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The Way We Think Shapes Our Future: On the Importance of Fruitful Concepts, Well-Founded Attitudes, and Powerful Rhetoric

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Additional information is available at the end of the chapter

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1. Introduction

“Business as usual” will not lead us into a sustainable future. Therefore, we need visions about alternative routes to follow. We have to think along new lines, both collectively and personally, in order to make other choices and to reconsider what is really important. Such alternative, sustainable thinking is already underway, and when we analyse it, we discover that a gradual creation of new concepts is important. New concepts open new perspectives and allow for fruitful discussions. However, new concepts have to be precise enough. Twenty-five years ago, the concept of “sustainable development” achieved global consensus [1], and initiated waves of new thinking. As we shall see, there was also a great need to discuss the concept itself, and to refine purpose and aims through a number of sub-concepts. This process is still going on. For instance, it is not yet clear what should be meant by “green economy”. In the following, we shall also illustrate how conceptual progress in certain academic disciplines has fuelled our thinking about environmental questions.

A significant element in sustainable thinking is our personal attitudes. Good concepts help us in the process of developing well-founded attitudes. We shall consider the development of attitudes as a process of systematic thinking. Our perseverance in environmental work depends highly on the quality and strength of personal attitudes.

Given a good conceptual framework and well-founded attitudes, we should probably be well armed to fight for a sustainable future? In addition, rhetoric, or the way you communicate, should not be underestimated. We are reminded by the famous Roman speaker Cicero (106-43 BC), that the way you present and formulate your message is crucial; also in environmental questions, rhetoric matters. In fact, concepts and rhetoric are not always clearly separated. The

formulation “Think globally and act locally” is both good rhetoric and contains a conceptual core about how we all can participate to solve common challenges. In a separate section, examples of well-formulated statements from various authors will be cited.

After having illustrated the importance of concepts, attitudes and rhetoric in order to shape environmental action, the problem of mental barriers will be discussed. We have all an ability to suppress, or deny, environmental threats. This psychological mechanism supports “business as usual”. The book “Collapse – how societies choose to fail or succeed” warns us about this psychological trap [2].

An important product of sustainable thinking should be to create hope. Concepts, attitudes and rhetoric are helpful not only to describe problems, but also to show possibilities. This will be discussed in a final section.

2. Material and methods

Except for Introduction, Discussion and Conclusions, this is a review paper based on relevant scientific literature, as well as a number of books and articles which illustrate the debate about sustainability. The review part has been structured into four topics:

Development of concepts. Here, the gradual refinement of the sustainability concept has been summarized. Since its “foggy” presentation in 1987 [1], the concept has been vividly discussed, and a number of new concepts have evolved in order to analyse and implement it. We shall also study the rise of applied ecological thinking, how global warming has triggered new concepts, and the difficulty of expressing the value of nature as a source of life quality.

Development of attitudes. While concepts can be adopted, attitudes have to be personally developed. The process of developing attitudes is exemplified.

Rhetoric matters. Here, selected citations are presented to illustrate the power of language.

Our ability to deny or suppress environmental threats. This is a summing up from Jared Diamond’s book “Collapse – How societies choose to fail or succeed” [2].

In the Discussion, we are reminded that concepts, attitudes and rhetoric must have the necessary quality. In debates, we must be ready to argue against misuse of concepts, unsustainable attitudes, “greenwashing” of unsustainable activity, and a “counter-rhetoric” which defends “business as usual”.

3. Development of concepts

A new step in science is often tied to the development of a new concept. A good example is Darwin’s “natural selection” from 1859 [3]. This concept soon became basic for our way of thinking within biology and opened doors for progress in a number of biological disciplines.

In 1973, the evolutionary biologist Theodosius Dobzhansky formulated the famous statement that "Nothing in biology makes sense except in the light of evolution" [4]. The term "evolution" is a term which today we accept as a given. Within the discipline of ecology, the great progress during the last hundred years has been fuelled by a continuous development of new concepts. In order to study, understand, and discuss how processes in nature are working and connected, concepts like food chains, food webs, trophic levels and energy budgets are basic. The 1965 version of Odum's classic textbook "Fundamentals of Ecology" [5] was structured upon a systematic presentation of such concepts. At that time, also terms like succession, niche, mutualism, commensalism, and others were in use. Later, ecological insight has grown strongly due to a number of other fruitful concepts like island biogeography, socio-biology, conservation biology, metapopulations, key species, cascade effects and many others. A university exam in ecology today could well be to define a number of central ecological concepts.

This example illustrates how fruitful the evolution of concepts is, and our dependence on them. But it also illustrates that a lack of concepts limits our insight, and also our ability to talk about a topic. Today's environmental change cries for insight, discussions and action – collective action. The following presentation will illustrate how a gradual development of new concepts has been fruitful within sustainable thinking, but also that a further conceptual development is necessary.

3.1. Sustainable development: A concept that triggered a breed of new concepts

3.1.1. Global consensus about a foggy concept

In 1987, the Brundtland Commission's report *Our Common Future* [1] presented the concept of "sustainable development". It was defined as a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". However, this well-meant concept rapidly turned out to be problematic [6-9].

Firstly, the commission had argued for strong and continuous economic growth in order to reach sustainable aims, and even today, many politicians talk about "sustainable growth". However, economic growth was soon identified as a major cause behind environmental problems. Consequently, some observers called sustainable development an *oxymoron*: fundamentally contradictory and irreconcilable. Secondly, the term is so "creatively ambiguous" that anyone can redefine and reapply the term to fit their purposes and proceed with business as usual. For instance, companies with an environmentally harmful activity could make small, cosmetic adjustments and then characterize themselves as "green" or "environmentally friendly". Such "greenwashing" of environmentally destructive activities became a problem. Clearly, the well-meant concept needed to be problematized: What should be sustained, what are the ultimate aims in a sustainable community, and which conflicts have to be solved – for instance between economic activity and other aims?

After eight years of debate, a clarification of terms was given [6]. A kind of consensus had been reached that we should distinguish between three parallel, but interconnected, aims of

sustainability: Environmental, economic, and social sustainability. In addition, within each of these concepts, there was a need for subconcepts [6], as explained below.

3.1.2. *Environmental sustainability*

The basic aim of environmental sustainability is to maintain healthy, productive, and species rich ecosystems. Such “supporting ecosystems” deliver “environmental services”. They have a certain tolerance to disturbance, and a certain “carrying capacity” regarding production of goods as wildlife, fish, various forest products, clean water, fertile soil, etc. Healthy ecosystems also have a certain “assimilative capacity” for our pollution and wastes. Many prefer to use the concept of “natural capital” for nature’s ability to serve us, and this capital has to be maintained. Furthermore, the term “sources” is often used for raw materials extracted from nature, and “sink” for wastes. A “sustainable production” and a “sustainable consumption” implies to live within the limitations of the biophysical environment, while “overconsumption” gradually liquidates nature’s ability to deliver environmental services. Loss of nature also implies loss of other “services” like recreation, various cultural values, and nature as a source of fascinating science.

As long as nature was “in excess”, nature’s productivity and assimilative capacity was enormous compared to man’s needs and activities. Today, healthy ecosystems have become a scarce resource, like intact forests, species-rich coral reefs, productive oceans, clean rivers, or fertile soils. During the last sixty years, ecological thinking and ecological concepts have become a cornerstone in defining the limits – but also the options – for man in a sustainable future. The conceptual development within the rise of applied ecological thinking is presented in chapter 3.2.

3.1.3. *Economic sustainability*

Since economic development is one of the primary drivers behind environmental degradation, economic activity should be kept within strong limits. For instance, to eradicate one resource after the other (e.g. whales, tropical forest, oil wells and fish stocks) may be good economics in terms of income, but totally unsustainable. Environmental costs have to be included in economic activity. A “sustainable economy” can be regarded as a human economy subsystem which does not harm the ecosystems and their ecological services on which we depend. Economics has rarely been concerned with natural capital, because until recently, these resources had not been scarce. The new scarcity of natural capital arose because the *scale* of the human economic subsystem had grown large relative to its supporting ecosystem. The “scale criterion” would constrain the so-called “throughput growth” – the flow of material and energy (natural capital) from environmental sources to sinks (pollution and waste), via the human economic subsystem. However, due to our limited knowledge about nature’s resilience and the danger of irreversible damage to ecosystems and their services, economists need to use the precautionary principle routinely. Also in economics, ecological thinking and concepts have become relevant.

