Design & sustainability

opportunities for systemic transformation

Jason Pearson

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GreenBlue
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preface

In late 2001, I was asked by The Summit Foundation to help create a new program to support innovations in sustainable design. I worked in 2001 and 2002 with Trustees and staff to refine the goals of this program and develop a clear focus for grant making. Unfortunately, development of the new program coincided with a sharp drop in the value of the Foundation's assets, leading finally to a decision to terminate program development in late 2002.

This report aims to capture the value of that early program-development effort, and lays out a framework for possible future action to achieve the goals identified by The Summit Foundation. Although the Foundation is not currently in a position actively to pursue these goals through grant making, it is hoped that this document will prove useful in its ongoing work, and to others in the field, as well.

The ideas presented here can be understood as a snapshot of opportunities for positive transformation through design. Generally, these are not new ideas. They have been drawn from the work and writings of leading thinkers and practitioners in the field, and this report simply aims to present them in a format which is legible and practical for funders interested in supporting and encouraging their successful application in the world. Every attempt has been made to credit the sources of specific concepts and strategies, and the bibliography provides suggestions for further reading.

Since formally leaving the Summit Foundation in early 2003, I have been involved in the creation and development of GreenBlue, a not-for-profit organization whose objectives are closely aligned with the original goals of the Summit program to support innovations in sustainable design. In all of its projects, GreenBlue seeks to stimulate the creative redesign of industry by focusing the expertise of professional communities to create practical solutions, resources, and opportunities for implementing sustainability. The content of this report has benefited from the lessons that we have learned at GreenBlue over the past three years, and some GreenBlue projects are cited to illustrate key concepts.

The original draft has evolved substantially in the past year through collaboration with Phil Storey, former Editor of *Green@Work* and effective co-author on parts of the material presented here. Many of the ideas are Phil's. Matthew Gaventa at GreenBlue also provided helpful comments and editorial suggestions on final drafts.

I am particularly grateful to the Board of the Summit Foundation, and to Carlos Saavedra, its Executive Director, for encouraging me to complete the text, and for providing a grant to underwrite its editing and publication. I sincerely hope that the ideas presented here will prove valuable to Summit and to others committed to the positive redesign of industrial activity.

Jason Pearson
Charlottesville, 2006

1
guiding values

Four guiding values shared by The Summit Foundation and GreenBlue have informed and structured the ideas presented here.

innovation

The Summit Foundation pursues the vision of "a world where people can thrive and nature can flourish," and this will only be achieved through the concerted application of inspired human creativity. The unique promise of design emerges from the strategic and timely application of such creativity to produce unexpected and innovative solutions to apparently insurmountable challenges. In this sense, innovation and creativity represent some of the most valuable (and thankfully unlimited) resources at our disposal in the quest for a sustainable world. To value innovation, therefore, is to value the ability of people to make a dramatically positive difference in the world.

optimism

The vision and mission of both The Summit Foundation and GreenBlue reflect a consistently optimistic view of the future. A position of optimism represents the kind of willful choice about where to focus attention that typifies effective design. The best designers will affirm that they do not set out to solve problems, but rather to *create solutions.* Faced with a design challenge, they tend to focus their attention, not on the challenges themselves, but on the generation of options and alternatives that will alleviate these challenges in unexpected and unprecedented ways. Great design, therefore, is a fundamentally optimistic endeavor.

systemic transformation

In its most superficial forms, the act of design can alter the way that the world looks without substantially affecting the way that it actually *works*. A focus on systemic transformation, however, sets a higher standard for the ambitions of design practice, insisting that the power of design is its ability to transform the physical, social, economic systems that constitute our relationship to the world around us. The global social, environmental, and economic challenges that we face are systemic challenges, and they require systemic solutions. The challenge, therefore, is to identify the most effective places and ways to intervene in order to catalyze broad, systemic change.

leadership

The Summit Foundation has strongly committed to investing in people as a strategy for change. Specifically, three types of design leaders emerged from the research.

Inventors. Those individuals and organizations actively engaged in the development of new, innovative technologies and practices that contribute positively to the promise of a world where people can thrive and nature can flourish.

Adaptors. Those individuals and organizations who recognize opportunities to adapt existing or emerging technologies and practices in creative new ways, often through significant modification or development of these technologies or practices.

Adopters. Those individuals and organizations who, although not directly engaged in the development of new and innovative practices, lead the way in the adoption of these practices, and thereby catalyze further innovation.

Successful realization of the promise of design will depend upon support for all three types of inspired leadership.

2

The Promise of Design

The challenges

In the years to come, we face the substantial challenge of striving to achieve continuing advances in quality of life for all while respecting and conserving the health of the earth's complex and diverse natural and cultural systems. Over the course of the last 200 years, we have developed and refined an awe-inspiring system of production that continues to bring unprecedented advances in technical efficiency, industrial productivity, and improved standards of living to diverse populations around the world.

At the same time, this same economic and industrial system has produced a disturbing array of persistent and difficult problems inseparable from its benefits. A quick survey of newspaper headlines suggests the dilemma: birth defects associated with toxic industrial waste… violent storms, floods, and other catastrophic effects of pollution-induced climate change… road rage among commuters frustrated by a society dependent on automobiles… failures of regional fisheries in the wake of overfishing… soil fertility and crop yields steadily eroded by chemically-intensive agricultural practices… entire national cattle industries destroyed by disease propagated through industrial husbandry… drinking water on every continent poisoned by street runoff and industrial pollution… entire species of deep-sea fish rendered unsafe for consumption by heavy metals… The list is long, and getting longer day by day. The costs of the industrial revolution may be starting to outweigh

The social costs of industry may start to outweigh its benefits.

its benefits, and even to destroy the very productivity that this revolution has engendered. Deep, systemic change is desperately needed.

The opportunities

This report explores a set of approaches and opportunities for achieving systemic change. Recognizing that many of the most stubborn problems created by the current system are the direct result of poor (or non-existent) design choices, we must then ask: *How can we systematically improve the quality of those design choices? How can we redesign economic and industrial systems for long-term sustainability? And how can funders encourage systemic shifts to more intelligent design choices – choices that will continually optimize quality of life for all species and all generations?*

How can we design economic and industrial systems for long-term sustainability?

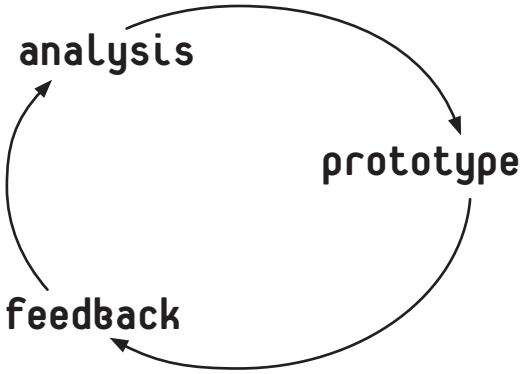
The answers provided here affirm that design – a mode of thought and action that consistently applies the vast resources of human creativity to challenges of all scales in order to find innovative solutions – offers one of the most promising avenues for addressing the substantial social, economic, and environmental challenges of the 21st century and beyond.

The ideas and projects presented attempt to trace a clear chain of logic from the broad goal of systemic change to specific activities that can exert maximum leverage toward that change. The tracing of this chain is, in the most literal sense, a clarifying process. Each logical step – each link in the chain – represents a pragmatic attempt to connect specific long-term goals for the sustainable future with immediate opportunities for action and leverage.

These opportunities represent the possibility of a positive future achieved by design.

design as strategy

Designers are frequently imagined and presented – and even present themselves – as solitary geniuses whose inherent brilliance and creativity enable them to generate innovative, new ideas in moments of concentrated inspiration. This is an appealing but misleading myth.



Truly great, lasting, and meaningful design emerges from a consistent process that is both more social and more methodical: We get an idea. We prototype it. We put it into use. We gather feedback. Then we use that feedback to understand the weaknesses of the prototype. And we brainstorm innovative new solutions that might eliminate the causes of any negative feedback we receive. Design innovation, in other words, is an iterative, incremental process that reveals, over time, unprecedented and unexpected solutions.

This is a process well understood by design professionals. It has been elegantly portrayed for popular audiences in the work of engineering professor Henry Petroski, whose meticulous books trace the decades-long history of trial-and-error out of which has emerged the simplest of our inventions – the paperclip, the pencil – and the most complex of our technologies – suspension bridges, integrated circuits. Petroski argues convincingly that these achievements – small and large – are founded on a productive social history of experimentation and failure. Engineers, he argues, individually fail their way to collective success. [1]

designers tend to fail their way to ultimate success.

At GreenBlue, we apply this model in looking at current industrial systems and thinking about how they can be improved. We recognize that many of society's challenges are caused by poorly designed industrial systems… prototypes that are now providing alarming feedback at all scales, from

toxic mothers' milk to holes in the ozone layer. We ask: *How can we design, prototype, and realize better products and systems?*

How can we design and prototype better products and systems?

This is the meaning of design as strategy. Asking such questions provokes rich possibilities for meaningful action across a broad community of organizations and funders. The unintended negative consequences of poorly designed economic and industrial systems affect every passenger on what Buckminster Fuller poetically termed "Spaceship Earth," and we all share both the right and the responsibility to participate in the productive redesign of these systems.

GreenBlue describes its ideal audience as "design decision-makers" or "high-leverage decision-makers" – those individuals, whether or not they call themselves designers, whose professional activities place them in the position of making significant resource-allocation decisions. We understand these decisions as *de facto* design decisions The chemist who decides what goes into a new personal care product is designing the toxicological impact of the product. The hospital purchasing officer who specifies paint for a new intensive care unit is designing the indoor air quality of the facility. The transportation engineer who lays out a new road is redesigning the habitat of local ecosystems. The advertising executive who creates international packaging for a new product is redesigning the visual landscape of the communities in which it will be sold. All are *de facto* design decisions, and the quality of our collective future depends up on the comprehensive intelligence of their decisions

sustainability is our collective response to this design challenge.

The sustainability movement is our attempt, as a society, to articulate an intelligent and strategic response to this design challenge… to encourage an intelligent framework for design decisions across all contexts of activity. An increasing number of individuals and organizations in the public, private,

and independent sectors are focusing on the task of redesigning existing systems in a wide range of social, economic, and environmental contexts, and the increasing popularity of "sustainability" as a field of interest and practice testifies to the positive momentum generated by these efforts.

Design understanding provides a language for making sense of this rich field of activity. In the iterative design cycle of prototype, feedback, and analysis, the critical, creative leap occurs between the analysis of feedback and the prototyping of new solutions. This is the moment when a designer's pencil touches paper to sketch out a new idea just forming in her head… the moment when the legacy of prior habit falls away to reveal a new, unprecedented approach or solution.

As a society, we are in the midst of such a moment of design innovation and experimentation. We have gathered substantial feedback from our current prototypes for industrial and economic activity. We have dedicated significant resources to analyzing and understanding the implications of this feedback. And we are now beginning to prototype new solutions, new ways of engaging in economic and industrial activity. In the following two sections, I seek to characterize these attempts, and then conclude with some comments on their implications for the funding community.

Notes

1 Petroski, Henry. 1985. *To Engineer is Human: The Role of Failure in Successful Design.* New York: St. Martin's.

3
envisioning a sustainable future[1]

In 1987, the World Commission on Environment and Development, commonly known as the Bruntland Commission, published what is arguably the most widely referenced definition of what has come to be known simply as *sustainability*.[2]

> *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

This definition is part of a broader conversation that has taken place over the past two decades as leading thinkers in the field have taken the first step in designing a sustainable future: imagining and describing it. Sometimes collaborating and sometimes competing in the marketplace of ideas, they have published manifestoes, treatises, case studies, and allegories that have influenced a growing number of policymakers, business leaders, and consumers alike. The movement continues to struggle with significant strategic disagreements, an unwieldy lingo, and occasional hyperbole.[3] Still, a coherent vision of long-term success has emerged, based partly on the observation and study of the dynamics of natural, living systems.

leading thinkers have taken the first step in designing a sustainable future: imagining it

The vision for a sustainable future includes five main characteristics:

1. **Runs on clean, renewable energy.** Is powered by natural, perpetual flows of energy – principally, like virtually all life on earth, from the constant energy of the sun.
2. **Uses all resources productively.** Eliminates the concept of waste. Emphasizes services over products.
3. **Supports healthy living systems.** Maintains and restores the health of people and natural systems.
4. **Aligns market incentives with long-term social good.** Aligns structural incentives to encourage the pursuit of economic, social, and environmental ambitions. Makes economic systems honestly account for value created and lost.
5. **Ensures social equity.** Generally embodies a broad definition of democracy.

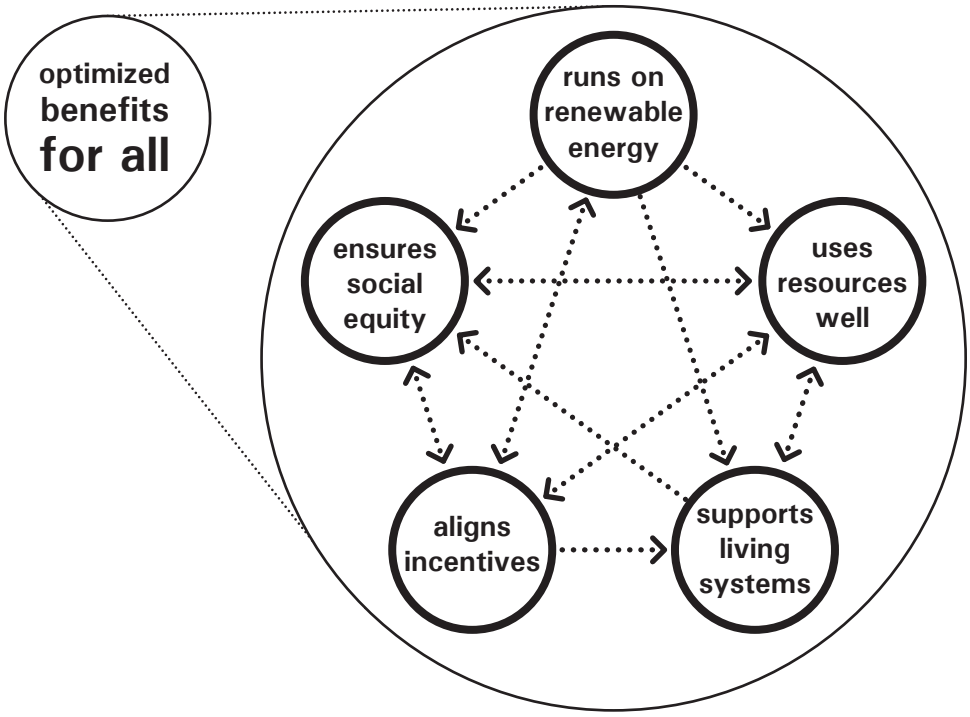


Figure 1. *A comprehensive vision*
We can envision a world where products and services in all sectors optimize economic, social, and environmental benefits for all. Each individual aspect of this vision -- energy, incentives, etc. -- depends upon the realization of one or more of the others. Resource productivity, for instance depends upon effective use of renewable energy, whose economic feasibility could in turn hinge upon appropriate government policies to align incentives for new technology development and implementation. Appropriate, effective action derives from a clear understanding of these relationships.

