



A BLUE PERSPECTIVE ON SUSTAINABILITY

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The Blue Economy is an international community of companies, innovators and scientists, providing open source access to develop, implement and share prosperous business models that strive to improve natural ecosystems and the quality of life for all. The book of the same name was published in 2010 by Paradigm Publications.

In this paper we take as our departure point the 21 general principles of the Blue Economy as they were formulated by their author Dr. Gunter Pauli and as they have been quoted in many global publications. Together they offer an all-round and well-defined philosophical perspective and shed a clear light on the 'blue approach towards sustainability.'

In the first part we elaborate on the basic tenets of each principle and try to sketch the path Dr. Pauli has followed to come to his conclusions. In the second part we make an attempt to translate the general principles into a set of practical guidelines for business management. In the third and final part we use the principles for an initial diagnostic test within the framework of sustainability accreditation (blue diligence).

In 1994 Gunter Pauli started the **Zero Emissions Research Initiative** at the United Nations University in Tokyo. For anybody who has a serious interest in the principles of the Blue Economy the very best place to start is by reading: **The Science Behind ZERI** . This can be found on: http://www.zeri.org/ZERI/Science_behing_ZERI.html

Here you will find:

Five Kingdoms of Nature: Inspired by the work of Dr. Lynn Margulis, ZERI methodology is based on the harmony and interaction demonstrated amongst these five different domains of Life. By understanding how each kingdom operates and interacts with each other, we can learn from nature how to integrate AND separate.

Five Design Principles: Based on observation of the natural world and existing ZERI projects, these design principles offer a framework for emulating nature as we consciously co-participate in the evolution of our planet.

Five Intelligences: ZERI embraces the different ways of learning and expressing and offers an educational approach that encourages integration of these complementary aspects of learning.

Twelve Axioms of Economics: ZERI's framework for integrated strategic thinking, guiding how we make day-to-day business decisions that add value, create opportunity to differentiate and develop a cohesive company identity.

PART ONE

The Principles of the Blue Economy

1. Solutions are first and foremost based on physics. Deciding factors are Pressure and Temperature as found on site.

The English word Physics is derived from the ancient Greek: 'physis', which means "nature". It is the science that involves the study of matter and its motion through space and time, as well as all the related concepts of heat, light and other forms of energy. More broadly, it is the general analysis of the world that surrounds us. Physicists aim to understand how the universe behaves and to offer fundamental explanations for all observed natural phenomena.

While the research field of contemporary physicists ranges from elementary particle theory to the formation and the evolution of the universe, Gunter Pauli makes neither an allusion to quantum mechanics nor to any concept of curved space-time. He certainly does not urge us to take a microscopic or a telescopic view. His instruction is simply to take an analytical and systematic approach.

Perhaps we should point out that when Gunter Pauli refers to 'nature' he not only refers to the work of Dr. Lynn Margulis but he also follows in the footsteps of James Lovelock who developed the theory of Gaia, where the Earth is seen as a living organism. This is not yet fully accepted as scientifically correct in the bastions of biology and that is one of the reasons why Pauli initially limits the instructions in the blue manual to those from the science of physics.⁽¹⁾ He further explains that in biology everything has an exception. Biology is packed with mutations while in the realm of physics the outcome is at all times entirely predictable. The laws of thermo-dynamics work constantly and there are no exceptions to the rule. Pauli also specifically excludes chemistry from his handbook on the grounds that chemistry usually depends on altering pressure and temperature as well as the use of catalysts, which are generally toxic. Ultimately the solutions offered by chemistry are not sustainable.

Within the framework of the blue economy Dr. Pauli uses the word 'physics' in its original meaning as the discipline to examine the various processes that occur in nature and explain them on the basis of the underlying conditions or in the terms of more simple phenomena. The implication is that whenever any situation begs for a solution, there may be one that is already 'physically' available, waiting to be discovered. "Pressure and Temperature as found on site" are technical terms from the field of thermo-dynamics. They also appear prominently and repeatedly as the conditions defining life in the field of geophysics, as presented by James Lovelock.

We should interpret these terms as coded language for 'the available ingredients under the conditions as they are'. If we carefully observe what solutions nature developed with the ingredients that were available we are likely to find expert guidance and inspiration. We will learn from 3.8 billion years of natural selection what technologies are sustainable through time. On the zeri.org website we find a splendid example of 'nature technology':

"A spider makes its nylon-like fiber at ambient temperature and pressure, from diverse raw materials. The moment the tension drops, it starts disintegrating. The spider operates at ambient temperature and pressure with fungi in its guts, and bacteria to control the process, with plant components as food..."

(http://www.zeri.org/ZERI/Five_Design_Principles.html)

Gunter Pauli suggests that advances in understanding will translate into new technologies. History is on his side. Advances in the understanding of thermodynamics led to the industrial revolution. Advances in the understanding of electromagnetism eventually led to the internet and the iPhone. (We shall leave the advances in nuclear physics unmentioned). While most of these new technologies were also developed by smart application of the laws of physics, the elegant new angle that comes with the introduction of the blue economy is the suggestion that we should follow in the path of Gaia and by copying nature technology evolve from 'zero sum' solutions and strive for win-win outcomes instead. In economic theory, 'zero-sum' is a mathematical representation of a situation in which a participant's gain or loss is exactly balanced by the losses or gains of the other participant(s). Win-win solutions satisfy the interests of all parties.

