

NATURAL CAPITALISM
FIELD GUIDE

Rocky Mountain Institute



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INTRODUCTION:

The Synergy of Natural Capitalism Principles

Rocky Mountain Institute Natural Capitalism Field Guide

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Natural Capitalism is a new business model for enhanced long-term prosperity and security. Its general principles will thrive in different organizations that use it in many different ways, much as the roots of a tree find different paths to anchor the tree according to the environment they encounter. This Field Guide is designed to help organizations plant the seeds of Natural Capitalism quickly and effectively, using the learnings from other organizations and Rocky Mountain Institute's (RMI) assessments of best practices.

Field Guide users will be organization leaders and implementers of Natural Capitalism, private consultants working with RMI or independently to help an organization implement Natural Capitalism, or stakeholders such as organization owners or directors, community members, or employees. RMI anticipates that organizations will combine the resources of the Field Guide with individual organizational analysis and planning to customize its own approach. Our Natural Capitalism Practice is available to help with implementation in your organization (for more information visit www.naturalcapitalism.org).

The Field Guide is designed to provide your organization with a logical guide to integrate Natural Capitalism techniques into your core business strategy — where it needs to reside. Each of the modules addressing one of the Natural Capitalism principles will suggest techniques and organizational tools that will help you implement them. Following the Principles Modules P1 – P4 are more technical instructive modules that specifically address how to successfully integrate Natural Capitalism into the tools/techniques of accounting/measuring, envi-

ronmental management systems, supply chain management, design, organizational development, and industrial process. RMI doesn't have all the answers; we hope you'll consider what follows a "good start" at developing a successful strategy for your organization...a seed ready to plant.

The Field Guide will be a living document. It will be continuously improved as new information becomes available from learnings or case stories. We invite Field Guide users to tell us what works for you and how our Field Guide could be improved (www.naturalcapitalism.org).

*Additional resources are listed in the Resources section at the end of each Field Guide Module. (Sections I to III are adapted from **Natural Capitalism: Creating the Next Industrial Revolution** by Paul Hawken, and RMI's Amory Lovins and L. Hunter Lovins.)*

RMI believes that the world stands on the threshold of basic changes in the conditions of business. Companies that ignore the message of natural capitalism do so at their peril. There are growing numbers of business owners and managers who are changing their enterprises to become more environmentally responsible because of deeply rooted beliefs and values. This is a wonderful change to witness.

But natural capitalism is more pressing than a request ... it is beginning to feel inevitable rather than merely possible. There is now sufficient evidence of change to suggest that if your corporation or institution is not paying attention to this revolution, it will lose competitive advantage. In this changed business climate, those who incur that loss will be seen as remiss if not irresponsible.

The Industrial Revolution that gave rise to modern capitalism greatly expanded the possibilities for the material development of humankind. It continues to do so today, but at a severe price. While industrial systems have reached pinnacles of success, able to muster and accumulate human-made capital on vast levels, natural capital, on which civilization depends to create economic prosperity, is rapidly declining and the rate of loss is increasingly proportionate to gains in material well-being.

Natural capital includes all the familiar resources used by humankind: water, minerals, oil, trees, fish, soil, air, etc. But is also encompasses living systems, which include grasslands, savannas, wetlands, estuaries, oceans,

coral reefs, riparian corridors, tundra, and rainforests. These are deteriorating worldwide at an unprecedented rate. Within these ecological communities are the fungi, ponds, mammals, humus, amphibians, bacteria, trees, flagellates, insects, songbirds, ferns, starfish and flowers that make life possible and worth living on this planet.

Humankind has inherited a 3.8-billion-year store of natural capital. At present rates of use and degradation, there will be little left by the end of this century. This is not only a matter of aesthetics and morality, it is of the utmost practical concern to society and all people. According to the Living Planet Index, around 30% of nature's productive capacity has been lost within one generation.¹ Despite reams of press about the state of the environment and rafts of laws attempting to prevent further loss, the stock of natural capital is plummeting and the vital life-giving services that flow from it are critical to our prosperity.

While technology has thus far kept ahead of resource depletion, providing what appear to be ever-cheaper resources as business inputs, they only appear cheap, because the stripped rainforest and the mountain of toxic tailings spilling into rivers, the impoverished villages and eroded indigenous cultures — all the consequences they leave in their wake — are not factored into the cost of production.

Natural capitalism recognizes the critical interdependency between the production and use of human-made capital and the maintenance and

supply of natural capital. The traditional definition of capital used by the “industrial capitalism” system is accumulated wealth in the form of investments, factories, and equipment — known as financial and manufactured capital. Actually, an economy needs four types of capital to function properly: Human, financial, manufactured and natural capital. Largely neglecting human and natural capital, “industrial capitalism” does not fully conform to its own accounting principles. It liquidates its human and natu-

ral capital and calls it income. It neglects to assign any value to the largest stocks of capital it employs: The natural resources and living systems, as well as the social and cultural systems that are the basis of human capital. Thus, industrial capitalism, as practiced, is a financially profitable but non-sustainable aberration in human development.

We have just enough time to learn a sustainable capitalism...if we begin today.

II. AN OVERVIEW OF NATURAL CAPITALISM PRINCIPLES

Natural Capitalism Principles are four central strategies that enable countries, companies and communities to operate more effectively or profitably by properly valuing all critical forms of capital. Doing so is the basis of responsible stewardship and prosperity for the coming century and beyond. Together, the Principles represent a coherent operational strategy that can guide organization decision-makers and stakeholders in their perspective and actions, both long-term and daily. Measurements of the efficacy in addressing these principles can be derived and serve as milestones for the effectiveness of their use. This approach and other organizational management approaches to use of the Principles are described in detail in this Field Guide. Below is a brief overview of the Principles.²

Principle 1: Radical Resource Productivity

Radically increased resource productivity is the cornerstone of natural capitalism because using resources (energy and materials) more effectively has three significant benefits:

- 1) It slows resource depletion at one end of the value chain,
- 2) Lower pollution at the other end, and
- 3) Provides a basis to increase world wide employment with meaningful jobs.

Radical resource productivity strategies can nearly halt the degradation of the biosphere and make it more profitable to employ people.

Increasing resource productivity means obtaining the same amount of utility or work from a product or process while using less material and

energy. Companies and designers are developing ways to make natural resources — energy, metals, water, forests, etc. — work five, ten, even one hundred times harder than they do today. These efficiencies transcend the marginal gains in performance that industry constantly seeks as part of its evolution. Instead, revolutionary leaps in design and technology will alter industry itself and leave behind those companies who miss the boat. Investments in the productivity revolution are not only repaid over short periods of time by the saved resources but in many cases can reduce initial capital investments, freeing financial capital for other profitable investments.

Factor Ten (a 90% reduction in energy and materials intensity) and Factor Four (a 75% reduction) have entered the vocabulary of public and private leaders throughout the world. The governments of Austria, the Netherlands, and Norway have publicly committed to pursuing Factor Four efficiencies. The same approach has been endorsed by the European Union as the new paradigm for sustainable development. Austria, Sweden and OECD environment ministers have urged the adoption of Factor Ten goals. Dow Europe and Mitsubishi Electric see it as a powerful strategy to gain competitive advantage.

Resource productivity doesn't just save money and resources; it can also improve the quality of life. Listen to the din of daily existence — traffic, airplanes, garbage trucks, lawnmowers, heat/beat/treat machinery — the waste and noise are signs of inefficiency, and they represent money being thrown away. The massive inefficiencies that are causing natural capital degradation almost always cost more than the measures that would reverse them.

Principle 2:

Nature as Design Mentor: Eliminate waste and toxicity

Reducing the wasteful throughput of materials — indeed eliminating the very idea of waste — can be accomplished by redesigning industrial systems on biological lines that change the nature of industrial processes and materials, enabling the constant reuse of materials in continuous closed cycles, and often the elimination of toxicity.

Industrial society runs on life-support systems that require enormous heat and pressure, are petrochemically-dependent and materials-intensive, and require large flows of toxic and hazardous chemicals. Much of these flows end up as pollution, acid rain, and greenhouse gases, harming environmental, social and financial systems and business profitability.

Growing competitive pressures to save resources are empowering chemists, physicists, process engineers, biologists, and industrial designers to reexamine the energy, materials and manufacturing systems required to provide the specific qualities required by end users: strength, warmth, structure, protection, function, speed, tension, motion, skin. Leading companies are turning away from mechanical systems requiring heavy inputs, metals, combustion and petroleum to seek solutions that use minimal inputs, lower temperatures and enzymatic reactions.

