Incommensurable Paradigms: Values and the Environment

- Supplément du MAUSS - Articles -

Date de mise en ligne : Monday 6 August 2007

Description :

La source de nos maux environnementaux et leur(s) remède(s) sont d'abord de nature éthico-politique selon Andrew Feendberg. Les technologies que nous employons et qui semblent liées à ces maux engagent en effet nos valeurs, et au fond notre vision du monde. Aucune voie ne s'impose. Ni celle de la décroissance (“de-developpment”). Ni celle qui résulterait d'un calcul coût/bénéfice. Nous pouvons nous donner collectivement des valeurs susceptibles de nous orienter vers des technologies plus soucieuses de notre environnement. Reste à énoncer ces valeurs...

Revue du Mauss permanente

Abstract

Environmental pessimists claim we must revert to premodern crafts to save the planet. Environmental optimists reply that the problems can all be solved within the existing system at modest cost. Both argue that environmental quality comes at the expense of other goods. Their only disagreement concerns how much of these other goods must be sacrificed to achieve environmental goals. This chapter rejects a vision of environmentalism based on the notion of unavoidable trade-offs and offers a different approach to environmental politics.

This critical constructivist approach is based on two fundamental points. First, the technological past was not a succession of rational decisions about the most efficient way to do things but the result of social choices between alternative paths with different environmental consequences. This realization suggests that, second, incorporating changed social values in future technical codes is not necessarily inefficient. Regulation can lead to technological changes that enhance economic activity rather than obstruct it, as we have seen in recent years in several domains. What is required today is conscious participation in a technological revolution we are already living unawares.

The trade-off theory

The dominant environmental discourse is based on the notion that environmental quality comes at the expense of other goods. Just how seriously we take the environmental crisis will then determine how much prosperity we are prepared to sacrifice. A lot say the ones, a little say the others.

The goal of this chapter is to criticize this trade-off theory and to suggest a different way of thinking about environmental politics. A great deal is at stake in this debate. Trade-off theory has led a significant fraction of the environmental movement to call for such unpopular and self-defeating notions as a return to preindustrial ways. I will begin by discussing the origins of the environmentalist version of this position before turning at length to more familiar conservative arguments.

In the early 1970s, Paul Ehrlich argued that environmental crisis was caused by both economic and population growth. He advocated de-development of the advanced societies to reduce over-consumption (Ehrlich and Harriman, 1972). This suggestion found support in *The Limits to Growth*, a famous study of the prospects for industrial collapse due to resource exhaustion and pollution (Meadows, et al., 1972). No-growth ideology formed the theoretical background to many early discussions of alternative technology. These critics argued that since industrial society is inherently destructive of the environment, we must return to preindustrial crafts to survive.

To claim that society must choose between industry and crafts is to concede that the existing industrial system is the only possible one, an essentially determinist position. But this excludes the very possibility of a reform of modern industrialism leading to the invention of alternative technologies compatible with the health of the environment. Such a reform would reconstruct the industrial system through the incorporation of new values into industrial design.

The risk of confusion between these two very different conceptions of technical change is evident in Robin Clarke's list of utopian characteristics of what he calls soft technology (Dickson, 1975: 103-104). The list includes dozens of pairs of hard and soft attributes. Some, like the following, could guide either the reconstruction of industry or a return to crafts.

ecologically unsound	ecologically sound
alienation from nature	integration with nature
centralist	decentralist
technological accidents frequent and serious	technological accidents fewand unimportant

But alongside these ecumenical objectives, Clarke lists such things as:

mass production	craft industry
city emphasis	village emphasis
world-wide trade	local bartering
capital intensive	labour intensive

These latter attributes determine a strategy of radical deindustrialization.

