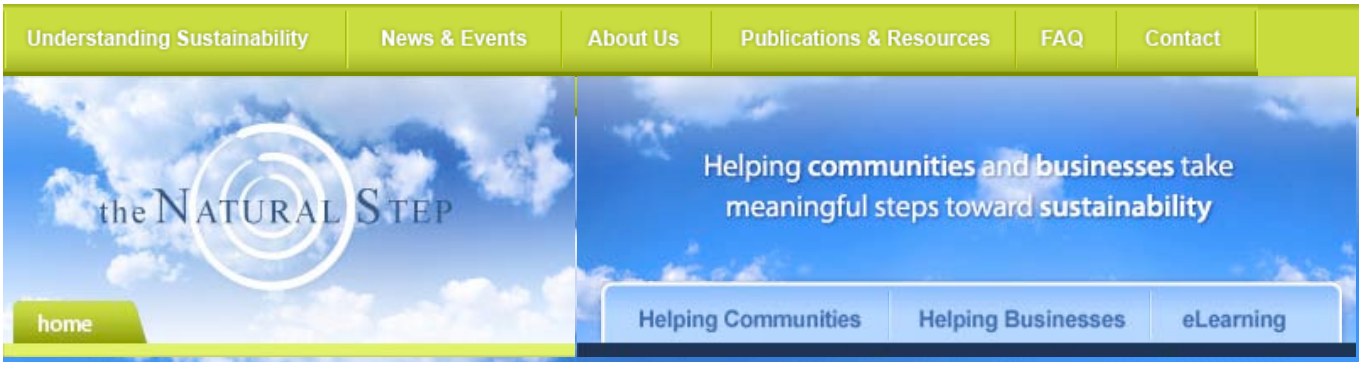


The Natural Step Framework

The Natural Step Framework is a methodology for successful organisational planning. It is based on systems thinking, recognizing that what happens in one part of a system affects every other part. We begin by understanding the broader system within which problems occur and the principles governing success within that system These principles for success then provide a practical set of design criteria that can be used to direct social, environmental and economic actions, developing effective, durable solutions to the environmental, social and economic issues of the new century.

The Natural Step framework provides a shared mental model, understanding, and common language that facilitates cooperation across organisations, disciplines, and cultures. It encourages dialogue, consensus-building and incremental change - key processes of organisational learning - and creates the conditions for significant change to occur.

From a decision-making perspective, The Natural Step framework is used as a planning tool to enable communities and businesses to profitably integrate environmental and social considerations into strategic decisions and daily operations.

The Natural Step framework complements other environmental tools and approaches such as life cycle analysis and ISO 14001 by providing a context and strategic vision that makes them more effective.

The TNS Framework has three main components:

The Funnel

The Natural Step uses the metaphor of a funnel to help us visualise the economic, social and environmental pressures that will inevitably impinge on society as natural resources continue to diminish and population grows.

System Conditions

The Natural Step's principles of sustainability define the conditions that must be met in order to have a sustainable society. These four System Conditions are the core of the Natural Step's sustainability framework. Their precise wording reflects a system-level understanding of how the Earth functions.

Implementation Methodology

How can the system conditions be applied to an organisation's everyday operations? The Natural Step has developed and tested an ABCD approach to help complex organisations to incorporate sustainability into their strategic planning and decision-making processes. It includes Backcasting - framing goals with regard to a desired future outcome - and systematic step-by-step implementation, that provides benefits in the short-term, while retaining a longer term perspective.

More about the TNS Framework:

Basic Science The basic science behind The Natural Step framework.
An organisation's sustainability objectives
Benefits of Implementing The Natural Step framework

The Four System Conditions

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, in that society...
4. people are not subject to conditions that systematically undermine their capacity to meet their needs.

System Conditions

Sustainability is fundamentally about maintaining life on earth and the ecosystems required to support it. Thus, addressing human needs is a basic element of creating a sustainable society. Therefore, meeting human needs worldwide is one of the four TNS system conditions.

The other three system conditions focus on interactions between humans and the planet and are based on an understanding that contemporary life is fundamentally supported by natural processes, such as the capturing of energy from the sun by photosynthetic organisms and the purification of air and water. These processes are essential to maintaining human life. However, as a society we are systematically altering the ecosystem structures and functions that provide life-supporting services.

Based on this understanding, The Natural Step system conditions are supported by the knowledge that ecosystem functions and processes are altered when:

Society mines and disperses materials at a faster rate than they are redeposited back into the Earth's crust (examples of these materials are oil, coal, and metals such as lead);

Society produces substances faster than they can be broken down by natural processes, if they can be broken down at all

(examples of such substances include dioxins, DDT, and PCBs); and,

Society extracts resources at a faster rate than they are replenished (for example, overharvesting trees or fish), or by other forms of ecosystem manipulation (for example, paving over fertile land or causing soil erosion).

By considering these three ways in which human life-supporting structures and functions are being altered, The Natural Step has defined three basic principles for maintaining essential ecological processes. The Natural Step also recognizes that social and economic dynamics fundamentally drive the actions that lead to ecosystem changes. Therefore, the fourth system condition focuses on socio-economic dynamics in terms of the importance of meeting human needs worldwide as an integral and essential part of sustainability.

System Condition Resources

Download the following files to learn more about the system conditions:

A Deeper Look at System Condition 1 (PDF 364KB)
A Deeper Look at System Condition 2 (PDF 376KB)
A Deeper Look at System Condition 3 (PDF 372KB)
A Deeper Look at System Condition 4 (PDF 364KB)

For a more detailed look at the System Conditions we also recommend 'Seeding a Quiet Revolution, the Story of The Natural Step', by Dr Karl-Henrik Robèrt, 'Dancing With The Tiger: Learning Sustainability Step by Natural Step' and 'The Natural Step for Business: Wealth, Ecology, and the Evolutionary Corporation' by Brian Nattrass and Mary Altomare. The Nattrass and Altomare books provide clear descriptions of The Natural Step system conditions, as well as case summaries of organisations using The Natural Step sustainability principles in their strategies for achieving sustainability. These books are available at many bookstores and through our website.

See our resources page for a complete list of academic papers, books, theses and articles written on The Natural Step and The Natural Step sustainability principles.

next

A DEEPER LOOK AT
system condition One

A number of individuals and organizations have asked for a deeper explanation of The Natural Step system conditions and specific examples of how they are being applied. In response, we will offer an exploration into each system condition in upcoming issues of TNS newsletters, beginning with this piece on system condition one.

The Icon

As part of the new TNS identity system, we designed abstract icons to represent each of the four system conditions.

1. Substances from the earth's crust must not systematically increase in the biosphere.

The pointed diamond shapes of the icon for system condition one suggest toxicity. These shapes "rise upward" or "percolate" and grow denser near the top. This configuration can represent the mining of minerals and heavy metals, the pumping of oil and gas, or the exhaust from a smoke stack.

- by Brian Dougherty,
Celery Design Collaborative

SYSTEM CONDITION ONE

By Jill Rosenblum

What is system condition one (and why)?

Substances from the Earth's crust must not systematically increase in the biosphere.

This means that in order for a society to be sustainable, the balance of flows between the ecosphere (living organisims and the physical systems with which they interact) and the lithosphere (the earth's crust) must be such that concentrations of substances from the lithosphere do not systematically increase in the whole ecosphere, or in parts of it. Why not? Over billions of years fossil fuels, heavy metals and minerals were sequestered into the earth's crust (the lithosphere) and nature has adapted to specific amounts of these materials. Mining and burning fossil fuels release a wide range of persistent substances into the ecosphere that build up and spread. Current living systems are not equipped to handle magnified amounts of lead, mercury, radioactive materials, and other hazardous compounds. Consequently, when humans support a systematic increase in the concentration of matter that is introduced into the biosphere from the lithosphere we risk destroying the functions and biodiversity of the ecosphere. The basic science behind this reasoning follows that:

1) Nothing disappears. According to the First Law of Thermodynamics and the Principle of Matter Conservation, matter and energy cannot be created or destroyed.

2) Everything spreads. Due to the Second Law of Thermodynamics, matter and energy tend to disperse. Thus, eventually, all matter introduced into society will be dispersed into natural systems.

The Science Logic

Dr. Karl-Henrik Robèrt, Chairman and Founder of The Natural Step, and John Holmberg, Ph.D., a physicist and Assistant Professor at the Institute of Physical Resource Theory in Sweden, explain: the first system condition states that the flow of materials between the lithosphere and the ecosphere must remain in balance, that is, substances from the lithosphere must not systematically increase in the ecosphere either overall or in parts. People can alter this natural balance at many stages: from the initial choice, quality, and quantity of mined materials, down to societies' technological ability to safeguard the balance through recycling and reuse of a given substance. What concentrations are finally acceptable depends on how "ecotoxic" a material is. Ecotoxicity must be measured both as the directly harmful effects on people and harm to the larger environment. However, because of the complexity of the ecosphere, ecotoxic effects are often not discovered for years, if at all, making it very difficult to predict what concentrations of a given material will lead to unacceptable consequences. In some instances increases in a material may have a positive effect at first, only to be followed by problems as concentrations increase. In many cases the acceptable concentrations have already been exceeded. This leads to a general rule: Do not allow human activities to cause deviations from the natural balance that are large in comparison to natural fluctuations. In particular, such deviations should not be allowed to increase systematically. Therefore, the minimum that must be achieved is a stop to these systematic changes. [1]

