ENVIRONMENTAL COMPETITIVENESS: COMPLETING THE COMPETITIVENESS PARADIGM

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1. Introduction

Michael Porter and his colleagues at the Harvard School of Business and Monitor Company, and others as well, have been researching, writing, and advising about a new paradigm of "competitiveness" since the late 1970s[1]. In the last six or seven years foreign assistance organizations have begun to understand that in the presence of a globalizing economy, encouraging "competitiveness" at the national, subnational, industry "cluster," and firm levels may be one of the most important things they can do to promote lasting and widespread economic expansion in developing and transitioning countries. The World Bank, Inter-American Development Bank, Danish Fund for International Development, OECD, and a number of other multilateral and bilateral agencies have undertaken competitiveness studies or operational initiatives in recent years. USAID alone has undertaken over 20 competitiveness initiatives, and more are in the pipeline[2].

Porter's basic competitiveness paradigm is indeed compelling, incorporating as it does supply; demand; rivals; upstream and downstream firms in a value chain; the supporting research and advice-giving institutions and organizations; information; incentives; government; chance; and more in a cohesive framework responsive to the realities of globalization, where information, capital, and goods can flow enormous distances at high speed and relatively low cost[3]. Competitiveness can be thought of as the ability of a company (or industry, or country) to constantly increase its productivity in creating differentiated goods that respond to market demand, and to bring those goods to market efficiently, while at the same time fostering an increasingly discriminating customer base.

Maintaining competitiveness involves a dynamic market orientation: not just constantly increasing productivity, but constantly increasing productivity *in creating differentiated goods... that respond to market demand*. Central to competitiveness is constantly upgrading human and physical capital and the way they are used so as to efficiently add more value that the market, as it shifts over time, wants and will pay for. Competitiveness provides the basis for a company (or industry, or country) to participate in domestic and international trade in a

[1] See, for example, Michael E. Porter's "Competitive Strategy: Techniques for Analyzing Industries and Competitors" (New York: The Free Press, 1980) and "The Competitive Advantage of Nations" (New York: The Free Press, 1990 and 1998), and Michael Fairbanks and Stace Lindsay's "Plowing the Sea: Nurturing the Hidden Sources of Growth in the Developing World" (Boston: Harvard Business School Press, 1997).

[2] Most of this and related information is summarized in "History of Competitiveness Initiatives," a paper presented at a conference organized by the Center for International Private Enterprise (CIPE) in Budapest in March, 2002, titled "Building Competitive Advantage in Nations: Increasing Transparency, Combating Corruption and Improving Corporate Governance." No author is shown for the paper, which is available at **www.cipe.org/pdf/whatsnew/events/budaconf/history.pdf.**

[3] For a quick exposition of the fundamentals of the competitiveness paradigm in the developing country context see Chapter 12, pages 221-238 of "Plowing the Sea."

way that increases incomes; this contrasts sharply with participating in markets on the basis of cheap labor and raw materials.

Michael Porter said it best: "The ability [of a country to produce a high and rising standard of living for its citizens] depends not on an amorphous notion of 'competitiveness,' but on the productivity with which a nation's resources…are employed [toward serving market demand][4]." Yet one is hard-pressed to find in the literature of competitiveness any meaningful reference to methodologies for achieving the highest possible efficiencies in the use of resources (inputs, including water and energy), especially in terms of environmental performance. This, despite the fact that in a 1995 article Porter and his co-author made the straightforward, succinct, and insightful point that pollution is waste, and therefore represents production inefficiency; and for that reason good environmental management can be a powerful source of innovation in a company[5].

It is now imperative that competitiveness practitioners incorporate "environmental competitiveness" into the basic competitiveness paradigm and the methodologies and tools that elaborate and operationalize it as a force for expanding trade and incomes. By environmental competitiveness we mean a high and rising level of environmental performance deriving from a deliberate environmental management effort that stresses preventing pollution and continual improvement, coupled with a program of environmental outreach and engagement for suppliers and customers.

Our aim in this article is to introduce the concept of environmental competitiveness; explain why being environmentally competitive is so important for firms in developing and transitioning economies that want to take advantage of trade opportunities offered by globalizing markets; introduce the principal tools that firms can use to be environmentally competitive; and show how environmental competitiveness implicitly resides within and can be used effectively to promote a broader competitiveness framework.

2. The Importance of Being Environmentally Competitive

First the supply side. By "supply side" we mean the operations of an enterprise, where the product is made, as against the "demand side," the markets where the product is demanded and sold. The first question we want to address here is how, explicitly, does a company's environmental competitiveness affect its operations, and through that the supply side of its overall competitiveness?

In a word, the fewer resources an enterprise consumes per unit of output, and the less waste and contaminants it generates, the better it is managing its interactions with the environment, and also the more efficiently and more sustainably it is being managed as a business.

There are four basic ways a firm interacts with the natural environment through its operations[6]: by consuming resources (inputs); by consuming energy (indirectly consuming

[4] From Michael Porter's "Competitive Advantage of Nations" (1998), p.6.

[5] See the article "Green and Competitive: Ending the Stalemate," Harvard Business Review, September/October 1995, pages 120-134, co-authored with Claas van der Linde.