Pharmaceutical companies are becoming microbial ranchers managing herds of enzymes. Architects and builders are creating structures that process their own wastewater, capture

light, create energy and provide natural habitat and community amenities. In chemistry, we can look forward to the end of the witches' brew of dangerous substances invented in the past century that were created to accomplish functions that can now be carried out far more efficiently with biodegradable and naturally occurring compounds.

**Principle 3:
Move to a Solutions-based Business Model**

Rather than making and selling goods, a natural capitalism economy would support producers providing services to their customers on a leased or rented basis. If manufacturers cease thinking of themselves as sellers of products and instead as providers of long-term services based on long-lasting, upgradeable durables, the goals would be the more competitive selling of least-cost results rather than equipment.

The producer's strategic question becomes: how can we provide the customer's desired service at the least long-term cost to ourselves, the owner of the product and/or systems producing the desired end-result. As long-term owner of the product and/or systems, the producer obtains powerful incentives to design for least long-term (i.e. lifecycle) operating cost, including product disposal through re-use or recycling.

Applying the concept to its own consumption, a producer would seek similar arrangements with its supply chain, helping it get out of the activities it doesn't need to be in (equipment maintenance, fluids disposal, power production) and into the activities that form the core of its competitive advantage: customer service and innovation.

The key to success in capitalistic systems is to get the incentives right; likewise the key for organizations is to properly reward behavior that maximizes customer value. Long-term ownership of the products and systems that produce customer value create the right incentives for the producer to minimize environmental liabilities of product operation/disposal, including energy use over the lifetime of the product (often the highest environmental impact of a product's entire lifecycle).

In the economy of service flows, the product is clearly a means, not an end. The manufacturer's leasing and ultimate recovery of the product means that the product remains an asset. The minimization of materials use, the maximization of product durability, and enhanced ease of maintenance not only improve the customer's experience and value but also protect the manufacturer's investment and hence its bottom line. Both producer and customer have an incentive for continuously improving resource productivity by forming a relationship that continuously anticipates and meets the customer's evolving value needs — which simultaneously rewards both parties for reducing the burden on the planet.

**Principle 4:
Investing in Natural and Human Capital**

Natural Capital

Living systems are a supplier of key components for the life of the planet, and they are now falling behind on their orders. Until recently, business could ignore such shortages because they didn't affect production and didn't increase

costs. To maintain income, we need not only to maintain our stock of natural capital but to increase it dramatically in preparation for the possible doubling of population in the next century. All organizations are consuming natural capital; each must endeavor to understand its natural capital impacts and fund cost-effective investments that decrease natural capital consumption and restore the natural capital needed for future prosperity.

What is consumed from the environment is not matter or energy but order or quality — the structure, concentration, or purity of matter. It is quality that business draws upon to create economic value. Instead of focusing on whether physical resources will run out, it is more useful to be concerned about the specific aspects of the quality that natural capital produces: clean water and air; healthy soil, food, animals, forests, pollination, oceans, rivers; available and affordable sources of energy; etc. If industry removes concentrated and structured matter from the system faster than it can be replaced, and at the same time destroys the means of its creation, namely ecosystems and habitats, it introduces a fundamental problem in production.

Natural capital can be viewed as the sum total of the ecological systems that support life, different from human-made capital in that natural capital cannot be produced by human activity. Only when the services provided by ecosystem functions are unmistakably disrupted do we step back and reconsider. Compared to the rest of the world, North Americans have been fortunate in not having suffered many debilitating degradations of ecosystem services. Many countries

and regions, more densely and historically populated, face far more severe effects of natural capital depletion. Yet North American ecosystems cannot long endure without the health of their counterparts around the world.

The industrialized world will need radically improved resource productivity, both at home and abroad, combined with adoption and biomimicry and service/flow models by global businesses, and then begin to reverse the loss of natural capital and increase its supply.

Human Capital

Like natural capital, human capital stocks are not adequately reflected in the balance sheets of industrial capitalism. Jobs that consume human health, for example, are inordinately cheap because the job-provider can escape many of the total costs of the employee's declining health (even while providing health insurance).

Principle Four applies equally to investments that prevent human capital degradation and restore human capital already lost. The health of societies depends not only on choosing the right means to satisfy human needs but also on understanding the interlinked pattern of those means. Successful societies require that each action they take answers many needs simultaneously. In effect, they adopt the same design philosophy, and achieve the same elegant frugality, with which whole-system engineering meets technical demands.

The bottom line for organizations is to acknowledge that their accounting systems do not properly reflect their "consumption" of natural and

human capital and make investments and support public policies that arrest the decline of capital stocks and build them for the challenges of the future.

Natural Capitalism Fundamentals

Implementing natural capitalism is a combination of integration with existing organizational programs/initiatives/practices (described in the Field Guide's Tool Modules) and development of fundamental habits or processes that are used throughout. In other words, behind the Principles are Fundamentals — concepts that are best learned and integrated into the organization with the Principles.

If the Natural Capitalism Principles as a systematic approach are just not right for your organization, try the Fundamentals as an imperfect, but viable substitute that will get you mostly to the same place (the differences being the inspirational power of the Principles, i.e. their strategy to go beyond "eco-efficiency" to the restoration of natural and human capital, and the synergies obtainable from implementing the Principles as a whole-system).

These Fundamentals are derived from *Natural Capitalism — Creating the Next Industrial Revolution* (especially Chapters 6, 7 and 13) plus RMI experience over two decades of assisting governments and businesses. Many are further described in the rest of the Field Guide or in *Natural Capitalism* (in the case of "Lean Thinking" fundamentals, in the seminal book *Lean Thinking* and subsequent publications by the Lean Management Institute), so we offer only brief explanations below.

Lean Thinking:

- Waste is "any activity that absorbs resources but does not add value"
- Provide a continuous flow of value, as defined by the customer, at the pull of the customer, in search of perfection
 - Reduce waste through *customer pull* systems (lean manufacturing systems) — don't build in big batches or for speculative demand. Every tool should be the right size for the job — bigger is just as bad as smaller
 - The right size machine depends on the rate and location of customer pull)
 - Don't cut butter with a chainsaw
 - Deliver a flow of solutions to value needs

End-use Least-cost

Carefully examine the end-use service desired — illumination rather than light bulbs — then provide at least cost

Whole Systems Engineering

- The whole system should be optimized with meticulous attention to detail (like eating a lobster — the morsels in the crevices are worth the effort)
 - Optimizing components in isolation tends to pessimize the whole system
- Whole-system life-cycle costing: All long-run measurable benefits and costs should be counted and properly assigned; unmeasurable ones should be considered, not ignored
- The right design steps should be taken at the right time and in the right sequence.
- Tunnel through cost barriers — big savings can cost less than small ones

III. WHY NATURAL CAPITALISM IS A COMPETITIVE STRATEGY

- Take a lifecycle design approach:
 - Design determines 80–90% of life cycle costs
 - All the really important mistakes are made on the first day
 - Integrate the design of an entire package of measures so each measure achieves multiple benefits
- Optimize entire buildings as a system
 - Piggyback system improvements on planned renovations

Practice "natural capitalism":

- Correct the value of significantly undervalued human and natural capital in design processes
- Nature does not compromise — nature optimizes

Synergies grow from whole-system approach through scale economies, organizational learning, enthusiasm

To Leap Forward, Think Backward

- Because saving one unit of energy downstream saves about ten times more at the source, downstream savings merit the greatest emphasis
- Downstream savings (i.e. energy efficient motors) should reduce upstream capital costs — magnifying system profitability

Consider your strongest competitor in your marketplace, and then consider the best opportunities for you to be more competitive. Your key competitive advantages are probably your costs of providing customers with the services they desire, the confidence your customers have that you'll be an organization they wish to engage for the long-term, the international reputation your brand carries, and the results of your products/services. Enhancing your environmental performance through Natural Capitalism positively affects each of these key areas.

Most every organization RMI consults with is missing many, if not a vast majority, of their opportunities for greater resource efficiency (i.e. lower product costs). The costs of energy and materials have become less and less prominent parts of industrial cost structures, particularly in developed countries, and many companies haven't given sufficient focus to their industrial processes.

In August, 2000 a small manufacturer chose to examine their electrical bill prompted by the first principle of natural capitalism, and immediately discovered it was very cost-effective to replace two air compressors with one more highly efficient model that would reduce the firm's monthly \$12,000 electricity bill by a one-fourth. The business owner had simply been too busy to give his energy bills much attention while employing 45 people to keep up with customer's demands. Sadly, most businesses suffer from unnecessary costs of this nature for a combination of reasons that can all be overcome by simple focus on processing efficiency.