By studying nature we will find that all ecosystems have achieved a state of self sufficiency. Nothing is consumed outside of what is available or produced within the system. In this way natural systems do offer a blueprint to sustainability. The challenge of our times is that in the current economic climate our species has unilaterally embarked on a path of wasteful production, excessive consumption and disposal, on such a scale that it has become a threat to our own future. In the blue economy we must make an attempt to change direction and the only place where we will find the solutions to sustainability and survival is in the huge database of the nature that surrounds us.

2. Substitute something with nothing – question any resource regarding its necessity for production.

The first part of the second principle has an arcane ring to it and may not be immediately obvious but in his book "the Blue Economy" Pauli gives several splendid examples of how studying nature and applying the laws of physics can lead to simple solutions. Here is only one: over the past 25 years orthodox 'green' instructions that saving energy was a necessary duty led to massive layers of polyurethane isolation material under the roofs of our houses. Unfortunately we are now finding out that this seriously reduced the indoor air quality and has brought unacceptable amounts of toxic chemicals (including known carcinogens) into our homes. If, as an alternative, we resolve to apply the same techniques that were developed over millions of years in termite colonies -following the basic laws of physics- careful ventilation of our homes can save the same

amount of energy much more intelligently. We substitute the synthetic solution with a natural one and...we substitute something with nothing. Pauli says: *Much of what we believe we need is entirely unnecessary and can be replaced by products and methods that are better and simpler than those used most widely today....to replace a toxic or non-renewable or process with one that relies merely on physics and natural processes is particularly exciting.*

In THE BLUE ECONOMY Dr. Pauli gives a long list of opportunities to replace something with nothing: *There are vaccines that need no refrigeration, heart rhythm devices that need no surgery, vortex technologies that de-scale water pipes without chemicals, algae that defeat bacteria by jamming their communications, or silk that cuts with razor-sharpness.* (In the book Pauli proceeds to explain all these innovative technologies one by one and he references them with the extensive scientific details.)

The second part of the second principle comes to the point. In the blue economy our goal of sustainability is 'to respond to the basic needs of everybody with what is readily available around us' but we must carefully analyze all production processes systematically and be on our guard for unintended consequences, or even collateral damage. There is an element of guilt in Dr. Pauli's personal history. He has learned from his 'mistakes'. As a successful entrepreneur in 1992 Pauli had established the biodegradable soap company Ecover near Antwerp in Belgium. This was Europe's first 'green' factory and offered a viable alternative to the petrochemical products of multinational giants like Procter & Gamble and UniLever which were major contributors to water pollution. The main ingredients in the Ecover detergent were the fatty acids of palm oil. When eventually even the majors switched to a similar formula, the worldwide demand for palm oil peaked dramatically and this in turn resulted in huge tracts of virgin tropical rain forest (mainly in Indonesia) to be cleared so the land could be converted into palm oil plantations. When Gunter Pauli was on a holiday in Sumatra he came to the conclusion that his valiant green efforts to help clean the waterways in Europe had contributed to the destruction of the habitat of the orangutan in Indonesia. In a sense, as an illustration of non-linear dynamics, it aptly underscored the butterfly effect in chaos theory. (http://en.wikipedia.org/wiki/Edward_Lorenz). It was especially ironic that the production of biodegradable products had actually degraded the environment half way around the world. These were certainly the events at the root of Pauli's admonition to question any resource regarding its necessity for production.

3. Natural systems cascade nutrients, matter and energy – waste does not exist. Any by-product is the source for a new product.

When we study complex ecosystems in the natural world, we will see that whatever is waste for one species is the nutrient for another species. On page 25 of "the Ages of Gaia", James Lovelock illustrates this in an illuminating and provocative way:....As you breathe, you excrete waste products into the air, such as carbon dioxide...At the risk of having my membership

card of the friends of the earth withdrawn, I say that only by pollution do we survive...We animals pollute the air with carbon dioxide, and the vegetation pollutes it with oxygen..."

All matter is separated and re-integrated in an endless cycle that is powered purely by the energy of the sun and in this process nature invariably adopts an "all-inclusive approach". The symbiotic cohabitation that we observe in natural ecosystems achieves a level of efficiency that should be a benchmark for all businesses operating in the blue economy. If a business emulates the comprehensive designs of nature, it will be able to produce more efficiently at reduced energy needs. The waste of one industry should be used as a basic component for another industry. In his lectures Dr. Pauli frequently points to an example that is radically ingenious and perhaps the start of a revolution. In a pilot project in Brazil, the CO2 exhaust of coal-fired power stations is being pumped through the waste cooling water of the same plants. The exhaust is highly toxic acid and the water is highly alkaline. Under these conditions it is possible to induce the biological miracle of growing Spirulina algae in large quantities. Spirulina algae have been an important food source since the days of the Aztecs and they contain all the amino acids plus the trace minerals that children need. Spirulina is a good source of protein and an extremely valuable nutritional supplement. In addition spirulina can be used as an ingredient in cosmetics and it can easily be turned into biofuel. In the blue economy such a spectacular solution is an attempt to address several problems at the same time from hunger to climate change. This is innovative systems design at its very best.

4. Nature evolved from few species to a rich biodiversity. Wealth means diversity. Industrial standardization is the contrary.

Taking a cue from nature it appears to be a successful survival strategy when an industry actively aims to diversify and distinguish itself from its competition rather than to seek conformity.

"Biodiversity" is often defined as the variety of all forms of life, from genes to species, covering the full scale of ecosystems everywhere on our planet. The word first appeared in the scientific community in 1985 and has taken on a life of its own. (<http://plato.stanford.edu/entries/biodiversity/>). Nowadays the word is occasionally even used very loosely for convenient 'conservation' purposes to mean "wilderness" or just "life." Although there still are some serious gaps in our understanding of the real diversity of life on Earth, (<http://www.economist.com/node/18437900>) there seems to be little doubt in the scientific community that planet earth is currently entering its 6th extinction period.