Why is it important to draw a sharp line between anti-industrialism and a program of alternative industrialism? There is a significant issue here which has to do with the value we place on modern life. The individualism and freedom we value so highly depend not only on political democracy but also on the technological accomplishments that support communication and transportation, and leave time for education in childhood and beyond. In sum, modernity and technology are mutuall interdependent. It is inconceivable that people living in small villages engaged in craft labor for all their needs could sustain the values and the form of life we associate with modernity. When Clarke valorizes the village and local bartering over the city and world-wide trade, he is thus implicitly questioning our identity as modern human beings.

I am firmly convinced that we need to develop a critical, democratic politics of technology within and not against the general project of modernity. This is a much contested position, both by those who despair of modernity and those who see no need for serious criticism of its accomplishments. I defend a critical modernism here in opposition to both these positions.

Costs and Benefits

If regression to traditional village life is the solution, can the problem be worse? This is the reaction of most who encounter the arguments for de-development. Thus the main effect of such arguments is to bring grist to the conservative mill of those opposed to excessive environmental regulation. Cost/benefit ratios are obviously unfavorable if industry as such must be sacrificed for environmental quality. Better adjust to the risks rather than surrendering all the advances of modern life out of exaggerated fears of remote disasters. Accordingly, the trade-off theory has emerged as the standard conservative response to environmentalism.

Despite its modern neo-liberal dress, these conservative arguments go way back. They pose the dilemma Mandeville mocked in a famous bit of doggerel at the end of the 18th Century. In the preface to his poem, he denounced those

silly enough to complain about the filth of London s streets, the major environmental problem of his day. In demanding cleanliness, they wish away the very prosperity of the city, which is the cause of the filth. The poem concludes :

> ... Fools only strive To make a Great an honest Hive. Bare Vertue can't make Nations live In Splendour ;
> they that would revive A Golden Age,
> must be as free For Acorns, as for Honesty (Mandeville, 1970: 76).

Cost/benefit analysis of regulations is supposed to be able to precisely quantify and compare alternatives along the continuum of choice between Mandeville s splendour and a diet of acorns. For example, each incremental increase in the cleanliness of the air produces an incremental decrease in the number of respiratory illnesses. The policy choice is clarified by estimating the cost of improving the air, for example by tightening the standards for automobile exhaust, then estimating the benefits of reduced medical costs, and comparing the two figures.

But how credible are the results? There are enough problems with cost/benefit analysis to cast doubt on its claims. The current value we place on the various elements of trade-offs may not make much sense in scientific or human terms. Organizations tend to hide or exaggerate costs that might interfere with their plans, and it is difficult to know how to place a monetary value on such things as natural beauty and good health. But these values must be translated into economic terms to enter the calculation. When environmental reforms are proposed, biased cost/benefit analyses can be devised to show that they interfere with economic performance. Arguments based on the trade-off approach are thus often based on flimsy estimates of costs and benefits.

The alternative is simply to impose environmental standards. Naturally, costs will come up in the debate over standards, but they will be evaluated much more flexibly and alternative arrangements designed to deal with them discussed much more freely if the issues are not boiled down to set of numbers pretending to scientific status.

This approach seems obvious, and indeed cost/benefit analysis is often pragmatically justified. But note its rather conservative political implications.

The question I will address in the rest of this chapter is whether cost/benefit analysis can supply us with an environmental philosophy. When so generalized it has been used, along lines anticipated by Mandeville, to argue that too much environmentalism will end up impoverishing society. But do we really understand the issues when we start out from the notion that there are trade-offs between environmental and economic values? While there are obvious practical applications of cost/benefit analysis, I will argue that it fails as a basis for environmental philosophy. In this I agree with an extensive critical literature [1] . To this literature I will add a chapter focusing on the technological aspects of the problem.

