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# The Policy-Science Nexus: An Area for Improved Competence in Leadership

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## Abstract

*It is a fantastic experience to understand basic principles for worthy goals together—across disciplinary, professional, and ideological boundaries—and to realize that we need each other in order to attain those goals. Conversely, it is sobering that so few of our leaders know how to build full sustainability into their decision making, and to shape their analyses, debates, action programs, stakeholder alliances, economies, and summit meetings accordingly. That deficiency is reflected in the questions put to scientists, who are often caught in the middle of conflicting policy proposals. On such occasions, empirical facts may be presented out of context and applied as arguments for alternative solutions: for or against the rapid phase-out of fossil fuels, for or against nuclear power, etc. This results in attempts to deal with one issue at a time, often creating a new sustainability problem while “solving” another. Strategic planning toward sustainability is not something that you simply pick up as you go along, if only you are sufficiently engaged in public debate, have a certain field of expertise, or remain faithful to a certain ideology. What is needed today are decision makers who are open to learning the crucial competence of strategic planning and the language that goes with it—a language that makes multi-sectoral collaboration possible at the scale required for success. Only then can leaders make their leadership relevant, cooperate effectively across discipline and sector boundaries; and only then can they ask the relevant questions of scientists and other experts. This is not incompatible with a strong economy or with competitiveness. It is just the opposite: We are now experiencing increasing costs and lost opportunities due to lack of competence in strategic sustainable development. Such competence is not incompatible with the freedom to embrace different values and ideologies, or with the creative tensions that may arise from the confrontation of such values and ideologies with each other. On the contrary, the potential value of creative tensions increases when they are not rooted in lack of knowledge and misunderstandings.*

## Introduction

There is a major problem with the current sustainability discourse between scientists and policy makers. Examples of this are the summit meetings in Rio, Kyoto, Copenhagen, and most recently in Durban, which nearly always involve attempts to move directly from scientific data to policy making without any agreed framework for sustainable decision making in the process. First-rate natural and social scientists in the fields of climatology, ecology, chemistry, economics, etc., typically provide data on negative developments in the socio-ecological sys-

tem, as well as on various possible means to deal with each of those. Policy makers are expected to devise strategies and agreements directly from this information. This article describes how this results in lost opportunities and outlines some basic constituents of a framework that makes it possible to make better use of empirical science.

Absent a generic framework to organize data in a comprehensive way for decision making, complexity increases as more problems are inevitably added and models become unmanageable. This leads to serious risks of misunderstanding each other's individual

frameworks for organizing data, with corresponding risks of also failing to satisfy both common and individual interests relating to sustainable development.<sup>1</sup> Examples of the resulting shortcomings include the following:

1. Failing to see the individual benefits of sustainable development, over and above the collective benefits.
2. Failing to deal effectively with system boundaries and trade-offs.
3. Failing to estimate sustainable resource potentials.
4. Creating a new problem in attempting to solve another.

<sup>1</sup> Blekinge Institute of Technology, Stockholm, Sweden and The Natural Step, Karlskrona, Sweden.

5. Sub-optimizations.
6. Running into expensive blind alleys, i.e., employing expensive measures to improve the current situation without ensuring that the chosen measures can serve as platforms for further progress later on.

The question thus becomes: Is it possible to link sciences to policy in a more effective manner, so that policy makers can make better use of empirical data in arriving at their decisions?

There are two key missing elements in the current discourse on sustainable development. First, there is a poor grasp of the obvious self-benefits of taking the initiative rather than waiting for others to act.<sup>2</sup> Second, once the benefits of being ahead of the game are understood, there is a lack of competence on how to act strategically so as to exploit opportunities in a spirit of enlightened self-interest.<sup>3</sup>

## A New Framework for Leadership and Decision Making for Sustainability

The aim of this article is to supply those two missing elements by outlining a framework for making policy decisions based on empirical data. It is a framework that has been developed in a scientific consensus process that has continued for over 20 years. The process is peer-reviewed and has been applied in practice by political and business leaders in a variety of real-life situations in many different parts of the world.

### *First Missing Element: The Benefits of Strategic Sustainable Development in a Dynamically Changing World*

The benefits to an organization, region, or country in moving gradually toward sustainable practices and lifestyles are typically not understood. Heads of state, mayors, and business executives act as though a competitive edge would be lost if all entities involved do not share the initial costs of developing new and sustainable paradigms and technologies. But has this ever been a winning

strategy in a changing world? Who wins—the last to abandon obsolete paradigms and practices, or those who proactively take the lead in adapting to the inevitable needs of change?