<http://www.actionbioscience.org/newfrontiers/eldredge2.html>

There is a general consensus that humans are the direct cause of ecosystem stress and species destruction in the modern world and that the decline in biodiversity brings irreversible and incalculable losses:

<http://www.economist.com/node/17309075>

Where ecosystem processes all over the world have been subject to the same laws of physics, the dazzling variety of life that has evolved on our planet shows that there are in fact countless different 'solutions' that perhaps evolved under slightly different conditions of pressure and temperature. We could translate the phrase "Wealth means diversity" into "Diversity means strength". The "resilience" of ecosystems (and of businesses that operate according to the principles of a blue economy) depends on an inborn willingness to adapt and a readiness to evolve. In this respect the eighth principle should be quoted in the same breath:

5. In nature the constant is change. Innovations take place in every moment.

In nature the process of trial and error never ends. All ecosystems are in a continuous state of flux. Likewise in business we must never stop testing the status quo and systematically continue to rethink problems into positive solutions. Continuous adaptation and learning bring an organization to a higher level in its 'Fitness Landscape' (which now is a widely used concept both in biology and in systems thinking.)

6. Nature provides room for entrepreneurs who do more with less. Nature is contrary to monopolization.

When we study ecosystems, we see that evolution is constant and survival depends on the ultimate viability of alternatives. Likewise, in any economic environment the resources available can usually be used to greater effect and more efficiently. Opportunities are often not recognized until a spark of innovative thinking leads to the discovery that there are additional applications and spin-offs. As Gunter Pauli says in one of his lectures: "There are often good ideas, but ideas are not enough. We also need the people to make it happen! We need entrepreneurs!" We would like to expand the statement slightly as follows: We need entrepreneurs who think in terms of systems and sustainability!

Monopoly is the absence of competition and the status that exists when the 'winner takes all'. While Pauli states that nature is 'contrary' to monopolization, it is certainly not a condition that is completely absent from nature. Although the phenomenon is relatively rare there are natural ecosystems where monopolizing species have competitively excluded other species from a given niche. It is observed in ant colonies: <http://www.springerlink.com/content/q15666108875764u/> Certain weeds are also known to monopolize local ecosystems

<http://www.tdc.ca/gianthogweed.htm>

and so do certain tree species, such as Eucalyptus

http://www.gees.ac.uk/projects/outputs/fieldsim/flr_eucalyptus.htm

We shall agree however, that within the cooperative framework of a blue economy monopolization is a condition that we must avoid, that we strongly disapprove of and that we shall always resist.

7. Gravity is the main source of energy; solar energy is the second renewable fuel.

Gravity is the force that causes two particles to pull towards each other. It is the weakest of the four fundamental forces, (after electromagnetism, the strong nuclear force and the weak nuclear force) yet gravity is the dominant force in the universe and shapes the large scale structure of galaxies and stars. Locally, on our planet the most obvious, abundant and easy application of the force of gravity is to make use of the continuous mass of water that streams down from the mountains to the sea or to tap aquatic energy stored in currents, tides or waves.

While we may not immediately realize other potential applications of gravity, its greatest advantage is that it is a constant. For many centuries mankind has relied on the hourglass as a timekeeper. When you turn it over the device has an immediately available supply of energy in an endlessly renewable operation.

While the sun shines constantly, at any given time its rays only cover only one half of the planet. Gravitation does not sleep.

Gravitation works in ingenious ways. Our own galaxy, the earth's Milky Way took the form of a giant swirl. Physicists have found that because of gravity water never moves in a straight line but similarly it has a built-in tendency to swirl. We observe this every day ourselves when water drains from our sink. The spout of a tornado is another classic and frightening example of the same phenomenon.

By accelerating the rotary flow of water we can induce a vortex. Vortices have many useful applications. High vortex pressure ruptures bacterial cell membranes and eventually the center of the water flow turns pure and clean, to the point of expelling salt. This brings us to case 1 in the Blue Economy as reported by the Marion Institute:

<http://www.marioninstitute.org/blog/2010/06/case-1-vortex-gunter-pauli> :

The vortex has the capacity to dramatically increase efficiency in water treatment, cutting costs while generating local jobs. This natural phenomenon could one day replace chemicals and membranes, and upset the existing cash flows of traditional suppliers that have looked safe. The technology platform of the vortex is inspired by the observation that dirty water cleanses itself as a river moves downstream. The continuous swirling movement forces air in and out of the water, discouraging and stimulating beneficial micro-organisms.

8. Water is the primary solvent (no complex, chemical, toxic catalysts).

The word 'solvent' is derived from the same Latin root as the word solution. ('solvere' means 'to loosen'). A solution is formed when one substance is dissolved into another. This is opposed to a 'mixture' where one compound is added to another and no chemical bond is formed; water is made from the two most abundant chemically reactive elements in the universe, and it is the necessary ingredient for Earth's type of life. Liquid water has played an intimate, if not fully understood, role in the origin and development of life on Earth. (<http://astrobiology.arc.nasa.gov/roadmap/g1.html>)

Physicists (and chemists) will explain that water makes for a good solvent because of its polarity: it has an uneven distribution of its electrical charge on the surface. The oxygen atom holds the shared electrons more closely than the two hydrogen atoms. This causes water molecules to be positively charged on the ends and negatively charged in the middle. The positive ends are good at breaking up other substances electrically, causing them to dissolve. Therefore water is frequently called the universal solvent. Actually, because so many substances dissolve in water, water is rarely pure. However, it is the substance that our body needs the most. Water sustains life and makes up more than half of our body weight.

