbidden, even though its chemical composition might be virtually identical to freely accessible “virgin” compounds. In short, as Davies and Mazurek (1998, p. 269) argued in the conclusion of their detailed survey of US environmental regulations:

The [US environmental regulatory apparatus is a] fragmented system [that] is seriously broken. Its effectiveness in dealing with current problems is questionable, it is inefficient, and it is excessively intrusive. These are fundamental problems... that cannot be fixed by administrative remedies, pilot programs or other efforts to tinker at the margins. They are problems that are built into the systems of laws and institutions that Congress has erected over thirty years.

Despite such shortcomings, Harvard University Professor Michael Porter (1991) has suggested that “well-designed” environmental regulations could stimulate innovations that would increase private and social benefits by enhancing productivity and reducing waste.³³ In light of recent experience, however, it seems more plausible to suggest that a property rights approach to environmental liability would be, when possible, more conducive to

32 The Cuyahoga River runs in the heart of the city of Cleveland (Ohio), famously “caught fire” in 1969 and played a major role in the adoption of the American Clean Water Act

33 Although often thought of as a new idea, this insight has been discussed in detail since the second half of the nineteenth century (Desrochers 2008; Freycinet 1870). For example, according to Kershaw (1928, p. 3), many “processes which were imposed upon the manufacturer originally by legal pressure have become profit-earning at a later date.” Building on this insight, he suggested that recently passed smoke laws would “ultimately [lead] to the use of coal with a much higher thermal efficiency both in our homes and in our industries.”

technological change and the development of win-win innovations than any politically-derived alternatives.

In the end, much evidence suggests that many of today's "unsustainable practices" were brought about through governmental failures, rather than market failures. In many instances, because innovative business behavior subverted the status quo, the status quo responded by successfully exerting pressure on elected officials who, in turn, adopted counterproductive measures that resulted in greater environmental harm than would have otherwise been the case. Removing political interventions from the normal conduct of business would therefore seem a more sustainable path for society as a whole in the long run, even though it might prove economically painful to some owners, managers and workers in the short run.

3. The Road to Environmental Hell is paved with CSR Initiatives

Although typically presented as both original and urgently needed, many environmental CSR proposals are in fact not novel. More importantly, proposals that are formulated without a basic understanding of market processes are likely to result in worse outcomes than actions guided by profits and losses. I now turn to a brief examination of some of the most common misconceptions surrounding market processes in the CSR literature.

Disregard of Profitability and Prices

Stakeholder-based proposals that ignore profitability considerations are incompatible with any meaningful definition of sustainable development for they sap the financial flow from which future-oriented investments may be made. In other words, short-term consumption at the expense of productive investment has always been akin to increasing short-term welfare by eating the seed corn that was going to produce the following year's crop. The point was certainly obvious to Simmonds (1876, p. 4) who, in his discussion of industrial waste recovery, wrote a cautionary note on the importance of profitability by suggesting that the development of by-products should be guided by "their success as articles of commerce" and that if "philosophically, nothing should be lost, commercially, much may be thrown away." Indeed, he warned that philanthropic views, while doubtless morally serviceable, had little chance of existence where they could not afford to keep up an establishment. Fortunately, it turned out that in most instances "what pays is for the general good. The converse may be equally as probable; but we should certainly hesitate before we entered on any speculation undertaken solely on the latter consideration" (pp. 10-11).

While the necessity of profits to ensure the survival of any type of business might seem obvious to most individuals, not everyone understands how market prices provide valuable information *about* the environmental impact of the various possible combinations of capital, energy, and other inputs that are required in order to achieve a certain economic result. Of course, it is often argued that market prices do not factor all environmental impacts (for example, by failing to factor in carbon dioxide emissions, because of the presence of price-distorting subsidies or of properly defined and enforced property rights), but they nonetheless do tend to structure production around the most efficient alternatives possible. A case in point is the recent "food-miles" controversy that, in many ways, resembles the meatpacking debate of the late 19th century. According to this framework, the distance traveled by food products from producer to consumer determines the relative 'environmental impact' of each product. Under this criterion, foods that travel longer