Many leaders may feel intuitively that the assumption of lost competitive edge may be flawed, and that it might be a good idea instead to be a bit ahead of the game and part of the solution—to act in a spirit of enlightened self-interest. That would be the optimal approach for any business or political entity, i.e., acting as a role model for others, not only saying the right things and taking the right actions, but improving on bottom-line financial success in the process. The benefits occur at two levels.

**Common good.** The benefits of sustainable development now seem to be gradually becoming better appreciated, and lack of understanding is perhaps a declining obstacle to international agreements. As noted previously,\* there will be a shared cost to everyone if we continue to lose biodiversity, natural resources, purity of ecosystems, and climate stability; the same applies to loss of trust between people and their leaders and institutions. That part of the discourse is more or less complete, especially in the European Union and China. Clearly, it is to everyone's benefit to develop technologies and policies for the inevitably and abruptly changing conditions in global markets that can already be foreseen. By the same token, it is essential to find ways of financing the transfer of clean technology to developing countries in order to help them avoid repeating our mistakes.

**Self-interest.** However, the corollary as regards to self-interest is not as widely appreciated or understood. It is still the case that leaders are anxiously watching competitors, including other nations, to ensure that the costs for sustainable practices are shared by all. This ignores the fact that the declining resource potential to sustain civilization means that it is a good idea for the bottom line of individual organizations or actors to be *comparatively* proactive.<sup>2</sup>

The gradual loss of social and environmental systems' capacity can be conceptualized as

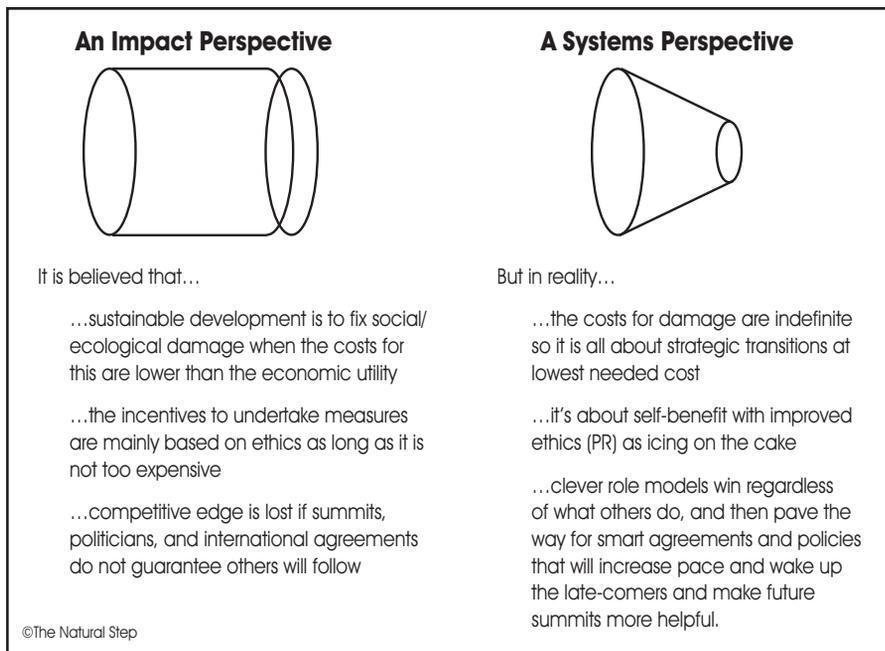
those systems move deeper and deeper into a funnel whose narrowing circumference represents increasingly harsher constraints and smaller degrees of freedom. It follows that the risk of being hit financially by the narrowing walls of the funnel are relatively higher for those organizations whose contribution to the global problem is relatively large, and that the risk is accelerating for those organizations.

Any organization that requires more resources and/or creates more toxic waste per added value, or relies more on unsustainable energy systems with fuel cycles based on larger resource flows (fossil, nuclear, and biofuels), thereby becoming increasingly irrelevant in markets that evolve as a consequence of the funnel, is subject to increasingly larger financial risks than its competitors. Such organizations will increasingly, and in abrupt ways that will be increasingly difficult to foresee, experience harsh financial impacts due to the narrowing funnel. They will encounter higher and higher relative costs for resources, waste management, and insurance, as well as lost market opportunities, lower creativity, etc. The opposite is true for those organizations that are skillfully and gradually becoming part of the solution, developing their practices so that they are moving toward the opening of the funnel, i.e., being ahead of the game.