[6] An enterprise can interact with the environment through its products (packaging, use, disposal) and through its operations. Here we will focus on a company's operations, especially its production process; but much of what we present is applicable also to other aspects of a company's operations (administration, marketing, distribution) and to its products.

resources); by managing waste (collecting, treating, storing, transporting, and disposing of output that has no market value); and polluting (not managing waste). Each of these is a major component of production costs, so good environmental performance can obviously be a major factor in achieving a high level of operational efficiency -- minimizing costs per unit of marketable production. But generally speaking, costs can be reduced only through the environmentally competitive approach of preventing pollution and waste, not by managing it after it has been created. This is especially true since regulatory pollution standards are constantly being tightened, driving up the cost of waste management. And unless there is continual improvement in environmental performance, an enterprise will soon enough be overtaken in production efficiency by competitors. As in all other aspects of competitiveness, an enterprise must be constantly innovating in order to sustain its environmental competitiveness.

To summarize, a first and perhaps most important contribution of environmental competitiveness to the supply side of overall competitiveness is production efficiencies that maximize marketable output per unit of input.

A second important contribution of environmental competitiveness is minimized risk of environmental and related liabilities. Without assurance that a company will not be swept out of business by its liability for damage to human health, animals, or natural resources, the benefits of being competitive may be moot. In many cases the issue is broader than the oil spills, toxic gas releases, chemical spills, and so on with which we have all become familiar. Good environmental performance is usually closely connected with product safety, product quality, and worker safety, three additional potential sources of business liability.

A third contribution that environmental competitiveness can make to the supply side of overall competitiveness is reduced general management and operating costs. Numerous studies[7] in the US and Europe have found that companies that manage their environmental interactions well tend generally to maintain control over their operations better than others and are more efficient in their management. This has been confirmed in our work in transitioning economies, where we have witnessed again and again the improved general management principles that enterprise managers have learned and applied after working with Western approaches to environmental management in their facilities. The capabilities for efficient management and maintaining control over production processes are extremely important for competitiveness.

Also, the better environmental performers -- the least polluting and best managed companies -- tend to be less at risk of business failure or liability. Consequently, they may enjoy readier or lower-cost access to financing and lower insurance costs, in addition to the lower environmental regulatory compliance costs and penalties that result from environmental competitiveness. Firms that pursue environmental competitiveness also contribute to conservation and efficient use of the overall society's collective natural resources.

Now the demand side. Recall that environmental competitiveness involves not just a high and ever-improving level of environmental performance, but also outreach to suppliers and customers (and other stakeholders). In other words, environmental competitiveness requires

[7] See, for example, the findings of a recent USEPA/UNC study at **http://ndems.cas.unc.edu**. For more background on this study see footnote 27.

both practicing a high level of environmental responsibility, and being seen to practice a high level of environmental responsibility.

Growing numbers of consumers in the wealthy markets of the world are concerned not only with the quality of the products they buy, but also with the environmental friendliness of those products (type of packaging, energy efficiency, recyclability, biodegradability, etc.); with the environmental friendliness of the production processes used to make the products; and with the environmental image of the manufacturer. While the majority of consumers in mass Western markets are not yet ready to pay a premium for demonstrated better environmental performance on the part of one company over another, when all other things are roughly equal (product quality, serviceability, price, etc.) large numbers of consumers tend to prefer the products of what they perceive as the more environmentally responsible firm.

Preference for the products of firms that are known to practice good environmental management is a recognized trend in the wealthy market regions of the globe[8]. Moreover, there are sizeable niche markets that do pay premium prices for environmentally friendly products and the products of companies believed to have environmentally friendly operations. Environmental responsibility is a useful competitive differentiator in final (retail, end user) markets, and will be increasingly so in the future.

In the case of corporate customers the trend is easier to perceive. In many developing and transitioning economies an important current or potential market for many firms is the supply chains of multinational corporations. Because of the preferences of their customers, the regulations of their home countries, the conduct of their competitors, their actual or perceived responsibility for the actions of their suppliers, and the ethical standards of their corporate cultures, corporations that are major players in international trade are increasingly requiring environmental regulatory compliance and demonstrated overall environmental responsibility from their suppliers. Growing numbers of major automakers, electronics manufacturers, soap and oil companies, food processing companies, food retailers, and others have announced such requirements in recent years[9]. Still other major corporate customers do not have specific environmental performance requirements for their suppliers (other than compliance with environmental regulations), but do have programs for supply chain management that feature a preference for prospective suppliers that can demonstrate the best environmental management.

Moreover, growing numbers of major corporations are systematically increasing requirements for their suppliers to demonstrate conformance with standards that address issues of product quality, purity, safety, or broader corporate governance and social accountability issues, but that have environmental management aspects. In many cases these derive from standards or codes of practice developed by industry associations for their members.

For example, most major US corporations require that their chemical suppliers adhere to a standard of behavior and performance developed by the American Chemistry Council called "Responsible Care," which is largely but not entirely an environmental management

[8] More information, and links to more information, on trends in market preferences and legal requirements that favor environmentally responsible enterprises and production process can be found at **www.tradeforum.org**.
[9] Examples include Caterpillar, Chiquita, Dole, DuPont, Ford, Fujitsu, Herman Miller, IBM, Starbuck's, Royal Ahold, Unilever, and many more.

standard[10]. A number of major EU food retailers are requiring that their agricultural suppliers be certified to the EUREPGAP standard, which has a few environmental aspects, by 2004; this requirement will gradually be extended to all suppliers of EU food retailers.