The Realities

Today we are living in a fossil fuel-based society and are largely dependent upon mining operations for energy, transportation, and a multitude of natural resources. At the same time, mining operations threaten national parks, require massive amounts of energy and chemicals that leak into groundwater, produce radioactive waste and noxious emissions, and can even displace communities. Mining and burning fossil fuels generate unsafe levels of many different pollutants causing acid rain, smog, ozone depletion, and global climate change, and contribute to environmental health problems such as learning disabilities, feeble immune systems, asthma, cancer,

SYSTEM CONDITION ONE (cont'd)

and developmental problems. For example, in 1998 the federal Centers for Disease Control and Prevention issued a report stating that 4.4 percent of American children (890,000) between the ages of 1 and 5 have toxic levels of metal lead in their blood. Toxic levels, or what the report calls "levels of health concern," mean generally that the children affected are developing with a diminished intellectual capacity, reducing their IQ and mental abilities. [2]

It is no secret that society's dependence on mined materials is becoming increasingly risky from both an economic and an ecological perspective. Consumers and political systems are favoring investments in renewable energy and energy-efficient technologies, while companies are experiencing a changing market place and being held accountable for their impact on the environment. In addition to stricter legislation and heightened public awareness, the "polluter pays" principle is showing up today in insurance and financing costs. For example, a commercial research center in the United Kingdom recently released a report suggesting that changing climate patterns are causing more frequent and fierce natural disasters. One "reinsurance" firm included a study that compared the scale and cost of natural disasters in the 1960s with those of today. The results show that natural catastrophes have tripled in number and are costing the industry fifteen times more than they did thirty years ago. [3]

In the words of Karl-Henrik Robèrt, "Being highly dependent on mined materials, or structures dependent on those, and defending this position in terms of 'lack of proof regarding how dangerous the increasing green house effect is, or how dangerous it may become, is like sitting in a car, driving full speed ahead knowing all the while that there is an abyss up ahead. Unfortunately, you don't know if it's 50 miles ahead, 500 miles ahead, or 5,000 miles ahead. It's misty and dark. What do you do? Do you brake the car and think? Or do you continue on at fullspeed, thinking about how comfortable it is in the car?"

Steps Companies Are Taking Today

There are three areas in particular where companies are looking at system condition one: transportation, energy, and metals.

TRANSPORTATION

Interface, Inc., is shipping by transcontinental rail, changing packaging so products weigh less, manufacturing closer to its customers, and moving information instead of matter. The company is also investigating the option of solar-powered transportation. **McDonald's Sweden** is locating warehouses closer to the stores and production closer to the raw material source. For example, McDonald's Sweden has located processing operations for french fries close to the potato fields. **Scandic Hotels** is working with suppliers to reduce packaging and increase the energy efficiency of the delivery of goods and services to the hotels. In addition, many of Scandic's hotels now provide bicycles for their guests. **Interface** and **IKEA** are increasing their use of teleconferencing in order to reduce the amount of personnel travel.

ENERGY

At its operations in Almhult, Sweden, **IKEA** is researching ways to have the south wall of every new IKEA store constructed with solar panels. Approximately 10 percent of the total energy needed in the Almhult retail store building, which also houses its global computer center, is solar-generated on the building itself. At **Interface, Inc.**, energy derived from non-renewable sources is counted as waste in its "War on Waste." The strategy is to reduce energy consumption as much as possible and to use the savings to explore alternative energy solutions. Interface is working toward the

Funnel Facts

The following information relates to system condition one and can be used by individuals to enhance presentations about The Natural Step framework.

In the 1950s there were 50 million cars on the planet. Today there are 500 million. *Earth Island Journal (US), Spring, 1997; Ethical Consumer(UK), Feb./ March, 1997.*

The world consumes 23 billion barrels of oil a year, but the oil industry finds only 7 million new barrels per year. *Earth Island Journal (US), Spring, 1997; Ethical Consumer (UK), February/ March, 1997.*

The world's car population is increasing five times as fast as the human population. *Earth Island Journal (US), Spring, 1997; Ethical Consumer(UK), February/ March, 1997.*

Cars currently consume half the world's oil and create nearly one fifth of its greenhouse gases. *Earth Island Journal (US), Spring, 1997; Ethical Consumer (UK), February/ March, 1997.*

The USA, with less than 5 percent of the world's population, consumed 25 percent of the oil used in 1997. *Vital Signs, 1998 by Lester R. Brown, Michael Renner, Christopher Flavin/WorldWatch Institute; Published by W.W. Norton & Company, 1998.*

The chance of developing silicosis, a virulent form of black lung, after 20 years of working at a strip mine is 61 percent. *The Courier-Journal, April 19-26, 1998, "Dust, Deception, and Death: Why Black Lung Hasn't Been Wiped Out" reprint.*

Steps Companies Are Taking Today (cont'd)

day when it will produce a "solar-made" carpet. At the Canadian Interface plant in Belleville, Ontario, the company is currently contracting with Ontario Hydro to receive energy from renewable sources. **Sanga Saby,** a Swedish conference center, uses solar-based energy generation to heat its saunas and swimming pool, uses rapeseed oil to run its farm equipment, and overall gets its energy primarily through geo-thermal sources, using the temperature differentials in Lake Malaren to produce energy.

METALS

Because of copper leakage evident in some areas of the country, **McDonald's Sweden** is replacing copper pipes with recycled plastic water pipes in the construction of new buildings. **McDonald's Sweden, Sanga Saby,** and **Scandic Hotels** are all using more organically grown products (vegetables, meat, milk) in their restaurants in order to reduce fertilizer use. **IKEA** is eliminating lead, cadmium, and chrome from their products and using recycled or recyclable metals wherever possible in their products. To help create a flow balance to offset the mercury in their low-energy light bulbs, IKEA is taking back used fluorescent light bulbs and recycling them in order to capture the mercury they contain and keep it from going to landfills. Both **Scandic Hotels** and **Sanga Saby** collect batteries from their guests for recycling.

[1] Robèrt, Karl-Henrik, Azar, Christian, and Holmberg, John, 1998. "Fossil Fuels and Corporate Economic Risk Assessment."

[2] Environmental Research Foundation, Rachel's Environment and Health Weekly, #63, Jan. 1999, "Lead in Children: Old Story, New Data." www.rachel.org

[3] Benfield-Greig Hazard Research Centre, Environmental Data Service, ENDS Daily, Jan. 1999, "Insurers Count Costs of Climate Change." www.ends.co.uk

A DEEPER LOOK AT
system condition two

The following article is the second piece in a continuing series that explores each of the four Natural Step system conditions in greater depth. The Natural Step system conditions are principles for sustainability. They define a favorable outcome, namely, sustainability in the ecosphere. The system conditions meet this goal by taking advantage of the fact that the ecosphere (living organisms and all the physical systems with which they interact) itself is sustainable, if humans stop destroying it. The system conditions can be concisely stated because, while the ecosystem is very complex, there are only a few general ways that people destroy it. Each system condition complements the others, covering a specific area of concern that is necessary, but not sufficient on its own. Only when all the system conditions are met, can sustainability be achieved.

The Icon

The icon for the second system condition,

substances produced by society must not systematically increase in the biosphere,

suggests a downward spiral of substances settling, such as airborne pollutants returning to the earth's surface or chemicals going down the drain. The increased density toward the center of the mark represents accumulation -- of endocrine disrupters in our bodies, plastics in our landfills, and a myriad of other synthetic and persistent compounds in the biosphere.

- by Brian Dougherty,
Celery Design Collaborative

SYSTEM CONDITION TWO

By Jill Rosenblum

What is System Condition Two and Why?

Substances produced by society must not systematically increase in the biosphere.

This means that in order for a society to be sustainable, the production and accumulation of human-made substances must not happen faster than they can be reintegrated back into natural cycles, assuming they can be assimilated by nature at all. The focus here is on reducing our dependence on synthetic materials by using safe, biodegradable alternatives which can be reintegrated into natural cycles, as well as decreasing the amount of waste generated by society in general. Why? First, as with system condition one, the earth has a limited capacity to assimilate waste and the sheer volume of material and naturally occurring compounds produced by humans today is building up at a rate that far exceeds the earth's capacity. Second, nature has no experience with the synthetic compounds humans are introducing and often has no way of breaking them down in order for them to be reintegrated into nature. As a result, it is often impossible to predict the consequences or locate the cause and effect linkages between generating synthetic materials and negative public and environmental health impacts. Even in the rare cases where it is possible to identify the problem source, the damage done is often irreversible or may take long periods of time to rectify.

The only way to avoid continually using band-aid solutions, stressing living systems to the point of degradation, and guessing as to the negative impacts of creating and using synthetic compounds, is to look upstream and understand basic sustainability principles. One telling example is that of persistent organic pollutants (POP's), a specific class of non-biodegradable, human made compounds that have widespread negative impacts on people and other living systems. Once produced, POP's disperse, accumulate in the fatty tissues of humans and animals, magnifying in effect as they move up the food chain, combine with other POP's, and disrupt biological functions. Furthermore, because it can take years for measurable effects and changes to occur, and because we have only begun to recognize what needs to be measured to assess the effects of POP's, the causal links between health risks and exposure to POP's (not to mention multiple exposures and the interaction of POP's and POP's impacts with one another), is difficult or impossible to prove. As a result, the public is often unaware of the consequences and generally uninformed.

The Realities

Rachel Carson once commented on our toxic legacy: "The most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials…We have subjected enormous numbers of people to contact with these poisons, without their consent and often without their knowledge." In just the last fifty years, we have introduced whole new families of toxic materials into the world. Without question we use "antibiotics" in our bodies, our homes, and on our farms to kill undesired life forms -- forgetting that we are also forms of life. In order to kill "insects" and "pests" and "weeds" and "fungi," we manufacture chemicals that nature and living cells cannot assimilate, and then fail to make the connection when we must then inject poison into our bodies to kill the cancer that results. We are living in an era that has been labeled, "the great biological experiment."

