

Enabling Environment



Srinivasan Sunderasan

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A Worm's Eye View of Environmental
Finance

 Springer

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Foreword

The term environmental finance may not be commonplace yet, but Srinivasan Sunderasan's book *Enabling Environment* brings light to this developing and pressing field. The term was first coined in 1992, by Richard L. Sandor, and describes financial investments, infrastructure, and devices that work with and preserve the environment. However, two decades later, most countries' economic policies continue to be at odds with an environmentally green agenda.

We stand at a point of economic and historic upheaval. Many developed countries' economies are in disorder or depression, continually increasing their needs for nonrenewable energy and therefore continuing to create large amounts of nonrecyclable and harmful waste. Developing countries, on the other hand, feel they should build their infrastructure, policies, and economies around the same principles that have landed developed countries in their previously mentioned precarious situation. Though this may appear a bleak outlook, it provides us a unique opportunity. Developed nations can incorporate the principles of environmental finance as they begin to reevaluate and restructure their economic policies. Developing countries, who are building their economic framework, can craft it around environmental finance theories, while becoming the new benchmark or standard for sound environmental and economic practices.

To halt this slide down the slippery slope of environmental degradation requires the brakes of reason that come from informed thinkers such as Al Gore, James Hansen, and others. Dr. Sunderasan adds his voice to this growing crescendo by developing a strain of thought that draws on established economic theory and is yet eclectic in its approach.

Devising solutions to these demanding problems can no longer rely on political diktat nor be sought by appealing to the social consciousness, but must rather draw on the irrepressible market forces that can be unleashed by Adam Smith's *invisible hand*. Dr. Sunderasan in his pioneering collection of essays proposes a range of proactive policy measures and market-based instruments that can alter patterns of behavior to achieve desired outcomes. The power of Dr. Sunderasan's solutions is rooted in their ability to merge the individual interest with those of the larger community – of positively internalizing what are strong negative externalities.

Dr. Sunderasan skillfully explores many areas of environmental finance, such as the green index, providing incentives to governments and businesses to increase green productivity and reevaluating measures of energy expenditure and even the social and psychological changes that should be made to bridge the inter- and intragenerational environmental gap.

In putting together this book, Srinivasan Sunderasan has done a remarkable job of focusing the lens of reason on what may be the most pressing issue of our time and initiating a new line of discourse to stimulate discussion among thinkers, policy makers, organizations, and market participants. Anyone wishing to enter the fray to restore our environmental heritage will find this book to be an invaluable guide.

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August 2012

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Prefatory Note

It has been a summer of discontent! Citizens in debt-ridden and shaky economies of the Eurozone, namely, Greece and Spain, have taken to the streets to disapprove of proposed austerity measures, pension and healthcare cuts, and longer working hours and other such measures which are collectively seen as a way out of the crisis for the domestic economy, the Eurozone, and for the global economy in general. It is difficult to point a finger at the guilty, for the voting public brought the populists into office who, in turn, drained the treasury. The very same voting public continues to back those who promise lesser austerity and more populism – even if the latter are faced with fewer options save eschewing profligacy and following a path of fiscal consolidation. While the political leaders who led to this impasse have probably gone into a comfortable retirement, it is today's common person and the persons belonging to the generations to come who bear the pain of lost jobs, of lost benefits, and, ultimately, of lost hope. It is common people who make choices which eventually lead to distress; it is common people who are expected to put up with a host of unpleasant circumstances in pulling themselves out of crises. Yet, there are few, if any, mechanisms other than periodic referendums or elections that engage individuals in decisions of global import, monetary, fiscal, environmental, or otherwise.

Practically speaking, it is individuals who make consumption-related choices on ways of living, traveling, or in preferring products or services over others. This collection of articles on environmental finance is an attempt to highlight the role of these everyday persons in aggregating individual effort toward collectively achieving positive global outcomes, effective transfer of technology and resources, and sustainable livelihoods for the present and for the future. Given that global negotiations among political leaders, policy makers, and activists routinely get bogged down on issues relating to responsibilities for past actions, and to intergenerational and intragenerational equity, it is possible for each individual to take moral ownership of the natural environment and to make positive contributions toward restoring it to its pristine state.

This collection of topical research work covers specific aspects and issues within environmental economics and finance, ranging from the politics of fossil fuel prices through stock-market valuations of green(er) companies, option-based payments

for ecosystem services, and behavioral models for inducing environment-friendly conduct. Owing to familiarity and convenience of access, data from India are employed to illustrate, but the concepts outlined could be applied globally. Each article tackles a real issue offering plausible, practicable solutions, without making idealistic and unreasonable assumptions. Specific investment or consumption choices, incentive structures, and behavioral patterns are discussed.

