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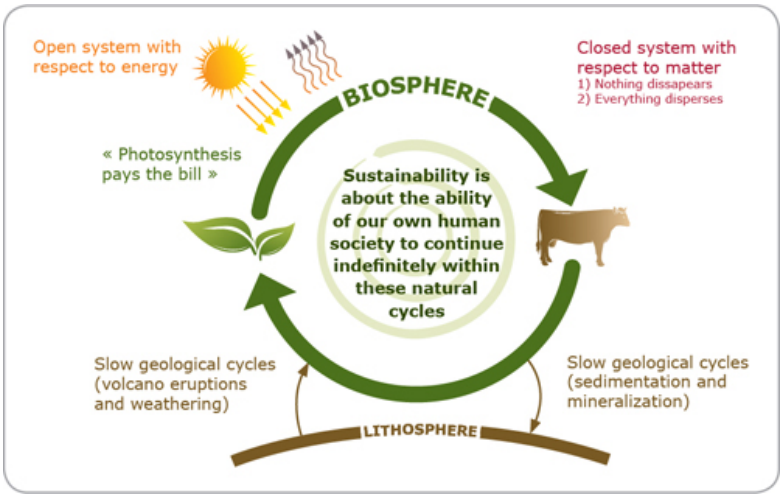
The Science Behind our Approach

Back to Basics



The Natural Step's approach to sustainability, including the 4 Sustainability Principles (http://www.naturalstep.org/the-system-conditions), are grounded in the scientific laws underlying the earth's systems. These are well known and accepted by scientists. While many of us intuitively understand these basic scientific principles, we often overlook them in our day-to-day lives.

The ones that concern us most with respect to sustainability are as follows:

Photosynthesis Pays the Bills

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.

There is Value in Structure

We determine the value, or use to us, of a material by the concentration and structure of the matter that makes up that material. For example, food and petrol are valuable because they have a high concentration and structure. We never actually 'consume' energy or matter because they are neither created nor destroyed by any of our actions. 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. If you drop a teacup and it breaks on the floor, each of the original atoms is still present, but most of the value (to us) from its former structure is lost.

Nothing Disappears

All mass and energy in the universe is conserved in one way or another. Energy and mass may be converted into different forms, but the total amount of energy and mass 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 arriving or spaceship leaving, the amount of matter on earth has stayed the same for billions of years. Another example: when matter is burned it is not destroyed, but transformed into waste, predominantly in the form of visible and invisible gases.

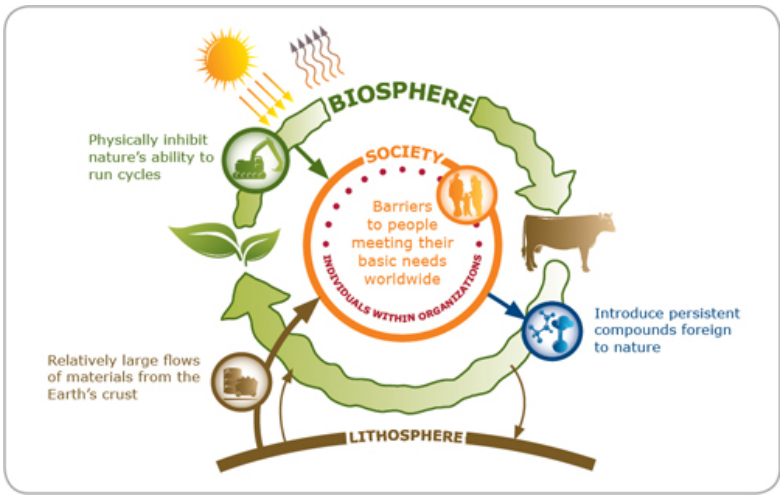
Everything Spreads

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

Although the total amount of energy in a closed system remains constant, the quantity of energy that is available in a useful form decreases with each transformation and tends to dissipate throughout that 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 dispersing in water, a car rusting and human-made PCBs found in ice samples taken in the Arctic Circle, far away from the site of their manufactue.

Thus, materials generated by, or introduced into, human society will eventually disperse throughout nature.

Summary



These basic scientific laws are what allowed The Natural Step, in collaboration with a large community of scientists from across many disciplines, to distil the 4 Sustainability Principles (http://www.naturalstep.org/the-system-conditions) which form the bedrock of our definition of sustainability, and our approach to empowering people and organisations to move towards sustainability in a strategic manner.

Sustainability Menu

Understanding the Problem (http://www.naturalstep.org/en/the-funnel)
A Strategic Framework (http://www.naturalstep.org/en/our-approach)
The Four System Conditions of a Sustainable Society (http://www.naturalstep.org/the-system-conditions)
What is Backcasting? (http://www.naturalstep.org/en/backcasting)
Applying the ABCD Planning Method (http://www.naturalstep.org/en/abcd-process)
3 Strategic Prioritisation Questions (http://www.naturalstep.org/en/3-strategic-prioritisation-questions)

Back to: (http://www.naturalstep.org/en/5-levels) The 5 Level Framework (http://www.naturalstep.org/en/5-levels)

Next: Glossary (http://www.naturalstep.org/en/glossary)