Some major international corporations have developed their own specific guidelines and/or requirements for environmental management by their suppliers. Much of this information has been placed on company websites to make it easier for current and potential suppliers to access. In some cases, website information is limited to recommendations about environmental standards that suppliers should consider (e.g. ISO 14001) and initiatives that suppliers might undertake (e.g. newsletters, posters to raise employee awareness of principles of environmental responsibility). In other cases, corporate information includes very specific standards for materials, technologies and processing that suppliers are required to achieve in order to sell to the corporation.

Two examples of companies that specify their own environmental standards for suppliers are Boeing Company and Baxter Healthcare Corporation. Both are global corporations with suppliers around the world. Boeing's supplier environmental website[11] lists explicit requirements for suppliers (including detailed specifications for certain materials) and general information suggesting initiatives that suppliers can undertake to meet Boeing standards. The Baxter website[12] also includes both general information to educate potential suppliers and specific requirements. Baxter has consolidated its supplier requirements into a set of Supplier Quality Standards, for which a manual has been produced and placed on the company website.

Finally, bilateral and multilateral trade agreements, as well as EU accession and trade agreements, increasingly require adherence to explicit environmental standards. And as mentioned earlier, these standards are constantly becoming more stringent. It is not unreasonable to expect that in the future the EU and other Western countries will use their market power to establish environmental performance requirements for trade. As they improve their environmental competitiveness, firms incrementally and systematically improve their environmental performance. This minimizes the cost, disruption of operations, and possible exclusion from markets that can result from waiting until meeting a particular environmental standard is required, and then scrambling to try to meet it.

3. The Principal Tools of Environmental Competitiveness

The principal tools of environmental competitiveness are pollution prevention (P2) approaches and methods, and environmental management systems (EMSs)[13].

Traditionally, as companies were prevented by environmental regulations from discharging untreated pollutants into the air, water, or soil, their response was to install "end-of-pipe"

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[10] Indeed, chemical companies can now be certified to "RC 14001," which combines the requirements of Responsible Care and ISO 14001, the international EMS standard touched on later in this article.

[11] **www.boeing.com/companyoffices/doingbiz/environmental**

[12] **www.baxter.com/doingbusiness/suppliers**

[13] What follow in this section are brief introductions to P2 and EMS as the principal tools of environmental competitiveness. To readers who would like more complete yet succinct primers on these subjects we recommend "Green Profits: The Manager's Handbook for ISO 14001 and Pollution Prevention," by A. Bendavid-Val and N. Cheremisinoff (Boston: Butterworth-Heinemann, 2001). Chapter 1, pages 4-17 is a primer on EMSs in general and also on the ISO 14001 international EMS standard; Chapter 5, pages 196-212, is a primer on P2.

pollution treatment and control equipment, such as smokestack scrubbers and on-site wastewater treatment plants. This equipment is typically costly, expensive to operate and maintain, and periodically has to be upgraded or replaced as it wears out and as environmental regulations become more stringent. End-of-pipe pollution management approaches involve capturing pollution and other waste as it leaves the production process, treating it in some fashion (filtering, chemically neutralizing, diluting, drying, etc.), in most cases storing it on-site for a period, and finally transporting it to a sanitary landfill, an incinerator, or a toxic waste disposal site for disposal. All these stages of end-of-pipe pollution management entail considerable costs.

The irony of end-of-pipe pollution management is that while it imposes major costs on an enterprise, it adds no value to the product and still does not eliminate the pollution: it changes the form of the pollution and moves it around, but does not eliminate it. And depending on how its form has been changed and where it has been moved to, the waste may continue to be a potentially disastrous liability to the company. A friend of ours is working on a litigation involving a company whose on-site waste storage facilities were found to have leaked 50 years ago and contaminated the aquifer from which local drinking water is taken. The medical consequences continue to be felt. The company may not survive the litigation[14].

P2, pollution prevention, entails, as the term suggests, preventing pollution, not managing it (or worse yet, dumping it) after it has been created. P2 is also referred to as "source reduction" because it involves material substitution, procedures, and technologies that eliminate or minimize pollution at the source, in the production process, rather than at the end of the pipe. P2 also goes by the names waste minimization and clean production. P2 involves interventions in a company's operations to ensure that less pollution comes out of the pipe in the first place. P2 not only results in more marketable output per unit of input, but because less waste is produced there are cost savings from less need for waste processing, storage, transport, and disposal. With P2 a company can direct to productive uses energies and resources that formerly were applied to waste management.

Of course in some cases P2 is not an option. In a slaughterhouse, for example, there is no way to reduce the amount of waste that must be dealt with. There may be creative ways of dealing with it that reduce the amount of pollution discharged into the environment -- using it in biomass generators, soil enrichers, animal food, and other products, for example -- but there is no way to prevent it at the source, during the slaughtering process.

P2 should be understood in the context of a hierarchy of waste management preferences:

- Pollution prevention (source reduction)
- In-process recycling
- External recycling
- Treatment and disposal
- Disposal (without treatment)

[14] While this kind of environmental liability may not be a major risk in developing and transitioning countries today, it is the kind of risk that corporate customers are increasingly concerned about, and one reason they are demanding evidence of good environmental practices as part of their supply chain management programs. Also, as environmental regulatory and enforcement regimes and legal systems throughout the world gradually adopt Western models, the risk of environmental liability for companies will rise. Smart managers that want to be environmentally competitive will begin now to adapt to that coming reality.