At the UN conference in Rio de Janeiro 2012 (Rio + 20), “green economy” was identified as a pivotal concept in order to create a sustainable development [10]. The intention was to define an economy which is positive for both environment, climate and poverty problems. However, economic growth is still a silent premise in the new “green economy”. In Rio, both OECD, The World Bank, large companies and national leaders in several of the richest countries encouraged further economic growth. This request was discussed and criticized in a Norwegian newspaper article [11]. For instance, the authors argued that the northern “brown oil economy” has to be changed into a green direction, which implies reduced overconsumption and more focus on intellectual resources. Furthermore, many ecological services cannot – and should not – be capitalized, as the optional value of biodiversity, nature’s production of clean water, air and soil, or the recreational value for man. The article also presented the concept of “brown-green new colonialism”, which was exemplified by the oil-nation Norway which pays for forest protection and climate quotas in the south, rather than on a national level within Norway.

3.1.4. Social sustainability

This concept points to a peaceful and tolerant community kept together by cooperation, but also by laws and discipline. Also here, the concept of capital is used. “Human capital” is created by investment in education, health and nutrition of individuals. “Social capital” points to the importance of social stability, and “moral capital” indicates shared values and equal rights. All three types of capital are threatened by the underlying problem of unchecked population growth. There is much debate about how many people the globe can support, but too little about how far we are above a “population optimum”. The Norwegian professor in social economy, Ragnar Frisch, who in 1969 received the Nobel price in economy, tried already in 1940 to define a “population optimum”. He argued that because natural resources in each country are limited, there is an optimum population size which gives the best quality of life for people within a specific area of land [12]. The concept of population optimum deserves to be used in visions about a sustainable future.

3.1.5. Alternative thinking about sustainability

An alternative model for sustainable development within a “sustainable hierarchy” has been presented [8]. This focuses on unsustainable activities which should be avoided and lists the most serious problems at the bottom. Level 1 actions endanger the survival of humans, Level 2 actions significantly reduce health and life expectancy, and Level 3 actions may cause species extinctions or violate human rights. The fourth and last level contains actions that reduce quality of life or are inconsistent with other values, beliefs or aesthetic preferences. The authors argued that this level should not be considered to be within the sustainability concept, since these topics to a high degree depend on subjective criteria. As shown in chapter 3.4., this viewpoint is not shared by the present writer.

Twenty years after the Brundtland Commission, it was suggested to “reopen” the concept of sustainable development [9]. This paper relies heavily upon a science-based approach to sustainability known as “The Natural Step Framework” after the organisation promoting it.

They focus on the way we extract resources, use them and produce wastes, but also on other ways in which we destroy nature's carrying capacity. In a nutshell, nature should not be subject to systematically increasing...

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

Regarding "economic ethics", the article stresses that "hidden costs of unsustainability" must be shown, and no economy should exceed nature's carrying capacity [9].

Another thorough review [7] was critical to economic growth and pointed out various misuses of the sustainability concept. Still, they saw a hope for a further "creative global dialogue". In fact, since sustainable development is an imprecise concept – but still with intuitive aims – it contains a "creative tension", and the debate is still active. Sustainable development can be viewed as a social movement: a group of people with a common ideology who try together to achieve certain general goals. The authors point, for instance, to the vision of "voluntary simplicity" and a need to define life quality by other criteria than by economy and consumption. Today, it has been a serious matter to explore various indexes of "well-being" or "level of happiness", see [13].

3.1.6. *Perspective*

We can conclude that during the twenty-five years since 1987, the vague vision of the Brundtland Commission has undergone a considerable conceptual refinement. Although we find different "schools" that vary in their way of thinking, they all strive to enlighten the way into a harmonious future. Ecosystem thinking has become a fruitful common approach, illustrating ecological services and nature's vulnerability to overconsumption. A further conceptual development will certainly occur, both in order to clarify ideals and principles, to describe conflicts, and to implement concensuses in law and in personal lifestyle.

There is a special need to clarify the conflict between environmental and economic sustainability. Even in 2012, world leaders include economic growth in the concept of "green economy". This concept is accepted and could be fruitful, but is unsustainable until it is defined as a sub-system which is in harmony with the biophysical limits of ecosystems. Also, what are the guidelines for an "economic ethic" that implies a moral aspect in addition to income? Economic thinkers have a challenging task, and interdisciplinary research is needed to describe a sustainable "green economy".

3.2. **The rise of applied ecological thinking: From basic science to politics**

This topic has already been mentioned when discussing environmental sustainability but here, the use of ecological thinking will be followed in a more chronological way.

3.2.1. *The awakening 1960's*

Until 1960, ecology was regarded as a narrow and rather anonymous science of little public interest. However, persons working with nature conservation became increasingly interested in ecology, which revealed insight in nature's structure and function. The first edition of Odum's textbook in ecology in 1959 [5] became an eye-opener for many persons and inspired "green" organisations. Here they found a scientific basis for discussing nature's vulnerability and the importance of taking care of nature's production and diversity.

A main focus in the 1960's environmental debate was the danger of pollution, which included the harmful concentration of agricultural pesticides in food chains. Rachel Carson's book "Silent Spring" in 1962 [14] created a global focus on these dangers. After a great rise in ecological awareness in Europe during the late 1960's, the Nordic Council of Ministers decided that 1970 should be the "European Year of Nature Conservation". The concept of "Natural heritage", which signalises both values and duties attached to nature, became established in several countries at that time. While the "Cultural heritage" focuses on historical documents which are made by people, the natural heritage points to "nature documents" as a part of a nation's identity.

3.2.2. *Nature as an ideal – Early "ecopolitical" thinkers*

Even though ecology as a science is purely descriptive and not normative, healthy ecosystems were gradually regarded as an ideal: Humankind has to cooperate with nature instead of conquering it. In 1971, two young Norwegian biologists published an article titled *Ecopolitics – the new dimension in nature conservation* [15]. Instead of a society based on continuous growth, they pointed to "a society in balance" as a political alternative. In the international arena, the American biologist Barry Commoner achieved much attention in the same year for his book *The Closing Circle* [16]. Here he presented his "four laws of ecology", as a basis for a new politics:

1. Everything is Connected to Everything Else. There is one ecosphere for all living organisms and what affects one, affects all.
2. Everything Must Go Somewhere. There is no "waste" in nature and there is no "away" to which things can be thrown.
3. Nature Knows Best. Humankind has fashioned technology to improve upon nature, but such change in a natural system is, says Commoner, "likely to be detrimental to that system."
4. There Is No Such Thing as a Free Lunch. Exploitation of nature will inevitably involve the conversion of resources from useful to useless forms.

3.2.3. *A new discipline: Conservation biology*

The practical application of ecological knowledge in nature conservation took a big step with the new discipline of "conservation biology". A textbook with this title from 1986 illustrates this well [17]. The aim of conservation biology is to find practical ways to preserve ecosystem

functions, and to avoid extinction of species, based on scientific knowledge. Ecological concepts which describe nature's vulnerability were now used in an applied perspective. "Resilience" was used for the ability of ecosystems to withstand stress, or to retain stability after disturbance. Certain species which have a pivotal role in ecosystems because many other species depend on them, were "key species" or "drivers". An extensive discussion arose whether some species could be lost without harming the ecosystem because they were "ecologically redundant". Does it matter that humans drive certain species to extinction? Such questions also stimulated the pure science of ecology. Today we know that even "anonymous" species may have important functions, for instance in pollination, decomposition, or degradation of human wastes. Microscopic fungi cooperate with the roots of trees in a symbiosis called mycorrhiza, on which many tree species fully depend.

An important section within conservation biology is the vulnerability of small populations to become extinct. Concepts like "minimum viable population", "extinction risk" and "extinction vortex" appeared in combination with mathematical models. "Fragmented populations" are vulnerable, but less if the various fragments can exchange individuals, as in so-called "meta-populations". Also, there was a growing understanding that extinction may take time. An early sign of extinction may be that the distribution area of a given species is shrinking, and the populations are also often gradually fragmented and isolated. Species depending on old forest in Finland illustrate this process. The gradual loss of old forest in Finland has already led to extinction of more than 100 species. Furthermore, approximately one thousand other old-forest species are on their way to extinction if the loss of old forest proceeds. The pre-destinated extinction, which is not yet realized, is called "extinction debt" [18]. This is a powerful concept which can be easily comprehended by non-biologists like politicians.