One primary reason these new toxic families exist today results from the 'lens' being used to define toxicity, and, thus, "proper" testing mechanisms. The risk/benefit analysis that is weighed, when it's even done, fails to address issues of sustainability. Given that 75,000 synthetic chemicals exist, the task of sufficiently assessing each of their individual impacts on living systems is impossible. Additionally, synthetic compounds are rarely tested in combination as they exist in

SYSTEM CONDITION TWO (cont'd)

human-made products or as they combine when released into nature. These chemicals include dioxins, chlordane, atrazine, carbaryl, trifluralin, lead, polycarbonates, alkylphenols, DDT, and dieldrin, and are dispersed through air, water, and soil.

The value of using The Natural Step framework as a lens is that it provides the linkage between sustainability and design processes, making it clear that the problem is two-fold. First, there is a steady stream of non-biodegradable synthetic materials being produced. Second, even "closed loop" systems are not entirely safe - since in the end "everything spreads." Returning to the POP's example, POP emissions and applications penetrate the food chain at all levels, crossing political and geographical boundaries as the substances bind with soil nutrients and airborne water drops. Even if carefully contained, hazardous wastes eventually leak into groundwater systems, making a strong case for finding benign, biodegradable alternatives. Today, POP's are found in a class of materials we often call "basic human needs" that include food, clothing, detergents, cosmetics, prescription drugs, plastics, paint, car parts, wallpaper, curtains, and carpeting. POP's that aren't built directly into our products can result from production processes, energy conversions, and combustion processes such as medical waste incineration, smelting operations, and power plant emissions. This does not take into account consequences of accidents and/or destrution of chemical factories, as with the recent NATO bombings of chemical factories in Yugoslavia.

Since 1940, the production rates of synthetic petrochemicals has increased from one billion pounds to over 400 billion pounds in the 1980's, the impacts of which include bioaccumulation and cancer.[1] Carol Dansereau points out in her book, The Case for Toxics Reform, that in today's culture it's fitting to say -- you are what you eat...and what your mother ate. For example, research has found that Inuit woman, who live far from any source of organochlorines, have the highest levels of these toxins in their breastmilk, because as they move up the food chain POP's accumulate in fatty tissues, building up over time, and effecting organisms' nervous, immune, and reproductive systems. These 'gender benders' affect humans by impairing reproductive abilities, diminishing intelligence, altering behavior, suppressing immune systems, and they manifest in birth defects and cancer. In unborn babies and children, who are much more vulnerable because of their small size and rapid physical development, toxic exposure is being linked to improper hormone development, autism, attention deficit hyperactivity, and learning disorders. In birds, fish, shellfish, and turtles scientists are seeing a combination of disorders which include thyroid dysfunction, decreased fertility, decreased hatching success, gross birth deformities, metabolic and behavioral abnormalities, demasculinization and feminization of male species, defeminization and masculinization of female species, and compromised immune systems.[2] Because toxins know no boundaries, species are experiencing long-term genetic change. Yet, even knowing all these effects there is still room for endless scientific debate, which is exactly where the TNS system conditions can be helpful in providing a compass for decision-making.

Why System Condition Two Matters

Without a sustainability framework, as provided by TNS, industry has no reliable way of defining their progress toward sustainability and is learning that the economic externalities of violating system condition two can be significant. As the long-term effects of toxic materials continue to surface, it's becoming less possible for businesses to get away with replacing one toxic material with another "less" toxic material. Increasingly, negative health effects from the use of synthetic compounds in products and processes is resulting in tighter government regulations, regulatory fines, potential law suits, higher management fees and clean up costs, and widening press reports about acute environmental destruction. Insurance premium renewals for the petrochemical industry can be fifty times the old rates because of the risk involved with their operations.[3]

Funnel Facts

The following information relates to system condition two and can be used by individuals to enhance presentations about The Natural Step framework.

In 1990, U.S. pesticide manufacturers exported over 465 million pounds of pesticides, and of those, 52 million pounds were banned, restricted, or unregistered for use in the US. *Generations at Risk Report, Physicians for Social Responsibility, www.LAbridge.com/PSR/*

Some pollutants can persist for many years, accumulate in tissues, and concentrate towards the top of the food chain, resulting in the current contamination of essentially every human being including our children with over 250 toxic chemicals. *"Strategy for Eliminating Bioaccumulative Chemicals of Concern: A Proposal for the Department of Ecology," Washington Toxics Coalition, June 1998*

No pesticide is 'safe' because pesticides are, by their vary nature, designed to be biologically active and kill various kinds of organisms. *Nonagricultural Pesticides: Risks and Regulation, United States General Accounting Office Report to Congressional Requesters, Chapter 3, P. 35, April 1986*

In 1998, the United States Environmental Protection Agency published a report stating that 100% of outdoor air in the continental US is contaminated with eight cancer-causing industrial chemicals at levels that exceed EPA's "benchmark" safety standards. *Woodruff, Tracey J. and others, "Public Health Implications of 1990 Air Toxics Concentrations across the United States," Environmental Health Perspectives, Vol. 106, No. 5 (May 1998) pages 245-251*

Twenty million American children age five and under eat an average of eight pesticides every day. *"How 'Bout Them Apples?" Environmental Working Group, Press Release, February 25, 1999*

The average apple has four pesticides after it is washed and cored. Some have as many as ten. *"How 'Bout Them Apples?" Environmental Working Group, Press Release, February 25, 1999*

Typical human breast milk is so contaminated with pollutants that it would fail to meet Food and Drug Administration standards for milk were it subjected to them. *Dansereau, Carol, Poisons in the web of life: The Case for Toxics Reform, Washington Toxics Coalition*

Cancer now strikes one in three, and kills one in four Americans. *Epstein M.D., Samuel S., The Politics of Cancer Revisited, East Ridge Press, USA 1998[1]*

SYSTEM CONDITION TWO(cont'd)

The fact that business is dependent upon chemicals that are gradually getting banned is illustrative of why sustainability offers a strategic competitive advantage.

The Natural Step framework is a powerful strategic tool for industry in that it helps companies avoid costly mistakes, and creates opportunities for innovation and market leadership -- as two of Sweden's leading companies, ICA and Electrolux, found out Back in 1992, ICA, the Swedish chain of grocery stores trained in the principles of TNS, was faced with finding ways to eliminate the use of chloroflourocarbons (CFC's) as insulation and cooling agents in their refrigeration and freezing systems. CFC's are known contributors to ozone depletion and the food retailing industry, the environmental community, and the national press began publicly recognizing this as a major environmental problem. Yet, because ICA does not manufacture these refrigeration and freezing systems the onus was on them to approach Electrolux, their appliance supplier. Initially, ICA's strategy was to invest millions of dollars in new technology produced by Electrolux, which ultimately meant replacing one toxic material with a less damaging, but not less persistent, material. However, using TNS as their compass ICA and Electrolux saw this strategy was not sustainable and decided to gradually phase out the CFC's from their products. With this strategic vision in place, Electrolux became the first in the industry to market a line of refrigerator and freezers void of any CFC's.

Cartoon by John Jonik

The World Looks Upstream

In addition to success stories such as ICA and Electrolux, other groups are seriously considering strategies to further the eventual elimination of POP's. At the Rio Earth Summit in 1992, an agreement was made to address the health risks posed by POP's and in 1995 the United Nations Environment Program adopted a resolution to identify a list of the 12 most dangerous POP's. Consequently, the Intergovernmental Forum on Chemical Safety saw the need for a legally binding global treaty to deal with the risks involved, and convened a group to generate an agreement. The group of roughly 100 different governments intends to complete negotiations by 2000. Additionally, Physicians for Social Responsibility are working with over a hundred NGO's to create an International POP's elimination network. The goal of the network is not to encourage better management but to work toward the total elimination of POP's.[4] In the end, government and industry are slowly learning to look upstream toward solutions and guiding principles such as The Natural Step framework.

[1] Fisher, Marjorie, Editor, "The Politics of Cancer Revisited," NOHA News (Nutrition for Optimal Health Association, Inc.) Winter 1999, vol. XXIV, No. 1, p.1

[2] Colborn, Theo, Dumanowski, Dianne, Peterson Myers, John, Our Stolen Future, Plume/Penguin 1997

[3] Epstein M.D., Samuel S., The Politics of Cancer Revisited, East Ridge Press, USA 1998

[4] Physicans for Social Responsibility Monitor, vol. 13 no. 1, February 1998

Steps Companies are Taking Today

Areas where companies are looking at system condition two include: identifying unsustainable chemicals and usages, reducing hazardous chemical use and phasing out chemicals of greatest concern, developing replacement technologies and products, influencing the supply chain, and cutting down on noxious emissions.

Sånga Säby, a Swedish Conference Center, has reduced their use of hard freons; is reducing the use of chlorine in their swimming pool water treatment system and gradually switching to environmentally friendly alternatives; and reducing raw material costs in their kitchen by increasing the amount of KRAV labeled food they purchase – KRAV is the Swedish ecological produce certification organization.

Interface, Inc., global flooring manufacturer, is challenging suppliers to develop natural fiber products that use industrial hemp, flax, and natural dyes. They are reducing their use of solvents in adhesives, working to ultimately operate within closed-loop industrial production processes, and recently produced their first 100% reusable carpet.

Scandic Hotels, a leading Swedish hotel-chain, is working with suppliers to eliminate the use of unnecessary chemicals such as prompting their linen supplier to stop using chloride bleach and optical brightners in their operations.