As word spreads throughout the business community that energy used during a machine's lifetime is generally its greatest environmental impact, and increasing numbers of your business, non-profit and individual consumer customers are intending to reduce environmental impacts, the energy efficiency of your products will come under increasing scrutiny as a competitive factor. Regardless of whether you lease or sell your products, savvy consumers are looking at lifecycle operating costs, particularly energy use and disposal costs, in their purchasing decisions. The long-term orientation of your products is a strong indicator of the long-term orientation of your organization and whether your major customers will wish to engage in a long-term relationship with you. Products that are energy hogs, or even just not on the cutting edge of energy efficiency, will make your company appear to customers like a potential spouse with lots of credit card debt — perhaps a poor risk for a partner.

Likewise, your brand reputation that opens doors for your company with potential customers worldwide — especially new customer prospects — is subject to rapid devaluation if you aren't capable of meeting the highest environmental performance standards of the international community. Are you ready to serve STMicroelectronics as a supplier, for example, considering their pledge to meet worldwide the strictest environmental performance standards anywhere in the world? If not, your brand name and your firm's health will suffer. Brand reputation is also critical to attracting the investment capital you need; failing to meet the standards of the rapidly growing green investment community worldwide will both diminish your brand and potentially drive up your capital costs since

you'll be seeking funds from a smaller pool of resources.

Perhaps most important for your organization's health is the actual performance of your products. Embracing natural capitalism principles will give your products or services greater value for customers by reducing their cost; will reduce disposal and regulatory costs by reduced toxicity and waste handling; will save your customers the headaches from activities they don't specialize in like machine maintenance/disposal, and will have reduced environmental impacts that are appreciated by all stakeholders because you are designing to minimize depletion of natural and human capital.

The case stories in this Field Guide illustrate organizations that have made great strides in their competitiveness through the pragmatic whole-system integrated approach embodied in natural capitalism principles; it makes them scary competitors...for both the best and brightest and more loyal workers as well as customers.

Most businesses have a goal to be performance leaders in their core competencies. Without a comprehensive approach to minimizing environmental impacts, performance leadership will be incomplete; your strategy will have an exposed flank that a competitor can drive cleanly through.

(More details about the "Business Case" for individual Natural Capitalism Principles are in the Principles Modules)

Employing Natural Capitalism Principles can be a catalyst for an organization to employ common organizational tools for improving environmental performance. Your organization may currently be using tools that integrate environmental performance into product/service design, accounting, organizational development, marketing, supply chain management, employee performance, industrial process design, and regulatory compliance; RMI believes that Natural Capitalism Principles will inform and enhance these tools with its coherent whole-system approach. If your organization is considering new systems to enhance environmental performance, integrating Natural Capitalism Principles into the system you adopt is a powerful means to use the new system for market leadership and maximizing your savings.

Natural Capitalism Principles can be easily combined with other environmental performance systems or commitments your organization has adopted. While not scientifically defining sustainability like The Natural Step or prescribing an environmental management structure like ISO14001 or establishing environmental reporting requirements like the CERES Global Reporting Initiative.³

Natural capitalism complements each of those structures with a clear path of action for reducing costs, aligning operations with natural systems, providing the right incentives for long-term product competitiveness and focusing on maintenance and restoration of the natural and human capital your organization needs for optimal long-term success.

In short, an organization using Natural Capitalism will:

- Integrate Natural Capitalism's four Principles into its core vision and strategy
- Realize that solutions lie in understanding the interconnectedness of challenges/opportunities rather than confronting them in isolation (i.e. whole-system least-cost approaches)
- Seek a common framework of understanding about the functions of earth and the dynamics of society
- Comprehensively plan for a future with natural and human appropriately valued
- Make positive contributions to supportive public policies

Each organization using Natural Capitalism Principles will make choices regarding whether to implement all four Principles as a strategic competitiveness system, or whether to implement individual Principles at different times or places according to the circumstances.

RMI anticipates that Principle 1, Radical Resource Efficiency, will often be the first Principle implemented because (1) immediate savings opportunities abound and (2) the implementation process doesn't require any "heavy lifting" from the standpoint of organizational training, strategic adoption, systematic integration, or pioneering of new business models. Implementing Principle 1 will generally require some company capital or require shared-savings contracts with suppliers of services, either of which will begin to generate savings in energy and materials costs within a short period of time.

The other three Principles generally have a longer-term focus although their implementation may still provide immediate paybacks. Leasing a service from a supplier may immediately reduce capital and monthly costs compared with buying a product. Eliminating toxicity from a process may immediately reduce materials and regulatory costs. Investments in local human capital may have immediate paybacks through the ability to hire the best and brightest workers due to enhanced community reputation.

But generally, the effects of Principles 2–4 will be high rates of investment return over a 2–10 years period. Leading companies will be prepar-

ing their future competitiveness today, but some are (actually or perceived) in a difficult position for add natural capitalism investments to existing capital demands. In these cases, RMI suggests that the immediate savings from implementing Principle 1 be dedicated to fueling the capital requirements for implementing the other Natural Capitalism Principles. While this arrangement is better than forestalling general use of the Principles, it isn't as effective as implementation of Natural Capitalism Principles as a whole-system.

A key principle of whole-system design is that optimizing one part of a system can pessimize the whole-system. At its most, basic Natural Capitalism is about whole-system long-term thinking and design. Likewise, the Natural Capitalism Principles operate as a system and the selection of one or two of the principles for implementation not only forfeits the potential synergies of the system, but may subject your implementation process to diminishing returns that "pessimize" your progress towards environmental performance and greater prosperity. The leaps in business operations and product designs from using all the principles will be less likely to accrue without these synergies.

For example, Radical Resource Productivity, Principle 1, will profitably reduce your throughput of energy and materials per unit of product. But one potential side-effect of practicing this strategy without reducing the toxicity of your materials (Principle 2) could be that your reduced amounts of toxic waste may no longer

...A reduction in materials use can assist a transition to more biologically appropriate materials if the market system ... places a higher value on the biologically appropriate materials.

be economic to transport to another business that can use it. The result would be that you are stuck with toxic waste, albeit in smaller amounts than before, but a more difficult problem to solve than if it had been economically transported to a re-user. However, this is a rare scenario; the vast majority of cases will result in very positive synergies...such as reducing hazardous waste completely, saving thousands of wasted revenues on waste handling.

On the positive side, a reduction in materials use can assist a transition to more biologically appropriate materials if the market system, for reasons beyond your control, places a higher value on the biologically appropriate materials. If materials throughput is reduced by Factor Four (75%) to provide the same service to customers, the service can still be competitively provided with more costly materials that are environmentally safer. Further, environmentally-safer materials in smaller quantities are more likely to be prudently and inexpensively stored until their volumes support transfer to another business as a material input, or even to be disposed on site as a nutrient to the natural capital of your operations (i.e. landscaping).

Another example of synergy is that Principle 3 will help you develop the right incentives for least-cost solutions throughout your product or service's lifecycle. These incentives will stimulate and support your supply chain's effectiveness at implementing resource efficiency and biomimicry; conversely, if Principle 3 isn't used, the incentives for making progress in Principles 1 and 2 will be muted, or existing perverse incentives will hold up your progress towards greater market leadership and competitiveness. Product design for the multiple objectives of all four Principles will produce more dramatic end-use, least cost solutions — thus promoting greater return on the design investment. Interface's 31-fold reduction in the energy and resources required to meet customer's flooring services resulted from lifecycle assessment and design that included recyclability (Principle 2), product leasing (Principle 3), design for replacement only of worn components rather than all components of the service (Principle 1) all together resulting in less strain on the natural capital required to operate plus a commitment to make the product lifecycle carbon neutral (Principle 4).

Each of the four Principles will interact with technological advances that are accelerating annually. Yet despite this acceleration, RMI believes it is possible that the pursuit of only one or even two principles alone will eventually suffer from diminishing returns of the efforts, at least in comparison with the synergies possible from using all Principles together. For example, a given product will only be subject to so much reduction in its materials composition without redesign considering new biologically-derived substitutes. The incentives for providing durabili-

ty and reusability will be less if the service leasing approach of Principle 3 isn't operating. While we haven't direct experience with an organization choosing to implement one principle rather than the whole system, examples from companies choosing to only focus on energy savings, for example, show that the ethic often doesn't "take" throughout the company and stimulate the creative thinking that forms the foundation of long-term competitive advantage.