The concept of "umbrella species" is also helpful in practical conservation work. Certain species need very large areas to survive. If we set aside sufficient areas to protect these, a number of other species will automatically be saved under their "umbrella". Examples are reindeer on the tundra, elephants on the plains, or large forest predators. In order to catch the interest of people or politicians for conservation measures, certain beautiful or spectacular species have been fronted. These are the "flagship species". Examples are the WWF symbol, the Giant Panda, the tiger, or paradise birds.

In close cooperation with conservation biology, also the discipline *restoration ecology* appeared in the 1980's. Since ecosystems are so often harmed by human activity, an important part of nature conservation work is to repair and restore damaged or destroyed ecosystems. This scientific study has its own journal "Restoration Ecology", and there is a "Society for Ecological Restoration". Within this discipline, there has been a special conceptual framework developed [19].

The fruitful cooperation between basic ecology, conservation biology and restoration ecology led to an improved understanding about nature's structure and function. Even "anonymous" species may have important functions, so we should be very careful to address a species as "ecologically redundant". The world needed a concept which covered the total variation in nature, and also an international agreement for preserving it. A breakthrough came with E. O. Wilson's book *Biodiversity* in 1988 [20]. Four years later, in 1992, the international *Convention*

on *Biological Diversity* (often shortened to Convention on biodiversity) was signed by a large number of countries in Rio de Janeiro. The biodiversity concept rapidly swept around the globe. It covers not only the diversity of species, but also the genetic variation within species, as well as the diversity of habitats and landscape types. Between the lines in the convention, the inherent, or intrinsic, value of biodiversity is acknowledged: Conservation measures shall not depend on argumentation of applied value or possible redundancy. As a natural consequence, countries are currently producing updated “red lists” of threatened species as a focus for their efforts. Also “black lists” are produced, listing problematic, introduced species which are ecologically harmful and should be combatted. Sweden and Norway have each established a “Biodiversity Information Centre”, often called “the species data bank”, which produces updated information on the biodiversity status, including red and black species lists. Based on such knowledge, politicians can decide practical measures to preserve biodiversity, and also initiate research on lesser known groups of organisms.

Box

Edward Osborne Wilson: A concept producer.

E. O. Wilson, born in 1929, is a famous American biologist and author. His biological specialty is myrmecology, the study of ants, on which he is considered to be the world's leading authority. Through several cross-disciplinary books, he has opened doors to new scientific fields and new recognition. Some of his famous and fruitful concepts are listed below.

Concept	Explanation	Reference: Book
Sociobiology (1975)	The extension of population biology and evolutionary theory to social organization.	<i>Sociobiology: The New Synthesis</i> [21]
Biophilia (1984)	Man’s unconscious interest and fascination for other life forms.	<i>Biophilia. The human bond with other species</i> [22]
Biodiversity (1988)	The diversity of nature types, species and genetic variation within species.	<i>Biodiversity</i> [20]
Ereozoikum (1994)	“The age of loneliness”, when man has lost many of the surrounding species.	<i>The diversity of life</i> [23]

3.2.4. *Ecological service: The new mantra*

Early warnings about environmental challenges were typically pollution problems, because they were visible locally, for instance in the 1960’s. The next decade focused as much on the limitation of resources like minerals, wood, oil, etc., often in combination with population growth. *The Limits of Growth* from 1972 [24] was a book about the computer modelling of unchecked economic and population growth with finite resource supplies. None of these topics have lost their importance. But today, we have also developed an ecosystem way of thinking,

realising that nature is servicing us through a number of vital “ecological services”. Species diversity represents a large potential for new ways of producing food, medicines or other products, and these options imply that species diversity represent a “gene bank”. Healthy ecosystems perform several functions - or services - on which we depend. They enable pollination of agricultural crops, provide clean water, air and soil, allow for decomposition of our wastes and neutralize pollution. The concept of ecological service is to an increasing degree used in national and international fora to promote nature conservation, and to implement the Biodiversity Convention. In order to illustrate the more or less hidden values of ecosystem services, some have tried to transform them into their economical value, including the astronomical costs of manual pollination of agricultural crops, for example, see [25]. The term ecological service is strongly “anthropocentric”, which means that we focus on humankind’s egoistic interests: *What is in it for me?* A broader perspective is the “biocentric” view: Life in general is in focus, respecting the intrinsic value of all life forms. Wilson [22] used both perspectives, but waiting for the intrinsic value to be seriously respected, he strongly argued for the anthropocentric motivation in nature conservation. Here, we find many duty-based arguments versus future generations.

3.2.5. Ecology in our mind: Eco-concepts matter

The vision of an “eco-policy” in which the society is in harmony with nature, has led to several new eco-concepts. The prefix “eco-” is often used in the sustainability debate: eco-friendly products, eco-food, eco-tourism, eco-efficiency practices designed to reduce waste, energy consumption, and resource use, etc. Within eco-effectiveness, the concept “cradle-to-cradle” is creative. Earlier, “cradle-to-grave” was a paradigm illustrating the linear use of resources resulting in waste, while “cradle-to-cradle” regards waste as a resource that can be recycled.

Sometimes, the term “green” is used as a substitute: an environmentally friendly economy may be called green economy. The term “ecological footprint” has also become universal: It represents the amount of biologically productive land and sea area necessary to supply the resources a human population consumes, and to assimilate associated waste, see [26].

Perhaps we should use, more often, the strong moral force in the eco-prefix to *warn*. Political decisions of today are often “eco-unfriendly”. The term “ecological crime” is already in use, often shortened as “eco- crime”. In Norway, eco-crime is in fact used for both ecological and economical crime, and an official body termed “ecocrime” was erected in 1989. On our journey towards a sustainable future we should probably have a stronger focus on environmentally unfriendly activities.

Literature has already produced a number of “eco-thrillers”, describing how nature strikes back when ecological limitations are crossed. Recently, the term “eco-angst”, or “eco-fear”, was presented in a Norwegian magazine [27]. Originating from the USA, the concept describes a new mental anguish which seems to be spreading: Bad forecasts for the future, for instance due to climate change, cause depression [28,29]. This is a serious signal to us all, both to politicians and consumers. Eco-fear is due to our eco-crimes. Overconsuming societies led by short-sighted economical profit are not only ecologically unsustainable, but also *mentally unsustainable*.

3.2.6. Ecological and precautional thinking in law: Examples from Norway

Until 1981, most wildlife species in Norway could be hunted without restriction, and hunting of various predators was often encouraged by payment for killing. However, as a better understanding of ecological knowledge showed, predators play an important role in nature and several of these became endangered. Therefore, the Wildlife Act of 1981 (implemented in 1982) stated that all wildlife species should be protected. Hunting became allowed only during specific periods for selected species. This turnover of practice was called “the mirror principle”. Wildlife in this connection encompassed all mammals, birds, reptiles and amphibians.

In 2009, a new act was adopted in order to protect biological, geological and landscape diversity and ecological processes through conservation and sustainable use: *Act of 19 June 2009 No. 100 Relating to the Management of Biological, Geological and Landscape Diversity (Nature Diversity Act)*. The act reflected an ecological and precautional thinking, as exemplified by the following principles:

Section 8 (knowledge base): Official decisions that affect biological, geological and landscape diversity shall, as far as is reasonable, be based on scientific knowledge of the population status of species, the range and ecological status of habitat types, and the impacts of environmental pressures.

Section 9 (precautionary principle): If there is a risk of serious or irreversible damage to biological, geological or landscape diversity, lack of knowledge shall not be used as a reason for postponing or not introducing management measures.

Section 10 (ecosystem approach and cumulative environmental effects): Any pressure on an ecosystem shall be assessed on the basis of the cumulative environmental effects on the ecosystem now or in the future.

Section 11 (user-pays principle): The costs associated with preventing or limiting any damage caused by a project to biological, geological and landscape diversity shall be borne by the project owner, unless this is unreasonable in the light of the nature of the project and of the damage.