IKEA, retail store and furniture manufacturer, has virtually eliminated PVC's in their product lines; is using only chlorine free paper in their operations and no longer contributing dioxin to nearby rivers; and is working with its suppliers to reduce their use of persistent organic chemicals in dyes, wood treatment paints and stains.

Electrolux, one of the world's largest appliance manufacturers, phased out CFC's entirely in a line of freon-free refrigerators/freezers; eliminating air emissions of chemical solvents by using water-based paints; and is reducing their dependence on chemical solvents by developing a water-based dry cleaning technique that uses biodegradable detergent.

Nike, a world leader in sports apparel, is phasing out all PVC use in their products and working with suppliers to assess all of the materials they use to identify non-sustainable chemicals with a goal of removal and replacement.

A DEEPER LOOK AT
system condition three

The following article is the third piece in a continuing series that explores each of the four Natural Step system conditions in greater depth. The Natural Step system conditions are principles for sustainability. They define a favorable outcome, namely, sustainability in the ecosphere. The system conditions meet this goal by taking advantage of the fact that the ecosphere (living organisms and all the physical systems with which they interact) itself is sustainable, if humans stop destroying it. The system conditions can be concisely stated because, while the ecosystem is very complex, there are only a few general ways that people destroy it. Each system condition complements the others, covering a specific area of concern that is necessary, but not sufficient on its own. Only when all the system conditions are met, can sustainability be achieved.

The Icon

The icon for the third system condition:

In order for a society to be sustainable, nature's functions and diversity are not systematically impoverished by physical displacement, overharvesting, or other forms of ecosystem manipulation.

is a broken circle. The pictogram represents the systematic physical destruction that compromises the integrity of the whole.

- Brian Dougherty,
Celery Design Collaborative

SYSTEM CONDITION THREE

By Jill Rosenblum

What is System Condition Three and Why?

In order for a society to be sustainable, nature's functions and diversity are not systematically impoverished by physical displacement, overharvesting, or other forms of ecosystem manipulation.

The third system condition addresses the physical destruction and manipulation of the biosphere, and, consequently, the services nature provides to society. While violations of system condition one and two also impact ecosystem services, system condition three focuses our attention on how we (from the individual to the societal scale) directly interact with the biosphere. This includes activities such as paving over productive bioregions, overharvesting natural resources such as forests and fisheries, and development leading to urban sprawl. It also includes protecting natural habitats, smart growth and supporting sustainable fishing, agriculture and timber harvesting practices.

In her book Nature's Services, Gretchen Daily describes "ecosystem services" as "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life. They maintain biodiversity and the production of ecosystem goods, such as seafood, forage, timber, biomass fuels, natural fiber, and many pharmaceuticals, industrial products, and their precursors." [1]

The following are some of the questions that system condition three raises given our definition of ecosystem services: How fast are forests disappearing and what role does direct, physical deforestation play? What are the state of the world's fisheries and what role has overharvesting or physical destruction of habitat, such as filling in wetlands, played? What is the current situation regarding arable land and topsoil loss and what role do physical actions play, such as erosion due to tillage farming, urban sprawl, deforestation, and increasing population densities? What is the state of world-wide water quality and what role do physical manipulations play, such as altering our natural water system in the western states or over-using aquifers? Are we systematically paving over more than we are conserving— and can we call what we are conserving equivalent to what we are destroying, such as planting trees in a city versus cutting down forests?

System condition three does not proclaim that all of these things are happening. And, like system condition one and two, system condition three is only one part of how people impinge upon the capacity of ecosystem services. According to Dr. George Basile, TNS/US Senior Scientist, “What system condition three does say is that, given that people need the regenerating capacity of the biosphere to survive, if we systematically destroy that capacity via physical means, we do so at our own, and today's biosphere's, peril.” In doing so, system condition three turns our attention to humanity's direct, physical interactions with the biosphere and complements system conditions one, two, and four.

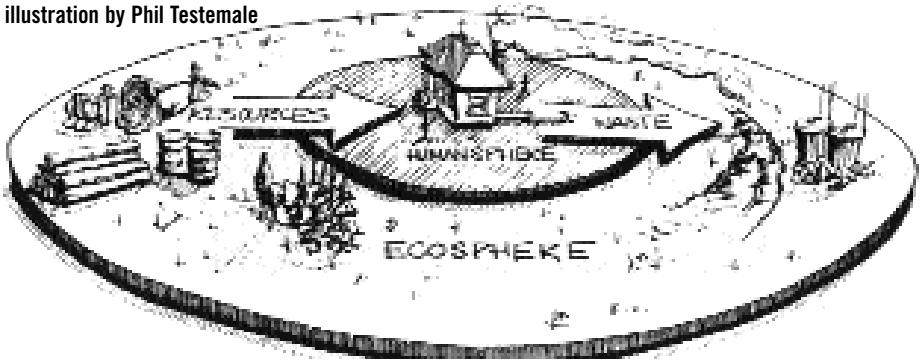
Furthermore, system condition three is focused specifically on safeguarding nature's ability to regenerate. Preserving the integrity of any living system requires first that society understands that what effects one part of a system may ultimately impact the system as a whole. Take the example of soil erosion. Human-induced systemic erosion, such as the potential large-scale loss of topsoil from intensive agriculture, is a direct violation of system condition three. It degrades the quality of the area directly impacted, as well as surrounding habitat such as downstream watershed. On a large scale, erosion can have devastating effects for the species that reside there, and ultimately it decreases the productive capacity of the land. Typical intensive agricultural practices erode three bushels of soil for every bushel harvested, while it takes, on average, two

SYSTEM CONDITION THREE (cont'd)

thousand years to build six solid inches of soil in a wild ecosystem. 3

System condition three provides one of the key lenses through which to assess our activities: Are we physically destroying the biosphere faster than it can regenerate itself? By asking this, system condition three asks us to assess our physical impacts on the level of species, habitat, landscape, ecosystem, watershed, or larger, and to manage our development in a responsible, sustainable way. The challenges and opportunities for society lie in finding ways to reduce our dependence on ecologically destructive practices in order to maintain as much healthy, ecologically productive capacity as possible.

figure 1.1. from Our Ecological Footprint
illustration by Phil Testemale



"We are part of nature. Nature supplies material requirements for life, absorbs our wastes, and provides life support services such as climate stabilization, all of which make earth hospitable for people." 2

The Realities

In 1997, Dr. Peter Raven (Botanist, Scientific Advisory Board TNS/US, Director of the Missouri Botanical Garden and President of the XVI International Botanical Congress) stated, "Over the course of the next century, not even taking into account further population increases or the intensification of human impact on the environment, between 10 and 50 percent of all the organisms on earth are likely to disappear forever." 4

Dr. Raven's statement makes it clear how important it is to change our consumption patterns and industrial practices. Although natural extinction exists, human activity is greatly accelerating this trend as a result of ecosystem destruction and degradation. For example the destruction of rainforests at the present rate is causing species extinction to happen 1,000 times faster than the natural rate. 5

During just the past forty years, erosion has claimed nearly one-third of the world's arable land and continues to affect more than 10 million hectares a year. Once again, natural erosion from wind and water does contribute to these figures. However, the annual rate of natural erosion is approximately .005 tons per hectare of land while erosion resulting from agricultural practices is between 20-40 tons per hectare in Asia, Africa, and South America, and 17 tons per hectare in the US and Europe. 6

According to a report recently released by the American Farmland Trust that analyzed 181 major land resource areas in the United States, 70 percent of the country's superior farmland is in the path of rapid development. In addition, every year a total of 400,000 acres of rural land is developed to build residential and commercial centers. 7

Funnel Facts

The following information relates to system condition three and can be used by individuals to enhance presentations about The Natural Step framework.

Seventy percent of all anti-cancer plants exist only in rainforests, as indentified by the National Cancer Institute, and fewer than one percent of rainforest plant species have been examined for their possible benefits. *--Caufield, Catherine, In the Rainforest, University of Chicago Press, 1986, pps. 218-219.*

Almost half of the marine fish populations in US waters are overfished -- that is, depleted faster than they can replenish themselves. Americans currently import more than 40 percent of the fish they eat, meaning that the US depends on a global seafood population that is in peril. *-- Speer, Lisa et al., "Hook, Line and Sinking," Natural Resources Defense Council, 1997, p. 29 & 125.*

Current fishing practices lead to a waste of about one quarter of each year's catch worldwide, and cause widespread devastation of marine habitat as well as the destruction of hundreds of thousands of "innocent bystanders" such as turtles, dolphins, and seabirds. *-- Speer, Lisa et al., "Hook, Line and Sinking," Natural Resources Defense Council, 1997, p. xi.*

Between 1970 and 1990, almost 20 million acres of rural land were developed nationwide. *-- Greene, Richard P., Russ, Karen and Sorensen, Ann A., Farming on the Edge, American Farmland Trust Center for Agriculture in the Environment, Northern Illinois University, Dekalb, Illinois, March 1997.*

American paper consumption is the highest in the world. On average, each American consumes more than 730 pounds of paper each year, and collectively the US produces and consumes more than 80 million tons annually.
-- Rosmarin, Heather, "The Paper Challenge: How to Have Our Paper and Our Forests Too," Positive Alternatives, Summer 1997.