When nature needs a solvent, it turns to water. Most other solvents are products of the chemical industry and often associated with health hazards. These synthetic solvents may be toxic to our nervous system, cause reproductive damage, liver and kidney damage, respiratory impairment, and cancer.

9. Nature only works with what is locally available. Sustainable business evolves with respect not only for local resources, but also for culture and tradition.

The basic purpose of any business or industry that operates according to the principles of a blue economy is "to respond to the needs of all with what we have". Those eleven words form an apt explanation of the concept of 'sustainability'. The keyword in this ninth principle is the word respect. We must make the best use of what is locally available and respectfully understand how our own existing ecosystem has evolved into a successful self regulating cycle. Upsetting a delicate balance is ultimately self defeating and unsustainable. There is rarely an absolute need to introduce external ingredients, (such as palm oil from Sumatra). In a human context it also should be fully understood that culture and tradition are the expression of how people have evolved within the conditions of the nature surrounding them. Culture and tradition must be respected unconditionally. This ninth principle is also the foundation of social responsibility. Sustainability is not a concept that only narrowly applies to our own individual or corporate behavior; it includes that we shall let ourselves be guided by respect for the totality of systems that we are part of and that surround us.

10. Nature responds to basic needs and then evolves from sufficiency to abundance. The present economic model relies on scarcity as a basis for production and consumption.

Professor Pauli now fills the Chair of System Design at the Polytechnic University of Turin in Italy but he trained as an economist at the Insead in Fontainebleau, France. The concept of scarcity is a basic argument from the field of economics. Goods or services are considered scarce when the availability is not enough to meet the demand. Thus the mechanics of markets and price become the tools for allocating scarce resources, making possible to produce in the right quantity for those who can afford the price. In any particular marketplace the technology and production capacity may exist to create abundance. In our market model economy, abundance will usually be avoided and excess product is considered to be an inefficient use of resources that will drive down the price. At the same time it is clear that the market mechanism does have its deficiencies. Major costs such as those that are related to pollution, the degradation of the land, the seas and the atmosphere are not counted when prices are being established in the marketplace. These costs are neglected and passed on to the future as 'toxic eco-debt.'

By contrast in the Blue Economy we strive to evolve from a mindset where the good is necessarily expensive, and the bad is cheap, to a system where the good and innovative is affordable.

11. Natural systems are non-linear.

This principle revolves around the inherent complexity in nature. In mathematics a linear system is a computation model based on the use of limited number of components, where events follow a single straight line. Non-linear systems are those that are too complex to be mathematically described as the sum of their components. Most natural systems are dynamic and inherently nonlinear. The weather is famously chaotic, where simple changes in one part of the system produce complex effects throughout. In a natural ecosystem there is a huge and complex input of nonlinear factors and it is impossible to predict the final sum of events and developments. A glaring example of 'non-linear uncertainty' must be climate change: <http://www.earthinstitute.columbia.edu/articles/view/2124>

When we operate in the blue economy we should never step into the trap of assuming that events are likely to be linear. In a blue organization it is imperative to view all processes and activities in relation to the whole. When we try to understand why sometimes problems do occur, the assumption that there always has to be a linear cause and effect is unlikely to be helpful. The holistic approach that takes a wide angle view of the entire non-linear system has a better chance of leading to a solution.

12. In Nature everything is biodegradable – it is just a matter of time.

We should probably rephrase that subtly: In nature **just about** everything is biodegradable, **or otherwise subject to erosion** – it is just a matter of time. The true significance is in the second part of the statement. It is just a matter of time.

After all: We are all stardust. If you have 8 minutes of time do watch:

Carl Sagan's Cosmos - Star Stuff

<http://www.youtube.com/watch?v=iE9dEAx5Sgw&NR=1&feature=fvwp>

Back to biodegradable: Merriam-Webster says that the word was first used in 1961 and gives as its meaning “capable of being broken down especially into innocuous products by the action of living things (as microorganisms).

Wikipedia is more specific: **Biodegradation is the chemical dissolution of materials by bacteria or other biological means. In nature different materials biodegrade at different rates. To be able to work effectively, most microorganisms that assist the biodegradation need light, water and oxygen. Temperature is also an important factor in determining the rate of biodegradation. This is because microorganisms tend to reproduce faster in warmer conditions. Many products that are biodegradable in soil – such as tree trimmings, food wastes and paper – will not biodegrade when placed in landfills, because the artificial landfill environment lacks the light, water and bacterial activity required for the decay process to begin.**

(<http://en.wikipedia.org/wiki/Biodegradation>)

For the Myths of Biodegradation and what really happens in the landfill go to:

<http://www.bpiworld.org/Default.aspx?pageId=190439>

From both a physical and a philosophical point of view however Gunter Pauli is absolutely right: In Nature everything will degrade – it is just a matter of time.

In physics this is called the Law of Entropy or the Second Law of Thermodynamics.

13. In natural systems everything is connected and evolving towards symbiosis.

Literally ‘symbiosis’ means ‘living together’. The word is used to describe close and often long-term interactions between different biological species and is mainly used to indicate a situation whereby two different living creatures derive mutual benefits from the relationship. The definition of symbiosis is controversial among scientists. Some believe symbiosis should only refer to persistent mutualisms, while others believe it should apply to all types of persistent biological interactions, i.e. mutualistic, commensalistic, or parasitic. (Commensalism is a class of relationship between two organisms where one organism benefits but the other is neutral. We speak of parasitism when one organism benefits and the other one is harmed.)