Finally, the act introduced the concepts of *priority species* and *selected habitat types*. These are threatened species or nature types which will be given special concern through specific conservation programs.

In order to implement these various intentions, increased ecological knowledge is often needed about species and habitats, cumulative effects, and risks. We see how ecology feeds politics, and how political intentions again ask for more ecology to be able to practice ecological intentions.

3.3. Global warming: A test on long-term thinking

Already around 1970, specialists in atmospheric physics warned about a gradual global warming, due to increased concentration of CO₂ caused by humans. A “greenhouse effect” due to “climate gases” was gradually considered as a dangerous threat both to man and

biodiversity, and in 1992 the Convention on Climate Change was born in Rio de Janeiro to reduce emissions. A much used concept is “climate quota”, which means that one country can pay another country for reducing their emissions, instead of reducing its own. Unfortunately, global CO₂-concentrations have continued to rise, and at the Rio + 20 meeting in 2012, the international hope was to limit temperature increase to 2°C. The ghost in this situation is the concept of “tipping point” [30]. At a certain temperature, which is unknown, natural mechanisms may take over and rapidly push temperature still higher by feedback mechanisms, out of human control. For instance, more open water at the poles means that more solar radiation is absorbed, and if the permafrost of the tundra starts to melt, the strong greenhouse gas methane (CH₄) will be released to an increasing degree. Besides a massive extinction of species, large groups of people will suffer due to unstable weather with drought, floods, strong cyclones, and rise in sea level. The concept of “climate refugees” is already on the lips.

Our hope is that temperature stabilises below the tipping point. Realistic visions about “carbon-neutral communities” based on “renewable energy” or “carbon-catching and storing” exist, but such options are followed up only slowly. Until now, extra “climate taxes” on CO₂ emissions have had little effect. It is still cheap and comfortable to do business as usual. Also, there is a conflict between the two Rio aims: biodiversity and climate. In Norway, for instance, there is a great potential to save energy through better design in buildings etc. Also, existing hydroelectric power stations can be upgraded to become more efficient. Nature conservation organisations want to give energy saving priority, and argue that the “greenest energy is the energy which is not used”. However, politicians are thinking along other lines, and the official energy politics in 2012-Norway is to increase the total use of energy. To achieve this, large plans exist for wind parks and new hydroelectric power stations. These plans are marketed as “green”, “clean” or “environmentally friendly”, although they may destroy nature of international value. Furthermore, this extra energy is not needed at present, and it does not substitute a corresponding reduction in the use of fossil energy. This is an example of tensions between possibilities and practice, between NGOs and politicians, which raises temperature also in energy debates. Such debates are to a large degree rhetoric, and “greenwashing” of increased energy use is often a problem.

Solar energy is an interesting option for the future, and some people have the vision of a “solar age”. No one owns the solar energy, and it can be downloaded by anyone anywhere. Seen from above, places where people live contain large areas of roofs on which this energy can be collected free.

3.4. Nature as a source of life quality: How to express it?

Many people claim that contact with nature has a strong recreational effect, and that loss of nature would reduce their life quality (Figure 1). The conceptual framework for these values is still limited, but we shall present some fruitful studies, that have appeared during the past decades. The mental value of nature contact is still undercommunicated and deserves both more concern and further research.



Figure 1. Nature, with beauty and silence, is a rich source for mental recreation. For many people, nature is an arena for the quality of life. From Jotunheimen mountains, Norway. Photo: S. Hågvar.

Callicott [31] listed the various values of biodiversity, pointing to both *intrinsic values* (diversity for its own sake) and *instrumental values* like various goods, ecological services, and information. Finally, he added the *psycho-spiritual values*, which include aesthetic beauty, religious awe, scientific knowledge, etc. The present author followed up the concept of psycho-spiritual values and pointed at nature as an *arena for the quality of life* [32]. He addressed these values as important among the “third generation” of environmental problems. While pollution problems were the main focus at the first UN conference in Stockholm in 1972, a “second generation” of environmental problems including climate change and biodiversity loss were discussed in the UN conference in Rio, 1992. He argued that it is due time to address the psycho-spiritual values in an international context as a “third generation” environmental challenge, broadening the perspective of nature loss to include our mental health.

Edward O. Wilson is a famous biologist who has coined several biological terms, but he has also contributed with an important concept regarding our mental relation to nature. He argues that humankind has a subconscious interest and fascination for other life forms (Figure 2), and calls this “biophilia”. The term literally means “love of life or living systems.” In his book *Biophilia. The human bond with other species* [22] he reminds us that we have evolved in nature, just like all other species. Genetically, we have not changed significantly since we lived completely surrounded by nature. Since nature is our original home, it may not be surprising that our brain – maybe unconsciously – enjoys contact with nature. Wilson argues strongly for rescuing the species richness of our planet – not only because species have an inherent value,

an ecological value, and an applied value – but also because the wonders of life fascinates us and elevates our life quality. Nature presents us for both beauty and mystery, which appeals to our brain. Biodiversity may thus be regarded as an important basis for the human spirit.



Figure 2. Wilson's "biophilia" concept indicates that man has a basic interest in, and is fascinated by other life forms. Larva of the Privet Hawk-moth, *Sphinx ligustri*. Photo: S. Hågvar.

Many studies have shown that contact with nature is good for our mental health. A classic book in this context is *The Experience of Nature* by Kaplan & Kaplan [33]. They documented that contact with nature – from gardening and urban parks to the experience of wilderness – increased people's life quality. Regarding nearby nature they concluded:

People feel more satisfied with their homes, with their jobs, and with their lives when they have sufficient access to nature in the urban environment. People value natural settings for the diverse opportunities they provide – to walk, to see, to think. They are not necessarily aware of the many forms of encounter they have with nature or the variety of benefits that accrue.

The modern, busy life often makes us feel worn out, and in need for a break or a recovery period. This worn-out state is generally not physical. Rather, these situations involve what we are calling “mental fatigue”. A mentally fatigued person finds it burdensome to concentrate, and to pay attention to something uninteresting. Kaplan & Kaplan found that we have two types of attention: An active and voluntary “directed attention” which we use when we concentrate upon a task, and a passive, “involuntary attention” which requires no effort. When we become mentally fatigued so that we need recreation, it is the directed attention which is exhausted. A key issue here involves the concept of “inhibition”. In order to maintain one’s focus on a particular thought, you have to inhibit the stimuli around you that compete for your attention. To resist the attractions of what you hear, see (or mental associations you get), for instance if you work in a room together with other people, demands mental effort. In short, continuous distraction breaks down your valuable, directed attention. For such “burned-out-people”, nature is a good arena for mental recreation. The directed attention is resting and recovering, at the same time as we can enjoy nature’s “soft fascination” by our passive, involuntary attention. Such psychological insight, based upon fruitful concepts, documents the value of having access to nature, as a mental source for recreation and life quality.

In the best-seller book *Last child in the woods: Saving our children from nature-deficit disorder* [34], Richard Louv worried about American children growing up without contact with nature. Not only is nature gradually lost where children grow up, but today’s access to electronic media results in sedentary children who often prefer to stay indoors. Access to electrical outlets may be more attractive than access to nature! The author concluded that this lifestyle was both mentally and physically negative for children and coined the concept of “nature-deficit disorder”. The book and the concept have inspired city planners to include green areas, especially remnants of real nature, as an important element in long-term city planning. For instance, in the author’s home city, San Diego, “undeveloped areas” like canyons with a rich plant and animal life were earlier regarded as a problem since they were difficult to urbanize. Instead, a process was started to preserve this varied near-nature by creating “San Diego Urban Canyonlands Park”. A new view on nearby nature had been triggered – but someone had to trigger it! There is now a growing understanding in the USA that protection of nearby nature has not only to do with biodiversity conservation, but also with the conservation of people’s physical and mental health.