Behind the trade-off approach lies an implicit philosophy of technology which I argue is incorrect. Once it falls, the limits of the approach it supports become apparent. That philosophy of technology assumes two connected principles, technological determinism and the neutrality of technology. I discuss these assumptions here in relation to several historical examples. In my conclusion I argue that environmentalism is not essentially about trade-offs but that instead it concerns a choice of civilization. The question it poses concerns the kind of world we want to live in, not how much we want of this or that. This was of course also the point of the environmental pessimists discussed at the beginning of this essay. But contrary to them, I believe alternative industrial models are possible based on different technological choices.

Background Assumptions

Economics is based on the proposition that one can't optimize two variables. To optimize A, some of B must be let go. While this seems clear enough, there are several background assumptions that economists make when they talk about trade-offs and these assumptions are not so obvious.

In the first place, it is necessary that the options in a trade-off be clearly defined. But defined by whom? There is an unfortunate ambiguity on this point. The trade-off concept has an obvious source in common experience where the agent who chooses between the options also defines them. But when it is incorporated into economics, it borrows plausibility from that common experience while overstepping its limits in important ways. Economists can deploy technical tools that enable them to extend the notion of trade-offs to include purely theoretical alternatives that figure in no actual calculus of well-being. This confuses the issues in public debate over live options.

Now, there may sometimes be good reasons for the economists extension of the concept, but it turns out to be very important not to mix the ordinary and this technical sense of the concept of trade-offs. Few of us would consider our failure to earn income through prostitution as a trade-off of moral principles for money for the simple reason that prostitution is not a live option for us. Similarly, well established environmental and safety standards are not up for grabs and their theoretical cost, which may sound impressive, is irrelevant to present concerns.

There is a second background assumption we must bring out into the open. For it to make sense to talk about trade-offs, all other things must remain equal. This assumption is called ceteris paribus. If laws change, if prices change, if the relation between goods changes, then what looks like a trade-off may no longer be one. One specific type of change that interests us involves cases where obtaining A turns out to be a condition for obtaining B.

Ceteris paribus is certainly plausible in most short run economic decisions. When one composes a personal budget it makes sense to assume that all other things will be equal, that one will not win the lottery, or be struck by lightning, or discover unexpected mutual dependencies between goods. But if the time span is extended from ordinary economic life to historical scales, it is not at all plausible to assume that things will remain equal. It is thus not surprising to find that the trade-off approach fails to explain past historical cases such as the regulation of labor that parallel contemporary environmentalism. The changes involved cannot be understood on the model of an individual working out a budget.

In order to maintain ceteris paribus in history one must exclude cases in which apparent trade-offs dissolve as it turns out that A is a condition of B. In technological terms, the equivalent would be the emergence of a new path of development made possible and necessary by regulation. This is commonplace. For example, the initial response of automobile makers to pollution controls reduced fuel efficiency, an undesirable trade-off. Later innovations, culminating in electronic fuel injection, successfully combined emission controls and fuel efficiency. Here, clearly, all things are not equal and the trade-off dissolves in the face of technical advance [2]. Applied uncritically, ceteris paribus excludes such cases and thus implies that development proceeds along a fixed track from one stage to the next without the possibility of branching out in new directions inspired by political interventions. This view is called technological determinism.

Deterministic applications of trade-off theory serve not only to challenge environmentalism but many other technological reforms. For example, in discussions of industrial management and administration we hear that more democracy means less productivity. Technological imperatives condemn us to obedience at work (Shaiken, 1984). Similar arguments in medicine keep patients in a passive role. Women demanding changes in childbirth procedures in the early 1970s were often told they were endangering their own health and that of their babies. Today many of the most controversial changes have become routine, for example, partners admitted to labor and delivery rooms. When AIDS patients in the 1980s sought access to experimental treatment they were told they would impede progress

toward a cure. Their interventions did not prevent the rapid discovery of the famous drug cocktail that keeps so many patients alive today (Feenberg, 1995: chap. 5). Over and over technological reform is condemned as morally desirable perhaps, but impractical. Over and over the outcome belies the plausible arguments against reform.