Runs on clean, renewable energy

Today the world economy is powered largely by oil, natural gas, and coal. In 2004, these fossil fuels accounted for 88 percent of the energy commercially traded and consumed in the world.[4] But, especially in recent years, it has become clear that our reliance on fossil fuels comes at great financial, social, and environmental cost. In the long run, human activity must rely on clean, plentiful, and rapidly renewable sources of energy.

For most of human history, people satisfied their energy needs from natural flows – sunlight, wind, and water – and from energy recently stored in plants and animals. The Industrial Revolution began the large-scale extraction and use of fossil fuels, on which we still overwhelmingly rely. In the past century, scientific breakthroughs offered the promise of harnessing the energy of atomic fission and fusion. The future may well offer more sources of usable energy, which could play a role in a sustainable future. It is generally agreed, however, that sustainable development will rely largely on energy from the sun, which supports virtually all life on earth through the process of photosynthesis.[5]

sustainable development will rely largely on solar energy.

The sun is a perpetual, constant, and abundant source of energy income. The solar energy reaching the earth's surface in less than one hour is more than the energy consumed each year by humans.[6] Converting solar energy directly into electricity using photovoltaic panels is the most obvious method for tapping the sun's energy, but there are many others. Solar energy also powers the water cycle that feeds rivers and the thermal flows that create wind. Hydroelectricity is a well-established source of energy, and new technologies are being developed to generate energy without many of the ecological problems created by large dams. Wind power technology is one of the fastest growing energy sources in many parts of the world. And biomass (solar energy stored recently in plants) can be burned to generate electricity or converted into other fuels, such as methane.

Other natural energy flows, not derived from solar, include geothermal and wave power. Like solar, these perpetual sources of energy can be converted to useable form without exhausting non-renewable resources. Both geothermal and wave power are the subject of research and development, but are further from large-scale commercialization (for generating electricity, at least) than the solar-based energy sources mentioned above.

uses all resources productively

In the process of creating value, modern economies convert resources into waste at an alarming rate. Materials are extracted, processed, used (often briefly), occasionally recycled, and then discarded as waste (often toxic). The scale of the material flows is staggering. The U.S. economy consumes around 28 trillion pounds of material annually in the United States alone,[7] in addition to vast quantities of waste generated by industrial processes abroad that feed American consumption. As we push the limits of the earth's natural resources, as population continues to increase, and as standards of living rise, these wasteful material-use patterns must change.

Economies will shift to a sustainable pattern of cyclical material flows in which materials are continually reused and recycled, providing useful service over and over, and never becoming waste.[8] Current models for cyclical material flows are inspired by nature's living systems in which there is literally no waste. All byproducts of a biological process become the inputs for another life process, in an endless cycle – the cycle of life itself. Proponents of what is referred to as "industrial ecology" design industrial processes following this model, so that virtually all process outputs become valuable inputs for other industrial processes.

economies shift to a sustainable pattern of cyclical material flows.

The beginnings of such a closed-loop model of material use are apparent in the increasing shift from consumption-based to service-based economic

models. The "product-of-service" model is a leasing arrangement (whether explicit or effectual) through which customers receive the service of durable goods but manufacturers retain ownership of valuable materials and technologies which they can refurbish or recycle perpetually. Such a model has the potential to align the interests of producer, consumer, and society; encourage cyclical material flows; enhance resource efficiency; lower prices; and improve overall product quality. There are already well-known examples of this strategy.

products of service align the interests of commerce and society.

- Xerox Corporation leases office machines (copiers, printers, fax machines), which are designed to be refurbished or recycled at the end of the lease term, with the goal of complete material reuse and no waste sent to landfill or incinerator.[9]
- SafeChem, a German subsidiary of Dow Chemical Company selling and recycling solvents for cleaning metal parts, began a pilot program in September 2005 under which it will sell parts-cleaning services rather than solvents. By collaborating with customers to achieve results (clean parts) rather than selling a product (quantities of solvent), SafeChem expects to increase the efficiency of solvent use between 40 and 80 percent.[10]
- Netflix DVD rent-by-mail offers access to a virtually unlimited library of DVDs, which subscribers can keep as long as they want and exchange as frequently as they like.[11]

supports Healthy Living systems

One of the most alarming costs of current models of resource use is the progressive, global degradation of living systems. Evidence of this is familiar to anyone who follows the news: the extinction of species at alarming rates;[12] rapid deforestation and desertification destroying ecosystems;[13] hazardous synthetic chemicals found in the breast milk of nursing mothers;[14] rising levels of toxic mercury found in seafood;[15] and dramatic increases in childhood asthma rates.[16] Economic and social systems must reverse these trends, and support the health of ecosystems and individuals alike.

A sustainable economy will employ the "precautionary principle" in one form or another.[17] One frequently cited definition of the precautionary principle states: "When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."[18]

While industry is generally suspicious (at best) of the precautionary principle, a growing number of professionals are applying its spirit in their work, at all scales of activity: from the design of molecules to urban and regional planning. In the relatively new field of "green chemistry," researchers are designing the chemical building blocks of healthier products and processes to replace those with hazardous substances.[19] Similarly, the design of communities, regional development, and even agricultural practices that incorporate an understanding of habitats and ecosystems will be integrated within healthy living systems and even restore habitat previously lost. [20]

a sustainable economy will employ the precautionary principle.

As this ethic is embraced widely by chemists, engineers, architects, industrial designers, and business leaders, the health of people and ecosystems will be restored and supported by economic activity on a large scale.

aligns market incentives with social good

A fundamental insight of the field of economics is that people respond to incentives. Unfortunately, today's economies exhibit many of what economists call "perverse incentives" – market signals which encourage actions that are harmful to social interests, frequently by causing environmental damage, threats to public health, or inflated unnecessary costs. Examples range from the U.S. government's huge and long-running financial subsidies to the fossil fuel and atomic energy industries,[21] to the failure of many consumer-product prices to accurately reflect the

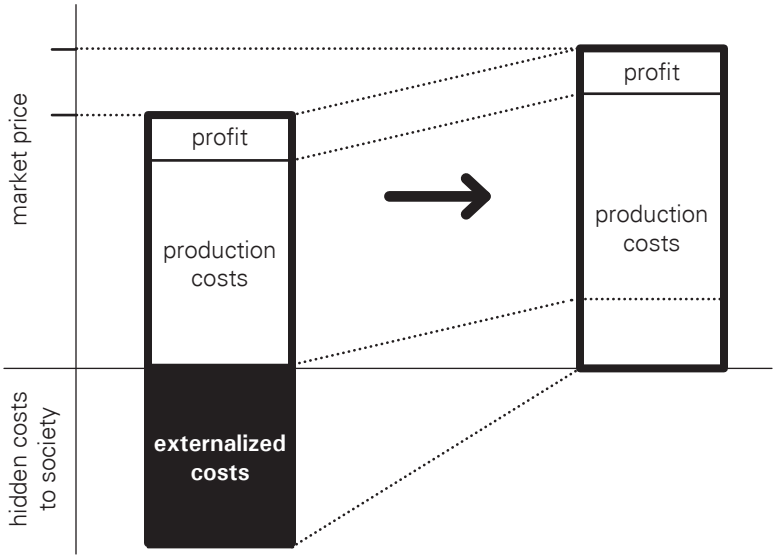


Figure 2. *Internalization of costs*
Free markets are not perfect. They efficiently establish accurate prices, but they do not account for full costs. The hidden social and environmental costs of economic activity are referred to as "externalized costs." Government policies and incentive programs that encourage internalization of these costs into the market price of goods and services put the free market to work for the long-term benefit of society. As shown, the cost to industry of internalizing costs is typically lower than the externalized social costs that they resolve. For instance, the cost of pollution-prevention measures are typically much lower than the total costs to society if the measures are not installed.

social costs of their production and use. A sustainable economy will align incentives so that market signals encourage actions that contribute to long-term social good.

At the most tangible level, economies should use what is called "full-cost" pricing, in which the purchase price of a product or service includes the indirect costs otherwise borne by society and the environment, a concept known as "internalization of costs."[22] In current economic systems, dominated by price-based competition, it is easy and attractive for producers to avoid paying many of the costs of production and consumption.[23] Activities such as "regulation shopping" – moving operations to locations with

sustainable economies align incentives to create the right market signals.

low regulatory standards for environmental or worker protection, thereby reducing compliance costs – and lobbying for government subsidies or tax breaks are standard business practices. Implementing full-cost pricing can be a politically difficult process. The United States has begun this in recent decades with the tobacco industry, as taxes and monetary settlements have been levied to pay for the enormous public health costs from the use of tobacco products, thereby raising prices. In a sustainable economy, full-cost pricing will achieve this more accurately and elegantly, unlocking the amazing potential for market dynamics to reward true value and efficiency.

funding and policy should support both individual and societal goals.

In the context of government, public funding and policy should be directed in ways that support both individual and societal goals in the short and long term. Policies can also play a constructive role by encouraging innovative problem solving using the other principles of sustainability. In the corporate context, the alignment of incentives would permeate every scale of activity. In many cases, this is simply common sense implemented at an institutional level. In some cases this could include adjusting financial mechanisms or relationships.

Performance contracting is a business practice currently used for replacing or upgrading the energy systems of buildings. In this model, an energy service company (ESCO) conducts an energy audit of a facility and makes recommendations for high-efficiency equipment replacement or upgrades that will be cost-effective over the term of the contract. The ESCO makes the up-front capital investment in the energy-saving equipment, and receives ongoing payments from the facility owner based on the actual savings in the facility's energy use costs. The model of performance contracting, which aligns short-term and long-term interests, could be adapted to other areas of commerce.

performance-based contracting aligns short-term and long-term interests.

The design and ongoing refinement of techniques and instruments that align market signals with long-term social good, of which full-cost pricing and performance-based contracting are but two examples, will be integral to a sustainable world.

ensures social equity

The social characteristics of sustainability are perhaps the least well defined and are hampered by the complexity of translating social objectives into performance metrics that can be used by organizations to measure progress. But as the lively debates around the issue of economic globalization illustrate, many organizations and thinkers are striving to define social equity in ways that are both useful and meaningful.[24]

sustainable communities are equitable, diverse, connected, democratic, and provide good quality of life.

For my present purposes, I will simply refer to a broad definition formulated in 2002 by the Western Australia Council of Social Service:[25]

> *"Social sustainability occurs when the formal and informal processes, systems, structures, and relationships actively support the capacity of current and future generations to create healthy and livable communities. Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life."*

However its exact characteristics are defined, pursuit of social equity is essential to any credible vision for a sustainable world.

* * * * *

In the early decades of the sustainability movement, the essential characteristics of sustainability outlined above would have been understood as aspects of the "triad" or the "three-legged stool" of sustainability, a conceptual framework which identified three overall categories of value:

the "3 E's" of economy, ecology, and equity (or, alternatively the "3 P's" of people, planet, and profits). Using this mental model, sustainability advocates argued the need to balance the competing demands of these three categories of value, especially in the business world. The interconnectedness of economy, ecology and equity was a fundamental principle, but often viewed in inherently competitive terms, requiring trade-offs and sacrifices.

The "triad" was a productive mental model for considering the wider context within which human industry operates. It provided a helpful widening of perspective, and it gestured toward the types of systems that we ought to design – systems that balance and even optimize the needs of people, planet, and profit. With the ongoing refinement and prototyping of more detailed, context-specific models for sustainable practice, however, the "triad" has become occasionally inadequate as a conceptual tool. Leading thinkers and practitioners of sustainability have begun to see a much richer interconnectedness both within and across systems that don't always correspond neatly to these three familiar categories, leading to the identification of previously overlooked opportunities to create new value and positive change.

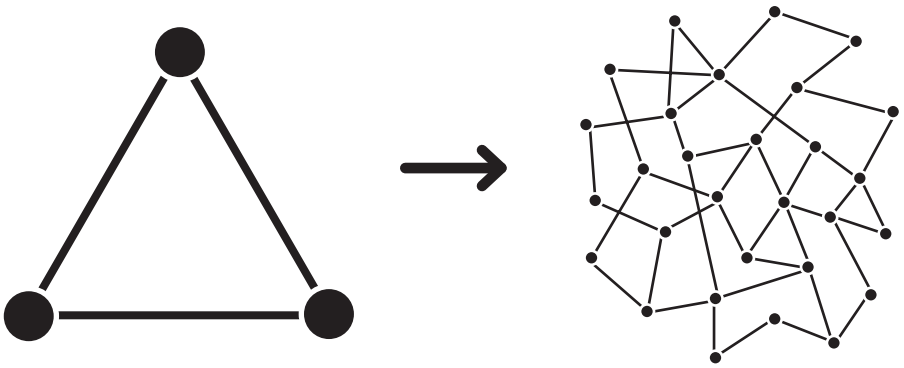


Figure 3. *Systemic analysis*
As organizations set out to redesign industrial and economic activity, the "sustainability triad" of Economy/Ecology/Equity (or People/Planet/Profit) may prove less useful as a conceptual tool than more detailed analyses of complex, systemic interrelationships among stakeholders, resources, and operating conditions. The unique opportunities for creative action and leverage documented in this report could onlyemerge from such detailed, context-specific systemic analysis.