Only 20 percent of the world's old growth forests remain. *-- Bryant, Dirk, Daniel Nielsen, Laura Tangley, "The Last Frontier Forests: Ecosystems and Economies on the Edge," World Resources Institute, 1997, pg. 9.*

SYSTEM CONDITION THREE (cont'd)

System Conditon Three Applied - a forest example
Industrial applications of system condition three focus on the implementation of sustainable practices with respect to natural resources, specifically, what an ecosystem requires to maintain high levels of productivity and diversity. For example, at Collins Pine Companies, a forest product manufacturer that has been practicing ecoforestry since 1930 and uses the TNS framework (see article on page....), system condition three addresses what you leave in the forest, as opposed to only what you take out, and how the forest works as an ecosystem.

Jim Quinn, CEO of Collins Pine, remarks, "A sustainable forest manager allows the trees to renew themselves. But that is only one part of it. The other side is that while you're managing the forest, you still have a conscious awareness of, and focus on, biological systems and diversity such that you don't take all the trees out at once and deprive everything that lives there of their habitat. So you do a little bit at a time." For the company, this means focusing on the quality of what remains after logging rather than only the quantity of timber logged, harvesting less rapidly than the renewal rate of biomass, keeping all age trees, protecting river corridors, being careful about transportation, and building roads that minimize erosion. This philosophy and methodology has left the company with more standing trees now than when they bought the land.

Examples of Steps Companies are Taking Today
Since 1996, **Sånga Säby** (a Swedish conference center) has been operating on renewable energy. The company has also started a waste initiative with the goal of composting 100 percent of all biodegradable waste generated at the facility, in order to help restore the soil. The waste is separated so that vegetable waste is used in their gardens and organic waste is deposited into a hot compost unit. Plans are underway to develop a "wet compost" to handle human sludge and kitchen waste. In an effort to be the "world's cleanest farmers," the company has acquired 163 hectares of land from the Federation of Swedish Farmers and implemented a new forest-management program that includes a natural/cultural protection plan that excludes nearly 25 hectares of the land from forestry operations.

Collins Pine Companies, a forest product manufacturer, has reduced water usage by 2 million gallons/year by reusing condensate generated in particleboard production to fuel boilers; performed preventative maintenance on 80 steam traps that is saving more than 90 percent of the water used from ending up as wastewater and has ultimately led to a cost savings of $25,000 a year; and learned how to recycle 100 percent of the sander dust used for particleboard production, which has reduced their annual fiber purchase by 14,000 board feet of timber and is saving the company roughly $525,000 a year.

Because approximately 75 percent of the raw material for **IKEA's** products, packaging, and catalogs comes from forests, the company has become actively involved with various organizations in establishing principles for sustainable forestry. It is a founding member of the Forest Stewardship Council and was a member of the working group for the Swedish Forest Stewardship Council criteria. IKEA has dedicated one full-time position to making an inventory of the company's current use of wood, including how much wood they use and from what sources. IKEA's ultimate goal is to use wood products sourced only from sustainably managed forests.

One of **McDonalds Sweden's** main goals is to find more organically and locally grown products. Currently, they serve organic milk in all their restaurants and purchase organic meat as often as possible. (See Spring 1999 TNS/US newsletter for full case study on McDonalds Sweden.)

1 1998, Human Development Report, page 2. New York: United Nations Development Programme.
2 Halweil, Brian and Brown, Lester R., "India Reaching 1 Billion on August 15: No Celebration Planned," Worldwatch News Brief 6-99.
3 Halweil, Brian and Brown, Lester R., " Unemployment Climbing as World Approaches 6 Billion," Worldwatch News Brief 6-99, Part II.

A DEEPER LOOK AT
system condition four

The The following article is the final piece in a continuing series that explores each system condition in greater depth. The Natural Step system conditions are principles for sustainability. They define a favorable outcome, namely, sustainability. The system conditions meet this goal by taking advantage of the fact that the ecosphere (living organisms and all the physical systems with which they interact) itself is sustainable, if humans stop destroying it. The system conditions can be concisely stated because, while the ecosystem is very complex, there are only a few general ways that people destroy it. Each system condition complements the others, covering a specific area of concern that is necessary, but not sufficient on its own. Only when all the system conditions are met can sustainability be achieved.

The Icon

The icon for the fourth system condition -

In order for a society to be sustainable, resources must be used fairly and efficiently in order to meet basic human needs globally.

- illustrates balance and equity. Notably, the peaks and valleys depicted in this symbol aren't extreme and the transitions between them are not steep."

- Brian Dougherty,
Celery Design Collaborative

SYSTEM CONDITION FOUR

By Jill Rosenblum

What is System Condition Four?

In order for a society to be sustainable, resources must be used fairly and efficiently in order to meet basic human needs globally.

"System condition four is essential because we are humans. No humans, and system conditions one, two, and three would likely not be challenged. We are the agents, the ones making choices that are compromising the fabric of life." - Vicki Robin, Co-author, Your Money or Your Life

Simply put, the fourth system condition brings humanity into the planning process from the very beginning. It raises the question, "What happens when you don't meet human needs?" It asks people to examine the extreme inequalities that exist in the world today and the consequences of such. It challenges people to define, for themselves, the concepts of "efficiency" and "enough." It draws attention to the way in which people are using and sharing the earth's limited resources. Most importantly, however, system condition four serves as a point of discussion for people working toward building not just a sustainable planet, but a sustainable society, and offers endless opportunities for innovation. As the following discussion illustrates, TNS certainly does not have all the answers. Instead, it helps turn the debate into a discussion and begins with the reality that humans are an integral part of the system and should be treated as such.

Dr. Karl-Henrik Robèrt, founder of The Natural Step, explains, "From a systems perspective, the fourth system condition divides into two major parts – the technical and the social." The technical part addresses the concept of efficiency and translates into the "technical reduction of resource throughputs." In other words, using less to make more by taking measures such as recycling, reducing, reusing, and eliminating waste whenever possible. The social part addresses the issue of fairness regarding "all aspects of human needs in relation to each unit of resources used by society." Dr. Robèrt goes on to explain, "The two parts of the fourth system condition allow for two methods of improvement. We can reduce the throughput of resources for the same utility unit (satisfaction of human kind), or we can increase the utility unit (satisfaction of human kind) per resource throughput. The best result is, of course, if we can do both at the same time."

The Technical

Often sustainability experts suggest changing the word "efficiently" to something more humane such as "carefully" or "productively." Some argue that the word efficient is too closely associated with physical resource metrics and measurements that traditionally have nothing to do with humanity. Others describe the possibility of sustainable societies that are sometimes wasteful and inefficient. Many theorize that efficiency alone can lead to an increase in resource consumption and invite people to use more of the earth's resources even more rapidly.

Perhaps choosing a different word, using more words, or fewer words could address some of these issues. However, at the heart of the problem lies the need to include the concept of sustainability in whatever words are used to communicate the goal of responsible resource use.

From a systems perspective, natural systems are inherently efficient. Unfortunately, human systems today are not. This is where people have a lot to learn from the planet. The challenge is for people to understand the local conditions and boundaries of a given environment and then to find

Funnel Facts

The following information relates to system condition four and can be used by individuals to enhance presentations about The Natural Step framework.

One child born in New York City, Paris, or London will consume, waste, and pollute more in a lifetime than as many as 50 children born in an average developing country.
- 1998, Human Development Report. New York: United Nations Development Programme, www.netaid.org/environment/index.htm

The World Health Organization estimates that more than 3 billion people, mostly in Asia and Africa, suffer from malnutrition. – *Higgins, Margot, "6 Billionth Earthling was Born Today," Environmental News Network, October 12, 1999*

According to the UNDP Poverty Report; a third of the people in developing countries continue to live in an "income poverty" bracket, earning less than $1 per day; about 60% of humanity have incomes of barely $2 per day; and each year between 13 and 18 million people, mostly children, die from hunger and poverty related causes. – *Poverty Report. New York: United Nations Development Programme, www.undp-jordan.org/press36.html*

The globe's next few billion people will be added to the poor countries of Asia, Africa, and Latin America. And within those countries, the growth will be focused on cities, and particularly the slums. – *Feldman, Linda, "The Challenges Ahead for a Population of 6 Billion," The Christian Science Monitor, October 12, 1999*

(continued)

SYSTEM CONDITION FOUR (cont'd)

ways to design and use the resources within that environment. Dr. George Basile, Senior Scientist at The Natural Step US, explains, "There is opportunity in system condition four for people to work with and within the system – to be efficient in the same way a tree is efficient. A tree throws off branches and leaves, blows off water and oxygen, and finally falls flat and sprawls on the ground. Yes, it makes a huge mess, but a tree is still efficient within the system because the 'waste' it produces is used as a resource for something, or someone, else. We can shift from linear models of infinite resource use and infinite growth to cyclical models of infinite transformation and change. This is how nature works."

For many companies, an important step is redefining their products as services. For example, someone selling lamps might come to realize that what they are actually selling is light. In most cases, this new perspective makes the prospect of redesigning products and operations more appealing. It typically makes throwing out the "stuff" that supplies your service seem like a bad idea. In all cases, it opens, enables, and encourages innovation and creativity. In doing this, companies can make a stronger connection between their businesses and the rest of humanity and the living systems we are imbedded in. Companies come to see their business as in some way helping to meet human needs -- which often brings the concepts of fairness and equity into the equation.