Determinism is often accompanied by the belief in the neutrality of technology. Means are simply means, and do not affect goals. They have no implicit value content except in so far as they can be judged more or less efficient. The neutrality thesis is familiar to us from the gun-control debate where it is expressed in the slogan: Guns don't kill people, people kill people. Guns are neutral and values are in the heads of the people who choose the targets.

Together, technological determinism and the neutrality thesis support the idea that progress along the one possible line of advance depends exclusively on rational judgments about efficiency. Since only experts are qualified to make those judgments, environmentalists obstruct progress when they impose their ideological goals on the process of development. Where goals conflict, one or the other must be sacrificed, environmental protection or technological advance, or in Mandeville s terms, virtue or prosperity.

I will discuss an alternative view later in this essay. Anticipating my conclusion, I will argue that technological development can switch tracks in response to constraints. On its new track, it may achieve several goals that were originally in conflict along its old one. Before introducing a philosophy of technology which supports this proposition, I want to discuss two historical examples in some detail.

Two historical examples

The first case concerns child labor. It is fascinating to go back to the British Parliamentary Papers and read the debates on the law regulating the labor of women and children. The issue arose because manufacturing took more and more children off the land and put them in factories. No one worried about the children so long as they worked on their parents' farm or shop. But the morality of child labor was questioned when they were employed in big anonymous institutions without parental supervision.

Lord Ashley was the leading speaker for regulation in the parliamentary debates of 1844. Today we would call his arguments ideological. He referred to no economic benefit of abolishing child labor or limiting the labor of women but instead emphasized the moral importance of motherhood. He worried that the factory system would result in a generation growing up without the tender care of a mother. He even complained that the mothers, once they were sent to work in factories, could be heard using foul language.

The response to Lord Ashley came from Sir J. Graham who complained about international competition, inflation, and technological imperatives, just like those who resist environmental regulation today. Why international competition? Regulation makes no sense in a globalized economy in which other nations continue to employ child labor. What about inflation? Because children cost less to feed and therefore can be paid less. If you replace their labor with adult labor, costs and prices go up. And who will that hurt? The poor, the very people who need help! So Sir J. Graham argued that the abolition of child labor is based on “a false principle of humanity that is certain to defeat itself” (*Hansard s Debates*, 1844: 1123).

Finally, this early opponent of regulation comes to the question of technology. His argument is vague but there is a famous old photograph by Lewis Hine which helps to understand his concerns [3]. This photograph shows a little girl in front of the equipment she uses in a cotton mill. She looks about ten years old, standing there in a white dress in front of ranks of machines going back into the distance. At first glance the picture seems quite ordinary. But soon one notices something strange about it: the machines are built to her height. The whole mill was designed for operation by children four feet tall. Industrial technology, like the chairs in an elementary school classroom, was designed for little

people. The machines would be obsolete without the children to operate them. Thus technological imperatives required child labor.

This sort of argument is all too familiar. We have all heard about environmental Luddites out to destroy industry. Well, it is an old refrain. But what actually happened when new laws regulated the labor of women and children? In fact child labor was phased out in all the industrial countries. Regulation and economics did not conflict as factory owners feared. The intensity of labor increased and productivity went up, more than compensating for the higher wages paid adults. Since children went to school for longer periods, they entered the labor force with more skills and discipline, which also improved productivity. A vast historical process unfolded, partly stimulated by the ideological debate over how children should be raised, and partly economic. It led eventually to the current situation in which nobody dreams of returning to cheap child labor in order to cut costs, at least not in the developed countries.

This picture of the history of child labor might be contested on deterministic grounds. It is of course possible that the evolution of technology and labor organization made the employment of children unprofitable, with regulation appearing only after the fact to consecrate economic necessity. Then ideology would have no causal role at all. A rather crude interpretation of Marx is the obvious source of this type of argument. It sounds good like most just so stories, the explanation is elegant in its simplicity but historians and sociologists have been invalidating such monocausal explanations regularly for a century now. The news has long since reached theoretically sophisticated Marxists, if not Chicago. What is more, determinism misses the cultural dimension of this historical change. In developed countries, child labor violates fundamental assumptions about the nature of childhood. Today we see children as consumers, not as producers. Their function is to learn, insofar as they have any function at all, and not to make money. This change in the definition of childhood is the essential advance that has occurred as a result of the regulation of labor.