If we are to design, realize, and implement sustainable industrial and economic systems, the "3-legged stool" will benefit from expansion into a more complex logic. In the next chapter I will discuss some of the ways that specific projects and organizations have begun to leverage an understanding of these complex, systemic possibilities for maximum positive impact.

Notes

1 This chapter was written in close collaboration with Phil Storey, who conducted much of the research and co-developed the overall organization.

2 Bruntland, G. (ed.), *Our Common Future: The World Commission on Environment and Development* (Oxford: Oxford University Press. 1987).

3 See Appendix A: Sustainability Models and Lingo.

4 Oil, 37%; coal, 27%; natural gas, 24%; nuclear, 6%; hydro, 6%. *BP Statistical Review of World Energy*, June 2005.

5 In recent decades scientists have discovered chemosynthetic organisms and ecosystems in extreme locations, such as hydrothermal vents and cold methane seeps, that do not rely on sunlight.

6 Alan Blackwell and David MacKay, ed., *Power* (Cambridge: Cambridge University Press, 2005).

7 World Resources Institute, "World Resources Institute Material Flow Accounts Database Pilot, Appendix 3: National Indicators by Weight and Sector, 1975-2000." This figure does not include the nearly 14 trillion pounds of "hidden flows" from earthmoving and infrastructure activities. Nor does it include the enormous amount of water used.

8 Industrial ecology has developed rapidly over the last twenty years through the creative collaboration of engineers and ecologists. Industrial ecology describes industrial ecosystems in which the uses of energy and materials is optimized, wastes and pollution minimized, and there is an economically viable role for every product of a manufacturing process. For more information on industrial ecology, see Thomas E. Graedel and Braden R. Allenby, *Industrial Ecology* (Upper Saddle River, NJ: Prentice Hall, 1995). The key concepts of industrial ecology are central to the vision of sustainability addressed to a wider audience in William McDonough and Michael Brauntart, *Cradle to Cradle: Remaking the way we Make Things* (New York: North Point Press, 2002).

9 Xerox Corporation, "2005 Environment, Health & Safety Progress Report."

10 "Chemical Leasing within the SAFECHEM Business Model," 16 September 2005. (www.dow.com/safechem/about/news/20050916.htm)

11 www.netflix.com

12 MSNBC.com, "Study sees mass extinctions via warming," 8 January 2004. (www.msnbc.msn.com/id/3897120/)

13 www.msnbc.msn.com/id/808449; archives.cnn.com/2002/WORLD/asiapcf/east/04/08/skorea.sand/

14 ehp.niehs.nih.gov/press/081303.html

15 www.cfsan.fda.gov/~dms/admehg3.html

16 William Booth, "Study: Pollution May Cause Asthma," *The Washington Post*, 1 February 2002, A02. Also: CDC. Surveillance for asthma – United States, 1960-1995. In: *CDC Surveillance Summaries*, April. MMWR 1998; 47 (no. SS-1). (www.cdc.gov/mmwr/preview/mmwrhtml/00052262.htm)

17 The European Union formally adopted the precautionary principle in 1992 as part of the Treaty of Maastricht, and the E.U. has been applying it increasingly through regulatory directives. The E.U.'s pending REACH legislation (which stands for Regulation, Evaluation, and Authorization of Chemicals), which will require sufficient health data on virtually all substances in commercial use, is the most comprehensive regulatory framework yet conceived around the precautionary principle. See Paul D. Thacker, "U.S. companies get nervous about EU's REACH," *Environmental Science and Technology Online*, 5 January 2005.

18 The Wingspread Statement, drafted in 1998 by a group of scientists, academics, and activists. (www.gdrc.org/u-gov/precaution-3.html)

19 Paul T. Anastas and John C. Warner, *Green Chemistry: Theory and Practice* (Oxford: Oxford University Press, 2000).

20 Janine Benyus, *Biomimicry: Innovation Inspired by Nature* (New York: Morrow, 1997), 11 ff.

21 In 1999, for example, the U.S. government provided subsidies to the fossil fuel and atomic energy industries of nearly $3 billion – almost three times the value of subsidies to the renewable energy industry. (http://www.eia.doe.gov/oiaf/servicerpt/subsidy/table_1.html)

22 This concept is treated extensively in Paul Hawken's book *The Ecology of Commerce: A Declaration of Sustainability*, (New York: HarperBusiness, 1993).

23 Robert A.G. Monks, a former Fortune-500-company executive and current corporate-governance critic, states: "The corporation is an externalizing machine, in the same way that a shark is a killing machine…. There isn't any question of malevolence or will; the enterprise has within it, and the shark has within it, those characteristics that allow it to do that for which it was designed." Quoted in Joel Bakan, *The Corporation: The Pathological Pursuit of Profit and Power* (New York: Free Press, 2004), 70.

24 See for example: http://www.unisa.edu.au/hawkeinstitute/research/eco-links.asp#THREE

25 Leanne Barron and Erin Gauntlett, "Housing and Sustainable Communities Indicators Project: Stage 1 Report – Model of Social Sustainbility," *WACOSS*, April 2002, 11. (http://wacoss.org.au/images/assets/SP_Sustainability/HSCIP%20Stage%201%20Report.pdf)

4
systemic ambitions[1]

Having envisioned clearly the signal characteristics of a sustainable future, we are now immersed as a society in the complex task of actually making those visions practical and economical in the real world. This is very literally a collective act of conscious, intentional design. Or perhaps more accurately, the sustainable future that we seek will emerge slowly out of the countless acts of context-specific design innovation that are being initiated by creative individuals and organizations around the world.

individual activities have meanings and effects in a range of contexts.

As this world has grown more complex and integrated, it has become obvious that individual activities and issues have manifold meanings and effects in a range of contexts. Designing and implementing the positive, sustainable future that we envision will require what I have called elsewhere "deep practice" - intentional engagement to achieve enduring, systemic change.[2] It is not enough to pursue immediate goals within the confines of existing systemic contexts; we must also seek long-term, meaningful change in the operations of the very systems and contexts themselves. By leveraging this understanding, innovative organizations are beginning to affect greater social good with their limited resources while creating models for further study and emulation.

deep practice is intentional engagement to achieve enduring, systemic change.

This is not naive utopianism that envisions widespread well-being springing forth organically from a few key ideas or the use of new buzzwords. It acknowledges the rich complexities of the real world, raising as many difficulties as it does possibilities.

Below, I identify four different types of projects with systemic ambitions, each of which is introduced with a metaphor. My descriptions of these project types include observations on the characteristics and unique potentials of each, along with examples. Longer descriptions of example

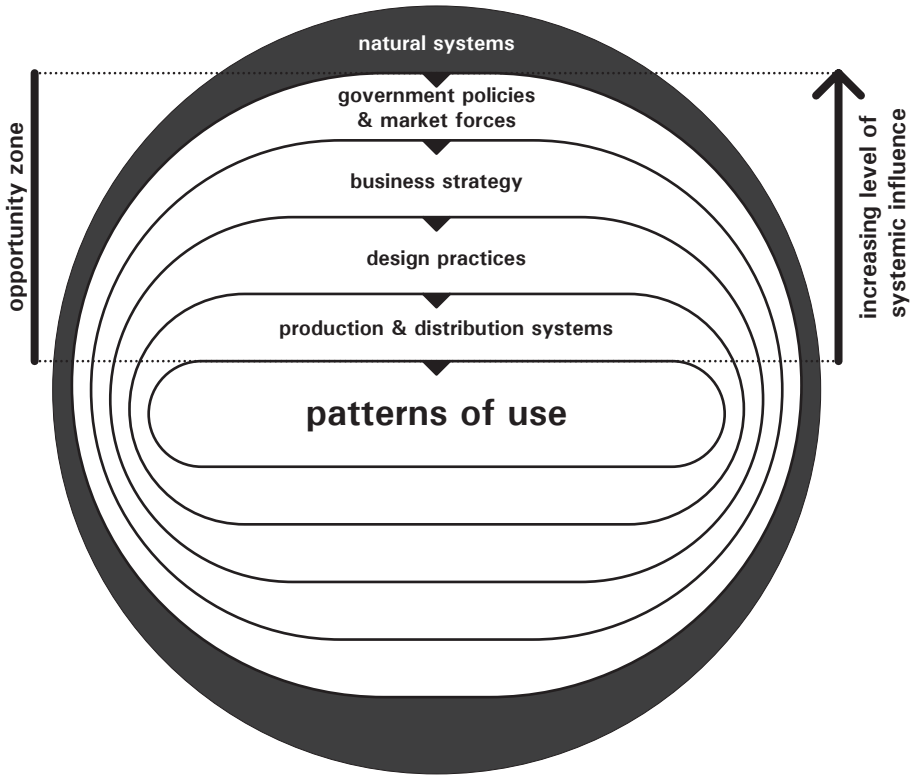


Figure 4. *Contexts of influence*
Patterns of consumption and use are structured by the entire economic and industrial system, which itself is subject to the influence of the natural systems on which it depends. Activity in any part of the system is conditioned by the influences of its own context. Production and distribution systems, for instance, are defined by design approaches, which are, in turn, determined by business strategies. Incremental changes within individual arenas of activity are both possible and necessary, but an ambitious vision for sustainability will require changes at all levels. Sustainable consumption initiatives, for instance, can alter patterns of use, but their potential for deep, systemic impact lies in the degree to which they can alter the structure of demand, a fundamental market force.

projects and organizations are found in Appendix B: Case Examples – Projects and Organizations. By providing this model for thinking about projects with systems-wide effects, I hope to contribute my perspective to the current wider discussions of how to effect positive, sustainable change with limited resources.

Type 1: Integrative Projects (Permaculture)

Permaculture is an approach to land use, especially for food production, conceived in the late 1970s in response to increasingly damaging agricultural practices. It seeks to achieve viable 'permanent agriculture' through the harmonious integration of human communities, microclimate, animals, annual and perennial plants, soils, and water. Rather than focusing on each of these elements, permaculture focuses on the interrelationships among them, based on patterns and principles found in nature. This integration of diversity gives permaculture systems stability and resilience as well as productivity.

Integrative projects seek to engage and affect a rich set of relationships and systems.

Like permaculture, integrative projects include a combination of elements working together to address specific needs and goals. They are designed explicitly around a systems view of the world and the opportunities at hand. Integrative projects seek from the outset to engage and affect a rich set of relationships and systems, and they most often employ multi-disciplinary approaches and project teams.[3] Their objectives are varied and ambitious, serving a variety of audiences and needs.

Because they explicitly engage a variety of roles, integrative projects have the potential to coordinate points of engagement throughout a system, helping improve the way the various elements relate to one another and to the system as a whole. These projects take advantage of the potential of system-wide engagement, rather than focusing solely on its inherent limitations.

Integrative projects must recognize the realistic limits of their efforts and use constant feedback to improve their performance continuously, resisting the allure of ivory-tower utopianism and theoretical perfection. To do this, successful projects will be intensely connected with the real-world context they aim to affect – the people and places on the ground.

Oregon Solutions Lakeview Biomass Project[4]

The Lakeview Biomass Project is a community-based, multi-stakeholder effort to develop an economically viable, ecologically sustainable biomass power facility as a key part of an integrated, multi-faceted forest health program. The biomass energy facility (approximately 15 megawatts in size) will be adjacent to the Fremont Sawmill in Lakeview, Oregon, located in the center of the nearly 500,000-acre Lakeview Stewardship Unit on the Fremont National Forest.

The project is part of the Oregon Solutions initiative, launched by the governor of Oregon in 2001, to promote a new model of community governance based on the principles of collaboration, integration, and sustainability. Oregon Solutions organized a series of multi-stakeholder meetings to fully examine the Lakeview Biomass Project's challenges and to build creative solutions to them with well-positioned stakeholders including state and federal agencies, local and tribal governments, energy companies, a lumber company and other businesses, academia, and non-profit organizations. The Oregon Solutions project culminates in the creation of a Declaration of Cooperation, signed by the dozens of participating stakeholders, that includes implementation plans, guideposts, and benchmarks for achieving the specific, effective actions.

a new model of community governance based on principles of sustainability.

The Lakeview Biomass Project aims to produce system-wide benefits by creating and applying new governance models, new forest management techniques and tools, new processes for utilizing what have historically been

economically unviable forest products, and new methods to contain costs and account for the full array of benefits derived from forest restoration.

Communities In Schools – Central Texas[5]

Communities In Schools – Central Texas is a twenty-year-old organization that provides professional social services to students who meet the statistical profile of being at risk of dropping out of school. Its programs are located on 48 public school campuses from pre-K through twelfth grade, in five central Texas school districts.

In order to prevent drop-outs, CIS brings together critical resources and relationships from throughout the community into the public schools. Services offered through CIS include:

- Counseling and Supportive Guidance (individual, group, family and crisis counseling)
- Heath and Human Services (referrals for basic needs, medical clinics, nutrition, prenatal education, WIC cards, community health fairs)
- Parental Involvement (home visits, family counseling, parenting classes)
- Pre-Employment/Employment (resume building, workforce training and development, computer skills, mentoring, math and science activities)
- Enrichment (field trips, celebrations, community festivals)
- Educational Enhancement (tutoring, homework clubs, mentoring, reading groups, book clubs)

brings critical community resources and relationships into the public schools.

CIS serves students at risk of dropping out of school, creating wider social benefits from greater student performance and staying in school. These benefits to society include lower unemployment, higher quality workforce and jobs, fewer prisoners and lower prison costs, and lower social services costs from decreases in homelessness, poverty, and health problems.

The Sustainable Packaging Coalition[6]

The Sustainable Packaging Coalition is an industry working group dedicated to promoting and implementing a more robust environmental vision for packaging. Through informed design practice, supply chain collaboration, education, and innovation, the Coalition strives to transform packaging into a system that encourages an economically prosperous and sustainable flow of materials, creating lasting value for present and future generations. The Coalition is a project of GreenBlue.

transforming packaging into a system that encourages sustainable materials flows.