Not to be overlooked are the many seemingly intangible but very real benefits that result from basing your competitive strategy on the extraordinary environmental performance achievable through use of Natural Capitalism Principles. These benefits include customer loyalty, employee attraction, loyalty and productivity, greater access to investor markets, positive publicity, regulatory relief, brand enhancement, and the numerous other benefits of market leadership. These benefits will be less likely to accrue if employees or potential investors perceive your efforts as half-hearted or, worse, "green-wash". Market leadership and brand reputation benefits will be much more slippery to take advantage of because of the compromised nature of your environmental approach. Environmental leaders will be a bit less excited to partner with you to design and product the next market leap.

It would be difficult to predict how much an incomplete approach to natural capitalism will diminish its benefits, but the approximate answer is going to be "more than none". People intuitively respect whole-systems approaches rather than timid, "stick-your-toe in the water" efforts. The energizing of your workforce and stakeholders behind a bold vision may ultimately be the most productive synergy of all since even small changes in worker productivity produce ripple effects in your bottom line.

Bold moves based in building a better society while earning financial rewards create organizational learning that supports leadership and innovation...and pride. These characteristics of environmental leadership firms provide multiple benefits throughout organizations — from esprit de corps to technical excellence. Innovation will permeate your core strategies. You may not be easily able to count or articulate the synergies from a fully integrated approach to natural capitalism, but you may rest assured all the feedback loops are positive.

This Field Guide is designed to give you a head start with the implementation of Natural Capitalism Principles. RMI encourages you to learn more about each of the Principles through the individual learning modules, consider how they would work in your company, and compare your thoughts to our ideas and experiences with the implementation tools that follow.

Organizational development strategies and implementation will be a key to success. Visit our Organizational Development Tool module for practices that will generally serve the needs of your organization, and consider how to customize the approach to maximize effectiveness.

Some actions to consider are:

- Get employees involved from all aspects of the company. They can apply the Principles to more and ever widening aspects of your organization's value chain. Insure that employees clearly understand the synergies of using all four principles and don't settle for just implementing one of them. If you are using or are going to use an organizational environmental management system (EMS), integrate Natural Capitalism Principles into it.
- Adopt organization-wide natural capitalism performance indicators, benchmark your present situation and monitor success. Common measurements create a common language that the whole organization can get behind. Implement the investment decision-making techniques described in RMI's Accounting / Measuring tool. Reward stakeholders, especially employees, who help you blaze your trails.
- Vision is a great motivator, but seeing is believing. Visualize your organization having made Factor Ten leaps in resource productivity, using non-toxic materials of which close to none are wasted, and is restoring and building natural and human capital. Set a time goal for reaching that state, and plan backwards from the goal step by step until it's clear which actions today support your long-term vision. Then do some initial projects that demonstrate the effectiveness of the Principles working together in your organization.
- Adopt accounting tools that properly assign natural and human capital impacts to specific products so product teams have the right information and incentives. Estimate the full value of natural and human capital in your product design planning systems.
- Spread the benefits of natural capitalism to your supply chain by integrating natural capitalism with supply chain management.

VI.1. INTERNAL BARRIERS TO BUST

Any new business model will meet resistance in an organization — the “organization’s immune system.” However, rarely does a new business model clearly align the organization’s success with preservation of a commonly desired future — one with sufficient natural capital for future generations to use.

Some of the barriers you’ll face are:

- Acceptance of a new business model for a paradigm
- Environmental apathy or cynicism
- Ignorance or disbelief of natural capitalism’s competitive advantages — in other words getting past the “impermeable” membrane between core strategy and environmental performance
- Customer and supplier education
- Integration with existing environmental performance tools or other high priority organizational initiatives

VI.2. EXTERNAL BARRIERS TO BUST

Natural capitalism is a profitable strategy to use today, without waiting for the business climate (government’s rules to govern the economy) change. Positive inputs into market-reinforcing public policy will help capitalism cultures thrive while appropriately preserving natural and human capital, but present public policies, even though not overtly supportive of natural capitalism, will rarely be an external barrier that deserves your attention. External barriers you will face include:

- Supplier resistance
- Economies of scale for natural capitalism-friendly inputs, though mass production will bring costs down, improve availability and expand design partner possibilities
- Mainstream investors that don’t yet understand the competitive advantages of natural capitalism

VII. CASE STORIES

Natural capitalism is a new enough business model that no organization has yet chosen to implement the Principles. Many organizations are actively considering the use of natural capitalism, and many more have implemented actions, strategies and tools that illustrate how natural capitalism works. The case stories below and with each Natural Capitalism Principle Module are examples of companies demonstrating good practices that a natural capitalism organization would consider.

The three case stories below illustrate comprehensive approaches to environmental performance that capture some of the synergies of using Natural Capitalism Principles together. Many of the other case stories in the Principles Modules P1–P4 are also stories of organizations taking on a comprehensive approach. DuPont, Ricoh, and Honda are especially strong comprehensive efforts by some of the world's most successful and respected organizations.

The case stories and examples in the Field Guide are for-profit businesses only at this time, with the exception of the City of Portland, OR case story below. Non-commercial organizations such as governments, hospitals and other non-profits face the same organizational challenges but with a slightly different bottom line: Effectiveness rather than profitability. We urge readers from non-commercial organizations to apply Natural Capitalism Principles to their own operations, and in the case of governments, to their governance strategies and actions. RMI's Communities practice is developing additional tools for community governance.

VII.1 INTERFACE INC.

What would a company look like if it were to adopt as its strategic paradigm a concept called Natural Capitalism? A striking example is emerging at the world's largest manufacturer of services and products for commercial and institutional interiors: Interface Inc. Based in Atlanta with over 7,000 employees and worldwide operations, Interface's sales approach \$1.3 billion; 40% of commercial carpet customers worldwide have Interface flooring.⁴

Conventional carpet firms replace commercial broadloom carpet every decade because it

develops worn spots. An office is shut down, furniture removed, carpet torn up and sent to landfill. (The millions of tons deposited each year will last for up to 20,000 years.) Then new carpet is laid down, the office restored, operations resumed (after lost productivity), and workers possibly sickened from the carpet-glue fumes.

Interface Inc. is the manufacturer and distributor of the world's best selling commercial carpet tile brand. It also produces commercial flooring systems and textiles and owns a commercial floor covering service network. Founder and

Chairman Ray C. Anderson established Interface's environmental leadership efforts in 1995, committing his nearly billion dollar (sales) firm to becoming the first company of the "Next Industrial Revolution." According to Anderson, Interface's sustainability vision is:

"not so much about recycling or rain-forests. It's about learning from the efficiency of natural systems and recognizing the web of interdependencies that connects our company, our customers, our shareholders, our suppliers, our associates, our communities, and our environment. Achieving our vision demands innovation. It forces us to change how we think about the products we make and the services we provide. It imbues every last one of us...with a passion for new ideas that will keep us ahead of the pack⁵"

Interface has received many awards for its environmental leadership, including being named the most admired company by its 200 Atlanta, GA peers in 1999. Anderson co-chaired President Clinton's "President's Council on Sustainable Development.

Their activities support Natural Capitalism Principles as follows:

Principle 1:

- New Solenium product designed to be 35% more materials efficient for same services provided
- Reduce face weights of carpet tiles while improving durability
- Reduced Shanghai factory pumping energy requirements 12-fold through straight pumps design

- Numerous efficiency investments in boilers, washers/dryers and temperature requirements at plants that save energy and reduce air pollution
- Resource efficient transportation strategies include:
 - lightweighting of packaging
 - movement of manufacturing plants closer to customers
 - using natural gas vehicles
 - utilizing electronic communications
- Internal commitment to reduce greenhouse gas emissions per unit of product (energy productivity)
- Created Vice-President for Sustainable Energy position
- Installed solar electricity panels at California plant

Principle 2:

- Zero Waste vision stimulated numerous initiatives to monitor and reduce waste
- Make process and product changes to "waste equals food"
- Developing hemp and corn-based products to replace petroleum
- Created 100% recycled fabric products and many other products with recycled content
- Solenium floor product almost fully recyclable into new product
- Naturally treating and reusing wastewater instead of diminishing river water quality
- Converted single-use metal dissipators to organic fibers
- Recycle vinyl trim waste into vinyl paste and other trim waste into backing materials

Principle 3:

- Established the Evergreen Lease of flooring services (see Principle 3 Module Case Story)
- Invested \$100 million in a U.S. value-added service network to support leases and take back products for recycling

Principle 4:

- Offsetting travel impacts by investing in tree planting
- Involving employees in restoring wildlife habitats around facilities for recreation
- “Adopt-a-stream” program gets employees and schoolchildren involved in efforts to restore natural capital
- Employees are rewarded through a formal bonus program for reaching sustainability goals

Beginning in 1995, Interface staff has sought to increase the productivity with which they use energy and materials. They implemented an initiative called the QUEST program to identify and eliminate waste throughout worldwide. They set goals (Zero Waste) and educated their associates (employees) about waste: *Waste is any cost that does not produce value to our customers.* Using this definition, waste eventually included all nonrenewable energy consumption. Powered by the vision and an employee suggestion program, Interface saved \$49.7 million in 3 years. From 1994 to mid-2001, this added \$167 million to the bottom line, and now provides 27% of the company’s operating profit.⁶ The source of these savings are dramatic gains in resource productivity: Greenhouse gas emissions are down 30% per dollar of sales and water consumption is also down 30%.⁷

These savings paid for early investments in cultural and operational shifts, which in turn led to advanced technologies and product concepts. Each step was designed as a platform for future steps and confirmed by economic results as well as positive ecological effects.