Our own bodies offer living proof of symbiosis: each person is made up of about 10 trillion cells but shelters about 100 trillion microbes.

The following remarkable item was reported recently (April 20) in the New York Times: Bacterial Ecosystems Divide People Into 3 Groups, Scientists Say

http://www.nytimes.com/2011/04/21/science/21gut.html?_r=1&scp=2&sq=bacteria&st=cse

14. In Nature water, air, and soil are the commons, free and abundant.

In nature there is no market mechanism that allocates what is available for certain purposes only. Life on earth depends on the availability of water, air and soil and as all the resources in the ecosystems are collectively 'owned' and shared between the inhabitants they are meant to be preserved regardless of their return of capital. Because we may use them freely, we have a duty to pass them on to future generations in at least the same condition as we found them. If we can add to their value, so much the better, but at a minimum we must not degrade them, and we certainly have no right to destroy them. In the blue economy there is the implicit responsibility to be inclusive rather than be exclusive and to be a responsible guardian of the commons. We must reduce and ultimately eliminate all activities that are contrary to the sustainability of life on our planet Earth.

15. In Nature one process generates multiple benefits.

In our attempts to emulate nature we have to guard against the unintended consequences of the second of these 21 principles but we must not close our eyes to serendipity either. Whether in nature one process *always* generates multiple benefits depends on the point of view of the observer and of the time frame, but in the end the wellbeing of the ecosystem depends on its functioning at peak efficiency and if it does, the value of the whole is by definition more than the sum of the parts. It is imperative that in the design of our business models we always try to integrate all the functional components that are available. Systems' thinking offers a roadmap to multiple benefits.

16. Natural systems share risks. Any risk is a motivator for innovations.

By the nature of their professions both investment bankers and insurance brokers spend a lot of time and many words on lengthy explanations how risks can be defined, managed and mitigated. In modern life we are surrounded by risks. There are credit risks, financial risks, strategic risks, legal risks and many other types of risk. Nothing is safe. Not even the most secure financial instruments are free from risk. Even American International Group, the largest US insurance company

and once the 18th largest company in the world with an in-house army of risk specialists eventually succumbed to a liquidity crisis in 2008.

(http://en.wikipedia.org/wiki/American_International_Group)

Risk can be best defined as 'the likelihood of harm'. In a purely human context risk assessment is the process of evaluating information to determine how likely we judge some events, developments or results to have a negative outcome. This is clearly a subjective endeavor and before a judgment can be made it first must be determined what is good and what is bad. In the context of natural ecosystems that is not an easy task. Natural systems evolve over time and in the end positive and negative outcomes are likely to even out. What is harmful to one species may give another a distinct advantage. In ecosystems the ultimate risk for one species may be the failure to survive, but the network will continue to exist. It makes evolutionary sense that we are programmed to steer clear of danger but avoiding risk altogether is usually impossible so we have learned to try and minimize the possibility of negative outcomes.

However, once we have identified a risk, we should always recognize that the situation may very well offer a window of opportunity. Furthermore, innovations can only be successful if we ignore the risk of failure. Oftentimes the most unacceptable risk is doing nothing.

17. Nature is efficient. Sustainable business maximizes the use of available material and energy, which reduces the unit price for the consumer.

A straightforward statement that is simple and elegant but the logic cannot be reversed. In economics the central issue is the optimal allocation of scarce resources. The key question remains if fully optimized allocation and use of resources would guarantee the sustainability of a business. It is best to assume that for this to be assured additional factors would need to be entered into the equation. However it is obvious that the sustainability of a business cannot be seen independently from the sustainability of our natural environment and this requires that we make use of matter and energy in the most efficient way. Efficiency and responsibility are two sides of the same coin.

18. Nature searches for the optimum for all involucrated elements.

This is the point where most students will stumble. We certainly did although we consulted a number of different dictionaries. Even detours through French, German and Spanish dictionaries did not help. Involucrate seems to be mainly used in a botanical sense where it means "a ring of small leaves or leaf like parts at the base of a flower or flower cluster of a composite plant". The word is derived from the Latin 'Involucrum', which means envelope, covering, case. It may be that Pauli is still using a 'green' spelling checker and we now believe that he really intends to say 'compound' or 'composite'.

Elements are substances that cannot be separated into simpler substances, whereas compounds refer to combinations of two or more elements. Salt is made up of the elements sodium and chloride. Water is made up of the elements hydrogen and oxygen. The biological backbone of all life on Earth is carbon. Complex molecules are made up of carbon bonded with other elements, especially oxygen, hydrogen and nitrogen, and carbon can bond with all of these.
<http://en.wikipedia.org/wiki/Carbon>

19. In Nature negatives are converted into positives. Problems are opportunities.

As Pauli proceeds towards the end of his list of principles, “nature” becomes increasingly virtuous. Of course the implication that Gaia has been in this business for a very long time is the basic axiom of the entire exercise and the theoretical basis for the philosophy that the business of nature is a perfect **blueprint** for the business of business. It is often said that opportunities are only visible to those who refuse to accept the status quo. Let us repeat the basic lesson: studying nature is a perfect start to turn a problem into a successful solution. Nature never stands still and perpetually exploits emerging opportunities.