In order to affect the production and use of products as diverse and ubiquitous as packaging, the Sustainable Packaging Coalition includes corporate members from throughout the industry's supply chain – raw material suppliers, converters, packaging designers, branded product companies, retailers, and consultants – and engages with relevant governmental and non-governmental organizations. This diversity of membership allows the Coalition to leverage the system-wide relationships of the packaging industry and, through improved communication and a shared vision for sustainability, encourage collaboration as a key strategy to facilitate the development of more environmentally responsible packaging and the creation of effective systems for recovery. The online design and information resources developed by the Coalition are used by companies across the industry to develop sustainable packaging and packaging systems.

membership diversity allows the coalition to leverage system-wide relationships.

Type 2: Key Ingredient Projects (Enzymes)

Enzymes are key facilitators of most of the life-sustaining chemical reactions that occur in the human body and other living things. They are natural catalysts, reducing the amount of energy or time required for chemical reactions. For example, without the help of the enzyme ptyalin in our saliva, the process of converting starch to glucose when we eat carbohydrates would take several weeks. Ptyalin, by allowing the quick conversion of starches into glucose, a form of energy usable by the body's cells, literally makes it possible for us to sustain ourselves.

discrete interventions that allow systems to utilize their inherent potential.

Like enzymes in the body's chemical reactions, key ingredient projects make discrete interventions that allow existing systems to utilize their inherent potential. These interventions must be based on an understanding of a system's key limiting factors as well as its strengths and potential. From this understanding, key ingredient projects efficiently design and deploy targeted tools or resources that facilitate positive systemic outcomes.

Key ingredient projects are also inherently experimental, especially as applied in new contexts, and not all problems lend themselves to key ingredient solutions. Just as the economic argument that "a rising tide lifts all boats" is an inadequate response to social concerns, other claims of silver-bullet solutions to social challenges should be viewed with caution.[7] Even some of the most widely acknowledged successes among key ingredient projects, like the examples here, are justly scrutinized to assess their systemic effectiveness.[8] But while these projects present inherent risk, they can also offer dramatic possibilities to unlock existing latent potential for positive change.

silver-bullet solutions to social challenges should be viewed with caution.

Grameen Bank[9]

In the mid-1970s, Bangladeshi economist Muhammad Yunus recognized the key role in the cycle of poverty played by the oppressive terms under which the poor had access to capital necessary to making a living. In 1976 Yunus created the Grameen Bank Project and the organization received legal recognition as a bank in 1983, dedicated to providing small but strategically critical loans to poor borrowers. By simply providing small loans to the poor through a strong grass-roots organization, Grameen Bank's members realize higher incomes and a host of quality of life improvements.

As a result of the microcredit, 55 percent of the families of Grameen borrowers have risen out of poverty, as measured by such standards as having all children of school age in school, all household members eating three meals a day and having access to regular medical checkups, a sanitary toilet, a rainproof house, clean drinking water and the ability to repay a 300 taka-a-week (US$8) loan.[10]

KickStart[11]

KickStart is a non-profit organization dedicated to the proposition that appropriate technology can be a key ingredient in helping huge numbers of East Africans escape chronic poverty by participating in the market economy.[12] KickStart develops and promotes affordable, simple, and effective technologies that can be used to establish and run profitable micro-enterprises. The organization is focused entirely on the private sector, where their technologies are produced, marketed and used based on standard (and sustainable) economic incentives.

With the availability of critical technologies, struggling families can increase their productivity sufficiently to participate in the market economy and dramatically raise their standard of living, including improved nutrition and education for their children. Since the early 1990s, African micro-entrepreneurs using KickStart's technologies – especially its highly successful, hand-powered water pump for irrigation – have started 39,000 new businesses (750 per month), generating $37 million a year in new profits and wages.

Type 3: Alignment Projects (Aikido)

Aikido is a martial art that uses an opponent's own energy to gain control of them or to throw them. It is not a static art, but places great emphasis on motion and the dynamics of movement. Aikido incorporates a wide range of techniques which use principles of energy and motion to redirect, neutralize and control attackers.

Alignment projects involve discrete systems interventions, as do catalytic projects, but based on an understanding of a key relationship between incentives and outcomes rather than individual key ingredients or limiting factors. Like aikido moves, alignment projects can redirect systems' inherent potential by devising effective means of realigning incentives with desired outcomes, even between systems often considered only tangentially related.

alignment projects are based on an understanding of relationships between incentives and outcomes.

Identifying and exploiting the potential of realignments is especially challenging. The most obvious win-win realignments are likely to have been made already, or to remain unexploited because entrenched interests make realignment inordinately difficult. Successful alignment projects often require a creative leap of imagination, either in recognizing two dots that should be connected, or in finding innovative, effective ways of connecting them. This insight requires an understanding of the effects of incentives both within and across diverse systems.

alignment projects often require a creative leap of imagination.

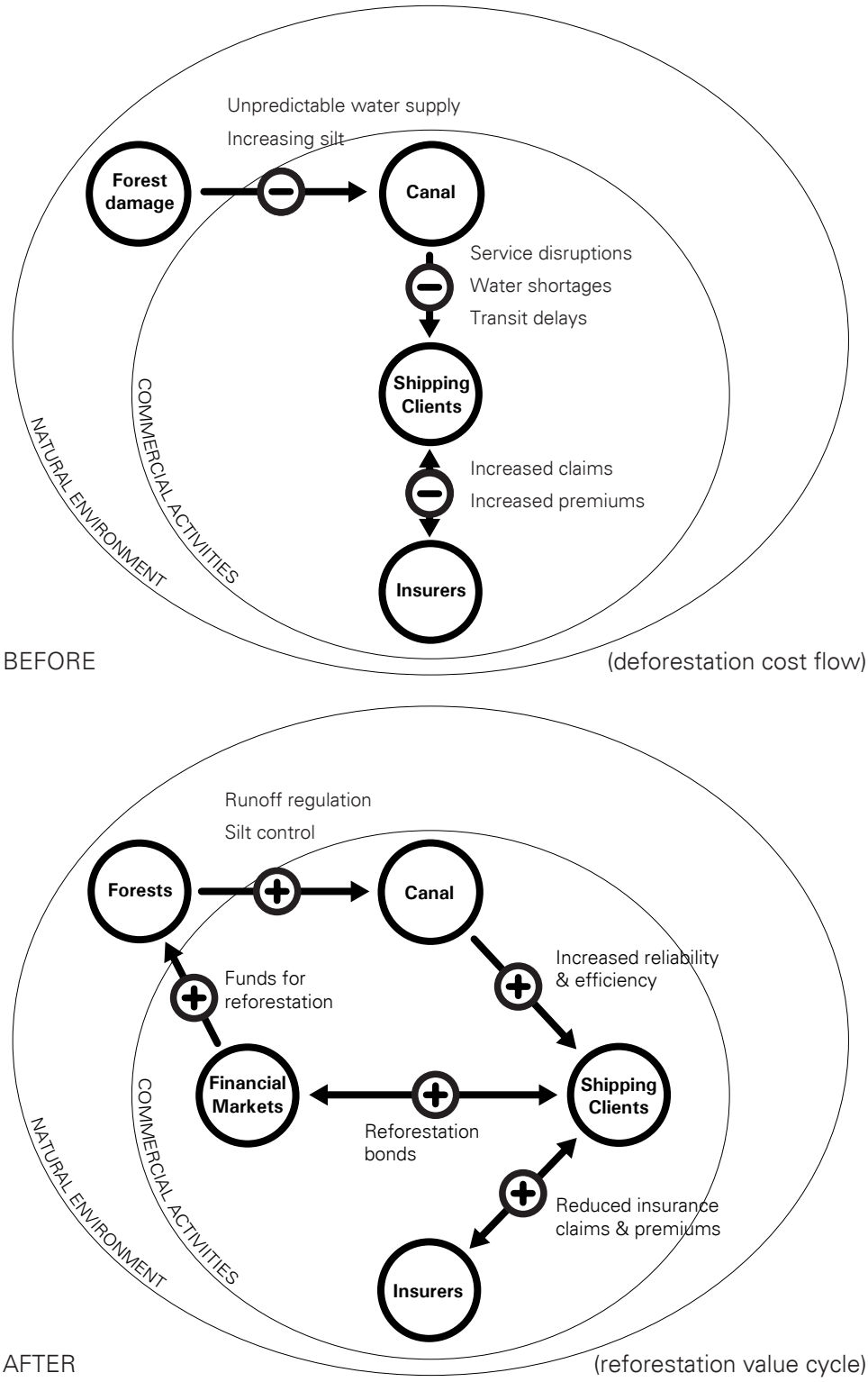


Figure 5. *Panama Canal reforestation bonds*
Rain forest damage from rapid logging threatens to compromise the ability of the Panama Canal to serve the needs of commerce. New "reforestation bonds" leverage the interests of canal users, their insurers, and re-insurers to finance forest restoration projects expected to mitigate these problems, making the canal more dependable and efficient.

Beyond Timber SA, Panama[13]

The Panama Canal is one of the critical transportation passages for the global economy, but one that faces growing challenges from stressed natural resources. The locks of the canal require huge amounts of fresh water for every ship that passes through. But fresh water resources have been dwindling. In addition to climate change, the logging of the rainforests that have historically surrounded the canal and regulated the flow of fresh water has been contributing to the problem. Deforestation has also increased the runoff of sediments and nutrients into the canal, requiring more frequent dredging, with both direct costs and the disruption of canal traffic. Reforesting the watershed of the canal would be ecologically beneficial, restoring the area's habitat and ecosystems, while helping ensure the smooth operation of the canal and the commerce it carries.

though the government has stewardship, stakes are high for many companies.

Though the government of Panama has stewardship over the natural resources in question, the financial stakes are high for many companies affected by the operation of the canal. These include large corporations that rely on the canal for timely delivery of goods – diverting a shipment around South America causes delays of three weeks – and large underwriters that insure these corporations against losses and canal closures.

John Forgach, chairman of the London forestry insurance company ForestRe, is pursuing a plan to invest in reforestation around the canal. According to the plan, insurance companies (and the reinsurance firms that cover their risk) will underwrite a 25-year bond to finance the reforestation. Their clients, the large companies they already insure against losses they would suffer from canal closures, will then pay reduced insurance premiums when they buy the reforestation bonds.

U.S. EPA's SO_2 Cap and Trade Acid Rain Program[14]

EPA's SO_2 Cap and Trade program is a market-based policy tool intended to align the interests of the energy industry with those of the wider public's health. The program begins by setting an aggressive cap to limit emissions. Sources of emissions covered by the program then receive allowances authorizing them to emit limited quantities of SO_2, the total of which throughout the program does not exceed the cap. Each source is then free to design its own compliance strategy, including reducing its own emissions or purchasing allowances from other sources for which emissions reduction is more cost effective. Actual emissions are measured by EPA, and matched with allowances as they are traded and used.

a market-based policy tool to align the interests of the energy industry and public health

The cost of compliance with the Acid Rain Program has been substantially lower than originally estimated. Achievement of the required SO_2 emission reductions (when the program is fully implemented in 2010) is now projected to cost $1 to $2 billion per year, just one quarter of original EPA estimates. And the public health benefits have been impressive. A 2003 Office of Management and Budget (OMB) study found that the Acid Rain Program accounted for the largest quantified human health benefits – over $70 billion annually – of any major federal regulatory program implemented in the last 10 years, with benefits exceeding costs by more than 40:1.

the largest health benefits of any federal regulatory program.

type 4: frameworks (artificial reefs)

Coral reefs are some of the most biologically rich, complex, and beautiful ecosystems on earth. The abundant biological diversity of the coral reef ecosystem not only includes coral and the commercially important fish species associated with the reef but also thousands of other plant and animal species. While they occupy only one percent of the ocean floor, they house nearly 25 percent of all marine life.[15] In contrast, featureless sea-beds are poor habitats for most marine life. To encourage thriving ecosystems, marine biologists create what are called "artificial reefs" – solid structures to which oysters, corals and other invertebrates can attach, providing the foundation for a flourishing ecosystem of fish and other marine life.

framework projects host conditions in which others can create solutions.

Like artificial reefs, rather than implementing solutions directly, framework projects create conditions around which others can devise and implement solutions more effectively or efficiently. Frameworks often create a point of reference and departure for organizations or individuals working in a given field. As frameworks make explicit the systemic nature of problems previously addressed largely piecemeal, flourishing ecosystems of concepts and strategies can sprout, giving rise to systems-aware solutions.

Framework projects are not universally appropriate. If they are established in contexts without the other resources required to create thriving, interdependent systems, frameworks can remain barren. Even in the most appropriate contexts, frameworks must be responsive to changing conditions and evolving needs over time. Unlike solid artificial reefs, if frameworks fail to evolve in response to the growth of the surrounding systems, they can constrain the overall development and progress toward the original objectives.