In-process recycling is close to pure source reduction because in-process recycling releases less pollution into the environment and results in the need for less inputs per unit of output. Since in-process recycling therefore has environmental and business benefits similar to source reduction, it is often considered a form of P2. In any case, an enterprise that wants to be environmentally competitive needs to be striving systematically to move up the waste management preference hierarchy in the way it deals with pollution.

Also, one result of P2 often is reduced energy and water consumption (from processing less material and managing less waste). Reducing energy and water consumption are themselves considered P2 or waste minimization because both types of consumption generally require "upstream" pollution: the pollution associated with power generation. Reduced water consumption may also be associated with reduced effluents and reduced wastewater treatment requirements. From the business point of view reducing water and energy consumption certainly rank with straightforward pollution prevention in reducing waste and the cost of inputs. The ultimate and unattainable aim for a company is to have no pollution and absolutely minimal consumption of energy, water, and other inputs; the closer an enterprise can come to this, the more environmentally competitive it can be.

P2 can be pursued at many levels. Following are examples of P2 actions and investments at four different levels, from "housekeeping" to major investments[15]:

- Housekeeping -- repairing leaking valves; installing insulation; instituting loading dock procedures to minimize heat (or cooling) losses; establishing a program of preventive maintenance; formulating energy-saving procedures for lighting, heating, and machinery use; carefully monitoring and metering water use[16].

- Small P2 investments -- installing automated valves; installing automated door controls; creating internal water recycling systems; substituting nontoxic for toxic inputs; capturing process heat for space heating and other uses; capturing and recycling fugitive metallic particles.

- Medium P2 investments -- installing internal chemical recycling systems; increasing batch processing size; enclosing conveyors and sieves; instituting batch processing instead of continuous processing; installing high-efficiency fireboxes in boilers and ovens; installing computer-linked monitoring equipment at all critical points together with statistical process control procedures.

- Large P2 investments -- fully automating production processes; installing heat and power cogeneration plants; installing other high-efficiency technologies.

A USAID-funded study[17] of 11 Polish chemical companies that had undertaken and then carefully monitored 35 P2 investments in their plants with USAID support found that:

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[15] What follows is a sampling of different scales of P2 procedures and investments in order to give readers a understanding of what P2 might mean in an enterprise in practical and concrete terms. For a fuller array of P2 possibilities, readers are referred to a series of tables that list P2 practices for different operations in a wide variety of specific industries, on pages 234-257 of "Green Profits."

[16] Housekeeping P2 activities are often called "no-cost/low-cost P2 measures." See Table 12 in Chapter 7, pages 306-307 of "Green Profits" for many more examples of these measures.

[17] Reported on pages 217-225 of "Green Profits."

> "Overall, the total reductions in emissions to air, water, and land were 528,949 tons per year, with raw-materials savings amounting to 1,479,230 tons per year, which together translate into annual savings of $7,184,490. The total cost for these savings (i.e., total capital investment) was $1,479,230; this calculates out to a 400 percent simple return on investment during the first year [and huge continued savings year after year]. Many of the P2 practices had payback periods ranging from immediate to fewer than three months.[18]"

About 85 percent of the pollution reductions achieved by companies participating in the study were achieved by low-cost/no-cost P2 measures; about 56 percent of the materials savings derived from low-cost/no-cost P2 measures; and nearly 60 percent of the total cost savings derived from low-cost to moderate P2 investments. Hence,

> "Many enterprises believe that the only way they can achieve more profitable operations and compete in international markets is by making significant… investments. While this may be true in some industry segments and in specific companies, this study demonstrates that a number of small-scale investments in P2 practices can not only achieve significant reductions in pollution, but collectively can add up to sizable savings that, in turn, can be invested in modernizing a company's operations[19]."

Here are three typical examples of P2 experiences. Many more can be found on websites listed in the "Additional Resources" section at the end of this paper.

A salicylic acid manufacturer in Romania[20] invested $16,000 in equipment for automatically dosing sulfuric acid in the precipitation phase of its production process, and also found a way to capture and reuse phenols in the process.

- Environmental benefits: Phenol discharges reduced by 15 tons per year
  Sulfuric acid discharges reduced by 24 tons per year
- Annual cost savings: $17,227
- Investment payback period: One year

A poultry processor in Minnesota[21] invested $41,000 for process water and wastewater monitoring systems and for pumping and piping systems to reuse high-quality wastewater.

- Environmental benefits: 70% reduction in BOD[22] effluent load
  67% reduction in other polluting discharges
  Savings of 8 million M^3 of water annually
- Annual cost savings: $75,000
- Investment payback period: Seven months

A pigments manufacturer in Romania invested $26,000 to monitor and meter water use and improve its filter press operations to reduce waste.

- Environmental benefits: 3 tons less zinc oxide discharged annually
  Savings of 2,400 M^3 of water annually
- Annual cost savings: $33,000

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[18] "Green Profits," page 218.
[19] "Green Profits," page 225.
[20] This and the other Romania case are taken from our own work experience with Romanian companies.
[21] From the Minnesota Pollution Control Agency, **www.pca.state.mn.us.**
[22] Biological oxygen demand; organic pollutants.