The Social

An overwhelming amount of data demonstrates that if basic human needs are not met, sustainability goals, ecosystems, and ecosystem services suffer. These patterns surface when highly impoverished societies sacrifice healthy living systems for survival, or overpopulated regions lack local resources, food, education, health care, and birth control. Consider, for instance, the familiar 20:80 ratio, which describes that the top 20% of the world's people living in the highest-income countries account for 86% of total private consumption expenditures while the poorest 20% account for only 1.3% [1]

India--population one billion--is a stunning example of a nation where many people's first priority is immediate survival, rather than long-term survival – A.K.A. sustainability. Today, more than half the children in India are malnourished, one third of the population is living below the poverty line, and half the adults are illiterate. Rising population pressures are threatening India's resource base. Forests are disappearing, rangelands are deteriorating and water tables are falling, endangering food production. [2]

Unfortunately, India is not an isolated case. According to the United Nations International Labor Organization, about one third of the world's work force is unemployed or underemployed (involuntarily working substantially less than full time, or earning less than a living wage) and in many countries rapid population growth is causing even more unemployment, poverty, and political instability. [3] Whether food, clothing, and shelter cover the gamut of "basic human needs," they are surely part of the equation, and yet without work, many people cannot even afford these necessities--not to mention health care, education, and making sustainable choices.

It's clear that environmental realities and human realities need to be equally important. When human needs are not being met, people cannot realistically address the other three system conditions. Why then in supposedly affluent societies where the majority of the populations' needs are being met (there are plenty of resources, relatively low unemployment rates, education for all, national security, available health care, etc.) are people still making unsustainable choices and struggling with sustainability issues? Because human needs have not been well defined.

Each American consumes about 50 times more goods and services than the average Chinese citizen. – *David Pimentel et. Al, "Will Limits of the Earth's Resources Control Human Numbers?, Environment, Development and Sustainability, Cornell University, September 1999*

For every product delivered to the consumer in the United States, another 32 pounds of waste is created. - *Interface Sustainability Report, Interface, Inc. 1997, page 5*

The "dirtiest" zip code (i.e., 30354) in the five-county Atlanta Metropolitan area is located in Fulton County and receives over 1.55 million pounds of toxic releases annually; people of color make up 69.1 percent of the population in zip code 30354. Residents in zip code 30336 are subjected to a whopping 873.9 pounds of toxic releases per person annually; this Fulton County zip code is 98.2% black. - *Bullard, Robert D. and Johnson, Glenn S., Environmental Justice Resource Center, Clark Atlanta University, "Atlanta: Social Equity Dimensions of Uneven Growth and Development," February 5, 1999*

Eight thousand pounds of hazardous wastewater result from the production of one tiny microprocessor in your computer. - *Interface Sustainability Report, Interface, Inc. 1997, page 5*

SYSTEM CONDITION FOUR (cont'd)

Going back to Dr. Robèrt's explanation of the social part of system condition four, in which he describes social as "all aspects of human needs," one can ask – How exactly do you define human needs? Looking beyond the obvious biophysical needs of humans such as clean air, clean water, and nutrition, humans also have emotional needs such as love, compassion, dignity, respect, fulfillment and creative expression. However, system condition four is not prescriptive. It integrates environment and society, and indivduals and the environment, and demands that the integration take place at the earliest possible point in a decision making process.

System condition four is a necessary point of discussion if the goal is to build a sustainable society and the discussion has many facets. In her work, author Vicki Robin distinguishes between human needs filled by the economy (resources) and human needs filled emotionally, intellectually, and spiritually. She explains, "Looked at in this way, humanity's need for resources is really quite limited. Once people focus on the preciousness of their own lives and how they sell their lives for money, they become naturally frugal. On average their expenses drop quickly by 20% or more."

Well-known author, environmentalist, and entrepreneur Paul Hawken suggests, "The fourth system condition is so important that it would make more sense to invert their order and make it the first. We wouldn't need The Natural Step were it not for human activity. Thus, while the first three system conditions express the relationship between human and living systems, the fourth implies that there needs to be different internal relationships within human systems – without which ecological change is impossible."

This points to the remaining element of the fourth system condition – fairness and personal responsibility. In speaking to this point, Randy Hayes, President of Rainforest Action Network, remembers Martin Luther King, Jr.'s adage, "an injustice anywhere is an injustice everywhere," and adds, "that would be reason enough to include the fourth system condition." He continues with the thought that, "when there are large numbers of under-consumers (malnourished or starving) we have a responsibility to assist to get them up to decency and sustainability just as we have a responsibility to get over-consumers down from indecency and unsustainability."

What TNS is Doing

In the end, the fourth system condition (and all its various components) makes the point that without humans there would be no need for The Natural Step at all or any other sustainability framework. It is focused on the social transformations that must occur in order to achieve a sustainable society, yet it does not attempt to resolve them.

In an effort to further examine all the intricacies of system condition four, The Natural Step US is focused on finding ways to better understand what it means to "be fair and efficient in meeting human needs." This year, the TNS/US Annual Conference in Atlanta will serve as a platform for discussion and dialogue, a place to explore the issues that encompass system condition four and to offer an opportunity for everyone to get more clarity on the topic. TNS/US is engaging with the community of Atlanta and other professionals working on social justice issues to design the workshop as a space for shared learning and education. We invite you to join us in the journey.

[1] **1998, Human Development Report, page 2. New York: United Nations Development Programme.**

[2] **Halweil, Brian and Brown, Lester R., "India Reaching 1 Billion on August 15: No Celebration Planned," Worldwatch News Brief 6-99.**

[3] **Halweil, Brian and Brown, Lester R., " Unemployment Climbing as World Approaches 6 Billion," Worldwatch News Brief 6-99, Part II.**

STEPS ORGANIZATIONS ARE TAKING TODAY

THE SOCIAL SIDE

Nike has been taking many new steps to help better the lives of the people in the countries where its contract-manufacturing plants are located. For example, in Thailand and Vietnam, Nike has successfully implemented a micro loans program for mainly rural women. These loans help to finance chicken, pig, and duck raising as sources of family income which act to keep families together in the countryside. Nike has also helped finance a sustainable agriculture project for rural people by providing money for an irrigation system to produce chemical-free food. In Thailand, Nike has developed a socially beneficial program of satellite stitching for hundreds of rural women. This allows the women to earn income by stitching components of Nike products in their villages without the dislocation of having to seek employment in the cities away from their families. All of these type of projects are designed with the purpose of helping to support the traditional way of life of the villagers.

Interface, Inc., understands the importance of sustainability education across the globe. The company is working internally to educate all Interface employees, sponsoring non-sales events to educate their customers and suppliers, and reaching out to many of the communities in which they operate. Interface Europe in Northern Ireland established a challenge program for local high schools to s
ubmit environmental projects. Interface Flooring Systems Canada is working with local civic leaders to promote TNS in local government, industries, and institutions through their "Quinte Initiative." Prince Street is using their facility as a teaching tool to educate 8th grade students on career opportunities relating to manufacturing and the environment. Interface Flooring Systems participated in an initiative to raise school children's awareness of pollution in the local Chattahoochee River.

The **University of Houston's Health Science Center** is dedicated to educating its community and offering itself as a model to other institutions working toward sustainability. Internally, the school is attracting interest from graduate students and providing sustainability education to the University's Historically Underutilized Businesses Program (HUB). HUB's mission is to identify small, minority, and woman-owned businesses, and to encourage them to partner and contract with the University. The Health Science Center (HSC) is itself supporting local vendors through contracts for food service, construction materials, and wood flooring. Every 60 days, the HSC provides free workshops on The Natural Step and sustainability for UTH students as well as local businesses, schools, and organizations. In addition, the University's award winning film, featuring its sustainable building project, has been translated into Spanish in order to reach audiences that might not otherwise have access to the information.

THE TECHNICAL SIDE

Interface, Inc., has shifted their thinking of products as things, to understanding products as a means to deliver a service to their customers. The Evergreen ™ Lease is Interface's first attempt to transform a durable commercial product, in this case carpet tiles, into a service. Rather than selling carpet tiles, the company has implemented a program to lease the services of the carpets to the building owner. As carpet tiles wear out and are replaced, the old ones are broken down and remanufactured into new tiles as part of the lease fee. The customer pays no installation fee, rather a monthly fee for constantly fresh-looking, functional carpet. Over time, the amount of raw materials used decreases, and employment increases while saving the customer money and providing a superior product. As in nature, the product becomes part of a cycle, either decomposing or breaking down into parts or molecules to become "food" in an organic cycle, or being synthetically broken down into a technical nutrient for a new product.

Scandic Hotels, a leading Swedish hotel chain, has used The Natural Step to implement a resource reduction program called the Resource Hunt. In the first year, the company reduced energy consumption by 7% and water consumption by 4%. Overall, Scandic has reduced its amount of unsorted waste at its Nordic hotels by 15%. The estimated financial benefits generated by the Resource Hunt was in excess of SEK 6 million (roughly US $800,000).

IKEA is working to design and construct furniture for future disassembly and recycling. In Switzerland, the company has been offering customers the service of recycling their old sofas and armchairs since 1994, and in 1996 this service was expanded to allow customers to return all types of furniture including kitchen units, white goods, and flooring. IKEA is also focused on decreasing the environmental impact of their transport needs. Wherever possible, IKEA plans to use rail transport and combined road-rail transport. In the long-term this requires influencing railway companies and public opinion about the economic and environmental benefits implicit in these choices. In addition, IKEA is working with its carriers to find ways to reduce the environmental impact of transport and facilitate more efficient transportation options.

Today **McDonald's Sweden** estimates it recycles 97 % of its waste and that, on average, each restaurant produces no more than one garbage bag of unsorted waste each month. The company has also decreased the average distance to each restaurant by almost 40%, and is developing new trucks equipped with trailers to facilitate rail transport.