LEED Green Building Rating System[16]

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. In the short time since its introduction in 2000, LEED has begun to transform the building market. To date, more than 2000 new construction projects have registered their intent to seek LEED certification, more than 350 projects have achieved LEED certification at one of four levels, and over 20,000 professionals in the building industry have been LEED accredited.[17]

The growth of LEED's certification program is widely admired within the field of sustainability. But LEED's truly transformative power is not so much the results of adherence to its definitions. Its real potential is in the energy and creativity of the professionals for whom the rating system provides a

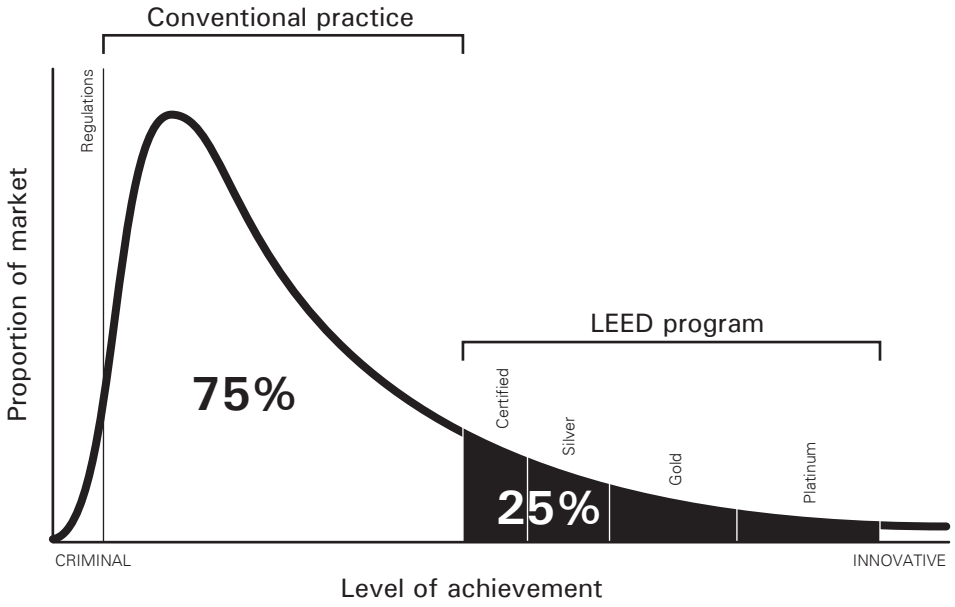


Figure 6. *USGBC LEED Program*
USGBC President Rick Fedrizzi emphasizes in public presentations that LEED is a leadership program that aims to "push the envelope" at the top end of the market. As the buidling industry as a whole moves to more sustainable practices, USGBC expects to progressively adjust its standards upward over time to continue to target the top 25%. LEED will never be aimed at transforming the mainstream of conventional construction practices, but by steadily advancing the highest standard for excellence, it may tend to raise the overall bar for achievement, as well.

focus for aspirations and collaboration. By identifying a common purpose and providing tools for exploring and understanding key principles, LEED creates a framework from which building industry professionals and others in related fields can apply their innovation and creativity to pursuing new, unanticipated achievements. And by incorporating intensive feedback into its ongoing development – the committees that develop and revise the standards are staffed by approximately 250 volunteers from among the professionals that use them[18] – LEED continues to evolve and maintain its relevance while encouraging continuous improvement within the building industry.

leed's potential is in the energy and creativity of professionals.

The effects of LEED have been felt beyond the strict confines of the building industry. Some financial institutions are recognizing LEED as contributing to qualification for preferable, 'green' financing products.[19] And increasingly, government agencies are incorporating requirements and incentives for public projects to achieve LEED certification.

InnoCentive[20]

InnoCentive is an online community launched in 2001 to allow scientists and science-based companies to collaborate worldwide to achieve innovative solutions to complex challenges – rewarding scientific innovation through financial incentives. Companies which collectively spend billions of dollars on research and development, post scientific problems confidentially on the InnoCentive site, where more than 85,000 scientists and scientific organizations located in more than 175 countries can solve them.[21] Scientists who deliver solutions that best meet the challenge's requirements receive financial awards ranging up to $100,000.

innocentive offers a framework in which problems can be outlined and solved.

As a neutral forum rather than a formal organization of scientists, InnoCentive offers only a framework within which problems can be outlined and solved – establishing the conditions for changing the way scientific research and development happens. To date, corporations have posted hundreds of challenges and successfully concluded approximately 65 of those, dispersing nearly separate 100 financial awards for the most successful responses. Unlike LEED, InnoCentive does not focus its community on a shared vision of sustainability, but its model could readily be adapted to progressive sustainability objectives.)

CleanGredients[22]

GreenBlue is currently leading a project to create CleanGredients™, an online database of cleaning product ingredient chemicals that will be a one-stop shop of accurate information to support green product formulation: green product design at the molecular scale. The database aligns broad environmental and human health goals with the cleaning product industry's business objectives and will support formulators in designing

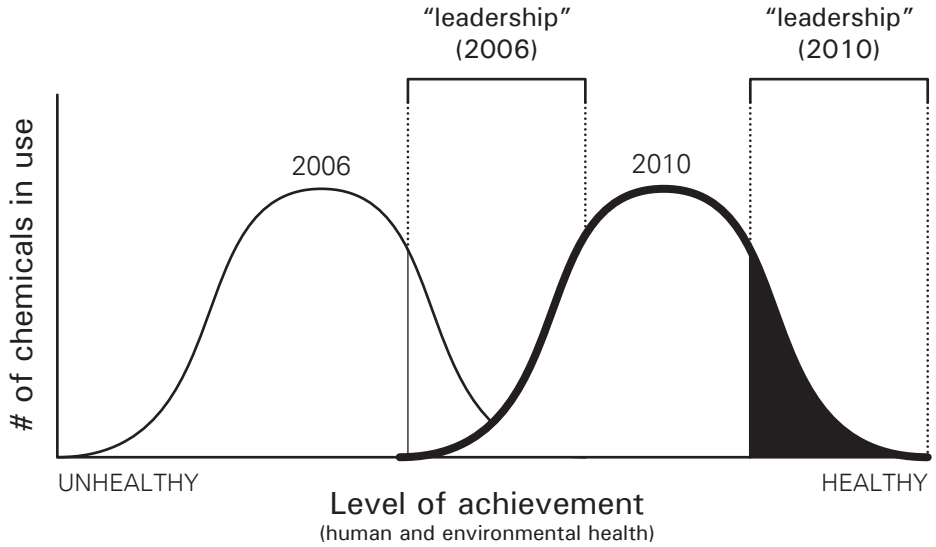


Figure 7. *Shifting the distribution curve*
CleanGredients creates a "pipeline" of chemicals that is intended to shift the distribution profile for the entire industry. As usage of CleanGredients grows, the number of "green" ingredients in use will steadily increase, while the number of problematic or hazardous products will steadily decrease. This shift will occur in parallel with a steadily more demanding definition of "leadership" in green chemistry.

products with human and environmental health benefits, whether to meet corporate internal objectives, more stringent regulations, voluntary product recognition programs, or national and international eco-labels.

CleanGredients creates a framework for shifting the direction of industrial and institutional cleaning product development toward products that are benign with respect to human and ecological health and safety. It is part of the broader Design for the Environment Green Formulation Initiative (DfEGFI) for Cleaning Products, which was launched in September 2004 as a collaborative agreement between GreenBlue and the U.S. EPA's Design for the Environment Program. The project is a multi-stakeholder coalition of participants from government entities, environmental organizations, industry associations, cleaning product formulators and distributors, and chemical manufacturers and suppliers.

a framework for shifting the direction of cleaning product development

* * * * *

The above discussion of four types of systems-changing projects is only a starting point. Further discussion and study could help to identify the specific factors that make each of the above types of projects most likely to have the greatest systems-wide impact, and to identify common mistakes within each type. My hope is that this discussion offers a useful model for identifying and understanding types of activities with similar potential.

Notes

1 This chapter, like the preceding, benefited from extensive research and intellectual work by Phil Storey, who identified many of the case studies and played a leading role in defining the typological categories that organize the chapter.

2 Pearson, Jason, "A Larger Context for Design", *ICON* Summer 2006 (Washington, DC: American Society of Interior Designers: 2006.)

3 The United Way of Greater Milwaukee, et al., *Nonprofit Collaboration and Mergers: Finding the Right Fit*, (Milwaukee: United Way of Greater Milwaukee, 2005).

4 www.orsolutions.org

5 www.cisaustin.org

6 www.sustainablepackaging.org

7 In the field of international development and poverty alleviation, the property-rights reform championed by Hernando de Soto has gained significant interest as a "key-ingredient" strategy, however difficult to apply. C.K. Prahalad, on the other hand, argues that the kind of development that will raise the standard of living of the world's poor (the base of the economic pyramid, or "BOP") requires the development of an entire economic ecosystem. "…traditionally, the focus of both business and social development initiatives at the BOP has been on one aspect of the ecosystems for wealth creation at a time – social capital or individual entrepreneurs (the focus of so much of the microfinance efforts), small and medium enterprises (SMEs), or large firms (market liberalization or foreign direct investment). There have been few attempts to focus on the symbiotic nature of the relationships between various private sector and social institutional players that can lead to a rapid development of markets at the BOP." C.K. Prahalad, *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits* (Upper Saddle River, NJ: Wharton School Publishing, 2004), 63. Hernando de Soto, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (New York: Basic Books, 2000).

8 A serious, recent note of caution on the current microcredit boom states that "microcredit is an almost perfect case of a phenomenon that has come to characterise much of development assistance – a widening gap between reality and propaganda. For while the promise of microcredit is irresistible…the hoped for poverty reduction impact of microcredit remains elusive." Thomas Dichter, "Hype and Hope: The Worrisome State of the Microcredit Movement," *eAfrica*, 9 January 2006 (http://www.saiia.org.za/modules.php?op=modload&name=News&file=article&sid=787)

9 www.grameen-info.org

10 www.oneworldonepeople.org/articles/World%20Poverty/Grameen.htm

11 www.kickstart.org

12 Jeffrey Sachs, in his book *The End of Poverty* (New York: The Penguin Press, 2005), also emphasizes the importance of technology: "I believe that the single most important reason why prosperity spread [during the Industrial Revolution], and why it continues to spread, is the transmission of technologies and the ideas underlying them. Even more important than having specific resources in the ground, such as coal, was the ability to use modern, science-based ideas to organize production." (p.41) Similarly, "Over the span of two centuries, the innovation gap is certainly one of the most fundamental reasons why the richest and poorest countries have diverged, and why the poorest of the poor have not been able to get a foothold on growth." (p. 62)

13 *The Economist*, "Are You Being Served?" 21 April 2005.

14 www.epa.gov/airmarkets/capandtrade/

15 www.nceas.ucsb.edu/nceas-web/kids/biomes/coral.htm

16 www.usgbc.org/LEED

17 Personal communication with Dara Zycherman, USGBC LEED Program Coordinator, 22 November 2005.

18 Personal communication with Matt Huber, USGBC LEED Customer Service Associate, 21 December 2005.

19 Enterprise Housing Financial Services Inc. requires the inclusion of at least one LEED Accredited Professional (or similarly qualified 'green building' specialist) in order to meet its Green Communities Underwriting Criteria for its Predevelopment or Early Predevelopment Loan Products. (www.enterprisefoundation.org/resources/green/about-essentials-loans.asp)

20 www.innocentive.com

21 InnoCentive is an especially clear representation of the model Robert Reich outlined in his 1991 book *The Work of Nations* (New York: Vintage Books, p 177) as the three fundamental roles within the knowledge economy of the twenty-first century (which he refers to as symbolic-analytic activity): problem solvers, problem identifiers, and strategic brokers. InnoCentive plays the role of strategic broker, bringing problem solvers and problem identifiers together in productive ways.

22 www.cleangredients.org

5
funding principles

Good designers ask good questions… questions that transform current challenges into rich opportunities for positive, practical action and change. The projects profiled above are asking exactly such ambitious questions: *How can we structure funding mechanisms to unleash grassroots creativity? How can we bring a wider range of expertise to the table to generate greater innovation and benefits for all of a project's stakeholders? How can we create new financial instruments that align economic and environmental objectives? How can we deploy programs and resources to encourage better design questions across industry?* Taken together, these projects ask: *How can we design industrial and economic activity to optimize long-term social and economic value?*

good designers ask questions that transform challenges into opportunities.

These are questions that the free market asks all too rarely. Because current market pricing mechanisms do not accurately reflect true costs and securities markets are impatient, commerce does not tend to optimize long-term social and environmental value. The types of projects described above are therefore swimming against the mainstream of contemporary business. Although each project provides substantial social and environmental returns to society, they often cannot offer a sufficiently competitive financial return to

commerce does not tend to optimize long-term social and economic value.

attract conventional forms of capital. Therefore, even though many engage directly with the private sector to enhance commercial activity, their success almost always depends upon bridge funding or seed investment from government or philanthropic sources.

funders can play a role in supporting the society-wide innovation movement.

Funders thus have a vital role to play in supporting the society-wide innovation movement of which the projects above are individual examples, primarily through support for key aspects of the design innovation cycle. While funders may be familiar with their central role, they may benefit from an explicit focus on both the design process and strategies for systemic change that I have outlined above. To assist in this, below I present an initial, admittedly incomplete, set of principles which might guide funders' thinking in this context.

support ambitious theories of change.

The broad outlines of a sustainable future have been imagined and described. We know where we want to go. The tricky question, of course, is, "How do we get there?" It is my argument here that this question can only be answered by the kind of systems-conscious, iterative experimentation that is the source of all genuine design innovation. We simply do not know which models for sustainable practice will ultimately prove most effective and successful in the complex fabric of society. Our only way to find out is to make educated guesses and then test the top candidates in the real world of practice.

funders and grantees must be prepared for occasional failures.

For funders, this means accepting that support for the experimental process required by true invention and innovation is inherently risky. It is critical that funders ask their grantees to be ambitious and creative, to strive for completely new ways of thinking and acting. In so doing, however, funders and grantees alike must be prepared for the inevitable failures that will be a productive part of this process. In this respect, support for

innovation will not benefit from an excessive emphasis on short-term evidence of success.

Fortunately, support for innovation and experimentation does not preclude a responsible framework of grantee accountability, and the increasing popularity among funders of a "Theory of Change" model of assessment is particularly relevant.[1] A "Theory of Change" is "a way to describe the set of assumptions that explain both the mini-steps that lead to the long term goal [of a project or program] and the connections between [the] activities and outcomes that occur at each step of the way."[2] This model is being productively used by a range of funders to provide a flexible framework within which to support innovation while monitoring progress.

a theory of change provides a flexible framework in which to support innovation.

Additionally, frameworks for considering the potential systemic effects of projects, such as the four-part typology introduced in the previous chapter, may prove helpful in assessing the opportunities and caveats of inherently risky, ambitious projects. And as our understanding grows of the strengths and weaknesses of various types of systemic interventions, and tools for identifying them are developed in the same prototyping/feedback cycle, funders' comfort level in taking such risks may increase.

By supporting ambitious theories of change, funders can support the experimentation that will be required to develop new models of sustainable practice, while at the same time ensuring an appropriate level of monitoring and accountability. Using a "theory of change" approach, a funder can encourage its grantees to try new ideas and approaches, but can legitimately request that these ideas and approaches be backed up by a well-researched, well-argued theory of change prior to any commitment of support.

emphasize positive alternatives.