- Investment payback period: Ten months

A portion of the savings in these examples derives from reduced water, energy, wastewater treatment, and environmental penalty costs. These costs are not taken seriously by some enterprise managers in developing and transitioning economies because they are very low, owing to subsidies or political considerations or just plain inappropriate pricing. But countries seeking EU accession and free trade agreements with western countries will find themselves forced by degrees to charge realistic prices for these goods and services, and this in turn will provide a greater financial incentive for P2 investments. Enterprises that want to be environmentally competitive will note the trends and anticipate the changes and will start now moving toward the efficiencies that may not be yet but soon will be essential to being competitive.

There are two basic tools for identifying and acting on P2 opportunities: a P2 study and an environmental management system. A P2 study, often called a P2 audit or P2 assessment, is an activity that a company can undertake from time to time to identify new P2 opportunities, from the housekeeping kind to major investments. A P2 study might begin with an observational walk-through of the plant, preferably with an experienced P2 engineer, and interviews with managers and workers. Then a series of P2 analyses might be conducted in each of the unit operations. These analyses would include such techniques as flow analyses, material balances,
water balances, and energy balances. Then a series of investment analyses would be conducted on the larger potential P2 opportunities uncovered[23], before the recommendations for new P2 investments are made to top management.

A environmental management system (EMS) is a management system -- a set of integrated procedures -- designed and put in place for the purposes of:
- Bringing a company into compliance with environmental regulations and keeping it there
- Identifying priority environmental concerns and P2 opportunities to improve a company's environmental performance and its profitability
- Continually improving the environmental performance of the company, and with that its business performance.

An EMS is not a study, but a permanent management system that is a powerful tool for environmental competitiveness because it is specifically designed as a means for achieving continual improvement in environmental performance. It can be made to incorporate all the elements of a P2 study, while also employing other means of dealing with a company's environmental needs[24]. In this way it combines P2 with continual improvement, providing an almost complete foundation for a company's environmental competitiveness. The only thing missing is a program of environmental outreach and engagement for a company's suppliers and customers (and other stakeholders), which the company can handle separately or incorporate into its EMS[25].

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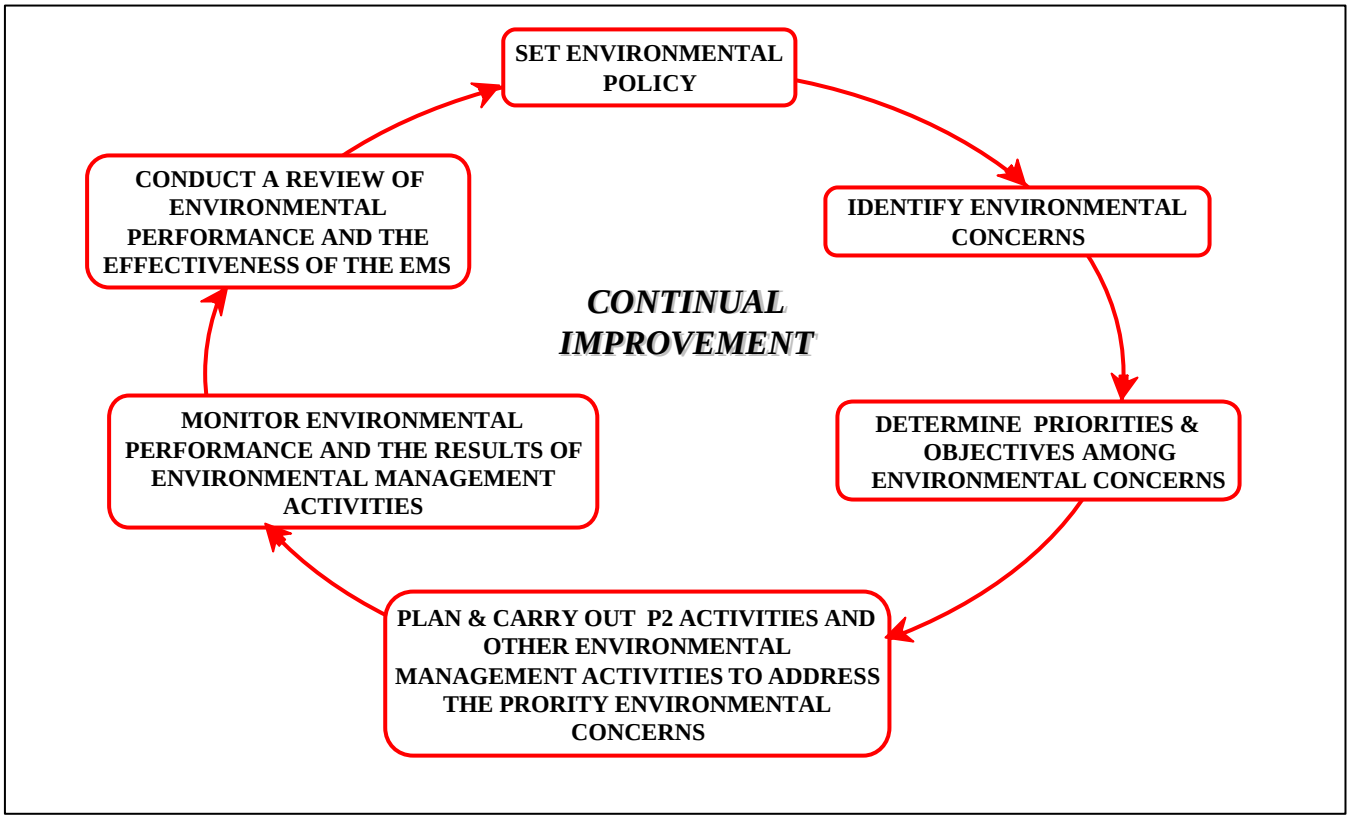
[23] P2 financial planning tools can be found in Chapter 8, pages 321-361 of "Green Profits," and more extensively in Chapter 7, pages 187-228 of "Achieving Environmental Excellence: Integrating P2 and EMS to Increase Profits," by A. Bendavid-Val and N. Cheremisinoff (Rockville, MD: Government Institutes, 2003).