The resulting new design paradigms drive Interface’s move towards biomimicry, services models and investment in natural and human capital (Principles 2 –4). Interface reinvented its research and development arm in 1995 to implement EcoSense — its program for implementing its sustainability vision. Eighteen teams from all business units worldwide were formed to implement 400 sustainable initiatives. All four Natural Capitalism Principles are represented in these initiatives — inspired by Anderson’s vision to become “the first sustainable corporation” and then the “first restorative corporation.” They looked at every operation from a whole systems perspective. Actions ranged from improvements to the performance of a single process to investing in nature and wildlife surrounding their facilities. An ongoing consulting team of diverse talents was assembled, the Interface Dream Team (including RMI) and its 75 associates in the QUEST/Ecosense group meet twice annually to share best practices.⁸

The business concept shifted from linear to cyclical: Interface has sought to close the loops of materials flows. It is implementing a program to almost completely recycle carpet. Other companies that claim to recycle carpet actually “downcycle” it, taking used carpet, chopping it up and reusing it in lower-grade products such as carpet backing. But this wastes the valuable embodied energy in the nylon “face” of the carpet, and uses new resources to make nylon for

the new carpet “face”. In contrast, Interface’s new “Solenium” product, released in 1999, is almost completely remanufacturable into identical carpet. The face is a new type of polyester that can be separated from the backing and remade into new face, while the old backing becomes new backing. This virtually severs the connection to the oil well at the front of the production cycle and to the landfill at the back end.

Solenium also provides better service. The new floor-covering, which may be leased or sold, is nontoxic, virtually stainproof, easy to clean with water, and “climate neutral” (the climate impacts of making and shipping it have all been offset⁹). Compared to standard nylon commercial carpet, it is four times as durable, one-third less materials-intensive and in appropriate applications, superior in every respect. It also turns the avoided waste into profit.

Interface implements the Principle Three by preferring to sell floor covering services rather than new carpet. People want to walk on and look at carpet, not own it. Under Interface’s Evergreen Service Contract, the company will install carpet tiles, which Interface will own and remain responsible for keeping clean and fresh. As needed, Interface will replace the 10–20% of the carpet-tiles that show 80–90% of the wear. This provides better service at lower cost. It also increases net employment, eliminates disruption (worn tiles are seldom under furniture), and turns a capital expenditure into a tax-deductible operating lease.

Solenium’s quadrupled durability and one-third lower materials intensity, coupled with the four-fifths lower materials flow from replacing only the worn parts, will cut Interface’s net flow of

materials and embodied energy by 97 percent even *before* the remanufacturing of the Solenium begins. When these attributes are *combined* with the remanufacturing, the continuing use of virgin materials will fall by more than 99.9 percent.

Finally, regarding restoration of natural capital, Interface is initiating a program to grow its feedstocks — replacing petroleum with plants — mindful that this will require them to ensure that their suppliers practice sustainable farming, so that they don’t just substitute one form of unsustainability for another. By end of 2001 Interface expects to introduce a line of its Terratex panel and upholstery fabrics (100% recyclable or 100% compostable) made from a biodegradable fabric made with corn-based polylactic acid (PLA). This will put them in the forefront of making a steady market for organic farmers who restore the land through their practices — and will ultimately free this once petrochemical-intensive firm entirely from its dependence on oil. It can then become natural capital “neutral”: take next to nothing from the planet, do no harm, restore ecosystems, and provide better customer service at lower cost and higher profit.¹⁰

Interface’s first four years on this systematic quest returned doubled revenues, tripled operating profits, and nearly doubled employment. Its latest quarter-billion dollars of revenue have been produced with no increase in energy or materials inputs, just from mining internal waste, closing the loops, eliminating toxics, and shifting to a service model. (In the fifth year, external circumstances unrelated to Interface’s sustainability work hurt the company, but it remained profitable because of its waste reductions and has recovered strongly.¹¹)

To protect its human capital, Interface provides innovative programs such as Smoking Cessation and the Ergonomic Team in addition to the full range of benefits and pro-active health care initiatives found in progressive companies. Wildlife At Work Teams help Interface sites in Maine, Georgia and Michigan be friendly habitats for native wildlife. Employees are encouraged to participate in local natural capital restoration efforts such as Adopt-A-Stream and watershed councils — usually on Interface time.¹²

Anderson says, “In business, sustainability means managing human and natural capital with the same vigor we apply to the management of financial capital. It means widening the scope of our awareness so we can understand fully the “true cost” of every choice we make.”¹³

Interface’s whole system approach has been rewarded in the marketplace. According to Chairman Anderson, “We attract the growing number of companies seeking environmentally and socially responsible business partners. We attribute millions of dollars in revenue directly to new relationships with large companies that sought us out because we’re recognized as a leading global proponent of sustainable enterprise. That’s good business.”¹⁴

VII.2
NIKE INC.

“As a citizen of the world, Nike must Do the Right Thing — try to be transparent about what we are doing right, and about what we are doing wrong; embrace diversity; drive sustainability. All of us know intuitively that making decisions based on what is good for future generations will help us create a company that is built to last.”

Nike CEO Phil Knight, 2001¹⁵

Nike, the global marketer of its shoe, athletic and apparel products (and products of returned shoes), has also become a leader in sustainability practices. Initially focused on recycling, environmental consciousness has bloomed into whole-system manufacturing approaches, environmental education contributions, and sustainability commitments that include both natural and human capital.

Founded in 1972, Nike now directly employs approximately 22,000 people and engage with approximately one million people employed by suppliers, shippers, retailers and service providers; its manufacturing is performed by approximately 750 tier one suppliers employing about 500,000 people worldwide. Annual sales in 2001 reached \$9.5 billion; earnings per share and return on equity have been steadily growing the past four years.¹⁶

Nike’s comprehensive approach has been building momentum gradually throughout the 1990s through the efforts of its Environmental Action Team led by Sustainable Development Corporate Director Sarah Severn. By 1998, Severn helped

achieve a full corporate commitment to sustainability through the 1999 adopted sustainability policy and the “Making Sustainability Real” program, new sustainability positions and personal video-recorded statements by division vice-presidents to broadcast the message internally and publicly.

Nike’s vision:

“Through the adoption of sustainable business practices, Nike is committed to securing intergenerational quality of life, restoring the environment and increasing value for our customers, shareholders and business partners. Nike will endeavor to:

- Integrate principles of sustainability into all major business decisions. Scrutinize our environmental impacts in our day-to-day operations and throughout every stage of the product life cycle.
- Design and develop product, materials and technologies according to the fundamental principles of sustainability.
- Promote our practices throughout the supply chain and seek business partnerships with suppliers who operate in a manner consistent with our values.
- Educate our employees, customers, and business partners to support our goal of achieving sustainability.
- Turn awareness into action by integrating environmental responsibility into job responsibility.
- Partner with experts and organizations that contribute to our knowledge about sustainability and stewardship of our outdoor playground.
- Contribute to quality of life in the communities in which we operate.
- Monitor, measure and report progress.”¹⁷

The process for developing this momentum and the strong public commitments is described in detail by Nike’s 2001 Corporate Responsibility Report. Starting from the base of Nike’s Environmental Action team, “action learning” was developed as sustainability training for 100 “champions” (executives) and 65 “captains” (e.g. product designers, procurement staff).

Nike says the program itself was successful, but its goal needed to be involvement with 100% of senior management and focused more on the consumer-oriented marketing aspects of the business instead of production. Nevertheless, sixty-five sustainability projects were launched including Nike’s European HQ building ... a green building “unparalleled” in The Netherlands.