In his book *The big connection. How modern Swedes consider man’s place in nature* [35], psychiatrist Nils Uddenberg studied how important contact with nature is for Swedish people. Both large studies with many people, and in-depth-interviews with fewer persons from different social groups documented that contact with nature was important for their life quality. In a large study covering one thousand people, 94 percent agreed with the following statement: “Strolling in the forest and fields makes me relaxed and harmonious”. However, when people were asked to explain why nature mattered, they had problems finding words to explain their statement. They lacked concepts and formulations for this purpose. People often ended up with religious concepts like holy, cathedral, or divinity to try to communicate their experiences, even if they were not religious. In my opinion, here is a field where a further development of

concepts should be welcomed. Emotions are valuable for us, but difficult to communicate. The situation might be paralleled by the difficulties of explaining a deep musical experience.

Nature's health-promoting effect in the Nordic countries Norway, Sweden and Denmark, came into focus three years ago by a report from Nordic Council of Ministers [36]. While epidemic diseases represented the main health problem in earlier times, the health of today's people is mainly threatened by *non-epidemic life style diseases*. There are two of them: Overweight due to inactivity, and a depressed mental state, maybe due to a strong materialistic focus. Physical activity is good for both diagnoses, but the effect is best if the physical activity occurs in nature. Nature greets us with the absence of stress, combined with beauty, silence, and other positive experiences. Furthermore, physical and mental improvements support each other through so-called "effect-chains", resulting in improved life quality. In Sweden, and to a certain degree also in Norway, doctors have begun to order outdoor activity as a "green prescription" instead of tablets. Rather than heading to the chemist, people are heading to nature. This is cheap medicine, since nature is free and always open. The new trend reminds us of the importance of having access to near-nature, a resource which is shrinking in many Nordic cities and other densely populated areas. Areal planners are increasingly aware that to preserve green areas and greenbelts are good health politics. Health improvements by green prescription is, of course, also economically favourable for the society by shortening the hospital queues.

Concepts like threatened nature types and threatened species are now universally used. Sometimes we also see the term "threatened nature phenomena". The Monarch butterfly is famous for its long, yearly migrations between Canada in north and Mexico and California in south. Although the Monarch is not an endangered species the annual migration is considered a threatened phenomenon by IUCN. Since there are very few overwintering sites where the adults aggregate, their populations become vulnerable. These sites are threatened by human activities, mainly logging, development, and agriculture. In 1984, the Monarch Project was created in order to save these sites. The Mexican conservation organization, Monarca, works closely with governmental agencies and local people to establish land protection and enhance alternative economic development in the region.

Also the spectacular, yearly migration of wildebeest and zebras over long distances through Tanzania and Kenya is a threatened nature phenomenon. Plans about a highway through the Serengeti national park, which would halt the necessary migrations, has till now been stopped, due to international protests.

The concept of threatened nature phenomena deserves to be used more actively. People are not only fascinated by the teeming diversity of other life forms, but perhaps even more about what they are doing: What kind of processes nature reveals for us, and how it all functions. And least of all: Nature's secrets and mystery, about which we like to wonder. In light of the psychological value of nature experiences we should also use the concept of "threatened nature experiences". And furthermore, we should regard nature as a "resource of positive experiences". My favourite concept, trying to include nature's various contributions to our mental health, is *nature-dependent life quality*.

4. Development of attitudes

The human mind seems to have a strong need for consistency, so we all develop attitudes [37]. Attitudes reflect our evaluation in various fields, and always have a focus (a person, nation, product, etc.). The attitude may be negative (unfavourable), neutral or positive (favourable). If we receive new information, attitudes can change since we want to eliminate mental inconsistency. Attitudes can be more or less conscious, depending on the amount of information and reflection, and they may be weak or strong.

Within the discipline of conservation biology, several authors have pointed to the development of attitudes as important in order to save biodiversity. Ehrlich [38] said that “a revolution in attitudes” is needed, and that “a quasi-religious transformation leading to the appreciation of diversity for its own sake, apart from the obvious direct benefits to humanity, may be required to save the organisms and ourselves”. Wilson [20] concluded: “In the end, I suspect it will all come down to a decision of ethics – how we value the natural worlds in which we evolved and now, increasingly, how we regard our status as individuals”. He also stressed that these questions include the “protection of the human spirit”.

Box

The power of “intrinsic value”

Many species do not have any apparent practical value for man, nor any clear ecological function. They may only have “intrinsic value” – an ethical right to exist. However, acceptance of intrinsic value may have great power. The endangered Northern Spotted Owl in the USA, which depends on very old forest, may serve as an example. In the conflict between conservationists and the timber industry, the strategy of the timber industry was to put the burden on the scientists to prove an adverse effect of timber harvest on Spotted Owl persistence. However, this strategy failed because the court found it sufficient that scientists could document a risk to the species – a decision which reflects an intrinsic value of Spotted Owl. This is in accordance with The U.S. Endangered Species Act of 1973, which claims that habitats on which any endangered species depend should be protected. Due to intrinsic value of the owl, the burden of proof shifted from conservationists to developers: Now the forest industry would have to prove that the advised measures to save the owl had a significant negative effect on their business. In this case, we also see the application of the “precautionary principle”: Doubt about a negative effect on the owl went in favour of the owl, and not in favour of the forest industry. Conclusively, intrinsic value has power both because it may shift the burden of proof from conservationists to developers, and because it may trigger the application of the precautionary principle.

For further reading about the Spotted Owl case, see [39].

The Norwegian philosopher Arne Næss is known for his “deep ecology”, which includes respecting the intrinsic value of all life forms [40,41]. This also implies respecting people’s spontaneous appreciation of species and nature.

The development of attitudes as a process of systematic thinking has been described by the present author [42]. His focus was the natural heritage, with biodiversity and pristine nature as the main elements. In the box, with permission from the Royal Swedish Academy of Sciences, four levels of insight are presented. The first level is to achieve good *knowledge* about the threats to the natural heritage. Step two is to discuss the *values* which are connected to biodiversity and pristine nature. The combination allows us to formulate *attitudes*, which represent the third level. Attitudes built on such stepwise thinking are clear and easy to explain. They form the motivation for *action*, or practical conservation work, the fourth level.

BOX

A gradual development of attitudes through various “levels of insight”. Attitudes create actions which preserve natural heritage.

Levels of insight	Contact with prehistoric times	Today's situation	Perspective for the future
1. Descriptive knowledge	Our planet is very old. The richness of species and biota is a product of several thousand million years' evolution.	Biodiversity and pristine nature disappear rapidly, due to uncontrolled human activities. Many species depend on pristine nature.	It takes millions of years to develop new species or biota. Biodiversity in the future depends on today's plundering or conservation.
2. Values	Pristine nature is an important part of our planet's identity, and brings us in contact with prehistoric times. Natural communities help us to reconstruct the evolution, and to document our biological roots.	The loss of biodiversity and pristine nature implies a loss of qualities and values. A number of ecological, egoistical and ethical values are connected to biodiversity.	Pristine nature has all potential uses intact. The diversity of species represents valuable "gene banks" for future generations. All life forms have an inherent (specific) value. Preservation of species is beneficial for evolution.
3. Attitudes	Respect for the planet's history, its pristine habitats and species richness (the planet's own products through evolution).	Constant care for biodiversity, pristine nature, and habitats for threatened organisms. All doubt should go in favor of nature (the precautionary principle).	Respect the democratic plurality of future generations. Do not destroy their possibilities by reducing biodiversity. Allow evolution to proceed on the basis of genetic diversity.
4. Action	Priority for preservation of pristine nature.	Mapping and preservation of threatened species and their habitats. General care of biodiversity in forestry, agriculture, industry, areal planning, etc.	An empty chair in important meetings, for the imaginary representative for future generations.

Because today’s situation is a result of earlier evolution and history, and also represents the options for future biodiversity, each level of insight contains a time factor. As well as having focus on today’s situation, we are invited to consider “contact with prehistoric times” and “perspective for the future”. At the first level, we are reminded that the planet is very old, and that today’s biodiversity is a product of a very long evolution. Correspondingly, evolution will

need millions of years to develop new species, and future biodiversity depends on our plundering or conservation. At the second level, pristine nature is considered to be an important part of our planet's identity. Intact nature also brings us in contact with prehistoric times, and helps us to understand and reconstruct evolution. In a futuristic perspective, pristine nature has all potential uses intact and can be regarded as a "gene bank". Besides this selfish aspect, the inherent value of all life forms is pointed at. Also, preservation of species is beneficial for further evolution, while termination of evolutionary lines in our time represents irreversible losses. The third level formulates attitudes in a condensed way, where words like "respect for" and "care for" are useful in expressing a feeling of responsibility and duty. The precautionary principle is central here, meaning that all doubt should go in favour of nature. In a prehistoric perspective, it is a matter of respecting the planet's own production through evolution. Likewise, it is considered morally right to allow evolution to proceed on the basis of genetic diversity.