This book is based on extensive research and on the author's personal experience, thus providing a technical overview for each issue being discussed and yet retaining focus on the practical economic and financial facet of the issue in question.

Enabling Environment is built on a theoretical foundation, draws on relevant experiences from across countries, and offers solutions and instruments that can directly be implemented in the real world. The collection is a singular blend of economic theory and empirical finance – and hence should appeal to researchers and academics as well as main-street investors. It leads seamlessly from economic theory into exploiting the investment opportunities available, while contributing to superior environmental outcomes through this transition.

The introductory chapter discusses the concept of individual transferable emission quotas as an equilibrating mechanism. The political irrelevance of fossil fuel subsidies is demonstrated in the following chapter followed by an analysis of the value of independent assessments and disclosure of environmental performance of firms across industry sectors. “Goodwill capital” emanating from superior environmental performance is quantified and read in conjunction with the generation of superior investor returns. The design of an innovative green stock-market index as a genuine reflection of the “greenness” of the economy is outlined.

From encouraging pro-environmental behavior, the focus shifts to internalizing externalities as a means of adaptation. Implied valuation of a ton of carbon is computed from a set of projects submitted under the Kyoto Protocol/UNFCCC Clean Development Mechanism (CDM). Furthering the discussion on carbon valuation and trading, a synthetic basket currency, “CERO,” is proposed with a view to enhancing the efficiency of international carbon markets. A “real-option” model is developed as a means of encouraging agroforestry on private lands to encourage sequestration and to deliver other ecosystem services. The collection of articles ends with a section on social incentives and societal norms involved in encouraging pro-environmental consumption choices.

Mysore, India
August 2012

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List of Abbreviations

APM	Administered price mechanism
AR4	Fourth Assessment Report (of the IPCC, 2007)
BSE	Bombay Stock Exchange (www.bseindia.com)
BAU	Business as usual
CC	Climate change
CDM-EB	CDM-Executive Board
CDM	Clean Development Mechanism (one of the flexibility mechanisms launched under the auspices of the Kyoto Protocol)
CER	Certified emission reduction
CERO	A “synthetic” “basket currency” proposed to value reductions in emissions (CER)
CPCB and PCB	Central Pollution Control Board (Government of India: http://cpcb.nic.in) and Pollution Control Board (at the state/provincial level)
DNA	Designated national authority
EA Industry	Economic Advisor to the Ministry of Industry and Commerce, Government of India (http://eaindustry.nic.in)
ECI	Election Commission of India (http://eci.gov.in)
ECX	European Climate Exchange
EIA	(The US Government’s) Energy Information Administration (www.eia.gov/)
EMS	Environmental management system
ERC	Emission reduction credit
FAR	First Assessment Report (of the IPCC, 1990)
FDI	Foreign direct investment
GDP	Gross domestic product
GHG	Greenhouse gas
GNH	Gross national happiness (Bhutanese qualitative measure of welfare)
GPI	Genuine progress indicator
HCA	Host country approval

HDI	Human development index
HDR	Human development report
INR	Indian Rupee (also Re. singular or Rs. plural)
IPCC	Intergovernmental Panel on Climate Change (www.ipcc.ch)
ISO	International Organization for Standardization (www.iso.org)
IUCN	International Union for the Conservation of Nature (www.iucn.org)
MITM	Man in the middle
NGO	Nongovernmental organization
NSE	National stock exchange (www.nseindia.com)
OLS	Ordinary least squares (regression)
PDD	Project design document
RBI	Reserve Bank of India (the country's central bank) (www.rbi.org.in)
SAR	Second Assessment Report (of the IPCC, 1995)
TAR	Third Assessment Report (of the IPCC, 2001)
TEQ	Transferable emission quota
UNDP	United Nations Development Programme (www.undp.org)
UNFCCC	United Nations Framework Convention on Climate Change (www.unfccc.int)
WG (II)	Working group (2) (of the IPCC) dealing with technical aspects of vulnerability assessments and adaptation
WTO	World Trade Organization

Chapter 1

Rainmakers

Sir Humphrey: "So, how's the environment?"

Lan: "Bit smoky, isn't it? Oh, you mean my department? Chaos, as usual!"