This emphasis on dynamic aspects is quite different from the traditional approach of sustainable development proponents, who typically stress the public relations value of sustainable development messages for return on investments. But gains from improved PR are merely the icing on the cake. In purely financial terms, they correspond merely to how much extra customers are prepared to pay for products or services provided by "nice" organizations.

Again, the major benefits result from adapting at an early stage to future markets by providing products and services that are sustainably produced and that will help others to be sustainable, while decreasing waste production and saving resources, the costs of which will skyrocket as the funnel narrows.

\*This article is featured as a chapter in the Blue Planet Laureates' collection, Environmental and Development Challenges: The Imperative to Act, which was presented at the 12th United Nations Environment Programme Governing Council meeting, Feb. 20, 2012.



**Fig. 1.** The Cylinder vs. Funnel Paradigm

Unfortunately, top executives in business and government around the world (not least in the U.S. Congress) have been laboring under the flawed assumption of a cylinder paradigm (see Figure 1). That view of the world, one that assumes a basically unchanged system potential, is a crucial barrier to sustainable development, and to relevant international policies and agreements at summits. It has resulted in steadily deteriorating consequences for the world at large; and what is typically neglected is that the deterioration is greatest for those individual organizations, regions, and nations that are relatively larger parts of the problem. How much of the current financial problems confronting many nations are in fact due to previous decisions leading toward the narrow outlet of the funnel rather than to its opening?

For decision makers to get stuck in the cylinder paradigm, or be obligated to congresses or parliaments back home that are stuck in the cylinder, is counterproductive. It backfires collectively, and it backfires in particular on those organizations and nations that hold fast to obsolete mindsets, policies, technologies, and practices. The further civilization moves into the funnel, the less free it will be. To both Democrats and Republicans in the United States for instance, the idea of freedom is a key policy component. But to neglect the consequences of the funnel, while waiting for others to take a lead

to avoid its imperatives, does not promote freedom.

Most likely, the problem is not a result of poor values. It is not about inferior intelligence. It is about incompetence in the face of a paradigm shift, even among very talented people.

### ***Second Missing Element: A Framework To Exploit Strategically the Opportunities of Sustainable Development***

The next hurdle to overcome is how to strategically manage the complex transition, i.e., to gradually prepare for new demands in the dynamically changing markets, and to avoid skyrocketing costs for poor resource management or dependencies on inherently unsustainable technical systems for energy, forestry, fisheries, agriculture, transport, etc.

From the individual organization's point of view, it is necessary to strike a balance so that the transition is, first of all, not so slow that it misses the opportunities offered by the constraining funnel-dynamics outlined above. Secondly, it must not be too fast for maintaining adequate return on investment. It's about surfing on the cutting edge. To do this systematically requires a very clear view of the endgame as well as logical guidelines to get there.

We cannot keep sidestepping the key element of strategic planning, which is to define what we want to be heading toward, the goal, i.e., toward the opening of the funnel. If sustainability is what we want, then a powerful concept of what that looks like must be on the table. Every leader responsible for investments must be able to clearly visualize sustainability, be free to improve upon it, and be engaged to own it as a personal and societal mission.

Further, it must be a comprehensive vision. By piling up ad hoc projects piecemeal, each addressing a separate sustainability thread, we have not been weaving a tapestry that can inspire people everywhere. There should be a clear differentiation between studies of the system within which we act, our definition of the objective of the planning, and the process by which we approach the objective. This has long been known to both military<sup>4</sup> and civil<sup>5</sup> strategic planners. However, the dominant planning method is forecasting in many decision-making settings. Forecasting extrapolates current trends into the future as a means to predict and fix problems.<sup>6-8</sup> This method leads to path dependencies<sup>2,9</sup> and is insufficient to proactively plan toward a novel future objective.

A way to deal with these problems, and approach the more military way of heading toward clear objectives, is called backcasting. It is generally applied in the context of scenario planning, i.e., envisioning a simplified picture of the desired future and then plan—backward in time—to make it possible to get there. Scenario planning has at least four potential shortcomings:<sup>3</sup> First, it may be difficult for large groups to agree on relatively detailed descriptions of a desirable distant future. Second, given technological and cultural evolution, it is unwise to lock into overly specific assumptions about the future. Third, if basic principles for sustainability are not explicit, it is difficult to know whether any given scenario is really sustainable or not. And fourth, a lack of common principles for success also makes it difficult to relate one planning endeavour with another; the process may need to be reinvented from scratch each time.