[24] An overview of a model for a fully integrated EMS/P2 program can be found in "Achieving Environmental Excellence," Chapter 3, pages 49-63.

[25] The model reviewed in Chapter 3, pages 49-63 of "Achieving Environmental Excellence" is for a type of EMS that also that incorporates stakeholder engagement and some other non-P2 environmental concerns.

Most EMSs are designed on the logic that senior management has to take the lead in



motivating and supporting establishment of an EMS in the company, or else it won't succeed. For that reason, as shown in Figure 1, most EMSs call for a company to issue a statement of environmental policy before an EMS can really get going. At a minimum, the policy statement would have to commit the firm to promoting its environmental competitiveness by complying with environmental regulations; preventing pollution whenever possible; continually improving its environmental performance; publicizing its environmental policy and performance; and perhaps more.

Through an EMS a company starts the environmental performance improvement process by first identifying its environmental concerns. These may include requirements for regulatory compliance; pollution and other forms of waste or unnecessary resource consumption (P2 opportunities); environmental requirements for gaining access to particular markets or corporate customers; voluntary commitments (such as agreements with workers or neighbors or local authorities) that include environmental actions or performance standards; environmental security and emergency concerns; and more. The next EMS step, as shown in Figure 1, would be to prioritize those concerns, since a company can't do everything at once; and to set objectives (such as reducing a certain type of pollution a certain amount) for the addressing the highest priority environmental concerns.

Figure 1: A basic EMS model

After that, the company would plan and carry out P2 and other activities (programs, initiatives, action plans) to address the highest priority environmental concerns. Most EMSs are designed with an explicit requirement for an environmental emergency preparedness and response plan (these days many companies have started including an environmental security component in that plan). Creating or upgrading such a plan would have to be a high priority activity under any credible EMS.

In subsequent steps, as shown in Figure 1, the company would monitor its progress; review its policy and performance; and make any adjustments needed in its policy, its current programs to improve environmental performance, or in the design and operation of its EMS. Then the company would move on to identify the next round of highest priority environmental concerns, and so on in a process of continual improvement.

Once an EMS is up and running it is not properly undertaken as a sequence of steps. All the "steps" of the EMS are underway more or less all the time. That is, senior management regularly reviews its environmental policy; the company is always looking for P2 opportunities and other environmental concerns, and ways to address the most important of those concerns; one or more environmental management activities to address priority concerns are always in progress and being monitored; and so on. In this way a company's EMS operations become integrated with the firm's overall management system; and, together with other aspects of its competitiveness, in time they become a normal part of the way the company does business.

The International Organization for Standardization, or ISO, has codified a variation of the model in Figure 1 and issued it as ISO 14001, the voluntary international standard for an EMS[26]. ISO 14001 sets out specific requirements for each "step" in the EMS continual improvement process, including the minimum record-keeping and procedural documentation required. The advantage of designing an EMS that conforms to the ISO 14001 standard is that a company can have its EMS audited by an accredited outside auditor and be "ISO 14001 certified." ISO 14001 certification is widely recognized as a mark of environmental responsibility, and so could be useful for demand-side environmental competitiveness. Though not quite as meaningful as certification, a company can also "self-declare" its conformance to ISO 14001.

It is important to understand, however, that ISO 14001 is only a standard for an EMS; it is not an environmental performance standard. A company that is ISO 14001 certified may also be a poor environmental performer -- indeed, it may have set up an EMS in order to begin improving its poor environmental performance. A company that is ISO 14001 certified can be out of compliance with environmental regulations. A company that is ISO 14001 certified can have a toxic spill[27].

To serve environmental competitiveness best an EMS has to be both very productive in terms of improving environmental and business performance, and be certified to ISO 14001[28], but not necessarily both from the outset. In our experience most companies in developing and transitioning countries tend initially to understand only the potential demand-side benefits of an EMS, and therefore focus on qualifying for ISO 14001 certification as soon as possible. This is generally a dead-end because when senior management is focused on certification,

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[26] For more information on ISO 14001 go to **www.iso.ch** or other websites listed in the "Additional Resources" section at the end of this paper.

[27] In January 2003 the University of North Carolina published its final report of a five-year study of U.S. companies with EMSs, entitled "Environmental Management systems: Do they Improve Performance?" The research, carried out on behalf of the USEPA, found among other things that (a) organizations with EMSs have better environmental and economic performance than those without EMSs, and (b) organizations with EMSs certified to ISO 14001 performed no better than those with EMSs not certified ("…content [of the EMS] was more important than certification"). The report can be downloaded from **http://ndems.cas.unc.edu.**

[28] Some companies may find it more to their benefit to certify their EMSs to the EU's EMAS standard or to any of a number of industry-specific EMS standards, rather than to ISO 14001.

workers get the message that documentation and meeting ISO 14001 requirements is what the EMS is all about. When that's the case the EMS tends to fade away after the initial certification, and so the whole exercise amounts to little more than a disruptive waste of time and money. Moreover, any responsible company should consider it too risky to exploit the differentiating and marketing value of ISO 14001 certification without otherwise being able to demonstrate the high level of environmental responsibility that the certification implies.