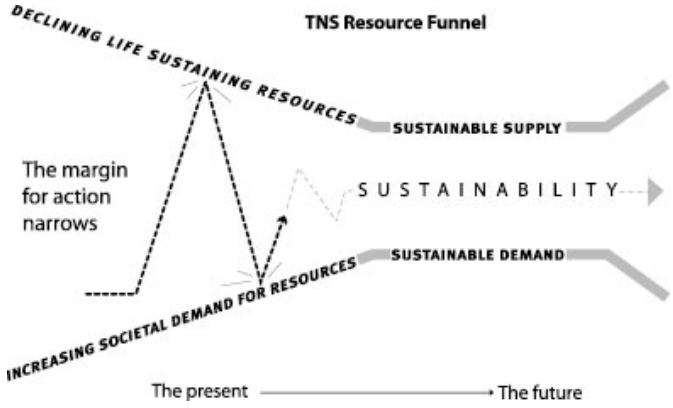
The Funnel

The Natural Step's Resource Funnel is a simple metaphor that illustrates the global trends of resource availability and functional capacity.

Imagine the walls of giant funnel, viewed from the side. The upper wall is resource availability and the ability of the ecosystem to continue to provide services. The lower wall is societal demand for resources that are converted into goods and services such as clothes, shelter, food, transportation and discretionary purchases.

The mechanisms that provide essential life-supporting goods and services for society's continued existence on the planet, such as food and fibre, clean air and water, productive topsoil and climate control, are in decline.

At the same time, society's demand for these resources and services is increasing. The Earth's population is currently at more than six billion people and growing. Our consumption level is also increasing. As society's demand increases and the capacity to meet this demand declines, society moves into a narrower portion of the funnel. As the funnel narrows there is less room to manoeuvre and there are fewer options available. The inactive company that proceeds in a 'business-as-usual' strategy is likely to hit the wall of the funnel - representing business failure.



Opening the Walls of the Funnel

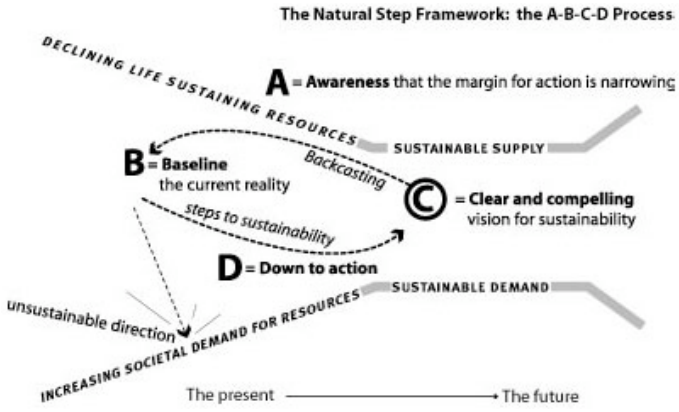
With the awareness that we all live in this funnel - individuals, businesses, governments, families, schools, etc. - we have the opportunity to change the impacts we are having and be more strategic when making choices and long-term plans. At The Natural Step we believe that through innovation, creativity and the unlimited potential for change, we can catalyse the shift toward sustainability and begin to open up the walls of the funnel. Companies which anticipate these changes can position themselves so they avoid the walls and invest towards the opening of the funnel and a future as a truly sustainable company.

next

Implementation Methodology

The Natural Step system conditions define a set of basic issues that must to be met in a sustainable society. How can these system conditions be applied to an organisation's everyday operations? The Natural Step has developed and tested an approach to help organisations to incorporate sustainability into their business strategies.

The A-B-C-D Analytical Approach includes four elements, which are repeated as the organisation progresses along various pathways towards sustainability. The process usually begins with a short, intensive session with key decision-makers, and proceeds according to the capacity, priorities and resources within the organisation, often with a 2 day workshop covering all four steps with a team drawn from across the organisation.



A = Awareness

The first phase involves aligning your organisation around a common understanding of sustainability and the 'whole-systems' context for their organisation.

A presentation of The Natural Step principles of sustainability, basic science and whole-systems approach provides a platform from which strategies for living in balance with nature and our global community are developed. Participants review details of the state of the earth's systems, including the ecological, social and economic trends that are undermining our ability to create and manage healthy and prosperous businesses and communities.

B = Baseline Mapping

What does your organisation look like today? This phase consists of conducting a Sustainability Gap Analysis of the major flows and impacts of the organisation, using the Systems Conditions, to see how their activities are running counter to sustainability principles. This allows the organisation to identify critical sustainability issues, their business implications and opportunities for moving forward. Bounded by natural systems and communities, this analysis includes the impacts of an organisation's entire supply chain and an evaluation of products and services, energy, capital and human resources from 'cradle to grave'. Another critical component of the assessment is the social context and organisational culture, which provide

dimensions to the analysis essential for understanding how changes can be positively introduced into the system.

C = Creating a Vision

What does your organisation look like in a sustainable society? Imagine what your operations will look like in a sustainable society based upon the four system conditions. In this phase, key decision-makers and stakeholders work together to create a compelling long-term vision for a sustainable enterprise. It is here that businesses often begin to identify the service they are providing the world independent of any one product (for example, providing energy services versus oil). Incorporating this awareness into the visioning process unleashes innovation and releases the company from certain existing limitations.

From this vision, organisations develop a strategy and action plan for moving towards sustainability. Strategies are developed based on looking backwards from a vision of success, a method we call "backcasting" from principles. This prevents the group from setting a direction based on simply overcoming the problems of today. Instead, they begin moving towards a shared vision and goal of sustainability, with each action intended to provide a platform for further improvement. Opportunities and potential actions are identified and prioritised, with priority given to measures that move the organisation toward sustainability fastest, while optimising flexibility as well as maximising social, ecological and economic returns equally.

D = Down to Action

Supporting Effective, Step-by-Step Implementation
Companies set their priorities for improvement, based on the vision they have created.

Phase four consists of advising and supporting the execution of specific initiatives by providing appropriate training, techniques, and tools for implementation, followed by measuring progress towards goals and suggesting modifications as needed. Backcasting is used on an ongoing basis as a method for continually assessing decisions and actions in terms of whether or not they move the organisation towards the desired future outcome identified in Step C.

Sustainability principles provide new design parameters that drive product and process innovation throughout the business system. This phase also incorporates organisational learning and change methods, which are both essential for effectively moving people into new ways of thinking and behaving together.

Once a person masters the principles, they can get more and more skilled at handling the details. In a sense, the principles help people to stay on course as they process the myriad bits of information and decisions involved in long-term planning. What is considered to be realistic today never determines the direction of change, only its pace.

The approach is fundamentally based on systems thinking, setting ambitious goals, and developing realistic strategies for moving forward.

Systems Thinking

One aspect of systems thinking is analysing and adhering to the overall principles of a system. These principles ensure that decision-makers have clear guides for assessing various options.

Setting Stretch Goals

The visioning process is one place where individuals are encouraged to come up with ambitious goals for their organisations which may require radical changes in how an institution operates. Some goals may take many years to achieve. Once sustainability stretch goals are set, The Natural Step advocates a step-by step implementation strategy.

Step-By-Step

Organisations are not expected to achieve long-term goals immediately. On the contrary, they are encouraged to move systematically by making investments that will provide benefits in the short-term, while also retaining a long-term perspective. Organisations can use The Natural Step Framework to map-out a series of steps that will eventually lead to sustainability. Finally, organisations using The Natural Step Framework are encouraged to start with the "low hanging fruit," and to take the steps that are easiest and will achieve results that help move an organisation closer to its goals.

Long-Term Partnerships

This approach is modified - sometimes significantly - to fit a given client’s culture and current business situation.

The Natural Step is interested in entering into long-term partnerships with organisations committed to moving towards sustainability. The initial launch of projects may require a series of events, spread out over a number of months, with occasional follow-up events, such as new team training, launching additional initiatives and annual assessments of progress. It may also trigger a need for new research to answer some of the questions raised by the new strategy. Our advisory team is available for ongoing support as required by the internal organisational teams or stakeholder needs.

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Basic Science

Back to Basics

Some basic truths about the natural systems we depend on for life provide the foundation for our work. The Natural Step principles and approach to sustainability are grounded in the science underlying the earth's systems. These scientific laws are well known and accepted by scientists, and we all intuitively understand them, yet their implications are largely overlooked by people in their day-to-day lives.

Nothing Disappears

All mass and energy in the universe is conserved and energy may be converted into different forms, yet the total amount of energy in an isolated system remains constant.

This principle of matter conservation and the First Law of Thermodynamics are helpful in understanding the Earth as a system. For example, apart from the occasional meteorite or spaceship, the amount of matter on earth has stayed the same for billions of years, and when matter is burned it is not destroyed, but transformed into waste predominantly in the form of visible and invisible gases.

Everything Spreads

Energy and matter tend to spread spontaneously; everything has a tendency to disperse (the Second Law of Thermodynamics, or the Law of Entropy).

Although the total amount of energy remains constant, the quantity of energy available in a useful form decreases with each transformation and tends to dissipate through a system. Entropy is a measure of the amount of disorder or randomness there is in a system, and in every isolated system - such as the universe - entropy always increases. Examples of this include food decaying, coloured dye in clear water dispersing, a car rusting and ice samples taken in the Arctic Circle containing measurable amounts of man-made PCBs.

Thus, materials generated by or introduced into human society eventually will disperse in nature, no matter what we do.

There is Value in Structure

We determine material quality by the concentration and structure of the matter that makes up a material. For example, food and petrol are valuable because they have a high concentration and structure. What we consume are the qualities of matter and energy - the concentration, purity, and structure of matter, and the ability of energy to perform work. We never consume energy or matter because it is neither created nor destroyed. If you drop a teacup and it breaks on the floor, much of the value from its structure is lost, but each of the original atoms is still present.