Other major projects included:

- Web-based (paper-saving) product catalogs for Asian retailers (saving \$40K/year in China alone).
- Develop “sustainable” Nike Apparel materials — done in partnership with Cargill-Dow, DuPont and other suppliers.
- Measurement of CO₂ emissions from factories to distribution centers as the first step towards a climate-neutral strategy.
- Sustainability training for 5000 retail employees and list of best practices.
- Create sustainable “cradle to cradle” Nike Kids product using antimony free, simple materials palette and easy on/off for customers.¹⁸

The environmental efforts were overseen by Nike's Director of Social Responsibility, a position created to unify community, labor and environmental concerns. Like other companies that have "run into a wall" and then become sustainability leaders, Nike at first was responding to critics, particularly of its labor practices overseas. Joel Makower, editor of Green Business Newsletter wrote in 1999:¹⁹

"Nike acknowledges that in the past it was less than vigilant of the practices of its factories — nearly all of which are contracted to independent manufacturers — but it has launched an aggressive and ambitious effort not only to correct such situations, but to set an example for its industry. Doing this has become nothing less than a mission for Nike. "We've come to a point that we recognize that we're going to be a poster child for overseas manufacturing," says Sarah Severn, (then) Director of Environmental Action. "But more importantly, I think the company has realized that the only way to change people's perception is to change the reality — to make sure that we put a lot of effort into the actions that we take."

By 1998, Nike was getting fully engaged in the environmental management systems of the overseas suppliers. It created its own version of the ISO14001 EMS system adapted to its own needs / values and providing consistency for its primary suppliers (called MESH — management of environment, safety and health). Nike "binds its manufacturers" to its Code of Conduct covering forced labor, child labor, compensation, benefits, work hours, documentation and MESH. MESH requires written health and safety guidelines, compliance with Nike EHS standards, limits organic vapor concentrations to U.S. OSHA standards and compliance with all local regulations.

Trainings were established and implemented throughout 1999 and collaborative technical assistance provided to an extraordinary extent for a U.S. manufacturer. "We don't really have any immediate payback for Nike other than knowing that we've done what we should be doing as a corporation," says Paula Valero, manager, strategic environmental management. However, she notes, "We believe that this will improve quality in the long term — either because we've eliminated solvents in the production process and the workers are more productive, or because they start to make the products differently to reduce the amount of waste they're generating."²⁰ Valero notes that the next challenges include integrating Nike's core sustainability principles—natural capitalism principles and The Natural Step system conditions—into MESH and the operations of its suppliers.²¹

Some immediate results bolstered momentum. According to Severn, "Nike eliminated the use of 800,000 gallons of solvents in its adhesives in one year and developed a goal of reducing its use of volatile organic compounds per unit of production by 90 per cent by 2001."²² Nike's water-based adhesives efforts have introduced six new less caustic glues to the Asian production system...usable by Nike and other companies.²³

Toxics-reduction efforts have gone beyond glues and into the 100 different materials that go into a shoe. Phil Berry, Nike's Global Sustainability Engineering Manager, helped Nike eliminate two-thirds of its solvents in the late 1990s and is now working with suppliers on closing whole-systems production loops. The leading-edge lean manufacturing efforts are complicated by continuance of the strategy to always have two suppliers. According to Berry, he is pursuing

whole-systems that are performance “optimizable” rather than the “cul-de-sacs” that represent dead-ends for materials. For example, shoe components are being redesigned to use trimmings from other components. Packaging is also seeing loops closed through a partnership with DuPont, who accepts used bags and converts them back into new ones. The loop-closing efforts are stimulating new concepts about factory designs that would facilitate recycled materials flows.²⁴

Several new corporate initiatives are continuing to build momentum and savings, yet Nike has chosen to quietly inform citizens and customers rather than pursue explicit green marketing strategies. Like many companies who have begun this path, they are humble about the work remaining to be done.

Current or recent projects include:²⁵

- Promote a pilot project in Laguna Beach, CA to demonstrate the viability of curbside shoe recycling in conjunction with existing curbside programs;
 - Promote contributions of pre-tax profits to children’s charities (approximately 3% over past four years);
 - Promote sponsorship of more than 100 “On The Field” after-school sports programs around the world
 - Promote creation of micro-loan programs (as little as \$75) to women in Vietnam;
 - Promote creation of the Air to Earth environmental education program in collaboration with the North American Association for Environmental Education and EcoEducators. Participating teachers make their schools eligible for Nike grants as much as \$10,000.
- Promote development of a full inventory of greenhouse gas emissions from business operations including sub contractors.
 - Promote support for employee commuting alternatives that have reduced “drive-alone” trips to work from 98% to 84%.
 - Promote engagement with McDonough Braungart Design Chemistry to identify and replace materials with “adverse effects on human health or biological systems.”
 - Promote investigation of the “product service” model creating full Nike product responsibility throughout its lifecycle.
 - Promote projects established to support manufacturing and transportation transition to renewable energy.
 - Promote encouragement of supplier locations of factories in rural areas to help slow crippling urban migration in Asia
 - Promote development of “Eco-class” business travel partnership with Delta Air Lines (carrier for nearly 50% of Nike’s 110 million mile air travel) that will invest in carbon-reduction offsets.

Product creation goals have emerged that will continue to drive Nike as a sustainability leader:²⁶

- Eliminating the concept of waste in our product design, use of materials, energy and any resource that cannot be readily recycled, renewed or reabsorbed back into nature.
- Eliminating all substances that are known or suspected to be harmful to human health or the health of biological or ecological systems.
- Closing the loop and taking full responsibility for our products at all stages of our product and process lifecycle, including the end of a product's useful life when consumers are likely to dispose of it.
- Developing financial structures that promote greater product stewardship in design, engineering and manufacturing. Create new financial models to reflect the full cost of doing business, ultimately providing additional benefits to both Nike and our consumers.

Nike's reporting in 2001 found that:

- The carbon offsets program from the last six months of 2000 resulted in a new more efficient natural gas boiler installation at a Portland, OR middle school — helping the school save energy expenses.
- Microloans to women have reached 3,000 families through the Vietnamese Women's Union
- Continual progress (68% reduction) is being made toward eliminating Sulfur Hexafluoride (SF₆) in Nike Air products by 2003 because it is a potential global warming contributor.
- Continual progress towards the goals of a complete phase-out of poly-vinyl chloride (PVC).
- Elimination since 1992 of 1.6 million gallons of organic solvents per year, resulting in savings of \$4.5 million (material costs only).
- Partnership with Cathay Recycling Development Corporation, a woman-owned business started in Qingdao that resulted in recycling 90% of previously landfilled or incinerated rubber waste from four Chinese factories. Solid waste per pair of shoes made in China or Indonesia has been reduced 29% from 1996.
- Use of Miratec apparel fabric that requires 43% less energy than conventional knitting or weaving.
- Continual support of organic cotton farmers through tripling of purchases from 1997–99 with goals to increase the blend in Nike t-shirts beyond 3% as availability allows.
- Development and marketing of Nike Grind athletic surface products to reuse the rubber in 2.3 million shoes now annually collected; revenue from Nike Grind sales supports athletic facility developments in under-served communities.
- Development and marketing of "eco-efficient" walking shoes with substantial use of recycled materials, 100% solvent-free production, reduced materials and packaging from predecessors...demonstrating that "traditional products can be improved inline without significant redesign."²⁷

Nike has also focused on promoting sustainability to consumers and citizens. It was a primary sponsor of the Earth Day 2000 “First Annual Race to Stop Global Warming” in Portland, OR.²⁸ It encourages employee volunteerism through projects that protect local natural capital, such as park trails.²⁹ It supports broader socially responsible business education through Business for Social Responsibility, Oregon Natural Step Network and The Natural Step U.S., and participation in corporate partnerships such as Climate Solutions.