The first wave of response to the negative feedback of our global industrial systems was primarily and appropriately reactionary and confrontational. But we are now moving into a new era, one in which an increasing number of organizations have begun proactively to commit to the redesign of industry. The significance of this shift from protest activism to design activism cannot be overemphasized. As advocacy organizations begin to think like designers, they open up space for genuine, productive conversation with industry about how to design, prototype, and realize new, sustainable alternatives that meet the requirements of the marketplace.

For funders, an emphasis on positive alternatives is an opportunity to dramatically enhance the impact of their investments by effectively lowering the "adoption cost" or "transaction cost" for industries wishing to embrace sustainable practices. As cost-neutral positive alternatives become widely available, free market forces will steadily motivate companies to replace existing problematic products and processes. This means that funder investments can be used functionally as levers to motivate voluntary, market-based action toward sustainability by companies and industries.

good alternatives motivate voluntary, market-based action.

The Campaign for Safe Cosmetics, for example, has recently been successful in focusing public and media attention on the toxic chemicals used in many personal care products, resulting in the Compact for Safe Cosmetics, a pledge to make safe products by more than 300 cosmetics companies. As these companies now seek to design replacement products, they are requesting good-faith assistance from the Campaign to identify non-toxic alternatives. This is an entirely new and unique role for an advocacy organization, and GreenBlue has been working with the Campaign to assess the viability of translating the CleanGredients model to this challenge.[3]

encourage prototyping.

Currently, the perception and reality of cost premiums on sustainability inhibit widespread adoption of sustainable industrial and business practices There are certainly many cases where the shift to sustainable practices requires substantial initial capital investment, possibly with no guarantee of financial return.[4] The perception – and current reality – of cost premiums must be overcome if sustainable practices are to become mainstream. This happens through the design and realization of new, sustainable solutions that do not incur cost premiums.

cost premiums must be overcome for sustainability to become mainstream.

Funders are in a perfect position to support such efforts by offering incentives that reward individuals and organizations for creative solutions that bring the cost of sustainable practices into line with market prices, or that result in the internalization of hidden environmental and social costs. Cost premiums for sustainable practices will fall more rapidly in a context of positive incentives and/or financial support for innovative research. Support for such innovative research and development efforts is a positive subsidy that encourages an accelerated transition to sustainability by insuring against the risks of failure inherent in experimentation. Such support will enable a broader spectrum of individuals and organizations to participate in our society-wide effort to prototype new, sustainable solutions.

positive subsidies insure against the risks of failure.

For example, in 2003, The Kresge Foundation, already well known for its "bricks and mortar" challenge grants, launched a Green Building Initiative to encourage nonprofits to consider building "green" for the first time. Recognizing that building green demands an up-front investment of planning time and technical design resources to identify affordable "green" alternatives, the program offers planning grants in amounts from $25,000 to $100,000 to subsidize these costs, with bonus "prize" grants of $150,000 to $200,000 for organizations whose buildings achieve US Green Building

Council LEED certification. Effectively, the Kresge Foundation is insuring these organizations against the risk of undertaking more experimental and innovative approaches than they could otherwise comfortably entertain. As of February 2006, The Kresge Foundation had awarded 64 planning grants totaling more than $5 million since the Initiative's launch positively influencing the energy and environmental profile of an estimated $50 million worth of new construction.

The Department of Energy's Solar Decathalon[5] competition is another instance of highly leveraged support for experimentation and prototyping. Every two years, the Department provides each of twenty university teams with a grant of $100,000 over two years to design, build, and operate an energy-efficient solar-powered home. The teams are encouraged to solicit additional local and national sponsors, and they ultimately transport their solar houses to the National Mall in Washington, D.C. to form a temporary "solar village" that is open to the public during a ten-event competition to determine an overall winner. The Solar Decathalon achieves a range of objectives: encouraging students to apply their creativity to challenges of sustainability, associating sustainability-oriented innovation with positive marketing opportunities for sponsors, educating the public about new approaches and technologies, and prototyping genuine innovations in technology and design that could be adopted by the mainstream housing market.

Other initiatives to support prototyping might include:

- Research to develop actual innovative products and processes
- Government initiatives that create positive incentives for private sector action
- Endorsement and award programs for innovative products and processes
- Design challenges, competitions, and award programs for sustainability innovations
- Business plan competitions for sustainable business models
- Studies of macroeconomic systems of incentives and policy frameworks

advance design intelligence.[6]

Intelligent design decisions are born of good understanding supported by accurate information. Design decision-makers (anyone who makes significant resource-allocation decisions) need not only an understanding of the systemic contexts of a decision, but also ready access to accurate, credible information about the contexts, in order to make good decisions. This detailed technical information is frequently lacking. The chemist designing a face cream may understand sustainability generally, and the contexts within which the product will be used, but she may not have ready access to the toxicological profile of individual ingredient chemicals. The hospital purchaser may worry about indoor air quality, but may not know the VOC content[7] of different paints. The transportation engineer may recognize the potential for negative environmental impact, but may not have a source for best practices relevant to his geographical region.

understanding + information = intelligence

Funders can meaningfully address these information gaps by supporting information, technology, and intelligence transfers that steadily enhance the design intelligence of key decision-makers. Depending upon the scales and contexts of particular interest to individual funders, the types of transfer supported will vary dramatically. For some, projects to provide targeted technical information may be an effective strategy, whereas others may prefer a broad convening role that allows them to host the sharing of intelligence and approaches among diverse change agents in a range of sectors and contexts.

detailed technical information is frequently lacking.

Methods of effective intelligence transfer will also vary by audience.[8] For,example, case studies have proved a particularly useful way to enhance the intelligence of business managers. Business and law schools have developed case studies as a pedagogical technique for documenting,

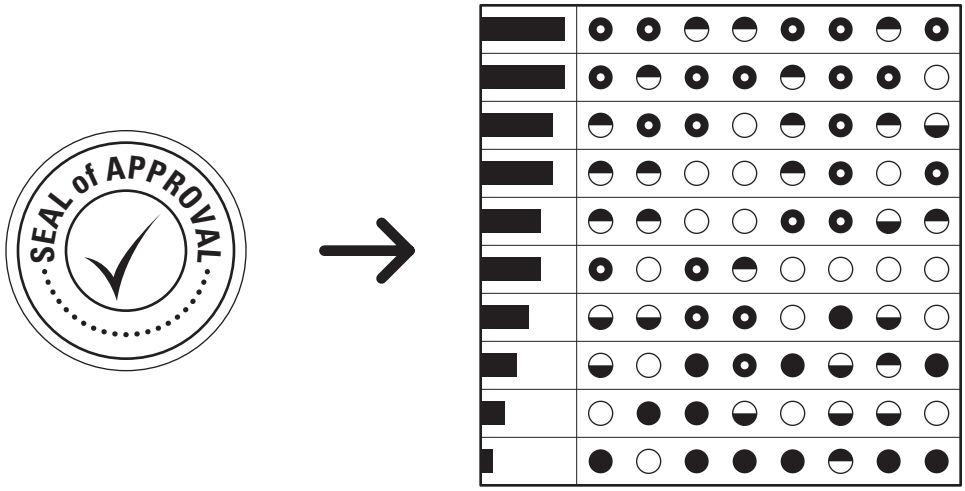


Figure 8. *A shift toward attribute-based decision-making*
As designers and decision-makers seek information to make intelligent, educated choices, they will increasingly turn to resources that provide attribute-based information about the relative sustainability of materials, components, products, and systems. Just as consumer product information has shifted from the simple "seal of approval" to the Nutritional Facts lable and attribute-based indices, so too will eco-labels and certification systems be supplemented by decision-making frameworks based on more complex, context-specific attributes.

analyzing, and teaching professional strategy and technique. They allow for a clear understanding of real-life situations and provide a framework for testing alternative strategies for achieving objectives. Credible, market-based case studies that could be used in design, business, and policy schools (possibly in the context of joint courses) would be tremendously useful, not only in training a workforce equipped to manage organizational transformations to sustainability, but also in educating managers about the opportunities available in their current operating environment.

effective intelligence transfer will vary by audience and context.

Specific strategies for advancing design intelligence could include:

- Design information tools and resources
- Attribute-based certification systems[9]
- Problem-solution brokering (cf. Innocentive)
- Solutions/innovations database (cf. www.changemakers.net)

- Feasibility studies for new technologies and approaches
- Case studies of successful, new business models
- Curriculum development for professional schools
- Research fellowships in universities or sustainability organizations

* * * * *

Hopefully, these principles, substantiated by the project typologies and case studies of work on the ground, will prove useful to funders in their support of the exciting, ongoing innovation process by which we will collectively achieve a sustainable future.

Notes

1 For information about the term "theory of change", see Weiss, Carol. *New Approaches to Evaluating Comprehensive Community Initiatives Theories* (The Aspen Institute, 1995) and www.theoryofchange.org.

2 http://www.theoryofchange.org/html/origins.html

3 For more information about the Campaign for Safe Cosmetics, see www.safecosmetics.org. For more information about CleanGredients, see www.cleangredients.org.

4 Energy efficiency is the classic example of this economic logic. Although energy-efficient technologies might easily pay for themselves within the first five years of use, the up-front premium discourages investment by organizations who are not able or willing to amortize these costs. In other cases, where increased cost of responsible action may not promise a even long-term financial return, the argument for sustainable practices is even more difficult.

5 http://www.eere.energy.gov/solar_decathlon/

6 Design intelligence should not be confused with the recently popular phrase "Intelligent Design," the quasi-theological proposition that the complexity natural systems proves the existence of a higher power, a divine Designer. I look forward to a day when the small "i", small "d" intelligent design practiced by people can be honored without fear of inadvertent reference to this hopefully short-lived anomaly of theological discourse.

7 "VOC content" refers to the Volatile Organic Compound content of a product, i.e. the percentage of the product that contains potentially harmful chemical compounds that are prone to "volatilize", or "off-gas" into the air. It is typically VOC's that give cars a "new car smell" or paints a certain odor.

8 In GreenBlue's own work, for instance, efforts range from information transfer about individual molecules (CleanGredients) to intelligence transfer about entire material classes (Sustainable Packaging Coalition material fact sheets).

9 Certification systems generally provide a positive market "pull" encouraging the development of improved products and processes. There is a real and present risk, however, that some could actually *inhibit* intelligent design decisions by setting inappropriately low standards of achievement. This is particularly true for "binary" certifications such as product eco-labels, which do not credit (and therefore do not encourage) ongoing incremental improvements. I compare binary eco-labels to the *Good Housekeeping* seal of approval, communicates that a product meets editors' requirements, but does not provide detailed information about individual attributes. *Consumer Reports*, on the other hand, which reports product performance for individual attributes of interest, which tends to enhance both design intelligence and product quality by highlighting areas of potential design improvement.

Appendix A
sustainability models & lingo

sustainability models

Below are examples of how various leaders in the field of sustainability characterize their visions for a sustainable future:

Gus Speth: *Red Sky at Morning*[1]

1. Stable or Smaller World Population
2. Free of Mass Poverty
3. Environmentally Benign Technologies
4. Environmentally Honest Prices
5. Sustainable Consumption
6. Knowledge and Learning
7. Taking Good Governance Seriously
8. Transition in Culture and Consciousness

The Natural Step[2]

1. Substances from Earth's crust must not systematically increase in the ecosphere.
2. Substances produced by society (man-made materials) must not systematically increase in the ecosphere.
3. The productivity and diversity of nature must not be systematically diminished.
4. Therefore, in recognition of the first three conditions, there must be fair and efficient use of resources to meet human needs.

Janine Benyus: *Biomimicry*[3]

Nature…

1. Runs on sunlight.
2. Uses only the energy it needs.
3. Fits form to function.
4. Recycles everything.
5. Rewards cooperation.
6. Banks on diversity.
7. Demands local expertise.
8. Curbs excesses from within.
9. Taps the power of limits.

Paul Hawken, Amory Lovins, Hunter Lovins: *Natural Capitalism*[4]

1. Radical resource productivity.
2. Biomimicry.
3. Service and flow economy.
4. Investing in natural capital.

Paul Hawken: *The Ecology of Commerce*[5]

1. Obey the waste-equals-food principle and entirely eliminate waste from our industrial production.
2. Change from an economy based on carbon to one based on hydrogen and sunshine.
3. Create systems of feedback and accountability that support and strengthen restorative behavior.

William McDonough and Michael Braungart: *Cradle to Cradle*[6]

1. Waste equals food.
2. Use current solar income.
3. Celebrate diversity.

William McDonough: *The Hannover Principles*[8]

1. Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition.
2. Recognize interdependence. The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.
3. Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.
4. Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems, and their right to co-exist.
5. Create safe objects of long-term value. Do not burden future generations with requirements for maintenance of vigilant administration of potential danger due to the careless creation of products, processes or standards.
6. Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.
7. Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate the energy efficiently and safely for responsible use.
8. Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not and inconvenience to be evaded or controlled.
9. Seek constant improvement by the sharing of knowledge. Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity.

The Hannover Principles should be seen as a living document committed to the transformation and growth in the understanding of our interdependence with nature, so that they may adapt as our knowledge of the world evolves.

the lingo of sustainability[9]

Base of the Pyramid (aka Bottom of the Pyramid)
Biomimicry
Brownfield Redevelopment
Civic Entrepreneurship
Clean Technology
Closed Loops
Community Capitalism
Corporate Citizenship
Corporate Governance
Corporate Social Responsibility
Cradle to Cradle
Design for Environment (DfE)
Eco-Effectiveness
Eco-Efficiency
Environmental Management
Environmental Management Systems (EMS)
Full Cost Accounting
Green Design
Greening
Inclusive Capitalism
Industrial Ecology
ISO 14001
Leapfrog Technology
Life-Cycle Assessment (LCA)
Life-Cycle Management (LCM)
Pollution Prevention (P2)
Radical Transactiveness
Resource Productivity
Restorative Technology
Risk Management
Stakeholder Management
Sustainable Development
Sustainable Technology
Systems Thinking
Take-Back
Transparency
Triple Bottom Line
Urban Reinvestment
Voluntary Regulation
Waste Reduction

Notes

1 James Gustave Speth, *Red Sky at Morning: America and the Crisis of the Global Environment* (New Haven and London: Yale University Press, 2004), 237ff.