20. Nature searches for economies of scope. One natural innovation carries various benefits for all.

Here we touch again on the issues of standardization (which is suppressive) and diversity (which liberates). Nature is holistic and seeks to improve the quality of life for the entire ecosystem rather than increasing the quantity for a part of it. In nature the cooperation between organisms and the environment are the chief agents of innovation. Evolution is as much the result of cooperative as of competitive processes. In traditional economics the term ‘economies of scale’ is usually associated with mass production and implicitly with economic growth. Economies of scale arise when the cost per unit falls as the production of a single good (or service) increases. In contrast ‘the economies of scope’ refer to the cost advantages that result when firms provide (and societies can benefit from) a larger variety of products or services.

We can evolve from an economy where the good is expensive, and the bad is cheap, to a system where the good and innovative is affordable. The blue economy goes beyond efficiency and better return on investment. In a final summary Dr. Pauli condenses the foregoing and formulates the challenge as follows:

**21. Respond to basic needs with what you have, introducing innovations inspired by nature, generating multiple benefits, including jobs and social capital, offering more with less:
 This is the Blue Economy**

(1) ‘The Ages of Gaia’, James Lovelock, W.W. Norton & Company, 1988, Preface xiv)

PART TWO

The compelling question is now how we apply these 21 principles in a practical business context. If we start up a new business from scratch and want to do so according to one of the many inspiring examples of Dr. Pauli's manual, the exercise will merely be a test of our entrepreneurial and managerial acumen. Reading the book will be a good investment and certainly be the best possible start. Pauli is a superb and engaging teacher and his enthusiasm is both contagious and highly stimulating:

"Often these new fields are more easily engaged by entrepreneurs outside of so-called market leaders. The shift in technological platforms and the need for new competencies liberates a start-up company from needing previous experience in the industry."

If on the other hand we must re-engineer an existing company and redefine the competitive framework of its business, the task may be more difficult, because we are likely to encounter a stubborn status quo and stiff resistance to any change in existing habits of production and consumption. What is required is a willingness to think 'out of the box' and explore if there could be a creative and innovative alternative to 'how everybody else does it' or to 'how we have always done it'. Creativity and innovation are the indispensable ingredients to blue change. If we keep following blindly on the path of standardization and 'how everybody else does it' the risk is that ultimately our business will not be sustainable and that it will enter an evolutionary dead end. Blue change, systems thinking and continuous adaptation is the only valid option. It would be an unacceptable risk to stand still and do nothing.

In the BLUE ECONOMY handbook standard subjects of business management doctrine such as Core Competence, Supply Chain Management, Outsourcing, Cash Flow as King and Crowding Out Your Competitors are dealt with rather disparagingly, but Pauli is adamant on commitment and focus:

"Lack of a joint commitment from all departments, especially finance, supply chain management, and marketing, could unleash overt and covert conflicts based on personal interests ranging from career plans and year-end performance bonuses, to corporate policies such as depreciation rules, tax planning and quarterly earnings targets. In the end these conflicts often undermine any innovation strategy.....

Developing market share is a challenge that requires enormous fortitude and perseverance."

"The inaction of today's market leaders may turn them into the dinosaurs of tomorrow, leaving tremendous opportunities for those who are ready to change the rules of the game."

In the theory of blue design we take our leads from the splendid examples that we find in nature and the Fifth Chapter of the BLUE ECONOMY handbook is headlined Nature's MBA (Master of Brilliant Adaptations). Again, buying and reading this book will be a good investment!

Our society and the markets that we operate in are no different from the natural ecosystems. To achieve a sustainable economic future we must realize that we can only prosper if we fully integrate into the community that surrounds us and act as a responsible player in our local environment. We can only integrate successfully (under the pressure and temperature as found on site) when we realize that we are part of a larger system of networks...

In practical management terms a first prerequisite is that the role and the objectives of the business are clearly defined and understood by all, employees, clients and suppliers alike. There has to be a distinctive and cohesive company identity. A blue company is exceptionally clear about its purpose. The 'mission and vision statement' is not a document that is written for the exclusive use of the marketing department 'because it is imperative that we do have one on the website'. Mission and vision must be embedded into the core conscience and the DNA of the business and the daily awareness of all employees.

First of all, a blue company must be seen as responsive to the social, environmental and financial needs of the local community. By definition a blue company has a sense of responsibility beyond itself. By creating jobs and generating income it improves the quality of life. Furthermore, the business can only be a healthy component of the community if its products, services and even its brand identity fit into the local tradition and culture. A blue business strives to be a good citizen in every respect. Social responsibility is a sine qua non.

Internally a blue enterprise is characterized by open system management whereby all employees have learned to share a common vision of the enterprise and have accepted (and own) the responsibility for its wellbeing. They are encouraged to be 'integrated strategic thinkers', who are providing continuous feedback on how to improve productivity, and always keep their eyes open to identify possible procedures to do more with less. Eventually the business can operate without a continuous central command and, if necessary, everyone in the network is trusted to step in. This idea is not a brand new blue invention. Business management consultants like to tell anecdotes of how janitors came up with some of the most profitable new ideas. Day-to-day decisions and adjustments can easily be made on the shop floor.

A blue enterprise does not stand still. There has to be a never ending quest to improve on the quality and range of the products or the services and to optimize the overall performance of the company. Even when a company has already achieved a steady and healthy cash flow and its profitability and survival appears assured, it remains necessary to keep challenging every facet of the operations.

As we pointed out before, Dr Pauli has a history and background in the industrial production of soap and detergents so in his twelve 'axioms of economics' he draws extensively from his own experience and identifies several areas where an industry

may easily find efficiencies that could have an effect on the bottom line. In industries that process raw materials or that are involved in the assembly of physical components it is in principle always possible to find substitutes, in order to increase the output with a smaller input, to achieve more with less, or even to turn waste streams into new products.