At the attitude level, a futuristic perspective also must consider our duties for future generations. We should not destroy their possibilities by reducing biodiversity. They also might find quite new ways of using or appreciating both species and nature types – including cultural and recreational purposes. Furthermore, there is a democratic challenge here: Later generations will consist of a much higher number of persons together, than the population living today. In that perspective, we have an ethical duty to respect their democratic plurality.

Finally, we reach the fourth level of action, which is our everyday fight to preserve nature qualities. It consists of mapping, preservation, and a general care of biodiversity in forestry, agriculture, industry, areal planning, etc. It is no secret that personal attitudes mean a lot in this work, which is often a fight against several strong, and often short-sighted forces. Even within a ministry of environment, it is possible to do both a bad and good job; even within schools or in your own local community. At all levels, it is often so that certain "resource persons" may be driving forces, and also inspire others. Furthermore, both the prehistoric and the futuristic perspective may be relevant for the way we think and act. An evolutionary perspective helps to motivate preserving pristine nature as nature documents. And what about placing an empty chair at important meetings, for the imaginary representative for future generations?

In our everyday work, we might need a "short version" attitude to guide our priorities and decisions. In a condensed form, a basic attitude could be formulated in the following way: "Respect for the planet's natural heritage, for future generations, and for future evolution" [42]. Perhaps this attitude may even help us to preserve our respect for ourselves.

Who shall teach us to develop sound environmental attitudes? A good beginning is to get people into contact with nature, the younger the better. If you love nature, you may be prepared to defend it. If you have not "tasted" enough nature to miss the savour when it is gone, you may not be concerned about nature loss. Today, more than half of the world's population lives in cities. Therefore, there is a danger of "less nature – less concern" [43].

5. Rhetoric matters

5.1. Some examples and citations

Former vice president of the USA and winner of Nobel Peace Prize, Al Gore, fought strongly for solving the climate crisis through the documentary film *An Inconvenient Truth* (2006). His creative rhetoric was probably as important as the data he presented. Another case of forceful rhetoric was seen in the Time Magazine of 13 September 2007. Here, Nancy Gibbs treated global warming under the heading GLOBAL WARNING, with these words:

In a week when cable screens were split among solemn ceremonies, falling governments, the first serious congressional debate over a war now in its fourth year and an economy with a nervous twitch, it was even harder than usual to catch the sirens in the distance – to hear the sounds of ice melting, species vanishing and cities choking the people who live in them. You can't really cover a story that hasn't happened yet, but sometimes the news about the future is the biggest story of all.

This was a week for warnings. U.S. government scientists announced that the Arctic ice cap is melting even more rapidly than they had feared; by 2050, 40% of the ice cover in the Arctic Ocean could be gone, a loss that wasn't supposed to happen for 100 years. One scientist called the news "astounding." Since greenhouse gases linger for decades, even drastic reductions in emissions won't be enough to prevent further decline.

Do we hear “the sirens in the distance”? Are we able to realise that “the news about the future is the biggest story of all”? The climate problem is not only a matter of collecting scientific data, but also a massive pedagogic challenge. Our motivation for action depends highly on a mental empathy for future consequences. We need concepts for debate, but sometimes even more powerful rhetoric for motivation – for mental change.

The American biologist Edward O. Wilson is known for several well-formed statements. His main concern is to preserve biological diversity. In 1980, professors within different disciplines at Harvard University were asked to identify the most serious threats of the nearest future. Wilson answered:

The worst thing that can happen during the 1980s is not energy depletion, economic collapse, limited nuclear war, or conquest by a totalitarian government. As terrible as these catastrophes would be for us, they can be repaired within a few generations. The one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly that our descendents are least likely to forgive us [44].

In his book “The Diversity of Life” [23], Wilson stated:

In the United States and Canada more people visit zoos and aquariums than attend all professional athletic events combined. They crowd the national parks to view natural landscapes, looking from the tops of prominences out across rugged terrain for glimpses of tumbling water and animals living free. They travel long distances to stroll along the seashore, for reasons they can't put into words.

In the same book, Wilson coined the concept “eremozoic age”, or “eremozoikum”, – the age of loneliness – to which we may be heading. If ecosystems collapse and the diversity of species disappear around us, humankind is getting more and more lonely on the planet. In this context, it is a paradox the some of the most threatened species are our closest relatives, the gorilla, chimpanzee and orangutang.

Wilson is a reputed synthesizer, and has come up with several basic hypotheses and concepts. The following statement is relevant for sustainable thinking, where information should be transformed to wisdom:

We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely. [45].

Norton [46] presented the following formulation about the mental value of contact with nature:

To be moved by the beauty of organisms and whole, healthy ecosystems, to experience a sense of wonder and awe in the face of nature's inexhaustible marvels, is to become a better person.

The conservation biologist Soulé asked for a stronger engagement among biologists about attitudes and ethics [47]. He refuses the viewpoint that we should leave speeches to the politicians, morality to the priests, and ethics to the philosophers: *Few of them can speak with authority and familiarity about the exquisite detail and amazing diversity of life.* He concludes: *Who are more capable than biologists to spread the word that it is wrong to terminate evolutionary lines, and that it is wrong to wipe out entire communities?* He also touches the human pain from the destruction of biodiversity: *The planetary tragedy is also a personal tragedy to those scientists who feel compelled to devote themselves to the rescue effort. It is painful to witness so much termination.* This is powerful rhetoric, where Soulé manages to communicate both the duties biologists have to fight for biodiversity, and also his personal pain in witnessing biodiversity loss.

The rhetoric of the American expert in atmospheric physics, James E. Hansen, is also well worth to listen to [30]:

It is worth imagining how our grandchildren will look back on us. The picture that I fear has the polluters, the utilities, and automakers standing in court demanding the right to continue to emit carbon dioxide for the sake of short-term profits. The disturbing part is that we, through our national government, are

standing alongside the polluters, officially as a hulking amicus curiae (friend of the court), arguing against limitations on emissions. Is this the picture of our generation that we want to be remembered by? We live in a democracy, and policies represent our collective will. If we allow the planet to pass tipping points, it will be hard to defend our role. The state of the wild is in our hands, and we can still preserve creation and serve humanity worldwide. A drive for energy efficiency and clean energy sources will produce high-tech jobs. Restoration of clean air will be universally beneficial. Rural life and the planet can benefit from intelligent development of biofuels and renewable energy. At the front lines, observing the changes in the wild, conservationists serve as a voice for the plants and animals that have already started reacting to climate warming. To conserve as much biodiversity as we can, conservationists must unite with many others to push for a far more radical reduction in carbon dioxide emissions than has hitherto been considered practical. Otherwise, alpine and polar species, coral reefs, and species living in areas that become arid will be lost over the next century.

In Norway, the biologist, Magnar Norderhaug (1939-2006) was well-known for his formulations in a number of books, articles and speeches about nature conservation. One formulation he used in order to wake up an audience was: *The future is no longer what it used to be*. Another formulation which was meant as a final inspiration was: *We must make the necessary possible*. The environmentalist and eminent speaker, Øystein Dahle, presented the following formulation about the need to deviate from "business as usual" on our journey into the future: *Our destination should not be where we are heading*.

Even the graffiti genre may deliver forceful formulations. The statement: *The future is canceled* is strongly negative and illustrates that rhetoric is a weapon that can be used in many ways. A more constructive formulation is: *Good planets are hard to find*. This is true, and could motivate us to rescue the one we have.