In sum, although the abolition of child labor was promoted for ideological reasons, it was part of a larger process that redefined the direction of progress. In the child labor case all other things were not equal because a new path of development emerged. On this path regulation actually contributed to increasing social wealth. Technology was not neutral in this case. It established the meaning of childhood and embodied that meaning in machines. The low machines suited to operation by the ten-year old girl made a statement about what it is to be a child. The value society places on childhood is embodied in the design of the equipment.

Here is a second example. Steamboat boilers were the first technology regulated in the United States (Burke, 1972). In the early 19th-century the steamboat was a major form of transportation like the automobile or airlines today. The US was a big country with few paved roads and lots of rivers and canals. Steamboats were essential means of transportation. But steamboats blew up when the boilers weakened with age or were pushed too hard. After several particularly murderous accidents the city of Philadelphia consulted in 1816 with experts on the design of safer boilers. This was the first time an American governmental institution interested itself in the regulation of technology, but in the end nothing was done and the accidents continued. In 1837, at the request of Congress, the Franklin Institute issued a detailed report and recommendations based on rigorous study of boiler construction. Some representatives wanted to impose a safe boiler code on the industry but boilermakers and steamboat owners resisted and Congress hesitated to interfere with private property.

It took from that first inquiry in 1816 to 1852 for Congress to pass effective laws regulating the construction of boilers. In that time 5000 people were killed in steamboat accidents. Once Congress imposed a code requiring thicker walls and safety valves, the epidemic of explosions abruptly ceased. To us it seems obvious that regulation was needed. But apparently it was not obvious in the early part of the 19th century. The situation was puzzling. Consumers kept on buying tickets despite the rising toll. At the same time people voted for politicians who demanded regulation. It seemed reasonable to ask what people really wanted, cheap travel or safety.

The controversy was finally settled at another level. In everyday life, our goals are nested in hierarchies. The student goes to campus to take a class to get a degree to get a job, and so on. But sometimes, particular actions or objects we pursue belong to several different hierarchies where they may have somewhat different meanings. Thus the same student might also go to campus to take the same class to sit next to a girl to ask her out on a date.

Trade-offs are complicated where goals are nested in several hierarchies associated with different decision procedures, each procedure introducing a different bias into the choice. For example, a purely individual decision may well differ from a communal one because the community will situate the options in goal hierarchies that the individual might not have considered. This complication is relevant to the steam boat case. Individual market based decisions led to different conclusions than collective political decisions because safety is situated in different goal hierarchies from these two different points of view.

Individual travelers simply wanted to reach their destinations at a reasonable price. They generally ignored the risk in their own individual case. But the politics is more complex because it involves more than individual risk. The basis for regulation is the commerce clause of the Constitution under which the government controls interstate transportation. This is not just a matter of economics but concerns national unity. Like the highway system today, the canals and rivers of the early 19th century unified the territory of the United States. The movement of people, ideas, and goods, the movement of troops, all the things that define a nation depend on transport and in that period most especially on steam transport. National unity is not an individual economic concern but a collective political one. Safe transport had obvious individual benefits, and indeed most of the congressional debate concerned those benefits, but it was also a legitimate national issue. For example, senators from the West argued that they should not have to fear for their lives in traveling back and forth between the nation's capital and their constituents.