For an EMS to work best for environmental competitiveness, we would argue that ISO 14001 certification must explicitly be put out of the picture for at least a year or two. A company should concentrate on designing a simple initial EMS that will begin producing supply-side benefits (production efficiencies) quickly. It can gradually and systematically expand the EMS in scope and complexity, at the same time expanding its supply-side benefits and possibly also reaping some demand-side benefits (like qualifying for a large customer's supply chain). In due course, when there is verifiable evidence of its good environmental performance, a company can easily and naturally secure ISO 14001 certification for its EMS, and reap the remaining demand-side benefits as well[29].

4. Environmental Competitiveness, the Diamond, and the Cluster

This is not the place to provide an exposition of the overall competitiveness paradigm and its analytical and operationalizing methodologies. Readers who want to know more about the subject of competitiveness are referred to the books and websites listed in the "Additional Resources" section at the end of this article. We need briefly to explore, however, what we consider the two most fundamental aspects of the overall competitiveness paradigm, the competitiveness diamond and the industry cluster[30], and how environmental competitiveness relates to them.

Competitiveness theory begins with a model of the basic elements of competitiveness usually called the "competitiveness diamond" or "Porter diamond[31]" -- *diamond*, because four principal elements of competitiveness are represented graphically in a diamond-shaped configuration. The competitiveness diamond can be used as a framework for analyzing, strategizing, and monitoring a firm's competitiveness, or the industry, regional, or national competitiveness context. In their simplest terms the four elements of the competitiveness diamond are:

Factors -- the condition, circumstances, and nature of utilization of the factors of production, including natural endowments, available to and accessible by the firm (or industry, or country), and how these factors and the way they are used are continuously upgraded. This is what we have been calling supply-side competitiveness.

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[29] In this way a company can also cover the not-insignificant costs of ISO 14001 certification from the savings achieved through the EMS.

[30] For a basic exposition of the competitiveness diamond see Chapter 12, pages 221-238 of "Plowing the Sea;" for an exposition of the concept of the industry cluster in the developing country context see Chapter 5, pages 76-92 of "Plowing the Sea." There are today many individual and organizational practitioners of competitiveness and a wide variety of approaches, including a wide variety of interpretations and elaborations of Michael Porter's original concepts, our own among them. While we are not experts in the general field of competitiveness, we do bring our own experience and observations to the discussion, and therefore only we are accountable for the way the competitiveness diamond and the industry cluster are presented here.

[31] Named for its originator, Michael Porter.

Demand -- the character of and trends in the nature, requirements, and segmentation of domestic and foreign demand, including opportunities to create discriminating high-value niches that favor the firm (or industry, or country). This is what we have been calling demand-side competitiveness.

Rivalry and Strategy -- the nature, extent, and unique attributes of competition from different quarters; and the sophistication of the firm's (or industry's, or country's) process for developing strategies to obtain and act on market intelligence, innovate, market, and promote market discrimination for its differentiated products.

The Industry Cluster -- the collection of "upstream" suppliers and "downstream" distributors, as well as makers of equipment and complementary products, and supporting research, regulatory, training, and lobbying entities, all located within relative proximity of each other; and how well they are organized and cooperate to promote efficiency, innovation, and market responsiveness for their common benefit.

The complete basic competitiveness model includes two additional elements typically represented graphically as hovering just outside the diamond, exerting a major influence upon it:

Government -- the policies, laws, regulations, operations, programs, investments, and so on that government undertakes, and how well government combines its activities to facilitate and promote competitiveness.

Chance -- good fortune and misfortune of the firm (or industry, or country), competitors, and markets that create or crush competitive advantages either temporarily or permanently, such as environmental disasters.

Readers can probably see for themselves how central environmental competitiveness, as described earlier, is to the basic elements of the competitiveness paradigm; and therefore how important it is to include the firm's (or industry's, or country's) environmental competitiveness status in any analysis of competitiveness or program to improve competitiveness. To summarize briefly:

Factors -- environmental competitiveness improves operational efficiency; is critical for minimizing the risk of environmental liability and therefore for ensuring sustainability; and can result in lower operating costs for a variety of other reasons as well.

Demand -- environmental competitiveness can provide access to new retail markets, can help respond to and foster high-end niche markets, and is increasingly becoming a requirement for participating in the supply chains of major corporations.

Rivalry and Strategy -- better environmental performance can be an important advantage of competitors; an adequately sophisticated process for developing competitiveness strategies has to take into account the current and potential differentiating value of good environmental performance.

The Industry Cluster -- industry clusters represent a particularly good framework for fostering environmental competitiveness; and a program to promote environmental competitiveness can serve to strengthen cooperation within a cluster (more on this below).

Government -- as is the case with other aspects of competitiveness, government policies, regulations, and programs, and how they are implemented, can present obstacles to environmental competitiveness, be indifferent to it, or facilitate it (more on this below).