5.2. Creating hope and action with words: "If you are a part of the problem, you are a part of the solution"

This formulation illustrates constructive, sustainable thinking [9]. We are talking about "enlightened self interest": A common problem must be solved by common efforts. This requires a "precautionary ethic" about what is morally right or wrong in a long term perspective. The *Local Agenda* perspective from Rio in 1992 placed a responsibility on all local communities through the slogan "Think globally and act locally". For instance, in Norway, several municipalities were inspired to present themselves as "environmentally friendly municipalities", and prizes were given to industry, companies, schools etc. which actively showed environmental responsibility by reducing pollution, wastes, energy consumption, etc. Some institutions were acknowledged as "environmental lighthouses": as examples for others to navigate by. Some measures are "win-win situations": for instance reducing costs by reducing energy consumption. In fact, sustainable practices could be regarded as a "public service", since they serve our common future [9].

On the personal level, it has been argued for "the good life" with reduced consumption, under the vision of "voluntary simplicity" [7]. This is "the responsible consumer", who practices a

“sustainable lifestyle” through “ecological choices”. If numerous enough, responsible consumers may achieve “consumer power”. For instance, the water quality of Norway’s largest lake Mjøsa was saved in the 1970’s through a coordinated effort: consumers agreed to stop buying phosphate-containing detergents, and farmers (with economic support) stopped the run off from leaky manure storage cellars. Another example is how environmentally conscious consumers in Europe have forced forestry in Norway, Sweden and Finland to reduce logging in virgin forests of high biodiversity value. Today, large companies like Springer Verlag and IKEA dare not buy paper or wooden products originating from Nordic virgin forest. To practice this, they have to trace the origin of the wooden products, and Nordic Forestry has been obliged to undergo an “environmental certification” to document a “green profile”. A part of their duty is to identify biologically important forests by means of sensible “indicator organisms”, and if so-called “key habitats” are cut, forest owners may lose their certificate and the possibility to sell the timber. Only within this forestry example, a number of new concepts were developed in order to agree upon aims, principles and control mechanisms. But behind it all stand environmentally conscious European consumers, kept together by “the responsible consumer”-rhetoric. Conclusively, we all matter.

6. Our ability to deny or suppress environmental threats

In his book *Collapse – How societies choose to fail or succeed*, Jared Diamond [2] shows how our choices in critical periods either saves the society, or allows it to collapse. How can, for instance, a society destroy itself by cutting down all available forest? While Japan in due time took care of a part of their limited forests on their islands, the inhabitants of Easter Island chose to cut down all their trees. This happened even though this island community depended on woody material for several purposes like fire wood, buildings and boats. After that, the society collapsed. The isle is famous for its large stone statues, which were probably of great importance. The current hypothesis today is that different tribes competed about making the highest statue, investing great prestige in this competition. Each statue demanded much timber in order to be transported, sliding or rolling, from the quarry to its final place. What did the person think, who cut down the very last tree? Perhaps that this trunk was just what they needed for the transport of the most recent statue?

A steady course towards catastrophe has occurred in several societies throughout history. Diamond’s book is important because he tries to understand how it is possible to act in a wrong way with open eyes. He presents the following six forces which may lead to so-called negative handling of crises – even after the crisis has been discovered and understood. They all have to do with the way we think.

1. Some are favoured by “business as usual”.

Short-sighted economical interests are often the motive, like destroying tropical forests in an irreversible way, overfishing, or continuing large-scale climate-hostile production and use of fossil energy.

2. Some are afraid of losing power.

Power attains many forms. Wealth often creates power, and rich persons, companies or nations may depend on continued plundering of nature and natural resources. Dictators may suppress democratic movements and even commit genocide to avoid losing power.

3. We are unwilling to change traditions, even if they are environmentally unfriendly.

Nordic settlements on Greenland existed for 450 years, but collapsed during the 15th century. Diamond assumes that the traditional Norwegian lifestyle, which they maintained, led to overgrazing and erosion. They had contact with eskimo people, but were not willing to consider harvesting from the sea, which would have been more sustainable on Greenland. Also, English traditional husbandry in Australia on vulnerable soils, with little forest and limited precipitation, has created several problems: overgrazing, erosion, lack of freshwater, and loss of forests and biodiversity. Diamond suggests that a sustainable Australia has to create new traditions, adjusted to the natural conditions.

4. We are reluctant to think in a long-term perspective.

While a farmer may be eager to leave his farm in an improved condition to his children, both politicians and private persons may evolve a mental obstacle about thinking too far ahead. Politicians may be more eager to be renominated than to grasp challenges demanding long-sighted thinking, and individuals may be more or less self-centered. Economic activity may be highly focused on short-term produce, and investments may easily be moved from one environmental hostile activity to another, with great total economic success.

5. Critical, individual thinking may be paralysed by group psychology.

History illustrates several cases where people have been seduced by charismatic, but dangerous leaders. It may be a demanding task to maintain independent, critical thinking amidst a mentally brainwashed and emotionally heated public. Clever nazi-propaganda in the 1930's made Hitler's crimes against humanity possible. Even a handful of good advisers may give bad advice as a result of unfortunate group psychology. Stressful circumstances and the need for mutual support and approval may lead to suppression of doubts and critical thinking, resulting in a dangerous decision. One example from the book is president Kennedy's advisers during the Bay of Pigs crisis. Later, Kennedy was careful to let his advisers think critically and independently before the group concluded. The movie "Twelve Angry Men" demonstrated how one critically thinking person, presenting his doubt, was able to break an unfavourable group psychology.

6. Psychological denial.

Man has a psychological ability to suppress, often subconsciously, the inconvenient. For instance, people who live just below a dangerous dam may claim that they do not fear a catastrophe. They suppress thinking about it. However, persons living further down the watershed dare to worry, and actively try to reduce the danger.

When discussing a way to a sustainable future, it is highly relevant to be aware of these psychological traps. "Business as usual" contains them all.

7. Discussion

This review illustrates how sustainable thinking depends on fruitful concepts and well-founded attitudes. We have also stressed the value of powerful rhetoric: It matters how you communicate about environmental problems. On our way towards a sustainable future, concepts, attitudes and rhetoric represent important weapons against "Business as usual". However, these weapons must have the necessary quality.

7.1. About concepts

A common conceptual framework is needed to identify, discuss and solve environmental problems. However, as illustrated by the concept of "sustainable development", a global consensus about foggy concepts creates little progress. During the last 25 years, this concept has been considerably refined. A division between environmental, economic, and social development, and further sub-concepts within each these parts, has been constructive. However, further clarification about aims and methods is necessary. For instance, the concept of "green economy" contains a problematic premise about further economic growth. It is also sufficiently foggy to allow a practice close to "Business as usual". There is good reason to believe that world leaders *wanted* a foggy "green economy" concept at the Rio+20 meeting in 2012.

Concept producers like Edward O. Wilson are valuable people. Several of his concepts, like "biodiversity", "biophilia" and "eremozoicum" were rapidly taken into use globally. It is a tempting idea that concept evolution within the field of sustainable development could be regarded as an important academic discipline, attracting creative people. New concepts should be relevant, sharp enough, and difficult to misuse. Within certain topics, a lack of good concepts may keep important questions outside of today's debate. For instance, the value of deep personal experiences in contact with nature is difficult to communicate to others, but of great personal importance for some people. Several of today's foggy concepts deserve a systematic study in order to make them operable and to avoid misuse. Progress within certain complicated fields, for instance how to combine economic, environmental and social sustainability, depends upon research. Environmental challenges may be of local character, and different social and economic structures may need different conceptual models.

The rise of ecological thinking illustrates how basic, scientific concepts can be modified and applied in sustainable thinking and practice. To cooperate with nature's own processes has become a main aim in environmental sustainability. Furthermore, "ecological service" has rapidly come into international use, in order to illustrate our dependence upon a well-functioning nature. Various types of research have been initiated by the concept, for example attempts to transform the value of pollination into economy. However, the idea of "ecological service" is strongly anthropocentric. We should not forget biocentric motivations to protect

nature. For instance, the inherent value of every species was the basic motivation for the philosopher Arne Næss in his fight for nature preservation. Fortunately, the Convention on Biological Diversity urges us to protect all species.

Some writers stress the importance of listing “non-sustainable activities”. This is a constructive approach. In this connection, the term “environmental crime”, or “ecological crime”, has been used. Presumably, business leaders would not be happy to have this label attached to their activity.