distances are viewed as less sustainable due to the additional energy and greenhouse gas emissions required for their transport. As critics point out, however, measuring the sustainability of agricultural production would be more accurately assessed by taking into account the total amount of energy used in all of the components of the food production chain, rather than focusing exclusively on the energy utilized during transportation. Under this more comprehensive criterion, the fact that New Zealand producers can get apples, meat and dairy products on United Kingdom supermarket shelves at a lower price than British producers simply reflects the greater overall efficiency of their productive system, and henceforth its greater sustainability (Saunders et al. 2006). This point was certainly obvious to Adam Smith (1776, book IV, chapter 2, non-paginated) who observed that with “glasses, hotbeds, and hot walls, very good grapes can be raised in Scotland, and very good wine too can be made of them at about thirty times the expense for which at least equally good can be brought from foreign countries.” It would have been, however, a “manifest absurdity” to employ thirty times more capital to achieve the same result and similarly absurd, “though not altogether so glaring, yet exactly of the same kind, in turning towards any such employment a thirtieth, or even a three-hundredth part more of either.”

Although government-imposed environmental CSR initiatives may be politically appealing, they cause price distortions of various kinds that are rarely, if ever, sustainable in the long run, while also being prone to generate unforeseen consequences that might hurt their primary intended beneficiaries. For example, the eventual demise of cottonseed utilization was precipitated by agricultural policies that restricted cotton production in order to raise its price. The resulting higher prices for cotton, however, also meant a higher price for cottonseed, which encouraged cottonseed users to try and eventually adopt alternative sources of fats and shortenings, primarily soybeans (Wrenn 1995).

Depletionism

While the “resourceship” paradigm has historically proven more accurate, “depletionism,” or the perceived need to economize on the consumption of rapidly depleting resources for the benefit of future generations, has always been more intuitively appealing, especially in light of the significantly increased economic growth of the last two centuries (Fairchild 1949; Sanbach 1978; Wrigley 1988; Deffeyes 2003). This perspective, however, has long been untenable on a number of grounds. First and foremost, human ingenuity in the context of market economies has always found a way around scarcity and rising prices through the development of new and improved extraction, processing and manufacturing technologies, along with the development of better substitutes, in the process making future demand for any given resource essentially unknowable. Furthermore, if resources crucial to society *were* finite in any meaningful sense, even economizing on their use would not prevent societal collapse at some point in the future. In other words, any belief in the finiteness of resources is fundamentally incompatible with sustainable development. In the end, as Barnett and Morse (1963, pp. 247-248) pointed out several decades ago, a more plausible resource-creation perspective ultimately implies that there is no need to replace short-term economic calculation with a future-oriented ethical principle. This is because stocks of untapped resources are only a small portion of the economically valuable legacy that each generation passes on to its descendents, which is comprised much more importantly of “knowledge, technology, capital, instruments and economic institutions.”

Environmental Degradation³⁴

While many sustainable development theorists recognize the validity of the “resourceship” perspective, they nonetheless argue that resource use must be curbed because of ecological limits such as loss of biodiversity and climate change. Although there are potential problems associated with both phenomena, it is still quite reasonable to suggest that there is a lot of uncertainty surrounding these issues, that the costs of the measures currently proposed as solutions are massively out of line with their potential benefits, and that wealth creation should make it easier for future generations to deal with these and other environmental problems (Beckerman 2002; Goklany 2007).