Chance – as noted earlier, most EMSs (actually, all proper EMSs) include an environmental emergency preparedness and response plan. These plans should include training and emergency response drills, and should be regularly updated and upgraded. Thus, as far as can reasonably be done, within its area of operation environmental competitiveness explicitly anticipates environmental misfortunes that could affect a firm's competitiveness.

Developing industry clusters to serve as the fundamental organizational framework for promoting competitiveness and trade is arguably the most important single practical innovation that the competitiveness industry has brought to economic development efforts in developing and transitioning countries. Typically, one of the first things that competitiveness consultants do is to help organize industry clusters around the most promising exports that have the most motivated and forward-looking entrepreneurs among the firms in their value chains. Member firms of the cluster establish an executive committee to lead the cluster program to undertake competitiveness analysis, gather market intelligence, and develop competitiveness strategy. The committee then establishes mechanisms for continually upgrading these efforts. In short, the cluster embarks on a program to improve and maintain its competitiveness, and thereby better penetrate and continually expand its participation in domestic and foreign markets, to the benefit of all enterprises in the cluster.

As with any other aspect of competitiveness, environmental competitiveness can be pursued most effectively through an industry cluster framework. EMSs and P2 have greater productivity and competitive power when an industry cluster as well as its member enterprises establish EMSs, as compared to when an isolated enterprise establishes an EMS. The greater productivity derives from joint use of EMS resources, like technical expertise; from shared EMS experiences and information among members of the cluster; and from the fact that suppliers and their customers in the value chain can easily work together to address environmental problems that extend beyond the property of a single firm. The greater competitive power derives from an ability throughout the industry cluster to orient the EMSs (principally by setting EMS priorities) so as to support the competitiveness strategy of the cluster.

Pursuing environmental competitiveness through an industry cluster framework also adds productivity and competitive power to the cluster. It adds productivity to cluster operations by helping to hone the lines of communication and cooperation among firms in the cluster through operation of the cluster-wide EMS and through P2 knowledge-sharing around concrete technical issues. It adds competitive power to the cluster because the entire value chain, not just a single firm, can claim verifiable environmental responsibility. This verifiable environmental responsibility is a mark of differentiated excellence for both retail and corporate customers for the cluster's product, and one that reduces the risk of environmental liability for everyone: firms in the industry cluster and their corporate customers.

5. Elements of an Environmental Competitiveness Program

An environmental competitiveness program, as part of a larger competitiveness program, could (and should) work at three basic levels: the industry cluster, the firm, and the national government[32]. Its principal components might be as follows.

At the industry cluster level[33]:

(a) The industry cluster, through its executive committee, establishes and maintains a form of EMS that extends upstream to suppliers, and downstream to processors, distributors, transporters, and retailers as far as practicable. This EMS would have to be tailored to the unique character and needs of the cluster, its member firms, its principal product, its markets, and its competitiveness strategy.
(b) The industry cluster executive committee helps obtain EMS and P2 technical assistance and training for individual firms in the cluster.
(c) The industry cluster executive committee oversees organization of joint EMS and P2 training, consultant use, problem-solving, and certification (if desired) among individual firms in the cluster, and coordination of this work with the process of establishing the EMS for the cluster as a whole.
(d) The industry cluster executive committee works with government agencies to encourage policies and programs that support environmental competitiveness.

At the firm level:

(a) Individual firms in the industry cluster participate in the cluster-wide EMS.
(b) Individual firms in the industry cluster undertake P2 audits and follow up on audit recommendations.
(c) Individual firms in the industry cluster establish and maintain their own EMSs, integrating them and their P2 activities as much as possible into other management systems they may have in place such as ISO 9001[34] or HACCP[35].

At the national government level:

(a) The government adopts environmental policies, laws, regulations, operations, programs, and investments that encourage and support good environmental performance, using market-oriented incentive programs wherever possible. Examples of possible government environmental actions include undertaking:
    - environmental laws and regulations that are consistent with those of major Western markets
    - technical assistance, training, research, and compliance scheduling to assist firms to comply with environmental regulatory standards
    - programs to promote environmental responsibility (e.g., offering a reduced environmental compliance inspection schedule to firms that have an operating EMS in place)
    - effective programs of environmental compliance and enforcement[36].

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[32] We could validly add a fourth level, local government. But the role of local government would depend very much on the role the national government plays, and on the authority and resources of local government, in the case of any particular country. Also, in many cases it would be appropriate to view local government as part of the industry cluster, so its activities in support of cluster competitiveness would be coordinated through the cluster.

[33] It is likely that significant efficiencies can be gained by developing a cluster-wide EMS, rather than promoting EMS solely at the firm level. This approach has shown promise in the context of industrial estates, which bear important similarities to clusters.

[34] The ISO's international standard for quality management systems. The requirements of ISO 9001 are similar to those of ISO 14001; the two standards are meant to be readily compatible.

[35] Hazard Analysis and Critical Control Point, a food safety management system.

(b) The government adopts trade and procurement policies, laws, regulations, operations, programs, and investments that encourage and support environmental competitiveness, such as:
- lower taxes or duties on P2 equipment
- programs to promote understanding of the role of environmental performance in trade
- cleaner production centers that conduct P2 research and provide free basic P2 advice, similar to extension service for farmers
- procurement preference for the goods of firms with superior environmental performance.

Additional Resources

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[36] Government should not, however, impose third-party standards such as ISO 14001 or HACCP on firms or clusters. The voluntary, industry-driven nature of these standards is a critical factor in improving competitiveness.

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