– Yes Minister Television series, "The Middle-Class Rip-Off,"
December 23, 1982

Beijing had a smog problem. Billions had been spent to reduce pollution, with limited to no success. Factories had been shut or shifted out of town. Special scrubbers were made mandatory for power plants, and electric heaters were installed to replace coal in ancient courtyard homes. Saplings were planted and parking lots were paved. Yet, incessant construction and rapid growth in automobile numbers added to the problem. A year to the day before the start of the 2008 Beijing Olympic Games, the president of the International Olympic Committee suggested that a few of the endurance events might need to be postponed (BBC Sport 2007). A fortnight before the inauguration of the games, the government forced over a million cars off the streets, suspended construction activity, and halted work at several hundred factories in surrounding provinces. Artificial rainmaking through cloud seeding was seen as a "natural" way to clean the air (AP 2007). Cars bearing odd-numbered license plates were required to drive on odd-numbered dates and those with even-numbered plates on even dates. Further, cars that shared the same last number of the license plate with the date were to stay away for the day (Spencer 2008). The antipollution measures disrupted workday commutes for residents and caused thousands of others to take time off work, involuntarily, and with cut-rate wages. Many of the restrictions were extended to neighboring cities and provinces. Domestic retailers found it difficult to replenish inventory. Exports were hit. Consumers in China's export markets suffered too. The air quality was also expected to adversely affect athletes' performance, especially those with asthma or other respiratory problems. Beijing remained wrapped in a gray haze. "When we grew up pollution wasn't a problem, because we didn't have all this industry," observed steel trader Zang (Oster 2008).

The skies cleared for a brief while and the games proceeded smoothly. Within months, the smog was back. Chen et al. (2011) observe that the plant closures and traffic control measures led to a *real* improvement in Beijing's air quality, albeit with a lag, beginning shortly before the games, continuing through the duration of the games, and managing to sustain the momentum for a few months thereafter. Others argue that while source-control efforts have definitely played a role in reducing size-fractionated particulate matter concentrations, meteorological parameters, namely, the migration of air masses from the south and precipitation, and the global economic downturn could have made more significant contributions (Wang et al. 2009). The centrality of such meteorological phenomena has been reiterated by Kenneth Rahn and cited by Madrigal (2008). It is found that polluted air originating in the provinces south of Beijing requires to be flushed out by cold fronts from Mongolia, and in the absence of such currents, there is precious little that the authorities could achieve.

Meanwhile, what could be considered the most aggressive pollution-reduction scheme in history had left a deep economic impact, especially in the cement, steel, iron ore, coal-fired power generation, chemical and pharmaceutical, construction, and transportation sectors. Notwithstanding the humungous investments into infrastructure creation and other preparations preceding the games, the employment- and environment-related benefits were short-lived (Ludwig and Turner 2010). Further, the "Beijing experiment" failed to throw up examples of cost-effective policies that could actually deliver sustainable and replicable results.

Measures of Responsibility

The Beijing 2008 experiment seems to suggest that, topographical features apart, the increase in carbon emissions is inextricably intertwined with all that goes in the name of growth and economic development. Policy makers are loath to diverge from a tried-and-tested fossil fuel intensive path for fear of upsetting the "business-as-usual" approach. Taking a global view, as lower income countries work toward enhancing opportunities and options for their peoples, growth in production and consumption need to, necessarily, be decoupled from rising emissions. In some sense, this calls for putting the clock back toward increased domestic agricultural production, sustainable and efficient use of resources, enhanced productivity, and moderate trade.

"For now, however, using per capita emissions as a development indicator allows for a clear and useful way to determine development that rests on the levels of energy expended by that country's individual citizens" (Cutlip and Fath 2011). The authors go on to observe that the United Kingdom and South Korea have stabilized, that is, remained consistent for a period, around 10 tons per person while the United States appears to have stabilized at 20 tons per person and conclude that a less fossil fuel dependent growth path could lead to comparable quality of life, if such paths are consciously chosen early enough. This also implies that for countries

like India, with rapidly rising populations, the per capita rate of emissions is bound to rise in the medium term, unless less carbon-intensive paths to welfare are discovered, through technology leapfrogging for instance, and by expanding the frontiers of technological and social possibilities.