A key theme in the BLUE ECONOMY handbook is that we need to discard the notion that the residue of a production process should automatically be considered as 'waste' and Pauli repeats tirelessly that we need to discover the tremendous potential value in these 'by-products' and see them as a nutrient, a raw material and a basic ingredient for another product. We only need to see that "discarding waste" is antithetical to the way natural ecosystems operate. In nature the waste of one process is always a nutrient or a source of energy for another, cascading from one biological kingdom to the next. Absorbed minerals feed microorganisms, microorganisms feed plants and plants feed other species, etcetera. Similarly we should not let waste go to waste and Pauli describes several remarkable projects that have already achieved impressive results, some of them on an industrial scale. One striking example: the massive amounts of agro waste produced by the food industry were found to be a huge resource as a growth medium for edible mushrooms. Mushrooms are rich in protein and in China demand has already grown exponentially to the point that the mushroom industry in Qingyuan now employs 120,000 people and has a yearly turnover of one billion dollars.

Mushrooms convert plant waste into edible fruiting bodies. The portion of the fungi that remains after harvest is mycelium, which is highly nutritious for animals. Animals generate manure which bacteria digest, enriching the soil so plants and microorganisms thrive. Pauli concludes as follows:

The cascading of nutrients from one species belonging to one kingdom to another species belonging to another kingdom is an ecosystems marvel. That is why there is neither starvation nor unemployment in an ecosystem. Everyone is busy contributing their best, gaining sustenance from something that was waste for another, and satisfying the basic needs of all.

The cascading model may be more complicated in the delivery of services. Yet, taking a cue from nature we should keep in mind that if it is not feasible to achieve any economies of scale, there may be economies of scope. Nature shows that survival often follows the path of diversification. Perhaps it is possible to diversify internally and offer complementary services with the resources that are already available and underused. While we should never neglect our core business and always 'keep our eye on the ball', it is obviously not sustainable to keep relying on a single cash flow stream. Once again: Nature never stands still and continues to pursue emerging opportunities. Nature also teaches us that evolution is more the result of cooperation than of competition. Perhaps it is possible to diversify externally and provide extended services through partnership with other organizations.

Even for entrepreneurs who do not entertain the thought of producing physical products but wish to deliver services instead there are important lessons to be found in the BLUE ECONOMY manual. Spellbinding topics such as the Seven Flows of

Building Design and Living Space, as well as Unlocking New Energy Options are extraordinary food for thought. Again, buying the book will be a good investment!

Dr Pauli summarized the conclusions that he had reached under the label of the Blue Economy, based on the way man observes his environment: The sky is blue, the ocean is blue and the earth seen from the universe is as blue as can be. What we must not forget is that blue thinking has a long green history and (if we may say so) seems to have evolved in a fairly straight line. It has firm philosophical roots in the theory of Deep Ecology as it was formulated by Arne Næss more than fifty years ago. Dr Pauli sums that up himself as follows: **Man is part of nature, not above, not separate from, nor can mankind pretend that nature is there to serve us.** It follows that a blue company will be pursuing zero waste policies and be a non polluting guardian of the natural environment. It tries to stay clear from using non renewable resources and toxic components. Of course these policies extend through the length of its supply chain.

The benchmark is 'sustainability' and therefore blue enterprises stay clear from markets that are characterized by excessive consumption. Unfortunately over the past twenty-five years the word 'sustainability' has been overused, often carelessly, and become a label that can be stuck on just about everything as an active green qualifier for all politically correct approaches, attitudes and lifestyles. From its original meaning of 'the capacity to endure, support, maintain' it is now widely being used in a diluted connotation as 'causing little or no damage to the environment'. We prefer to stick to the most widely quoted definition of sustainability as it dates back to the Brundtland Commission of the United Nations in 1987: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

From a business perspective, the goal of sustainability goes further than just to stay in business. It is to increase long-term shareholder and social value, while decreasing industry's use of materials and indeed: reducing negative impacts on the environment. This is now fully accepted corporate policy. (At Wal-Mart, we know that being an efficient and profitable business and being a good steward of the environment are goals that can work together.)

Where Blue departs from Green is that "less bad" is not acceptable. Blue insists on "more good". Pauli clearly states: "The core objective of my work is to go **beyond** sustainability. We wish a **better** future for all children on Earth and for Earth itself as well."

The world has been racked by food, fuel, environmental, financial, and economic crises. In the blue economy we must deal systematically with the complex environmental, social and ethical challenges of the traditional economy and success is not measured by stock market value but by the amount of jobs the organization creates. That is the very real human dimension

of sustainability. In any company that aspires to be blue what is always at the top of the agenda is the wellbeing of all the people who are touched by its operation, clients, employees, suppliers and neighbors alike. There must be awareness that all are stakeholders and part of the network that supports the wellbeing of the company.

The idea that companies have obligations that go beyond financial success is of course not new and well preceded the emergence of the blue economy.

In 1994 John Elkington, the founder of a British consultancy called Sustain Ability, introduced the concept of a “triple bottom line”.

The Triple bottom line consists of three Ps: profit, people and planet. It aims to measure the financial, social and environmental performance of the corporation

The first is the traditional measure of corporate profit—the “bottom line” of the profit and loss account. The second is the bottom line of a company’s “people account”—a measure in some shape or form of how socially responsible an organisation has been acting. The third is the bottom line of the company’s “planet” account—a measure of how environmentally responsible it is.