### **Unifying Framework**

A unifying sustainability framework is already being developed to take the above obstacles into consideration (for references see [www.alliance-ssd.com](http://www.alliance-ssd.com)). Through an

ongoing consensus process between pioneering scientists of many sustainability related methods/tools and concepts,<sup>2,3,6,10-21</sup> policy makers,<sup>22-26</sup> and business leaders<sup>27-35</sup> an overarching framework for strategic sustainable development is emerging. A rapidly growing group of decision makers including hundreds of mayors, CEOs, and other high-level managers across the world are using it to tackle the sustainability challenge.

The framework has been developed first in theoretical science, and then improved in action research with business and municipalities. It is designed to be unifying by placing any organization or planning endeavour (regardless of scale) within a context of global sustainability. It also has a unifying effect by making better use of various tools and concepts for sustainable development. Examples of this include ecological footprinting, management systems, life-cycle assessments, product service systems, value-chain management, modeling and simulation, development of indicators, etc.

To serve such a unifying role, the framework had to comply with the following logical sequence:

1. If you want to be strategic, you must at least know what the objective is.
2. The objective can generally not be defined in detail when it comes to complex systems. "Nobody can look into the future." For complex endeavours in complex systems we need basic principles as constraints for the design.
3. If a set of principles is to serve as a basic and operational definition of an objective, e.g., sustainability, the principles must be:
  - Necessary, but not more than that, to avoid imposing unnecessary restrictions and to avoid confusion over elements that may be debatable.
  - Sufficient, to avoid gaps in the thinking, i.e., to allow elaboration into second and higher orders of principles from a complete base.
  - General, to be applicable in any arena, at any scale, by any member in a team and all stakeholders, regardless of field of expertise, to allow for cross-disciplinary and cross-sector collaboration.
  - Concrete, to actually guide problem solving and redesign and a step-by-

step approach in real-life planning.

- Nonoverlapping, to enable comprehension and facilitate development of indicators for monitoring progress.
4. When you have defined a goal by a set of principles that fulfill such criteria, and only then, can you attain the following benefits:
    - The resource potential becomes calculable. If you do not know how to define the objective, you cannot even attempt to calculate the resource potential and determine the degrees of freedom within the constraints of the objective. But if you do, your planning and decision making can be supported by a scientific estimate of the resource potential (using physics and ecology, for example), rather than being based only on the constraints of current technologies and cultures.
    - Trade-offs can be rationally managed. Advantages and disadvantages often relate to different variables and parameters and come in different units. "Is it better to risk polluting with mercury than to waste energy (as in the case of low-energy light-bulbs)?" Analyzing the either/or of snapshots in the short term has limited strategic value. However, if you know the end goal, you can evaluate various options for their capacity to serve as stepping-stones to bringing the process to a stage where the trade-off does not exist. You model optional routes to complete success, rather than evaluate snapshots at this moment as good vs. bad. If you frame a choice as between plague or cholera, you are likely to get one or the other.
    - System-boundaries setting can be guided by the objectives. Science puts demands on clear and adequate boundaries when systems are studied. Sustainability discourses in an organization often come with debates around where to draw the system boundaries. Trained scholars tend to ask: Do you mean the factory with its walls, or do you include clients... supply chains... other stakeholders... the whole world? The last alternative is often proposed with a little smile, to demonstrate

how unimaginable that would be. Yet, the truth is that when it comes to sustainability, the whole world does count to some extent. Again, basic principles of objectives provide a way forward. You put yourself in the shoes of the CEO or project manager and ask yourself what, in the whole world, needs to be taken into account to make the respective organization/planning region/region support societal compliance with sustainability principles and you let this inform your decision on system boundaries, from geography to disciplines and beyond.