Traditionally, it has been believed that rapid growth in populations would “almost certainly” result in proportional growth in emissions. Activists have often sought to pin responsibility for cumulative historical emissions, irrespective of emissions in current years. Bhattacharyya and Ghoshal (2010) observe that the ranks in respect of total emission among the top polluters demonstrate very low correlation with per capita measures. They also find that “the link between growth rates of aggregate consumption and emissions [aggregate as well as per capita] is relatively stronger for developed countries.” Geominne and Paredis (2010) consider environmental issues as both an intragenerational issue as well as an intergenerational one. They view emissions by industrialized countries as a debt which involves more-than-proportional appropriation of the absorptive capacity of the oceans, vegetation, and forests and through the deposition of toxic substances and conclude that the access to ecosystem services cannot be on a first-come-first-served basis. Simultaneously, they point out that present overexploitation of the ecosystems could have far-reaching social and economic consequences for future generations.

Experts have argued that the concept of intergenerational equity and the associated moral intuitions urging the present generation to treat future generations as we would treat ourselves are largely ethical dilemmas (Arrow 1996). Kuhtz (2011), on the other hand, argues that the issues of global warming and climate change are not in the ethical realm, but real issues on hand that need to be tackled, and seeks to shift people’s habits and behavior toward enhanced social and environmental responsibility. This, the author proposes, would be achieved through education and awareness creation but more significantly through “reshaping people’s organizations’ and institutions’ values and concerns.”

Real People and Real Issues

While the principle of “common but differentiated responsibilities” is generally accepted, the basis for apportioning responsibility for current actions or for historical deeds with a view to handing down a habitable planet for future generations would need to be chosen scrupulously. This volume argues that “per capita emissions,” by itself, is a very poor indicator of environmental performance, unless data relating to the dispersion of such emissions among the populations of individual countries is studied. Further, such an average measure puts countries with lower populations at a disadvantage relative to the more populous ones. Second, this collection of articles illustrates the use of existing social, economic, and regulatory structures, suitably modified or extended, to help internalize the environmental externality, as opposed to superimposing newer institutions over existing arrangements.

Natural ecosystems have served as sources of raw material and as sinks to digest tail-pipe wastes. The source of supplies, be it minerals or metals, oil or ores, stone or sand, coal or diamond, and the dump-sites for wastes, radioactive, polluting, biodegradable or otherwise, have been overlooked, consciously ignored, and often taken for granted. These ecological services need to be recognized, appropriately priced and the costs allocated to the agents concerned, irrespective of their domicile status.

The Abstractions of Per Capita Measures

Per capita emissions, like all average measures, summarize the essence but convey little about a group with potentially infinite differences and variations among individuals constituting the group. In this spirit, “per capita emissions” are a deceptive bundle, both, at the global as well as the national levels. The average emission is not the “typical” contribution made by an individual in the country: in general, more people are on the lower side than “above the average.” In a populous country like India, a couple of million people above the average could pull the average well above the middle, in effect, appropriating the absorptive power of natural ecosystems that should rightfully be assigned to the hundreds of millions below the average. The absence of credible emission data, possibly distributed by income deciles or preferably with a finer calibration, would mean that one billionaire could lift the average more than several millions of people collectively could, thereby obscuring the true picture. If one were to adhere to the principle that each (adult) citizen of the planet should have equitable access to the absorptive capacity of natural ecosystems, or in other words, an entitlement to emitting specified volumes of greenhouse gases, in countries with wide disparities in individuals’ emission levels, the use of per capita measures would imply that several hundred millions of the poor end up subsidizing the carbon quotas of the few thousand “above-average” rich. Negotiators and policy makers would do well to reduce the abstraction, to identify the medians for various subgroups, and to engage in more equitable and fair (Oberheitmann 2010) distribution of pollution allowances within and among countries.

From a microeconomic perspective, a rational, utility-maximizing individual would increase his/her consumption to the extent that she reaches a tipping point and the marginal utility begins to decline. Given a certain pollution range (permissible carbon footprint) for (adult) members of a specified group or subgroup, increase in pollution resulting from increase in consumption by individuals can be justified only to the extent that it does not lead to reducing overall welfare for the group. Given the commons nature of climate change, the climate benefits accruing as a result of efforts by groups of people or an entire country would be available globally and across generations. It is therefore imperative that policy actions are coordinated among countries. Likewise, free-riding within countries needs to be discouraged through appropriate policy measures.

Equilibrating at the Retail Level

In spirit, the high-end polluters in developing countries should be treated alongside the residents of developed countries with comparable levels of greenhouse gas emissions. Market-based mechanisms or regulatory measures, or a combination of both, would then be required to bring about equitable distribution of environmental rights, privileges, and responsibilities.