<http://www.economist.com/node/14301663>

The term ‘triple bottom line’ or 3BL has become widely accepted jargon in green businesses because the concept sounds sensible and attractive but critics have dismissed it as rhetorical device with little substance. The bookkeeping itself is certainly not straightforward.

Adding up the financial plusses and minuses is a lot easier than subtracting the environmental shortcomings of a firm from its ethical achievements. In the financial realm, money provides a common unit of measure that permits expenses to be subtracted from revenues, but comparing the ethical values of apples to the environmental value of oranges is more difficult.

The true believers remain convinced:

Triple Bottom Line is not an award, accreditation or a certification you can achieve - it's an ongoing process that just helps a company keep on track towards running a greener business and demonstrates to the community at large they are working not just towards riches, but the greater common good - and that's what consumers are increasingly wanting to see these days.

<http://www.greenlivingtips.com/articles/264/1/Triple-bottom-line.html>

Gunter Pauli would not disagree with that last statement but where the Blue economy departs from 3BL is that it seeks to integrate the very same concerns systematically in the design process of the business plan rather than in the later

accounting. He suggests that by fully utilizing its resources (raw materials, people, time, cash, information, ecosystems, tradition, culture) a blue company will create optimum value from the point of view of the consumer and of the local communities and in the end, by offering higher quality at lower prices, the same final result will eventually appear on that most important bottom line.

Pauli suggests the same integrated approach on cash flow. Rather than producing one core product or providing one single service that generates just one cash flow stream, a blue company will seek to create additional products and services that provide additional cash streams. In addition it may be possible to provide shared services with other companies to oneself and local communities. His advice is to keep looking for hidden assets that can be turned into cash flow generating activities. Pauli even suggests trying and identifying the pockets of 'information-exhaust' in the organization and selling that information to other companies, customers or consumers who would value that information. We have to incorporate into our systematic research that we try to identify economies of scope rather than economies of scale. Ultimately survival and sustainability depend on multiple cash flows.

The general health of a business that attempts to follow the principles of the blue economy ultimately depends on the full acceptance by all employees and other stakeholders of the basic truth that the whole is more important than the sum of the parts. In the biosphere of nature all the various elements such as air, water, vegetation and animals work together in order to survive or perish. It is not different for a business; all the components are interconnected. In the business plan and its execution everything and everybody has to fit and work together. The old cliché is very true: if people are not working together, they are probably working against each other. Business processes and problems always have to be examined in the context of their relationships with all other components in the overall structure, rather than in isolation. Similarly a business is never standing alone or apart. It is inseparable from its environment.

PART THREE

1. Let us get started with a short explanation of the fundamental purpose of your company/organization in approximately 50 words.
2. Would most of your colleagues and employees recognize the explanation that you have given and would they be able to give a similar formulation?
3. How long has your company operated in its current location?
4. Is your company still operating on the basis of its original business plan? If there have been strategic historic changes, please clarify briefly.
5. Who are your target clients or customers?
6. What products or services do you provide to those clients?
7. What makes your product or service different from those that are offered by your competitors?
8. Do you see your product range and target customers as permanent pillars of your business model or do you make regular/occasional adjustments to improve your revenue or profitability?
9. When was the last time you introduced or added a new product or service to your product line?
10. Has your company/organization formulated any strategic ideas or policies for the future?
11. Would most of your colleagues and employees be able to answer the previous question in a similar manner?
12. How often do you review your mission and vision statement?
13. How often do you evaluate the financial performance of the company?

14. How often do you evaluate the full range of products that you offer and the activities that you engage in?
15. How often do you evaluate the feedback from your customers?
16. How often do you evaluate the reputation of your company in the market place?
17. How often do you evaluate the level of contentment and the welfare of your employees?
18. Please give an indication of the time frame that is most commonly used when the future is discussed in your management meetings or staff gatherings.
(Monthly/Quarterly/Annual/Multiple-year-plan)
19. When was the last time that the specific issue of the ultimate sustainability of your business model and plan was discussed in such meetings?
20. If sustainability has ever been identified as an ongoing concern, to whom or which department in your company has the responsibility been delegated to report on the issue?
21. In case there has never been any doubt about the specific sustainability of your own company has there ever been any discussion on the general health and viability of the markets and environment that your company operates in?
22. How often do you review the ethical standards your company adheres to?
23. Has your company carried out an environmental risk assessment?
24. Do you provide environmental training and awareness programs for your staff?
25. Do you set company guidelines and goals for energy consumption and efficiency?
26. Do you set company guidelines and goals for water use?
27. Do you set company guidelines and goals for waste management?

28. Do you monitor the environmental policies/compliance of your suppliers?
29. To whom or to which department in your company has the responsibility been delegated to monitor energy, water and waste issues?
30. What percentage of your staff can walk to work?
31. What is the median distance and traveling time between their home and workplace for those who cannot walk to work? Do you provide transportation or do you organize/encourage pooling?
32. Is there any company involvement in the health insurance policies of your employees?
33. Do you monitor if the health insurance adequately covers the medical needs of your employees and their immediate families?
34. For supplies and eventual outsourcing, do you select on the basis of price only or do you allow 'neighborly' considerations of vicinity and distance to play a role?
35. Can you confidently state that your company is considered to be a valuable and respected presence in your local community?
36. Have there ever been any conflicts or disagreements with your local community?
37. Does your company have a corporate social responsibility program in place?
38. Do your CSR activities have a regular and structural or incidental character?
39. To whom or which department in your company has the responsibility for the CSR activities been delegated?
40. Can you give examples of what your CSR programs have achieved? How often do you measure the results against the goals that were set?