From an individual standpoint the imposition of regulation traded off ticket prices for safety, but at the collective level something quite different was going on. The infrastructure of national unity lies beyond the boundaries of the economy. It cannot be traded off for anything. Once security of transport is treated as essentially political, it ceases to figure in routine economic calculations. It no longer makes sense to worry about the trade-off of ticket prices for safety once the principle of national interest in safe transportation is established. Just as we don't worry about all the money we are losing by not marketing our bodies, so the cost of insuring a certain minimum security of transportation figures in no one's account books.

The steamboat case shows how economic considerations are sometimes undercut by the instability of the problem definition associated with particular technologies. For there to be a trade-off account, the options must be stabilized. But in the steamboat case the options are not stable. There are two slightly different and competing problem definitions, one at the individual and the other at the collective level, and it is not clear what the problem is until it is finally settled. In this case the decision about what kind of technology to employ could not be made on the basis of efficiency because efficiency is relative to some known purpose. If the purpose is in question, efficiencies cannot be compared.

This is still true of the regulation of transportation today. Once safety standards are established, individuals no longer consider the excluded options as potential factors in their personal well-being. The only trade-off in which yesterday s unsafe designs play a role is in the head of conservative economists. As zealous accountants they may insist that we monetize all these considerations and mark them down as expenses. But when the boundaries of the economy shift, so many cultural and technical consequences follow that it makes no sense to look back with an eye to costs and benefits. In the only sense in which it is significant for policy, social wealth must be measured with respect to the fulfillment of actual desires, not theoretical constructions.

To be sure, we should be interested in economists opinions regarding the value of options of which most people are temporarily ignorant such the consequences of smoking or poor diet. But that concerns a future in which live options

can be expected to appear. Once the case is settled, the dead options are no longer relevant. And since it is impossible in any case to say how we would evaluate changes in the direction of progress in monetary terms, cost/benefit analysis can play only a minor role in such debates. In sum, economics can help us navigate the flow of wealth but it cannot tell us where to place the dams or change the course of that flow.

Thus it is a misrepresentation to claim that we are spending a specific sum such as $100 billion a year on environmental protection. No doubt most of the money went into improved design standards we now take for granted, for example, proper toxic waste disposal, safer water supplies, and so on. Economics has no choice but to regard these as “goods” but we do not think like that any more than New Yorkers conceive of Central Park as a piece of real estate they could sell if they wanted something else for a change.

One might object that in failing to appreciate such theoretical trade-offs, we ignore economic realities, but that is a short term view. This type of cultural change is eventually locked in by technical developments. For example, in the abstract one could redo all the calculations of labor costs taking into account the savings that might be made with cheap child labor, but that is an economic absurdity to the extent that the economies of developed societies presuppose the educated and disciplined products of schooling and could not be operated by children. Priorities change too so it is impossible to compare the value of something like cleaner air or water to other goods on a constant basis over historical time.

A constructivist approach

There is a philosophy of technology that acknowledges these difficulties. Various versions of constructivism argue against technological determinism that there are many paths of development and that the choice between them is social and political and not a simple matter of efficiency (Pinch, et al., 1989). A way of life is expressed in design. Values are thus embedded in technology. I will come back to the environmental question from a constructivist perspective in the conclusion to this paper, but let me first explain this alternative view of technology.

Constructivist technology studies grow out of an earlier revolution in science studies. Thomas Kuhn s famous theory of scientific revolution holds that the apparent rationality of scientific progress is at least partially illusory (Kuhn, 1962). In fact scientific advances are under-determined by properly scientific reason and embody fundamental cultural values as well as evidence and arguments. This parallels what I have been saying about technology.

The technological development of the boiler appears purely rational surely a safer boiler is better from an engineering standpoint. But history shows that it took 40 years to decide to make safer boilers, and then the moving force behind the change was politics, not considerations of efficiency. We thus have the same kind of problem in understanding the development of technology that Kuhn had with scientific development: progress is surely real but it is not reducible to a succession of purely rational choices.