7.2. About attitudes

Development of well-founded attitudes is a personal process for each of us. A “ripe” attitude is clear and conscious, and gives us motivation. We must be able to explain our attitude, and to defend it in discussions. In environmental debates, disagreements are often due to different attitudes. If people are unwilling or unable to explain the fundament of their attitudes, debates may become foggy and not very constructive. For instance, a person may find loss of species to be unproblematic, due to lack of biological knowledge. There are people who focus mainly on the “plate biodiversity”, which are species we can eat or otherwise use in a practical way. Even among biologists, there have been discussions about “ecologically redundant species”, which are species that could be removed without any ecological harm. However, this is a dangerous discussion, because we have several times discovered that “anonymous” species may have key functions in nature. One example is the mycorrhizal fungi which makes it possible to have forests on northern latitudes. In such discussions, the attitude expressed by the “precautionary principle” becomes important.

Concerning the danger of climate change, groups of “climate sceptics” are common. They do not find it sufficiently proven that climate change is due to human activity. Several of them find it wrong to use massive resources to reduce carbon dioxide emissions. However, some of them accept applying the precautionary principle; accepting that they might be wrong. For them, to act is an insurance for the future; we insure our houses even though the chance of it burning down is little.

People who love nature are strongly motivated to defend it. However, attitudes signaling indifference to nature qualities are not uncommon. We see this attitude practised all over the world, and there are many companies which depend upon destroying nature.

Finally, political leadership is crucial. If political leaders do not act, even engaged people may loose motivation and think that perhaps problems are not so serious after all – since political leaders do not take them seriously. This creates a negative spiral, while the aim should be that people and politicians support each other in a positive spiral, making the necessary possible.

7.3. About rhetoric

While a consensus about concepts is obviously important, and clarifications of each other’s attitudes can be crucial in environmental debates, why should we include rhetoric as a premise for success? The answer is that we are short of time. Environmental problems increase faster

than we are able to solve them. Just as in literature, certain thorough formulations may have great mental power. The power of rhetoric can be used to take future generations seriously, to warn of environmental catastrophes, to expose in a pedagogic way ecological crime – or it enables us to describe possibilities, inspire individual action and create hope. Our leaders need inspiration to use the necessary resources to save biodiversity and halt climate change. Many of them know that it may be more difficult to try to repair damages in the future, than to prevent them, but they are still reluctant to act. Leaders who *want* to act, need rhetoric help to inspire people to cooperate.

Increased use of “sustainable rhetoric” is perhaps the most efficient single factor in order to create change. In debates, we must be ready to meet a “counter-rhetoric” which defends “business as usual”. It is a challenge for debate leaders to identify foggy concepts, environmentally unfriendly attitudes, and argumentation based on our mental tendency to deny or suppress environmental problems.

7.4. About “mental enemies”

As shown in Jared Diamond’s book [2], the human brain is clever in suppressing or denying threats. The six more or less unconscious mechanisms he refers to are our “mental enemies” and represent a serious halting against sustainability. Therefore, we have to identify them and avoid them. The case of group psychology may deserve special attention. Political leaders often rely heavily on advisory groups, since their advice is supposed to be strengthened by contribution from people with different backgrounds. However, valuable opinions from the best person may be drowned by group psychology, due to stress, loyalty and a common wish about consensus. President Kennedy’s dangerous experience in the Bay of Pigs crisis led him to decide that on later occasions, his advisors should think critically and independently before the group concluded. This is an invaluable “take-home-message” also for today’s political leaders.

7.5. About hope

Lack of hope is a serious obstacle on the way to sustainability. On the other hand, collective hope may have a strong force. Both concepts and rhetoric are good helpers in creating hope.

Certain concepts should be used actively to create hope, by showing possibilities. Several eco-concepts have this function, as eco-policy, eco-friendly products, and eco-efficiency. In Norway, companies, institutions, schools, etc. which change their practice in a sustainable way, may achieve a diploma for being “environmental lighthouses”, by which others can navigate. Fortunately, there are several win-win situations towards sustainability, for instance, reduced costs by conscious energy saving. Another approach is reducing waste, and by regarding the remaining waste as a resource. Re-use following the principle “from cradle to cradle” is a promising principle.

There is a special challenge to develop a strong rhetoric of hope – and to practice such rhetoric. However, constructive hope depends on visions about possibilities. The following formulation is good rhetoric: “If you are part of the problem, you are part of the solution”. Here, facts,

obligations and hope are signalled in one package. The formulation calls for cooperation, and opens a door for change.

8. Conclusions

In order to realize a sustainable future, we have to deviate from "business as usual". This calls for alternative thinking, based on fruitful concepts and well-founded attitudes. A literature review illustrates how the unclear concept of "sustainable development" from 1987 has undergone a considerable conceptual refinement. Today's conceptual framework is, however, still too weakly developed to encourage community development onto a sustainable track. For instance, the concept of "green economy", accepted by The World Bank, large companies and national leaders in several of the richest countries at the Rio+10 meeting in 2012, is foggy enough to "greenwash" unsustainable economic activity by making only cosmetic changes. The concept also contains a premise about further economic growth, which is a main cause of environmental degradation. A lack of consensus about precise concepts and principles is a threat to sustainability. The author suggests that concept development about sustainability should be regarded as an important academic task. There is a need to coin and define new, fruitful concepts, to give existing concepts a more precise meaning, to point at misuse of concepts, and to identify topics which are excluded from the debate due to a lack of operable concepts. For example, the value of deep personal experiences in contact with nature is difficult to communicate to others, but of great personal importance for some people. Progress within certain complicated fields, for instance how to combine economic, environmental and social sustainability, depends upon research. Environmental challenges may be of local character, and different social and economic structures may need different conceptual models.

This literature review about the rise of ecological thinking illustrates how basic, scientific concepts can be modified and applied in sustainable thinking and practice. To cooperate with nature's own processes has become a main aim in environmental sustainability. Our dependence upon a well-functioning nature is illustrated by the concept of "ecological service". This fruitful concept has initiated many new studies and calculations, and increased our awareness about saving nature qualities. However, the concept is strongly anthropocentric, and too narrow to secure biodiversity. Fortunately, the Convention on Biological Diversity is based on a biocentric view.

Some writers stress the importance of listing "non-sustainable activities". This is a constructive approach. The concepts of "environmental crime", "ecological crime", or "eco-crime" deserve to be used more actively, for instance by NGO's when criticising environmentally harmful activity.

Well-founded attitudes are another prerequisite for a sustainable development. Attitudes motivate us for change, and support our endurance. However, non-sustainable attitudes are common, as well as a lack of attitudes in this field. A personal developmental process is necessary to alter our attitudes about sustainability - they cannot simply be adopted. A well-founded attitude is based on adequate knowledge and conscious evaluation. This means that

education pertaining to environmental questions is vital. Furthermore, positive experiences in contact with nature will often trigger motivation for preserving nature qualities. Today, more than half of the world's population resides in cities, with little or no contact with nature. There is a danger that reduced access to nature leads to less concern about it. Therefore, schools at all levels should allow young people to experience the values of nature contact. Closely connected to attitudes is the field of environmental ethics. A "biocentric" view, respecting the intrinsic value of all life forms, may have great practical value.

Armed with fruitful concepts and well-founded attitudes, we should be well equipped to fight for a sustainable future. There is one more factor though, which is our ability to communicate. Because we are short of time, rhetoric matters. Forceful rhetoric may transform eco-fear into motivation, and allow environmental threats to be clear and challenging. Just as in literature, certain thorough formulations may have a strong mental effect. At present, increased use of "sustainable rhetoric" is perhaps the most efficient single factor in order to create change. In debates, we must be ready to meet a "counter-rhetoric" which defends "business as usual". It is a challenge for debate leaders to identify foggy concepts, environmentally unfriendly attitudes, and argumentation based on our mental tendency to deny or suppress environmental problems. People who are skilled in the art of rhetoric are today typically engaged in the advertising business; often convincing people to buy things which they do not need. The rhetoric force is today needed to convince people – and politicians – of a change that we all need. The politicians themselves should use encouraging rhetoric to make us all cooperate. The following formulation is an example: "If you are a part of the problem, you are a part of the solution". Most of all, rhetoric should be used to spread hope. Hope is a strong mental force, and collective hope may change a community.

We need a "mental tipping point" where sustainable thinking takes over – and remains. The way we think is our hope.

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