Some historical perspective on both topics may help convey a better sense of trade-offs and proportions. Concerns about environmental degradation and what would now be referred to as a loss of biodiversity is sometimes associated with the oldest written work of fiction known to modern scholarship, *The Epic of Gilgamesh*, whose leitmotiv is the deforestation of the Ancient Fertile Crescent (Oosthoek, undated). In 200 A.D., the Christian theologian Tertullianus observed that humans “have actually become a burden to the earth, the fruits of nature hardly suffice to sustain us. There is a general pressure of scarcity giving rise to complaints, since the earth can no longer support us” (quoted by Nisbet 1980, p. 52). In their influential *The Rape of the Earth*, Jacks and Whyte (1939) warned of impending and massive deforestation and subsequent erosion and desertification caused by reckless agricultural practices.³⁵ Writing more than five decades ago, Zimmermann (1951, pp. 813-814) observed that “every so often writers warn us that mankind is headed for a new catastrophe, a globe so crowded with starving billions that the highest values of our civilization will be crushed to death in the world struggle for a bare existence.” At the time of his writing, the “crest of the wave” had been reached in 1948 with the successive publications of two best-sellers, Fairfield Osborn’s *Our Plundered Planet* and William Vogt’s *Road to Survival* which were then “reaching literally millions and leaving their mark on the minds of many throughout the world.” As was pointed out earlier in this essay, however, market incentives and technological change have since gone a long way in improving the state of the environment in developed economies. While loss of biodiversity is a legitimate concern in many less developed areas, it is perhaps more typically the result of the inefficient use of natural capital (and therefore poverty) and ill-defined property rights rather than increased resource creation.

Similarly, anthropogenic influences on the climate have been a reason for concern since before the eighteen century (von Storch and Stehr 2006). While anthropogenic greenhouse gas emissions are now widely considered problematic, it can hardly be disputed that there might be some benefits associated with the human influence on climate (such as warmer nights and carbon dioxide fertilization) and, more importantly, that the problems associated with global warming (ranging from infectious diseases and hunger to sea-level rise and biodiversity loss) can be addressed much more inexpensively if tackled directly rather than through climate change mitigation and reduced economic growth (Goklany 2007). Furthermore, while greater efficiency in the combustion of a hydrocarbon results in

34 For more detailed optimistic – if controversial – takes on these issues, see Lomborg (2001) and Goklany (2007). This author’s views on climate change policy have been greatly influenced by the type of arguments found in, among other places, Carter et al. (2006).

35 See Williams (2003) for a broader survey of the deforestation literature of the 1930s and 1940s.

increased CO₂ production, it has been observed that CO₂ emissions per GDP have been declining at the rate of 1.3% per year for the past century and a half (Goklany 2007: 231) and that, despite much more significant economic growth, CO₂ emissions in the US since the turn of the millennium have been significantly lower than in the fifteen countries who were part of the European Union when the Kyoto Protocol was drafted (United Nations Framework Convention on Climate Change 2007). In addition, absolute U.S. carbon dioxide emissions from burning fossil fuels are said to have declined 1.5 % in 2006 (Energy Information Administration 2007).³⁶ While these issues are complex, the available data once again suggests that economic and industrial growth is not necessarily incompatible with environmental remediation, that a richer and warmer world might be more appealing to the vast majority of human beings, and that, for several reasons, voluntary actions by corporations in terms of greenhouse gas emissions should not go beyond “win-win” innovations (Bradley 2000; Goklany 2007).

Precautionary Principle

As Carter (1939, p. 143) pointed out several decades ago, to be commercially successful, inventions must display at least one of the following characteristics: save time, lower costs, last longer, do more, work better and sell more easily. While not all of these characteristics have environmentally beneficial implications, most do. Another important characteristic of successful innovations is that they must create smaller or less important problems than those solved in the first place (De Gregori 1985). In short, when firms are rewarded for generating measurable improvements and held accountable for failures, the benefits of new technologies introduced in a competitive marketplace will spontaneously tend to outweigh their costs and shortcomings. In this context, the “precautionary principle” - whose strongest version would essentially prevent technological change in the absence of full scientific certainty - can only be described as profoundly reactionary and incompatible with any meaningful form of “development” (which implies, by definition, some form of improvement). In other words, as Goklany (2007: 238) observes, while proponents of the precautionary principle claim benefits for the reduced environmental and public health risks associated with their stance, they ignore the risks that this policy itself might generate or prolong, making their cure potentially worse than the diseases they seek to redress. Indeed, had this principle ever been taken seriously, humans would still be dwelling in caves without fire, and leading an existence undoubtedly more solitary, poor, nasty, brutish and short than they presently do. Had resistance to change been more significant in the last two centuries, real income, life expectancy and food consumption would undoubtedly be much lower than they currently are, while infant mortality, food prices and hours worked, among other things, would have been much higher (Goklany 2007; Lomborg 2001).