Kuhn's solution was the notion of paradigms, by which he meant a model for research both in terms of theory and practice. Such models have tremendous influence on those who come afterward. For example Newtonian mechanics dominated physics for several hundred years. In Newton physicists had not just a correct theory of gravitation, but a model of how to do physics.

Scientific revolutions occur when paradigms change. Normal science, Kuhn argued, is research within the established paradigm. The technological parallel would be what I call technical codes, the codes that govern technical practice (Feenberg, 1999: 87-89). These incorporate value decisions that are embodied in technical disciplines and ultimately in technical designs. As we saw, the technical code of the mill in Hine s photograph dictated certain height specifications which corresponded to a decision about the age composition of the workforce. In contrast our

technology includes a height specification for adults. Similarly, the boiler code looks merely technical but it actually embodies a decision about national security; that decision governs the technical specifications.

Normal progress in technology is the pursuit of efficiency within a paradigm. Once a decision is made on the boiler code, then all kinds of refinements are possible. Revolutions in both science and technology involve fundamental changes in values reflected in the paradigms or codes that control the normal pursuit of truth or efficiency. Within a paradigm progress proceeds through the normal process of research and development, but there is no continuity between paradigms. They open up incommensurable worlds.

This constructivist approach has consequences for our understanding of the rationality and autonomy of the technical professions. At every stage in the history of their field experts inherit the results of earlier controversies and struggles, earlier revolutions. Engineering students do not have to learn how this or that regulation was translated into a design specification. The results are technically rational in themselves and presented as such. This gives rise to an illusion of autonomy that is characteristic of these disciplines. In fact their autonomy is more limited than they think. They imagine their past as a succession of decisions identifying the one best way as defined by scientific principles when in fact it is the result of social choice between several good ways with different social consequences. There is thus what might be called a technological unconscious in the background of technical disciplines.

Since values enter into the evolution of technical disciplines, major civilizational changes give rise to technological changes. Withdrawing children from the labor process and putting them in school was an enormous change, a change of civilization. Such a change is bound to generate a different path of technological development.

Technological revolutions look irrational at first but in fact they simply establish another framework for rationality, another paradigm. Thus it is neither rational nor irrational in some absolute sense to build a safer boiler. Constructivists would say that the decision to do so is under-determined by pure considerations of technical efficiency because it also depends on a decision about the importance of safety. As we have seen, that is a value question settled through political debate.

Conclusion: Environmental Values

Now let me return to the question of the relation between environmental values and the economy with this constructivist argument in mind. I have identified several problems with the trade-off approach. First, it ignores the significance of the shifting boundaries of the economy. We do not mourn the cost of using adult labor instead of child labor for the simple reason that child labor is no longer an economic issue.

Second, the trade-off approach assumes the fixity of the background, the ceteris paribus clause, but technological change over the long time spans of history invalidates that assumption. All things are not equal in history since cultural change and technological advance alter the terms of the problem.

Third, the trade-off approach obscures differences in problem definition and goals reflecting different contexts of decision. There is no absolute context from the standpoint of which an unbiased evaluation is possible. It is thus deceptive to compare such things as the risk of death in an automobile accident with the risk of death from a nuclear accident since the one case involves individual responsibility and the other collective responsibility.

Fourth, the trade-off approach confuses short run economic considerations with civilizational issues. These latter concern who are we and how we want to live. This is a different proposition from getting more of A at the expense of B. There are certainly many occasions when we want to know about trade-offs and economics is usually the best guide in such cases. But like other intellectual disciplines, economics has limits and exceeds them to its peril&and

ours.

Here is an example that concerns a current environmental issue, the case of air pollution and asthma. Currently, asthma attacks are treated as a cost in cost/benefit calculations. One study of the revised clean air act valued asthma attacks at an average $32 (Rowe and Chestnut, 1986). Obviously, the lower the cost of attacks, the less benefit is recovered by decreasing their frequency. Although this is offensive to anyone with asthma, it makes some kind of sense to the extent that our society is not fully committed to the struggle against this disease, which has modest medical costs [4].