2 The Natural Step, *What is Sustainability?*, http://www.naturalstep.org/com/What_is_sustainability/.

3 Janine Benyus, *Biomimicry: Innovation Inspired by Nature* New York: Morrow, 1997), 7.

4 Paul Hawken, Amory B. Lovins, and L. Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution* (Boston: Little, Brown, 1999), 10-20.

5 Paul Hawken, *The Ecology of Commerce: A Declaration of Sustainability* (New York: HarperBusiness, 1993), 209-210.

6 William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the way we Make Things* (New York: North Point Press, 2002).

7 Sustainable Packaging Coalition, *About the SPC: What is Sustainable Packaging*, http://www.sustainablepackaging.org/about_sustainable_packaging.asp.

8 William McDonough, *The Hannover Principles: Design for Sustainability* (New York: William McDonough Architects, 1992).

9 Stuart L. Hart, *Capitalism at the Crossroads: The Unlimited Business Opportunities in Solving the World's Most Difficult Problems* (Upper Saddle River, NJ: Wharton School Press, 2005), 59.

Appendix B
case examples: projects & organizations

oregon solutions[1] (integrative)

Oregon Solutions is an initiative that grew out of the State of Oregon's Sustainability Act of 2001 to develop sustainable solutions to community-based problems that support economic, environmental, and community objectives and are built through the collaborative efforts of businesses, government, and non-profit organizations. Oregon Solutions promotes community governance based on the principles of collaboration, integration, and sustainability. It provides a mechanism for problem-solving that involves working across sectors, jurisdictions, interests, and issues. Using a model called the Community Governance System, Oregon Solutions works with communities to bring diverse partners to the table to reach agreements on solutions that support Oregon's Sustainable Community Objectives.

The Community Governance System includes five elements:

1. A problem or opportunity defined by the community that addresses at least one sustainable community objective.
2. A neutral community convener from the local community, appointed by the Governor, who can lead a team to address the challenge.
3. An Oregon Solutions Team of federal, state, local, and other government entities, businesses, non-profits, and citizens who are needed, or can contribute to a solution.
4. An integrated solution that leverages the resources of the Solution

Team to meet the challenge at hand and sustainability objectives.

5. A declaration of cooperation that team members sign, committing resources and time in an integrated action plan.

Project: Lakeview Biomass Facility

The Lakeview Biomass Project is an effort to develop an economically viable, ecologically sustainable biomass power facility as a key part of an integrated solution to a multi-faceted forest health problem. The biomass energy facility (approximately 15 megawatts in size) would be adjacent to the Fremont Sawmill in Lakeview, Oregon, in the 492,642 acre Lakeview Stewardship Unit on the Fremont National Forest. Significant environmental, economic, and community benefits are envisioned as byproducts of the project.

The Oregon Solutions engagement with the biomass facility project involves a series of multi-stakeholder meetings to fully examine the challenges and to build creative solutions with well-positioned stakeholders. This involvement culminates in the creation of a Declaration of Cooperation that includes implementation plans, guideposts, and benchmarks for achieving the specific, effective actions. Participants include:

- Non-profit organizations (Wilderness Society; Defenders of Wildlife; Climate Trust; Bonneville Environmental Foundation; Sustainable Northwest; Energy Trust; 3E Strategies)
- Lumber industry (The Collins Companies)
- Energy industry (PacifiCorp; DG Energy Solutions; Surprise Valley Electrification Corp.)
- Other industry (Tempo Foam; Mater Engineering)
- Local and regional government (Central Oregon; Lake County; Town of Lakeview)
- State government (Office of the Governor; Department of Environmental Quality; Department of Forestry; Department of Fish and Wildlife; Department of Energy; Economic and Community Development Department; members of State Senate and House of Representatives)
- Federal government (USDA Forest Service; Fremont and Winema National Forests; Bureau of Land Management)
- Tribal government (Klamath Tribe)
- Academia (Oregon State University)

communities in schools – central texas[2] (integrative)

Since 1985, Communities In Schools – Central Texas has been providing professional social services to students in five central Texas school districts who meet the statistical profile of being at risk of dropping out of school. CIS is located on 48 public school campuses from pre-K through twelfth grade. Through campus-based programs and special projects, CIS creates a network of volunteers, social services, businesses, and community resources that work together to break down barriers, help students succeed, and prevent drop-outs.

Most communities have resources available to help students succeed in school and prepare for life, but they may be in the wrong place. Children and families must first locate and then travel to agencies scattered all over town, usually during school hours and with no way to coordinate the various services. CIS reverses this process, bringing resources and relationships to where children already spend their days: the public school. The organization brings together community resources so that "at risk" students can concentrate on learning and teachers can focus on teaching.

Services offered through CIS include:

- Counseling and Supportive Guidance (individual, group, family and crisis counseling)
- Heath and Human Services (referrals for basic needs, medical clinics, nutrition, prenatal education, WIC cards, community health fairs)
- Parental Involvement (home visits, family counseling, parenting classes)
- Pre-Employment/Employment (resume building, workforce training and development, computer skills, mentoring, math and science activities)
- Enrichment (field trips, celebrations, community festivals)
- Educational Enhancement (tutoring, homework clubs, mentoring, reading groups, book clubs)

The intensive, integrated delivery of services CIS offers has achieved

strong results. The organization's immediate results from its activities in 2004 include:

- Reached 24,000 students
- Closely served 4,000
    - 99% stayed in school
    - 87% advanced to next grade level
    - 88% improved grades, attendance, or behavior

Wider social benefits from greater student performance and staying in school include:

- Lower unemployment
- Higher quality workforce and jobs
- Fewer prisoners and lower prison costs
- Lower social services costs from decreases in
    - Homelessness
    - Health problems
    - Poverty

(Communities In Schools – Central Texas, Inc. is a member of the national Communities In Schools community-based, drop-out prevention network. More than one million students and their families have access to Communities In Schools programs in 245 school districts in 32 states and the District of Columbia.)

sustainable packaging coalition[3] (integrative)

The Sustainable Packaging Coalition (SPC) is an industry working group inspired by cradle to cradle principles and dedicated to creating a more robust environmental vision for packaging. Founded by nine industry stakeholders in 2003, the Coalition has grown to more than fifty member-companies in 2006, and includes representatives from across the value chain and a number of Global 500 companies.

Because of the varied and far-flung nature of the packaging value chain,

the Sustainable Packaging Coalition includes as members suppliers, converters, designers, consultants, and even governmental organizations, each of which occupies a unique position with respect to materials management and contribution to material flow. The primary function of the Coalition is thus educational: to leverage the growing and robust diversity of membership towards sharing best practices and strategies at a systems level.

In 2005, the SPC completed version 1.0 of the Definition of Sustainable Packaging.[4] This definition represents an important first step in articulating a common understanding of the term "sustainable packaging." It provides a common vision and a framework for understanding activities directed toward improving packaging and continues to inform the future vision of the coalition and its individual member-companies.

Sustainable packaging:

- Is beneficial, safe & healthy for individuals and communities throughout its life cycle;
- Meets market criteria for performance and cost;
- Is sourced, manufactured, transported, and recycled using renewable energy;
- Maximizes the use of renewable or recycled source materials;
- Is manufactured using clean production technologies and best practices;
- Is made from materials healthy in all probable end of life scenarios;
- Is physically designed to optimize materials and energy;
- Is effectively recovered and utilized in biological and/or industrial cradle to cradle cycles.

Taken as a whole, these criteria outline the SPC's vision for sustainable packaging, though the SPC recognizes that the timelines for achievement will vary across criteria and packaging materials.

Using the above criteria as orientation, the SPC is working collaboratively to develop the tools and resources necessary for real implementation. The Coalition is currently at work on a design guidance document intended

to help packaging designers understand the decision-making criteria necessary to make positive and productive design choices for material health. Additionally, the Coalition is also developing a Material Assessment Tool that will evaluate the material health (human/ecological toxicological impacts) and sustainability characteristics (energy, emissions, etc.) of basic packaging materials and components.

Both of these projects represent attempts to capitalize on the SPC's most valuable asset: the diverse knowledge and expertise of its membership. Both represent attempts to transform that expertise from scientific data into real applications with global value. As membership in the Coalition continues to grow, so too its leverage within the value chain, leverage increasingly useful as a way of catalyzing continued discussion about sustainable packaging and supporting continued efforts to achieve it.

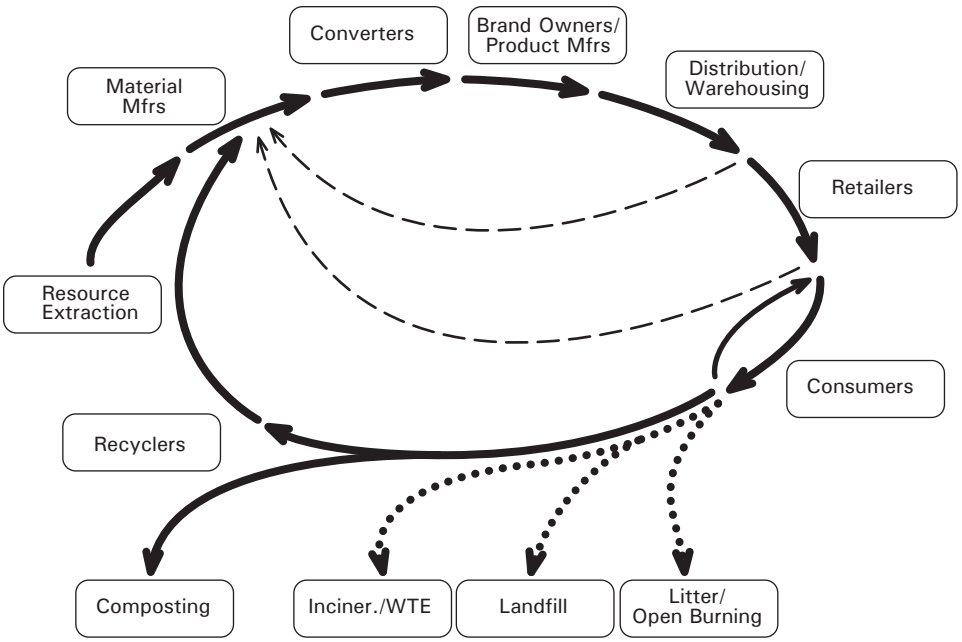


Figure 9. *Sustainable Packaging Coalition membership / supply chain*
The Sustainable Packaging Coalition includes companies along the entire supply chain of packaging supply and recovery, enabling members to collaborate effectively to align incentives for effective design of packaging materials and systems.

Grameen Bank[5] (Key Ingredient)

In the mid-1970s, Bangladeshi economist Muhammad Yunus recognized the key role in the cycle of poverty played by the oppressive terms under which the poor had access to capital necessary to making a living. In 1976 Yunus created the Grameen Bank Project and the organization received legal recognition as a bank in 1983, dedicated to providing small but strategically critical loans to poor borrowers. By simply providing small loans to the poor through a strong grass-roots organization, Grameen Bank's members realize higher incomes and a host of quality of life improvements.

Grameen Bank's credit delivery system has the following features:

1. There is an exclusive focus on the poorest of the poor, established through clear eligibility criteria and increasingly prioritizing service to women.
2. Borrowers are organized into small homogeneous groups to facilitate group solidarity as well as participatory interaction.
3. Special loan conditions which are particularly suitable for the poor. These include: very small loans given without any collateral; loans repayable in weekly installments spread over a year; self-chosen, quick income generating; close supervision of credit by the group as well as the bank staff; stress on credit discipline and collective borrower responsibility or peer pressure.
4. Simultaneous undertaking of a social development agenda addressing basic needs of the clientele.
5. Design and development, through trial and error, of organization and management systems capable of delivering program resources to targeted clientele.
6. Expansion of loan portfolio to meet diverse development needs of the poor.

As a result of the microcredit, 55 percent of the families of Grameen borrowers have risen out of poverty, as measured by such standards as having all children of school age in school, all household members eating three meals a day and having access to regular medical checkups, a sanitary toilet, a rainproof house, clean drinking water and the ability to repay a 300 taka-a-week (US$8) loan.[6]

Grameen Bank is now entirely self-sufficient financially, with operations in more than 50,000 villages, has more than five million borrowers who own 94 percent of the Bank, and it recently passed the $US 5 billion mark in loans to the poor, with a repayment rate of 98.98 percent. The success of the Grameen Bank and its borrowers led to the creation of a burgeoning microcredit industry. There are now several thousand microlenders – a few hundred of dominant scale and impact – helping tens of millions of borrowers escape poverty and raise their quality of life.[7]

KickStart[8] (Key Ingredient)

KickStart (originally called ApproTEC, or Appropriate Technologies for Enterprise Creation), is a non-profit organization founded in 1991 by Martin Fisher and Nick Moon, two veterans of development work in Africa. The organization was conceived around the proposition that appropriate technology could be a key ingredient in helping huge numbers of East Africans escape chronic poverty by participating in the market economy.

KickStart develops and promotes affordable, simple and effective technologies that can be used to establish and run profitable, small scale enterprises. The organization is focused entirely on the private sector, where their technologies are produced, marketed and used based on standard (and sustainable) economic incentives. With the availability of key technologies, struggling families can increase their productivity sufficiently to participate in the market economy and dramatically raise their standard of living, including improved nutrition and education for their children.

Since the early 1990s, KickStart has developed and introduced several successful hand-powered technologies: a series of water pumps for agricultural irrigation, a seed press for extracting cooking oil and a press for making strong building blocks. KickStart's activities include researching markets to discover new opportunities, designing new technologies to exploit those opportunities, training manufacturers to produce the new technologies, promoting and marketing them, and monitoring the impacts of the technologies.

KickStart now has offices in Kenya, Mali and Tanzania and partners with development agencies throughout Africa. Since its founding in 1991, KickStart's technologies and programs have helped create 39,000 new businesses in East Africa, which generate an additional $37 million annually – new revenues equivalent to 0.5 percent of Kenya's gross domestic product.