Most recently, Nike announced in October 2001 its climate change reduction program. Partnering with the World Wildlife Fund and the Center for Energy & Climate Solutions, Nike committed to pursue a 13% reduction of 1998 greenhouse gas emissions from travel and Nike facilities/services by 2005. According to Severn, “We take very seriously the effects of climate change on our planet. Nike’s reduction of greenhouse gases will illustrate how environmental strategies can align with business goals and will hopefully inspire more businesses to address climate change.”³⁰

VII.3 STMICROELECTRONICS

Observing that “the world is priceless, ecology is free,” STMicroelectronics (ST), the world’s sixth-largest computer chipmaker, has set a goal of zero net carbon emissions by 2010 despite a 40-fold increase in production from 1990, in pursuit of commercial advantage. They are well on their way: Compared to company’s 1994 baseline, ST has already achieved 29 percent reduction in electricity consumption and greenhouse gases and a 45 percent drop in water usage. ST’s CEO Pasquale Pistorio notes that energy conservation projects to date have averaged less than two years payback, with none exceeding three years.³¹

ST is a global semiconductor company with annual sales worth \$7.8 billion. The firm “designs, develops, manufactures and markets a broad range of semiconductor integrated circuits and discrete devices used in a wide variety of microelectronic applications”. Operating income has grown steadily the past five years, more than doubling from \$800 million to \$1.78 billion. ST is based in Geneva, but operates 19 facilities worldwide employing 43,000 employees. U.S. headquarters are in Carrollton, Texas, in the Dallas metropolitan area. Its products are in approximately one-third of new cars today — helping electronically controlled engines optimize fuel consumption.³²

ST believes its carbon neutral goal can be met by decreasing its total energy consumption 5 percent per year for each million dollars of added value (sales revenue minus purchasing costs). It will be achieved by increasing energy efficiency, using more combined heat and power plants and adopting renewable

energies where viable. Creation of carbon sinks through reforestation will help compensate after all economic measures have been taken.³³

CEO Pistorio says, “Deeply embedded in our Company’s culture, our environmental commitment is nurtured by two strong beliefs:

- Ethical values, responsibility and ideals are an important base for motivating people to enhance their capabilities as individuals and as members of our organization.
- Ecology is free:
- Prevention is cheaper than correction, because it is more effective to anticipate future legislation than to react once it is enforced;
- Eco-efficient corporations use less natural resources, and therefore they are intrinsically more profitable than the others;
- Shareholders’ value is not threatened by corporate social and environmental responsibility; on the contrary, we believe that by being good citizens we can amplify stakeholders’ value and return to investors.”³⁴

ST’s unique “Decalogue” of sustainable business principles and goals is the core driver for its whole-system approach. First adopted in 1995 and updated in 1999 with more rigorous performance goals, the “ten eco-mmandments” are currently the most rigorous and comprehensive in the world for a major company:

Regulations:

- Meet the most stringent regulations of any country throughout the world.
- Comply with international protocols at least a year before the deadline.

Conservation:

- Reduce total energy consumption per dollar of sales by five percent per year.
- Reduce water drawdown per dollar of sales by five percent per year.
 - Achieve 90 percent water recycling at two pilot sites by 2005.
 - Reduce paper consumption per employee by 10 percent per year, and use at least 95 percent recycled paper or paper produced from environmentally certified forests.

Greenhouse Gas Emissions:

1. Reduce total CO₂ emissions due to our energy consumption (in tons of carbon equivalent per sales dollar) by at least a factor of ten in 2010 versus 1990.
 - Increase utilization of wind, photovoltaics and thermal solar so that they represent at least 5 percent of our total energy supplies by 2010; adopt where possible alternative energy sources such as cogeneration and fuel cells.
 - Compensate for the remaining CO₂ emissions through reforestation or other means aiming at total carbon neutrality by 2010.
 - Reduce emissions of perfluorinated compounds (PFCs), in tons of carbon equivalent per sales dollar, by at least a factor of 10 by 2008 versus 1995.

Pollution:

- Noise: keep “noise to neighbors” to 60db(A) at any point and at any time outside our property perimeter for all sites or comply with local regulations— whichever is most restrictive

Pollution (continued)

1. Contaminants: handle, store and dispose in a manner meeting or exceeding the strictest environmental standards of any community in which we operate.
- Ozone depleting substances: phase out all remaining class 1 ozone depleting substances (including in closed loops of small equipment) by 2001.

Chemicals:

- Reduce the consumption of the six most relevant chemicals by at least 5% per year (in tons per sales dollar of added value).

Waste:

- Reduce the amount of landfilled waste below 5 percent of our total waste by 2005.
- Reuse or recycle at least 80 percent of our manufacturing and packing waste by end of 1999 and 95 percent by end of 2005.

Products/Processes:

- Design products for decreased energy consumption and for enablement of more energy efficient applications.
- Contribute to global environmental control by establishing a database of Life Cycle Assessment of our products.
- Systematically include the environmental impact study in our development process.
- Publish and update information about the chemical content of our products.

Proactivity:

- Support local environmental projects at sites.
- Produce Annual Environmental Day events at each site.
- Encourage employee participation in community committees, etc.

Include Environmental Awareness education in training for employees and offer it to suppliers and customers

- Strongly encourage environmental certifications of suppliers.

Measurement:

- Continuously monitor our progress including periodic audits of all our sites worldwide.
- Cooperate with international organizations to define and to implement eco-efficiency indicators.
- Measure progress and achievements and publish our results in annual Corporate Environmental Report.

Validation:

- Maintain the ISO14001 certification and EMAS validation for all sites worldwide.
- Certify new sites within 18 months of their startup.³⁵

ST projects that reaching the Decalogue goal for carbon neutrality will result in company energy savings of \$900 million from 1994–2010. If its desired mix of 65 percent cogeneration, 30 percent conventional energy and 5 percent renewable energy is achieved by 2010, its CO₂ emissions will be 80 percent reduced from 1990 levels.³⁶

Progress to date has often included techniques applicable throughout the industry. One example: Energy savings of 85 percent during silicon wafer probing have been achieved in Italy by creating a minizone, a clean area around the wafer rather than a complete "clean room." At an Italian plant, a cogeneration system providing electricity, heating and cooling will reduce greenhouse gases and energy by 25 percent from a standard system.

In France a wind turbine is being installed that will provide 40 percent of the electricity for corporate offices. A wind farm planned for Morocco is expected to provide 20 percent of the electricity needs for two manufacturing sites.³⁷

ST has focused on environmental product solutions as well as reducing its own impacts. An ST solution for mobile phone chargers that disconnects battery charger power when the battery is fully charged would save enough electricity to power 10,000 homes if applied to all mobile phones sold in 2000. The company is also developing electronically activated valve systems and hybrid engine systems that increase fuel economy in automobiles.³⁸

To close loops, reduce waste and eliminate toxicity, ST has found innovative ways to reuse their suppliers' silicon wafer packing — reducing their own packaging needs by 10 tons per year and diverting it from the landfill. The goal of reducing perfluorinated compounds (PFCs) by 95 percent is tough — but ST has already achieved it in one of its processes and is one of 24 industry signatories to an agreement to share technical information about PFC reduction technologies. An innovative process at the Carrollton, TX plant eliminated 95 percent of all Volatile

Organic Compound emissions; the process is now being adopted at ST plants worldwide.³⁹ Use of recycled paper rose from about 50 percent in 1994 to over 98 percent in 2000. ST reduced the use of paper per employee by 37 percent from 1997 to 2000. By publishing technical documents on CD-ROM and DVD, the number of publications printed decreased from 120 tonnes in 1995 to only 2.4 tonnes in 2000.⁴⁰

ST, with Infineon Technologies and Philips Semiconductors, together the three largest semiconductor manufacturers in Europe, unveiled their proposal for the world's first standard for defining and evaluating "lead-free" semiconductor devices. The initiative shows the three companies' commitment to work towards the elimination of lead in electronic systems to improve environmental protection, e.g. in the recycling or disposal processes of electronic devices. Starting in February 2001 the three companies developed the proposed standard, which provides a common definition of "lead-free" and assesses factors such as solderability and reliability of alternative materials." The EU deadline is 1 Jan 2006 for lead, mercury, cadmium and other materials forbidden in electronic and electrical devices. "By sharing our knowledge and enthusiasm, Europe's leading semiconductor manufacturers can make huge steps towards meeting this goal," said Leo Klerks of Philips. The three companies will be able to introduce their "lead-free" products far in advance of the deadline.⁴¹

The consistently positive results continue to confirm Pistorio's beliefs. "Eco-efficient companies are intrinsically more profitable than others as they use fewer natural resources," he has said. "Shareholder value is not threatened by

corporate social and environmental responsibility; on the contrary ST has found that it amplifies stakeholder value and return to investors." ST also recognizes that "accomplished and talented men and women will be more attracted to a company where people are at the center of the enterprise and where ethical, social and environmental values are at the heart of the company's success."⁴²

Adds Pistorio, "Nevertheless, we are strongly motivated by a spirit of 'constructive dissatisfaction,' and we cannot be complacent. There is much more to do and we are still far from meeting the needs of today without compromising the ability of future generations to meet their own needs."⁴³

VII.4. CITY OF PORTLAND AND MULTNOMAH COUNTY, OREGON

The City of Portland and Multnomah County are part of the 29th largest city economy in the U.S., encompassing three Oregon counties and the Vancouver, WA area. Population of the economic region, now at 2.3 million, grew 26% (473,000) during the 1990s.⁴⁴

The City and Multnomah County began sharing comprehensive sustainable development efforts through the newly combined Office of Sustainable Development in 2000. The results were long-term policy changes and new ordinances designed to promote sustainability in the Portland area. Key components of the broader community strategies are:

- The Local Action Plan on Global Warming—an April 2001 plan for a 26 percent decrease in present community fossil fuel consumption, intended to decrease usage to 10 percent below 1990 levels by 2010;

- The 2005 Solid Waste Recovery Goal seeks to increase the City's present solid waste recovery rate of 54 percent to 60 percent in the next four years;
- The comprehensive "Green Building Policy and Standard", adopted January 2001, that requires city owned or funded buildings to meet Portland's own Leadership in Energy and Environmental Design (LEED) standards⁴⁵;
- The "Community Energy Efficiency Strategy" that will guide expenditures of approximately \$8 million from the State of Oregon, for annual energy conservation investments, beginning in 2002.