But it is entirely possible that we will respond to the rapidly rising incidence of asthma and the rising death rate associated with it by attempting to eliminate pollution as a factor in causing the disease. If we were to rule asthma out of account in this way by setting health-based standards that place it beyond the boundaries of economic calculation, we would eventually arrive at a state of affairs which would seem obvious and necessary both technically and morally.

Polluting methods would be replaced gradually by clean ones everywhere. No one would make parts for the old polluting devices anymore and they would be abandoned. After a while, the new ones would be better in many respects, not just environmentally, since all later progress would be designed for the new devices. It would not occur to our descendants to save money by going back to the old ways in order to cheapen industrial production or transportation. They would say, We are not the kind of people who would trade off the health of our children for money, much as we would immediately reject the suggestion we supplement the family budget by sending our children out to work in a factory or sell our bodies for a little extra cash. This would be a civilizational advance in the environmental domain.

This leads to the question of why environmental values appear as values in the first place. Indeed, why is it at all plausible to claim that environmentalism is an ideology intruding on the economy? This is explained by the fact that our civilization was built by people indifferent to the environment. It is this heritage of indifference that makes it necessary to formulate concern for the environment as a value and to impose regulation on industry. Environmental considerations were not included in earlier technical disciplines and codes and so today they appear to come from outside the economy.

This charge of indifference need not imply an overly harsh judgment of our predecessors. Not only are we richer and better able to afford environmental protection, but the immense side effects of powerful technologies that have come into prominence since World War II have made environmental regulation a necessity for us in a way it was not for them (Commoner, 1971 [5]). However, it does imply a harsh judgment of contemporaries who rely on specious arguments to justify dismantling regulations we can well afford today and desperately need. However powerful these conservative politicians may look at the moment, we can expect their current offensive to fail as the severity of environmental problems make an obvious mockery of their claims.

From this standpoint it seems likely that the ideological form of environmental values is temporary. These values will be incorporated into technical disciplines and codes in a technological revolution we are living unawares today. Environmentalism will not impoverish our society. We will go on enriching ourselves but our definition of prosperity and the technologies instrumental to it will change and become more rational in the future judgment of our descendents. They will accept environmentalism as a self-evident advance. Just as images of Dickens in the bootblack factory testify to the backwardness of his society, so will images of asthmatic children in smog-ridden cities appear to those who come after us.

Although its progress is slow and there are setbacks, environmentalism has the temporality of a revolution. Revolutions represent themselves as fully real in the future and look back from that imagined outcome at the limitations of the present. The French revolutionary Saint-Just asked what “cold posterity” would

someday have to say about monarchy even as he called for its abolition (Saint-Just, 1968). With history as our guide, we too can overleap the ideological obstacles to creating a better future by realizing environmental values in the technical and economic arrangements of our society.

Acknowledgements

I want to take this opportunity to thank Simon Glynn for first setting me the task of explaining my views on the environment, and Michael Benedikt and Andrew Light for challenging me to explain myself more clearly, and Arne Elias for advice on an early draft.

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Contacter l'auteur : Feenberg@sfu.ca

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[1] See, for example, Venkatachalam (2003) and Kopp, et al. (1997).

[2] Gilbert Simondon describes such cases as concretizations (Simondon, 1958). For more on concretization, see Feenberg (1999: 216ff).

[3] See http://www.eastman.org/ar/letchild/m197701810015_ful.html#topofimage

[4] Stranger still is the notion that, since individual wealth correlates positively with life expectancy, regulations induce deaths by reducing disposable income. This cost of regulation was brought before the court in a challenge to the Clean Air Act, but the judge was not impressed. For further discussion of the costs of asthma, see The Benefits and Costs of the Clean Air Act, 1990 to 2010.

[5] For more on Commoner s argument for this point, see Commoner (1971) and Feenberg (1999: chap. 3).