- Interdisciplinary cross-sector cooperation can be better facilitated. With a principled definition of the objective, each expert group becomes better in drawing the relevant knowledge from their respective silos. Again, each sector that needs to be taken into account to comply with the sustainability principles, and the relevant data from each, following the same principles, are brought to the table.
- Unknown problems can be avoided. You can do much better than just fixing the impacts you already know. If you redesign your respective area of responsibility by basic principles that are robust for success, you will not need to learn all the detailed consequences from not doing so. For instance, you can avoid contributing to increasing zinc or silver levels in natural systems without knowing exactly what further increases in such concentrations may imply at certain (unknown) ecotoxic thresholds—just as we should have done, for example, with CFCs from their very introduction, before we learned what they do to the ozone layer. They are relatively very persistent and foreign to nature, so it was inevitable that they would gradually increase in concentrations in the biosphere for as long as they were used in consumer goods. It was clear from the beginning that they did not belong as such in a sustainable society.
- Selection, use, and development of other concepts, methods, and tools can be guided. A principled definition of the objective, fulfilling the

listed criteria, makes it possible to make better use of other existing concepts, methods, and tools for sustainable development by guiding the selection of such concepts, methods, and tools that are necessary for reaching the objective. The framework is applied to display the gap of an organization to comply with the basic sustainability principles, action plans are put forward to bridge it, and the appropriate tools and concepts to monitor the bridging are chosen. It can also help identify a need for development, and it can guide such development of new concepts, methods, and tools.

A framework for strategic sustainable development (FSSD)—including sustainability principles fulfilling the above criteria and thus with the ability of providing the preceding unique benefits (see point 4)—has been developed, scrutinized, tested in reality, refined and scrutinized again in a peer-reviewed scientific consensus process that has continued for over 20 years. The FSSD helps to merge seemingly impossible-to-merge polarities into unity: big picture with small picture, long term with short term, ethics with money, and sectors and disciplines with each other.

The major intellectual contribution of FSSD is not only the sustainability principles—those are under continuous scrutiny and refinement in peer review. The major contribution is the concept of “Backcasting from Principles.” Since there are myriad possible sustainable designs of human society, sustainability must be defined by principles. Once that idea is understood, that is, the rationale for “Backcasting from Principles,” we need principles that are necessary, sufficient, general, concrete, and nonoverlapping. It may be theoretically possible to create other principles that carry those characteristics, but thus far, the above-noted sustainability principles are the only ones that are designed for this purpose.

## The Economic Imperative and the Lack of Clear Vision

The most urgent challenge is to arrive at a critical mass of leaders in line with the above, who master the logistics of putting basic principles of sustainability on the table and then asking questions about alternative

The FSSD is structured in five levels, each of which is “cut” along the dimension of what we want in the system, i.e., the second level of the framework, the principled vision (including the sustainability principles). The five levels are described briefly as follows:

1. **System.** The global socio-ecological system (society within the biosphere) including laws of nature, the biogeochemical cycles of nature and, integrated in this system, the global social system, and, integrated in this system, the respective organization, region, or planning activity.
2. **Success.** Basic principles of sustainability for all of civilization, plus the organization/region/topic reaching its goals without contributing to violation of the basic sustainability principles.
3. **Strategic Guidelines.** Backcasting from the above image of success, i.e., envisioning it, and then drawing the right strategic conclusions backward in time from this image; logical guidelines for step-wise transitions between current challenges and future opportunities.
4. **Actions.** Actions put into a plan that help move the organization/region/topic toward its sustainable vision.
5. **Tools.** Tools used to help planners explore actions (4) to be strategic (3) to arrive at the objectives (2) within the system (1).

The current formulation of the sustainability principles (level 2) is as follows:

In the sustainable society, nature is not subject to systematically increasing

1. concentrations of substances extracted from the Earth’s crust,
2. concentrations of substances produced by society,
3. degradation by physical means, and
4. in that society, people are not subject to conditions that systematically undermine their capacity to meet their needs.

Furthermore, an organization can translate the sustainability principles to its own ultimate objectives in order to eliminate its contribution to:

1. systematic increases in concentrations of substances from the Earth’s crust,
2. systematic increases in concentrations of substances produced by society,
3. systematic physical degradation of nature, and
4. conditions that systematically undermine people’s capacity to meet their needs.

Guidelines on how to put each of the basic principles into operational practice include:

1. Certain minerals that are scarce in nature can often be substituted by others that are more abundant. And it includes using all mined materials efficiently, and systematically reducing dependence on fossil fuels and nuclear power.
2. Certain persistent and unnatural compounds can often be substituted by others that are normally abundant or break down more easily in nature. All substances produced by society should be used efficiently.
3. Resources should be drawn only from well-managed ecosystems. The most productive and efficient use of both those resources and land should be systematically pursued. Caution should be exercised in all modifications of nature, including the introduction of new species.
4. Thought should be given to how our behavior has consequences for people, now and in the future, how it can restrict their opportunities to lead fulfilling lives. The key question is whether we would like to be subjected to the conditions we create.

routes toward that goal, including relevant economic questions.