Furthermore, as Rosenberg (1994b) has pointed out, assessment of the viability of new technology in a competitive marketplace encourages incremental improvements that leave open numerous options, course corrections and the pursuit of new and more promising innovation paths. In contrast, politically-driven innovation policy typically favors a “big

³⁶ This result, however, was mostly attributed to favorable climate conditions and higher energy prices. While a satisfactory treatment of this issue is beyond the scope of this paper, especially regarding the causes of the recent US performance, much information on these and related issues can be found on the website of the United Nations Framework Convention on Climate Change < <http://unfccc.int/2860.php> >

step” approach that tends to over-commit resources to a particular way of doing things long before sufficient information is available to allow for an intelligent evaluation of research options. Once political sanction is in place, failed projects or policies are unlikely to be terminated, making the reallocation of resources to more promising investment opportunities difficult or impossible. In short, while market-based economic development will inevitably generate mistakes (and may even result in the occasional loss of human life and/or health problems), much evidence suggests that its benefits will outweigh its costs and that individuals working in the private sector will be more prone to correct mistakes than individuals working in the governmental sector.

Conclusion

The widespread belief that economic growth and technological innovations are fundamentally incompatible with environmental improvements has increasingly shown itself to be dependant on inconclusive climate scenarios³⁷ and theoretical frameworks that implicitly view resource creation as inherently unsustainable.³⁸ Historical trends, on the other hand, paint a much more positive picture. Of course, while economic growth often generated undesirable environmental side-effects, its benefits were deemed too obvious by a majority to be ignored. For example, when writing on some potential technological improvements that would make “unusual,” but “not necessarily injurious... smells less prevalent,” Crory (1876: 72) remarked that “to remove the chemical works of East London out of the places they at present occupy would entail a great deal of sickness as a result of shortness of bread consequent on want of employment.” But while the invisible hand might have been beneficial in some respect, it is now typically argued that it needs a regulatory glove sewn through political struggles to prevent it from committing ecocide.

37 Of course, a case could be made that much of the current impetus behind current policy proposals to significantly reduce greenhouse gas emissions stems just as much from a perceived incompatibility between economic growth and environmental protection than on climatic model results. For example, the chairman of the Intergovernmental Panel on Climate Change (IPCC), Rajendra Pachauri, is on the record as stating the following: “We have been so drunk with this desire to produce and consume more and more whatever the cost to the environment that we’re on a totally unsustainable path... I am not going to rest easy until I have articulated in every possible forum the need to bring about major structural changes in economic growth and development. That’s the real issue. Climate change is just a part of it” (quoted in Walker 2007: non-paginated version)

38 Perhaps the most significant example of such a framework is the so-called “ecological footprint” approach which attempts to measure the human demand on nature and compares human consumption of natural resources with the earth’s ecological capacity to regenerate them (Wackernagel et al. 2002). This methodology is the basis for studies according to which if all of humanity’s was to live according to North American standards, something along the lines of three more planets would be required. Among other problems associated with this approach is that it recognizes no role for prices, institutions and technological change. Interestingly, while it purports to factor in human impact on cropland, grazing land, forestland, fish stocks, built environment and energy (with its impact measured in terms forestland needed to act as sink for CO₂, with nuclear energy production assumed to require a similar sink as hydrocarbon-based energy), its spectacular results are derived almost entirely from this latter component because, as was pointed out earlier in this essay, prices, institutions and technological innovation have allowed massive increases in human population and well-being to take without major increases in cropland, grazing land and forestland needed to sustain them. In other words, the ecological footprint is, for all intent and purposes, an “energy footprint” which assumes that “strong sustainability” (ie, the total absorption of anthropogenic carbon emissions by biomass) is a prerequisite for sustainable development. For a more detailed critique of this issue, see Jørgensen et al. (2002).