One of the major sources of perverse incentives is subsidized fuel pricing and the consequent lopsided benefits derived by certain sections of society. Inefficient fossil fuel subsidies artificially increase demand while making investments into alternative technologies less attractive. Developing country governments have been unwilling to eliminate or even reduce fuel subsidies owing to political-economy considerations either because they would not like to “rock the boat” and continue with the business-as-usual scenario or because they are restrained by lobbies and pressure groups. Coady et al. (2010) of the IMF have found that fossil fuel subsidies especially those provided to gasoline and diesel disproportionately benefit the relatively wealthy in developing countries. The first article in this collection demonstrates, with the help of data pertaining to India, that other things held constant, micromanagement of fossil fuel prices has no direct impact on electoral outcomes.

The economic and environmental benefits from phasing out subsidies on transportation fuels could be significant. Additionally, optimal consumption could reduce vulnerability to disruptions in oil supply and help keep prices stable and reasonably predictable. Yet, given the relative inelasticity of fossil fuel consumption in the medium term, especially for transportation and power generation, appropriate mechanisms to protect the interests of the large populations in the lower income deciles need to be developed. Such mechanisms need to be transparent, easy to implement, and should involve low transaction costs.

One such mechanism could be an emission reduction credit (ERC) which involves the allocation of tradable certificates (“individual transferable quotas”) proportionate to emission ceilings (caps). Industry and individuals with lower marginal costs of abatement choose to contain emissions, while others procure credit certificates from those generating lower emissions levels. To make the system cost effective, standards, and consequently the initial and subsequent allocation of credits, should be technology agnostic and should specify emissions per unit of production, say tons of CO₂e per MWh of power generation, etc., for individual sectors, namely, pulp and paper, cement, fertilizer, steel, mining, airlines, and the like. As discussed earlier, in countries like India and China, a handful of billionaires and millionaires could match the cumulative emissions of several millions of the poor. Clarke-Sather et al. (2011) confirm that “global patterns in CO₂ emissions are not mirrored at the sub-national scale.” The phase out of subsidies on fuels could be made up to the poor by issuing them with such credits that could be traded to individuals with living styles involving conspicuous and extravagant consumption of resources and consequently resulting in disproportionate use of the absorptive capacity of the natural ecosystems.

Going retail through such personal carbon trading schemes, either for businesses or individuals, might not be as cumbersome or daunting a task as appears at first sight. Such transfers could be affected by proportion of electricity consumption, for instance. Consumers drawing higher quantities of electric power than specified for individuals or per unit of output for businesses, possibly based on a 24- or 36-month moving average, could pay in accordance with steeply rising price slabs. Likewise, those drawing lower than specified quantities could receive rebates in their periodic bills, thereby completing the equilibrating cycle. Similar fuel consumption standards and price escalations and rebates could be employed in the transportation sector, tracked by suitably coded vehicle registration numbers. Eventually the market for such rebates and levies would attain equilibrium with global markets, given that both sellers and buyers could trade credits across borders. This would bring about consistency of treatment meted to polluters and non-polluters irrespective of nationality or domicile status, in the absence of which, cross-border environmental arbitrage emerges as a real challenge.

Exploiting Existing Instruments, Institutions, and Structures

Tackling the challenges associated with climate change and designing suitable adaptation strategies require coordinated action by governments, civil society, and businesses, and the use of a sophisticated combination of economic as well as noneconomic instruments, namely, norms and standards relating to resource extraction, information dissemination and awareness creation, price-based policies, use and disposal of wastes, and moral suasion. Shareholder activism in individual or combined capacities and government regulation relating to environmental disclosures, standards, etc., help align incentive structures among the constituencies. Governments would need to try and bring about market transformation and alterations in living styles through energy efficiency standards for appliances, fuel-efficiency standards for vehicles, and the like. This should be combined with awareness creation campaigns starting at a young age, given that today's children might be faced with a less habitable planet in the decades to come.

The role played by the equities markets and the consequences of public disclosure of companies' environmental performance could be significant. Likewise, the use of existing financial instruments, namely, options and of stock market portfolio and benchmark indices, with suitable modifications, could help channel resources to businesses with superior environmental credentials.

The power of social norms is frequently underestimated. Existing social and institutional structures have evolved over time and are substantially based on cooptation and trust, especially in jurisdictions with weak legal enforcement. Efforts to promote positive environmental behavior would be more effective if fraternity norms and groupthink are suitably exploited (Goldstein et al. 2008). For instance, large proportions of the populations in developing countries are dependent on agriculture, an