Plants Create Structure and Order by Using Energy From the Sun

Net increases in material quality on Earth are generated almost entirely by the sun-driven process of photosynthesis. Chloroplasts in plant cells capture energy from sunlight and form bonds that provide energy for other forms of life, such as animals.

According to the Second Law of Thermodynamics, disorder increases in all isolated systems. The Earth is a closed system with respect to matter, but it is an open system with respect to energy because it receives light from the sun. It is this flow of sunlight that continues to create structure and order from the disorder.

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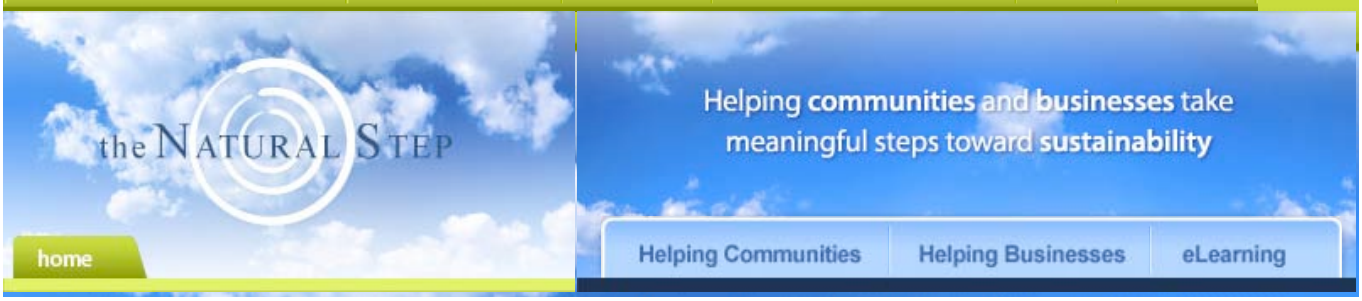

An Organisation's Sustainability Objectives

An organisation can derive its ultimate sustainability objectives from the System Conditions. Often when translated into an organisation's documents, these objectives will be amended to focus on aspects of particular relevance to the organisation. Note that the System Conditions (and these objectives) are phrased in the negative - they do not specify what MUST be done (that is left for the organisation to determine), only what must NOT be done if society is to be sustainable.

Our Sustainability Principles are to:

1. ...eliminate our contribution to systematic increases in concentrations of substances from the Earth's crust.
2. ...eliminate our contribution to systematic increases in concentrations of substances produced by society.
3. ...eliminate our contribution to systematic physical degradation of nature through overharvesting, introductions and other forms of modification.
4. ...contribute as much as we can to the meeting of human needs in our society and worldwide, over and above all the substitution and dematerialisation measures taken in meeting the first three objectives.

Guidance on Putting Objectives into Practice

1. This means substituting certain minerals that are scarce in nature with others that are more abundant, using all mined materials efficiently, and systematically reducing dependence on fossil fuels.

2. This means systematically substituting certain persistent and unnatural compounds with ones that are normally abundant or break down more easily in nature, and using all substances produced by society efficiently.

3. This means drawing resources only from well-managed ecosystems, systematically pursuing the most productive and efficient use both of those resources and land, and exercising caution in all kinds of modification of nature.

4. This means using all of our resources efficiently, fairly and responsibly so that the needs of all people on whom we have an impact, and the future needs of people who are not yet born, stand the best chance of being met.

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Potential Benefits of Implementing The Natural Step Framework

The training methodology of The Natural Step provides the foundation for the mind-shift that is needed to reverse negative trends in the social and physical environment and to place societies on a pathway towards sustainability. When The Natural Step Framework is applied, today's problems are viewed from a future sustainability perspective. The question then becomes how can we move strategically toward our vision rather than solely being focused on solving problems.

In addition to the 'common good' in the goal of sustainability, there are also clear commercial benefits for companies and organisations. Case studies from Canada and overseas are showing a range of benefits including an increase in brand loyalty and market share, an ability to innovate, and an ability to anticipate and stay ahead of changing Government regulations.

Communities and companies committed to a sustainable vision and strategy measure their investments by monitoring social, environmental and financial performance. These investments pay off handsomely in the form of:

Cost savings

Redesigning energy, material flows and impacts in the direction of sustainability can significantly reduce operational costs while increasing access to capital by lowering risks.

Product and Service Innovation

Sustainability principles and strategies inject revolutionary thinking into new product and services, opening up new markets, growing customers, and reducing risk throughout the lifetime of products.

Competitive Advantage

Visionary organisations use sustainability to adapt to competitive pressures through innovative, flexible and adaptable products and processes, with an enhanced ability to quickly respond to change.

Customer and Employee Loyalty and Trust

Enhanced brand equity and reputation accompanies sustainable business practices serving to attract customers and employees alike.

Increased Shareholder Value

Research shows that companies pursuing sustainable business strategies have significantly greater shareholder value than their peers.

At The Natural Step we provide professional advisory services to leading companies committed to change. By integrating our sustainability principles into the core strategies and operations of The Co-operators, Alcan, Home Depot, Swedish McDonald's, Bank of America and others, we are co-creating durable, sustainable solutions and driving the transition to a sustainable future.

History

“The Natural Step provides an elegant framework, a compass, to guide us on the road ahead and is a powerful tool for all seeking a new mental model to move their businesses into a sustainable future.”
Maurice Strong, Secretary-General,
UN Earth Summit 1992

The Natural Step Story

The Natural Step was founded in Sweden in 1989 by Dr. Karl-Henrik Robèrt, a cancer clinician and a cancer scientist with a strong connection to nature and the outdoors since childhood. Dr Robèrt was struck by the resources and compassion mobilized by families, care providers and society in response to the sickness of children in his cancer clinic. That response was swift, coordinated and comprehensive. This stood in stark contrast to the confusion between business, the environmental movement and government over our rapidly sickening planet.

Dr Robèrt realized that the heart of the problem was that so much of the environmental debate was focused on downstream issues and so little on systemic causes of problems. We needed a new way of looking upstream instead, understanding the systemic causes and navigating away from them. That kind of “holistic” approach had been flaky, to say the least. How could it be attempted in a way that is rigorous, comprehensive and concrete?

As a physician, Dr Robèrt understood that to address the systemic causes enough to come up with a principled definition of the goal, sustainability, you first have to understand the system. Working with more than 50 Swedish scientists, Dr. Robèrt developed a consensus document that describes the basic knowledge of the biosphere's functions, how society influences natural systems, how humans are a part of those natural systems, that humans are threatening themselves by degrading natural functions and, finally, that there are great opportunities to change the situation into an attractive sustainable society. The document, supported by the government and the King of Sweden, was sent to every household and school in Sweden.

Dr. Robèrt has since then worked with a growing number of international scientists to develop a framework for strategic decision making, allowing systematic step-by-step approaches towards a clear picture of sustainability, while reducing financial risk and supporting design and innovative decisions in business and government. This framework is the intellectual foundation of The Natural Step.

Major Swedish companies, like IKEA, Electrolux, Scandic Hotels, and McDonalds began incorporating the framework into their business practices. 60 municipalities throughout Sweden adopted the framework and created a network of eco-municipalities that still thrives today.

As news of The Natural Step’s success reached beyond Sweden’s borders, the organization received requests to set up offices in other countries. Recognizing the unique challenges faced by business and government in each local setting, TNS decided to license the framework to local not-for-profit partners. TNS International acts as steward of the Framework, leading its further development and application, while regional Licensees work in active projects with local business, government and institutions. Natural Step organizations have been established in the UK, the U.S., Australia, New Zealand, Canada and South Africa, Japan, Brazil, Israel, Italy, and France.

The Natural Step has received numerous awards from around the world for its work in sustainability including *Mikhail Gorbachev's Millennium Award* in 1999, *The Blue Planet Award* in 2000, considered the "Nobel Prize of the Environment", and in June, 2005, Dr. Robèrt was honoured with the first *Laureate Medal for Social Responsibility* issued by the new Global Centre for Leadership and Business Ethics.

The Natural Step Canada

The Natural Step Canada is a registered national charitable organization with its head office in Ottawa. The role of The Natural Step Canada is to educate and support the growing network of individuals, municipalities, businesses, and other organizations who are interested in learning about and using The Natural Step Framework in their work and lives to create a more sustainable society. We have developed a sophisticated, results-oriented sustainability education and training program, and created supporting tools and materials.

In addition to a team of sustainability advisors, we work with a team of associates located across Canada to deliver our programs and services. ,

The Natural Step International

The Natural Step is active in eleven countries worldwide - Australia, Brazil, Canada, Japan, New Zealand, South Africa, Sweden, the United Kingdom, the United States, and most recently in Italy and France.

Our international headquarters are located in Sweden. The Natural Step International coordinates activity between member countries, promotes international awareness of The Natural Step, participates in a number of international fora, maintains the quality and scientific rigour of our programmes, leads research and development programmes which continue the development of The Natural Step Framework, facilitates the introduction of TNS to new areas and raises funds from international sources for the benefit of member countries. TNSI is made up of representatives from the board and staff of each country organisation, and has a small and growing international staff. For 2006-2009, The Natural Step International has three strategic priorities that will guide its growth:

Priority 1: Research -- To bridge the gap between the science and practice by creating research partnerships devoted to the core science of sustainability and linking outcomes to real-world applications.
Priority 2: Capacity Buidling and Education -- To build capacity among decision-makers to make informed decisions resulting in clear steps towards sustainability among organizations and greater collaboration across organizations and sectors.
Priority 3: Outreach and Advocacy -- To spur an open and informed dialogue about the real challenges and opportunities of moving towards a sustainable future.

To learn more about The Natural Step International or about our other country offices, please go to http://www.naturalstep.org.