As was argued in this essay, however, mainstream environmentalists and sustainable development theorists typically misunderstand the beneficial, albeit unplanned, benefits of market institutions and processes. Indeed, despite its counterintuitive nature, much evidence suggests that market incentives have long ensured that economic development is not so much about decreasing returns, scarcity and the picking of low-hanging fruit, but rather, that it is about the development of ladders and other technologies that not only allowed human beings to reach higher-hanging fruits, but also to plant ever more productive orchards, to develop a more diverse array of food sources and to process and deliver them ever more efficiently. Much historical evidence further suggests that the carrot provided by the profit motive, i.e., the incentive to create as much value as possible from costly inputs rather than releasing some of them wastefully into the environment, proved much more significant in this respect than the stick of public policy interventions. In this context, greater competitive pressures through freer trade would ultimately deliver ever more efficient and greener production processes rather than so-called “Pollution Havens” where firms would willingly use inputs more wastefully than in other locations.

In the end, the ultimate compatibility of profit-making activities with environmental remediation or progress should not be viewed as inherently surprising. As the economic journalist Philip Wicksteed (1910, non-paginated, Book I, Chapter 1) observed in the opening page of his *Common Sense of Political Economy*, “economy” was widely understood to be “the administration of any kind of resources (time, thought, or money...) in such a way as to secure their maximum efficiency for the purpose contemplated.” In this context, there was a constant effort to minimize waste, i.e., “expenditure upon objects in excess of their worth, or loss and destruction of resources by mere thoughtlessness or negligence.” Indeed, if one was to combine “the current meaning of the word ‘economy’ (the avoiding of waste) upon its etymological meaning (the administration of a household),” economy as a practical subject could be described as “the administration of the affairs and resources of a household in such a manner as to avoid waste and secure efficiency.”

In the same vein, the economist Erich Zimmermann (1933: 790) could not help, despite his generally hostile stance towards laissez-faire policies, but question the basic premise of the American Conservation movement³⁹ in the following terms:

If, as contemporary writers generally suggest, conservation is to mean economical use, intensive utilization, waste elimination or reduction of waste, standardization, scientific management, “wise utilization,” etc., one wonders how it differs from economy. If to conserve means nothing more than to economize, why burden our vocabulary with this

³⁹ Hays (1959) is the standard history of this turn-of-the-twentieth century American movement. Zimmermann’s (1933, chapter 39) anti-laissez faire stance towards resource exploitation was ultimately based on intergenerational equity issues, a position which is clearly incompatible with his own ‘resourceship’ perspective. In other words, he seems to have been unable to follow his own train of thought to its logical end. As he put it: “As long as conservation is inseparably linked up with a reduced rate of output or of consumption, economies which stimulate output or consumption cannot be conservation... This type of conservation may involve a sacrifice on the part of the present consuming generation... If the objective cannot be gained by economy in harmony with the free play of economic forces, conservation must be imposed on private economy by means of social control through the exercise of the police power or through taxation” (pp. 791-2).

synonym and blur the issues? Little can be gained by the adulteration of a word which, prior to this sophisticated interpretation associated with the new conservation movement, quite generally conveyed the idea of a reduced rate of consumption.

Wicksteed and Zimmermanns' insights are just as relevant to the evaluation of the modern day "corporate social responsibility" (CSR) and "sustainable development" movements as they were to the context in which they were writing. It is important, therefore, to recognize if and when CSR and sustainable development theoreticians are misunderstanding the workings and [often unintentional] environmental benefits of market forces. Even more importantly, it is vital to question such theoreticians when they suggest replacing market forces with well-meaning, but ultimately counterproductive proposals. This is the only way in which mankind may truly witness the fact that the invisible hand does indeed possess a green thumb.

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Figure 1 (around here)
(Source: Shelford 1919: 100)

FIG. 1. Diagram showing, in the form of a tree, the various wastes and the useful substances into which they may be manufactured or which may be obtained from them.

Figure 2 - around here
(Source: Zimmermann 1933, non-paginated)