This is opposed to believing that fixing the myriad problems one by one, e.g., climate change, outside the realm of all the other sustainability-related problems would be a feasible solution. Or to believe that if only knowledgeable enough people meet and share knowledge, collected from their respective silos, the big-systems perspective will take care of itself. Beyond a robust framework for sustainable decision making, large enough in time (backcasting) and scale

(all of civilization), the big picture of sustainability and sustainable development has not, and will not, take care of itself.

One example of what may otherwise happen is that biofuels sourced from cropland to help curb fossil CO<sub>2</sub> emissions (first sustainability principle) may lead to increased food prices with serious implications for social sustainability (fourth principle), thereby delaying adequate system-level solutions to climate change. Another well-known example is the change from ammonia to CFCs to get rid of a highly irritating

gas, only to discover that we had developed a life-threatening problem at the global level (violating the second sustainability principle). Or to believe that some silver-bullet modification of the economy would possibly lead to sustainability, over and above effective leadership, with its demands for adequate means, of which the economic system is but one.

The common discourse of searching for silver bullets in the economic system is in itself evidence of our era's lack of competent leadership. We have become so accustomed to the lack of clear and robust sustainability visions amongst our leaders, who have focused too strongly and too long on the short-term economy with its growth imperative, that the current costs for this are already exploding, still without the right systems-derived conclusions being drawn.

Economic growth, i.e., increased (Gross National Product) GNP, could be a nice means for achieving some worthy goal, but is certainly not a goal in itself. Scientific research and actions for completing/modifying our economic system are needed. Relevant questions to ask are: How can our present economic system be used more effectively to bridge the gap to sustainability? How could we complete/modify the economic system such that it would even more effectively empower the proactive leaders to harvest all the sustainability driven opportunities and to wake up the latecomers?

## A Research Alliance for Strategic Sustainable Development

A research alliance has been established for more effective cooperation across silo boundaries. The objective of a new research alliance will be all about inspiring change, with examples set by competent and successful role models, and to help them cooperate effectively across value chains and sectors and regions and nations (see [www.alliance-ssd.com](http://www.alliance-ssd.com)).

A model for such systematic cooperation has already been tested in cooperation with five Swedish agencies in a three-year research program called Real Change (see three-year report on [www.alliance-ssd.org](http://www.alliance-ssd.org)). The program is based on all scientists and

practitioners sharing the framework for the approach outlined above, the FSSD. We have seen, and published, reports on several examples of how leaders inspired by their acquired competences first begin developing step-wise industrial and governance models toward the full scope of sustainability, and then turn to politicians to suggest higher taxes (e.g., Electrolux concerning heavy metals in batteries, and OK Petroleum asking for higher tax on petroleum), tougher legislation (e.g., IKEA asking for harsher legislation than the EU Reach protocol on chemicals), or develop CO<sub>2</sub> labeling of their consumer goods and suggesting that this become the norm (e.g., Max Hamburgers (Sweden)).

The objective of the alliance is to scale up this model, i.e., to increase the number of leaders in business and municipalities across the globe who share the FSSD, and to empower them with the research they need to: a.) create an arena for active modeling and problem solving across borders of disciplines, sectors, value chains, regions, and nations; b.) develop and test FSSD tools that are adequate for analyses, envisioning, planning, decision-support, monitoring, modeling, simulation, and communication in relation to global sustainability; c.) create a growing database of case studies of best practices; and d.) widely disseminate the results of those efforts in order to influence change through successful role models.

It is a fantastic experience to understand basic principles for worthy goals together—across disciplinary, professional, and ideological boundaries—and to realize that we need each other in order to attain those goals. To make that happen, we must first understand that unsustainability is the greatest challenge that humanity has ever faced. Second, we must fully grasp the benefits to ourselves of being proactive. Third, the leaders of our era need to learn the competence of how to move strategically toward sustainability—step-by-step, while ensuring that each step moves in the right direction, can be further developed later on, and will generate enough income to sustain the transition. Effective policies, adaptations of the economic system, and constructive decisions made at summits—all these rely on a build-up of sufficient numbers of leaders with this competence in policy and business.

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The Blue Planet Prize—often deemed the Nobel Prize for the environment—is an award presented to individuals or organizations worldwide in recognition of outstanding achievements in scientific research and its application that have helped provide solutions to global environmental problems. The Prize is offered in the hopes of encouraging efforts to bring about the healing of the Earth's fragile environment.

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