Technology: MoneyMaker Water Pumps

KickStart's most successful technology is its MoneyMaker line of hand-powered irrigation pumps. The original MoneyMaker pump was introduced in 1996 at a retail price equivalent to $55. The small treadle-operated pump could pull water to an irrigation ditch from as deep as 23 feet, to irrigate up to two acres of land. Over four thousand of the pumps were sold in the two and one-half years it was marketed. In late 1998 the Super-MoneyMaker was introduced, with the added ability to pump water uphill through a hose. In 2001, KickStart released the MoneyMaker-Plus, an even lower cost, smaller, single piston treadle-powered pump that can push to a hose and irrigate one and one-half acres.

The MoneyMaker pumps account for the vast majority of the income realized through KickStart's technologies. Results include:

- 45,000 pumps are in use by poor farmers.
- 29,000 new waged jobs have been created.
- More than half of the pumps are managed by women entrepreneurs.
- Four manufacturers are producing the pumps.
- Over 200 retailers are selling the pumps in Kenya, Tanzania and Mali.

Beyond Timber SA, Panama[9] (Alignment)

Emerging markets in ecosystem services are beginning to connect related costs and benefits in very different types of system: financial and ecological. The Panama Canal is one of the critical transportation passages for the global economy, but one that faces growing challenges from stressed natural resources.

The locks of the canal require 200,000 liters of fresh water for every ship that passes through. But the canals fresh water resources have been dwindling. In addition to climate change, the logging of the rainforests that have historically surrounded the canal and stabilized the release of fresh water have contributed to the problem. Deforestation has also increased the runoff of sediments and nutrients into the canal, requiring more frequent dredging, which is costly and disrupts traffic through the canal. Reforesting the watershed of the canal would be ecologically beneficial, restoring the area's habitat and ecosystems, while helping ensure the smooth operation of the canal and the commerce it carries.

The government of Panama has stewardship over the natural resources in question, but few resources for addressing the issue. The financial costs are high, however, for stakeholders affected by the smooth operation of the canal. These include large corporations that rely on the canal for timely delivery of goods – diverting a shipment around South America causes delays of three weeks – and large insurers that hold policies covering these corporations for losses from canal closures. Investing in reforestation around the canal clearly makes economic sense, but until recently there was no mechanism for connecting the economic incentives for reforestation with the ecological outcomes required.

John Forgach, chairman of the London forestry insurance company ForestRe, is pursuing just such a plan: insurance companies (and the reinsurance that cover their risk) will underwrite a 25-year bond to finance the reforestation. Their clients, the large companies they already insure against losses they would suffer if the canal were closed, will then pay

reduced insurance premiums when they buy the reforestation bonds.

In December 2005, Forgach incorporated and staffed Beyond Timber SA, Panama, which is now working on plans with stakeholders that include the government of Panama, The Smithsonian Institute (STRI), PRORENA and Yale University. Beyond Timber is in negotiations with a number of insurers, reinsurers, and banks to set up the financial mechanism. And the concept has gathered significant interest – the initial project has been expanded, both in scope and size (new partners and new ecosystem business opportunities).[10]

U.S. EPA's SO_2 Cap and Trade Program[11] (Alignment)

EPA's SO_2 Cap and Trade program is a market-based policy tool intended to align the incentives of the energy industry with those of the wider public's health. The program begins by setting an aggressive cap to limit emissions. Sources of emissions covered by the program then receive allowances authorizing them to emit limited quantities of SO_2, the total of which throughout the program does not exceed the cap. Each source is then free to design its own compliance strategy, including reducing its own emissions or purchasing allowances from other sources for which emissions reduction is more cost effective. Actual emissions are measured by EPA, and matched with allowances as they are traded and used.

The cost of compliance with the Acid Rain Program has been substantially lower than originally estimated. Achievement of the required SO_2 emission reductions (when the program is fully implemented in 2010) is now projected to cost $1 to $2 billion per year, just one quarter of original EPA estimates. And the public health benefits have been impressive. A 2003 Office of Management and Budget (OMB) study found that the Acid Rain Program accounted for the largest quantified human health benefits – over $70 billion annually – of any major federal regulatory program implemented in the last 10 years. A 2005 study estimates that in 2010, the Acid Rain Program's annual benefits will be approximately $122 billion (in 2000

dollars), at an annual cost of about $3 billion – a 40-to-1 benefit-to-cost ratio.

The SO_2 Cap and Trade program has also encouraged innovative savings strategies among regulated companies.[12] Cost-saving changes for which the program is at least partially responsible include: increased availability and lower cost of low-sulfur coal; innovations in fuel blending; innovations in scrubber markets and use; and perhaps even more significant organizational innovations in firms and markets facing compliance.

LEED Green Building Rating System[13] (framework)

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System® is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. The system provides a complete framework for assessing building performance and meeting sustainability goals. LEED was created to:

- define "green building" by establishing a common standard of measurement
- promote integrated, whole-building design practices
- recognize environmental leadership in the building industry
- stimulate green competition
- raise consumer awareness of green building benefits
- transform the building market.

In the short time since its introduction in 2000, LEED has indeed begun to transform the building market. To date, more than 2000 new construction projects have registered their intent to seek LEED certification, more than 350 projects have achieved LEED certification at one of four levels, and over 20,000 professionals in the building industry have been LEED accredited.[14]

As a consensus-based, specific framework, LEED's truly transformative power is not so much the results of adherence to its definitions. The real potential is in the energy and creativity of the professionals for whom the rating system provides a focus for aspirations and collaboration. By identifying a common purpose and providing tools for exploring and understanding key principles, LEED creates a framework from which building industry professionals and others in related systems can apply their innovation and creativity to pursuing new, unanticipated achievements.

LEED has spurred significant activity in the building industry, as evidence by the birth and growth of the US Green Building Council's annual GreenBuild International Conference and Expo. Previous to the first USGBC expo in 2002, the major national conference held annually covering issues of

sustainable design and construction was EnvironDesign, begun in 1997. EnvironDesign6, held in Seattle in spring 2002, attracted nearly 1200 participants[15] – the best attendance in the conference's history. Yet the inaugural USGBC expo, held that fall in Austin – two years after LEED was introduced – drew more than 4000 attendees. GreenBuild 2005 was attended by close to 10,000.[16]

The effects of LEED have been felt beyond the strict confines of the building industry, by other participants in the systemic context of building. Some financial institutions are recognizing LEED as contributing to qualification for preferable, 'green' financing products.[17] Increasingly, government agencies are incorporating requirements and incentives for public projects to achieve LEED certification.

innocentive.com (framework)

InnoCentive is an online, incentive-based initiative created specifically for the global research and development (R&D) community. It offers companies an opportunity to increase their R&D potential by enrolling as a "Seeker," posting challenges to a confidential online forum, and gaining access to leading scientific minds.

InnoCentive has established relationships with several dozen Seeker companies representing billions of dollars in annual R&D budget, including Dow Chemical, Eli Lilly and Company, Boeing, BASF, and Procter & Gamble. InnoCentive's expert community of problem solvers includes more than 85,000 scientists and scientific organizations located in more than 175 countries.

The Seekers get their problems posted to a global community of research scientists, and then pay for the solutions to problems that are judged "the best." The solution Seeker pays InnoCentive for this service and problem formulation expertise. An InnoCentive Challenge is a unique scientific problem that is posted by Seeker companies looking to find the "best" solution for their problem. If a solution is selected as "best" by the

Seeker company, the Solver receives a financial award, which varies per InnoCentive Challenge.

InnoCentive was launched in 2001 as a business venture incubated through the e.Lilly division of Eli Lilly and Company. Between its launch and January 2006, InnoCentive has hosted hundreds of challenges, approximately 65 of which have been solved successfully, resulting in nearly 100 awards given from Seeker companies to Solvers. As of January 2006 there were nearly 50 open challenges in the fields of chemistry and biology.

As a neutral forum rather than a formal organization of scientists, InnoCentive offers only a framework within which problems can be outlined and solved – establishing the conditions for changing the way scientific research and development happens. It aims to create a previously inaccessible level of problem-solving diversity and risk management in R&D.

cleanGredients[18] (framework)

GreenBlue is currently leading a project that will create a framework for shifting the direction of industrial and institutional cleaning product development toward products that are benign with respect to human and ecological health and safety. The Design for the Environment Green Formulation Initiative for Cleaning Products was launched in September 2004 with a collaborative agreement between GreenBlue and the U.S. EPA's Design for the Environment Program. The project is a multi-stakeholder coalition of participants from government entities, environmental organizations, industry associations, cleaning product formulators and distributors, and chemical manufacturers and suppliers.

As part of the DFE Green Formulation Initiative for Cleaning Products, CleanGredients™ is being developed as an online database of institutional and industrial cleaning ingredients – a one-stop shop for green formulation. The database will enable formulators to identify preferable ingredients while also enabling suppliers to showcase innovative, new ingredients, helping to foster a marketplace of information and product that will improve the

health and quality of the cleaning products industry while decreasing the level of inherent hazard at a systemic level.

CleanGredients is designed to build on current momentum and the needs of the marketplace. Many in the cleaning products industry are working to meet the demand for cleaning products that contain healthy and safe ingredients. But formulators do not have reliable, up-do-date information about new "green" ingredient chemicals, and chemical suppliers do not have a standard format to describe the "green" advantages of newer, safer, healthier ingredient chemicals. CleanGredients addresses this problem by providing a database designed to showcase preferable solutions instead of identifying "bad" chemicals, and by working in partnership with the broad coalition of stakeholders who have worked together to identify the key criteria that will drive the project.

CleanGredients is designed to serve formulator needs for more environmentally friendly ingredients while showcasing and helping to market such ingredients for suppliers. The database includes data on

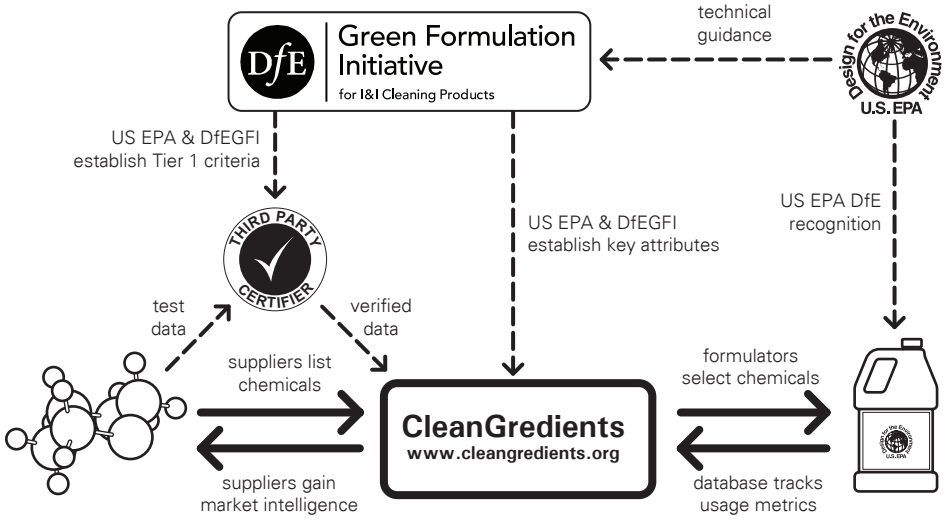


Figure 10. *CleanGredients*
CleanGredients aligns suppliers' and formulators' incentives to encourage the design of better chemicals and products. Whereas other resources tend to focus on identifying bad chemicals, CleanGredients provides helps to identify preferable alternatives, with criteria confirmed through a genuine consensus process, and key data third-party verified by the US EPA Design for Environment program.

relevant environmental and human health attributes, with key data third-party verified by the Design for Environment Program. CleanGredients also provides supplier contact information and links to websites, material safety data sheets, technical fact sheets, and more.

The database aligns broad environmental and human health goals with the cleaning product industry's business objectives and will support formulators in formulating products with human and environmental health benefits, whether to meet corporate internal objectives, more stringent regulations, voluntary product recognition programs or national and international eco-labels. The unique CleanGredients approach and the powerful, flexible architecture of the database have generated enthusiasm among industry and NGO's alike as a prototype for application in other sectors, with immediate opportunities available in textiles, fragrances, and cosmetics.

Notes

1 www.orsolutions.org

2 www.cisaustin.org; www.leadertoleader.org/innovation/innovation/innovation.asp?innov_id=75

3 www.sustainablepackaging.org

4 www.sustainablepackaging.org/about_sustainable_packaging.asp

5 www.grameen-info.org

6 www.oneworldonepeople.org/articles/World%20Poverty/Grameen.htm

7 http://uncdf.org/english/microfinance/facts.php; Maria Otero, "The Future of Microfinance: Creating Financial Systems to Serve the Poor Majority," speech delivered 11March 2005 at the Economic Self-Reliance Conference, Brigham Young University, Provo, Utah.

8 www.kickstart.org

9 "Are You Being Served?" *Economist*, April 21, 2005

10 Personal communication, John Forgach, ForestRe Holdings UK, Ltd, January 2006.

11 www.epa.gov/airmarkets/capandtrade/

12 Dallas Burtraw, "Innovation Under the Tradable Sulfur Dioxide Emission Permits Program in the U.S. Electricity Sector," Resources for the Future Discussion Paper 00–38, September 2000. (www.rff.org)

13 www.usgbc.org/LEED

14 Personal communication with Dara Zycherman, USGBC LEED Program Coordinator, November 2005

15 www.greenatworkmag.com/gwsubaccess/02julaug/happenings_ed6.html

16 USGBC press release, 15 November 2005. (www.usgbc.org/News/usgbcnews_details.asp?ID=1944&CMSPageID=161)

17 Enterprise Housing Financial Services Inc. requires the inclusion of at least one LEED Accredited Professional (or similarly qualified 'green building' specialist) in order to meet its Green Communities Underwriting Criteria for its Predevelopment or Early Predevelopment Loan Products. (www.enterprisefoundation.org/resources/green/about-essentials-loans.asp)

18 www.cleangredients.org

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