They are also focused on reducing city/county costs and environmental impacts through systematic application of sustainable practices to their own operations. "The City of Portland pro-

notes and encourages sustainability as a corporate practice and as a community ethic,” says a City document.”⁴⁶

Global Warming and Sustainable Development Initiatives

Portland has been active throughout the 1990s, beginning with establishment of a City Energy Policy in 1990. The City’s first Climate Action Plan was adopted by City Council in 1993.⁴⁷ The following year a new City Economic Development Policy initiated sustainable development strategies, including cutting edge environmental technology loan programs for small businesses and examination of eco-industrial park development opportunities. City Enterprise Zone tax incentives were limited to socially-responsible companies providing adequate wages, benefits and training while encouraging employee ownership, use of local small business suppliers, transit support and home purchase assistance programs.⁴⁸

Portland and Multnomah County are among 400 local governments worldwide that have adopted local climate change plans. The updated 2001 plan is to reduce the overall fossil fuel consumption to 10 percent below 1990 levels by 2010. But the Plan notes that success in doing so is only a beginning because stabilizing atmospheric levels of greenhouse gases required a 60–70 percent reduction from 1990 levels.

To do its share, City and County governments have agreed to invest in all energy efficiency measures with a payback of ten years or less and to require all new government buildings to beat the current energy code by 20 percent. Focused energy management of City operations,

beginning with the 1990 Energy Policy, has saved over \$9 million in energy costs over the past decade — currently at a rate of \$1.4 million savings annually.⁴⁹ The City has also helped weatherize 20,000 apartments and 2,000 low-income homes and today expects to weatherize 1,650 apartments and 125 low-income homes annually.⁵⁰

To help the community reach these goals, plans include:

- Expanded public education and awareness tools, including helping purchases of green power be a “community ethic.”
- Full integration of the Plan into community land-use/development planning efforts.
- Energy conservation programs for buildings including design requirements for government-funded projects.
- Expanded access to energy conserving appliances.
- Facilitate energy-service performance contracts.
- Partner with major energy consumers to set and meet reduction targets.
- Improve transit service and access.
- Support state government actions including congestion pricing and incentives for high mile-per-gallon vehicle purchases, and green power percentage minimums in the electricity offered to consumers.

The City has applied energy efficiency and sustainable design techniques to four major building projects in the past several years. A complete renovation of City Hall used closed loop HVAC systems, low flow fixtures and other features to save 2.4 million gallons of water (out of 3.1 million previously) and \$13,000 per year⁵¹ The City's Office of Sustainable Development (OSD) will move in autumn 2001 to the Natural Capital Center, a privately owned green renovation of a downtown area industrial building. Among the Center's remarkable environmental designs are 100% onsite stormwater treatment through natural processes, 30% of building lighting needs from daylighting and 20% greater energy efficiency than conventional buildings.⁵²

The OSD is also promoting Energy Star and green power purchases by public and private organizations. The "Businesses for an Environmentally Sustainable Tomorrow" (BEST) awards program for the region was a national leader when established in the early 1990's and has provided 60 business case stories to inspire others. In the nine years the City has assisted businesses and issued BEST Business Awards, award winners achieved annual savings of \$11.7 million in costs, 857 million gallons of water and 103,000 tons of CO₂ emissions. BEST awards programs have been replicated in four other communities—Austin, TX; Chula Vista, CA; Spokane, WA and Seattle/Puget Sound, WA.⁵³

Three-term Portland Mayor Vera Katz says, "We know that cutting CO₂ emissions is not only smart for the environment, it's great for business, too. If we reduce our CO₂ emissions we also reduce local air pollution, plant more trees, lower energy bills for residents and business, use more solar and wind power and create a

more livable, walkable, community-oriented city for all of us."⁵⁴

Green Building Policy and Standard

An ordinance adopted by the City in 2001 requires all city-related buildings (owned or funded) to meet the green building standards known as LEED: Leadership in Environmental and Energy Design. LEED is a set of standards created by the U.S. Green Building Council to provide minimums and consistency for building designers. Portland is taking a leadership role requiring these standards be met by its own operations and economic development construction projects.⁵⁵

"This policy is the City of Portland's emphatic statement that it will not contribute to the environmental degradation associated with traditional building practices or construct inefficient, resource-depleting facilities that threaten people's health and productivity" asserted City Commissioner Dan Saltzman. The City predicts that the standard, when applied to its near-term goal of 600 housing units and three million square feet of commercial space, will create annual savings of \$1 million in utility bills, 5,900 metric tons of carbon dioxide, and eight million gallons of water.⁵⁶

The private building sector, including several major developers, has been engaged through the work of both the City and local nonprofits such as the Northwest Earth Institute, which promotes sustainable business practices.⁵⁷ Ed McNamara of Prendergast and Associates, a downtown office and apartment developer, observed that "Building green makes good economic sense. In our apartment buildings we're

incorporating a number of green features and still keeping our construction and operating costs as low or lower than conventional buildings.” The City’s “G/Rated” program is offering \$3,000 grants to 40 homeowners to provide the City with green building demonstration projects, and assistance of up to \$20,000 for commercial LEED projects.⁵⁸ In addition, the City is providing extensive educational resources through publications and its website. One publication is a 97-page resource guide on building green affordable housing.

Solid Waste Recovery Leadership

Like Portland’s global warming and green building efforts, other environmental initiatives have received strong public, political and participatory support. Recycling is one of those areas. Eighty-eight percent of multifamily residences were recycling four or more materials by 1996; 82 percent of all businesses are recycling four or more materials — up from 55 percent just three years earlier...helping the commercial recycling rate increase nearly 20 percent. Annual recycling per household, measured in pounds, has more than tripled since 1991. All construction projects with a value greater than \$50,000 are required to separate and recycle some materials. Materials recovery is currently the highest of major cities in the U.S. — 30 percent higher than seventh-ranked Los Angeles.⁵⁹

Benchmarking

To track relative progress, Portland set up Sustainability Benchmarks for comparison with nine other U.S. cities in 2000. The Benchmarks examine air quality, global warming, transportation, toxic releases, parks / greenspace / tree

cover, recycling, poverty, home ownership, urban vitality, and green building.⁶⁰ They are coordinated with the nationally-known work of the Portland/Multnomah Progress Board that identifies, monitors and reports on community-wide goals in economy, education, governance and civic participation, health, public safety and urban vitality.⁶¹ The Climate Action Plan calls for annual progress monitoring and reporting to citizens.

Smart Growth

Future urban growth of the region will be examined with respect to its biological carrying capacity. The Portland region has long been considered one of the best planned in the U.S. because an elected regional government, METRO, manages growth with an urban growth boundary process. METRO’s 1992 Charter requires a Future Vision regarding settlement patterns that “the region can accommodate within the carrying capacity of the land, water and air resources of the region.” METRO’s 1999 ordinance to address carrying capacity planning requires full development cost recovery by local governments. It intends to promote efficient urban growth in addition to sustainability concepts and air, water and open space environmental standards that “balance our region’s growth with its livability.”⁶²

Local political leadership is solidly behind these all efforts, as exemplified by Interim Multnomah County Chair Bill Farver: “We must all be wise stewards of our land, air and water for future generations.”⁶³

END NOTES

INTRODUCTION: THE SYNERGY OF NATURAL CAPITALISM

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- ⁴⁵ LEED standards were created by the US Green Building Council – see www.usgbc.org. Portland adopted its own version of the standards for the Green Building Policy and Standard
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- ⁴⁷ See Local Action Plan on Global Warming; available at <http://www.sustainableportland.org/eeplan.pdf>
- ⁴⁸ RMI's Christopher Juniper, who contributed to this report, was Portland's Economic Development Policy Manager and involved in these initiatives 1993-97
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