Sustainability **2011**, *3*, 1637-1661; doi:10.3390/su3101637

OPEN ACCESS

sustainability

ISSN 2071-1050

www.mdpi.com/journal/sustainability

Review

Sustainable Development: A Bird's Eye View

Tom Waas [1,2,*], Jean Hugé [1,2], Aviel Verbruggen [3] and Tarah Wright [4]

[1] Plant Biology and Nature Management, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgium; E-Mail: jean.huge@vub.ac.be

[2] Institute of Environment & Sustainable Development, University of Antwerp, Universiteitsplein 1, 2610 Antwerp, Belgium

[3] University of Antwerp, Prinsstraat 13, 2000 Antwerp, Belgium; E-Mail: aviel.verbruggen@ua.ac.be

[4] Environmental Science, Dalhousie University, 1355 Oxford Street, Halifax B3H 4J1, NS, Canada; E-Mail: tarah.wright@dal.ca

* Author to whom correspondence should be addressed; E-Mail: tom.waas@ua.ac.be; Tel.: +32-3-265-21-15.

Received: 14 September 2011; in revised form: 16 September 2011 / Accepted: 19 September 2011 / Published: 27 September 2011

Abstract: At the turn of the millennium, the world's political leadership adopted sustainable development as a leading model for societal development. However, the terms "sustainable development", "sustainability" and "sustainable" are sometimes over- and misused despite wide consensus about the concept's meaning among sustainability scholars and practitioners. While the concept allows various sustainability views to co-exist, random conceptualizations which do not respect the fundamental sustainability principles undermine the concept's objective to steer action. This lack of understanding of sustainability arguably inhibits its practical realization and a proper understanding of sustainability is urgently needed. In this paper we aim to contribute to a better understanding of sustainability by adopting a bird's eye perspective. We review the rich contemporary literature, with a specific focus on the terminology, genesis, fundamental principles, mainstream views of sustainability, and several governing aspects. Further, using the evolving body of sustainability literature, the paper provides arguments to combat common misconceptions of sustainability.

Keywords: sustainable development; sustainability; meaning; principles; history; governance

1. Introduction

By the end of the 20th century, in response to a growing environmental crisis and inequalities in global development, the international community adopted sustainable development as a leading development model [1-8] with action-guiding power that calls for particular orientations of actions [9].

There is considerable consensus among sustainability scholars and practitioners about the meaning of sustainable development [9-17]. However, as contemporary buzzwords, prompted by an increase of public awareness and concern over environmental and social issues [15,18], the terms "sustainable development", "sustainability" and "sustainable" have become over- and/or misused by several stakeholders in society, individuals and groups [9,15,18-22]. Some (over)used the terms without a true understanding of its' original meaning [9,18,22]. Others deliberately (mis)used the terms as a "green or sustainable smoke screen"—resulting in a watering down of the concept's fundamental principles or simply neglecting them—window dressing unsustainable "business as usual" activities [15,19]. Hence, to many people the terms have become meaningless, although any similar term that manages to break into the public eye, would probably suffer the same fate [23]. Clearly, while the concept allows various sustainability views to co-exist, the "anything goes" mentality must be overcome. Random conceptualizations that do not respect the fundamental sustainability principles undermine the concept's objective to steer action, is self defeating [9] and arguably inhibits its practical realization [6,8,13,19,24-29]. After more than two decades of debating and implementing sustainable development, to overcome arbitrary interpretations and reinforce the concept's action-guiding power, a better understanding of sustainable development and its implications for decision-making and policy-making is still needed [9,21,22,25].

This paper contributes to a better understanding of sustainable development by adopting a bird's eye view of the available scholarly literature and provides arguments to combat common misconceptions. We offer an analysis of the plethora of sustainability literature, including its terminology, genesis, fundamental principles, mainstream views and several governing aspects. These various aspects are inherently linked and when considered together they are mutually strengthening in support of a proper understanding of sustainable development. Our "broad" discussion offers this unique perspective and is complementary with the "specialized"—focusing on one aspect—scholarly sustainability literature (for example [17,18,21,25,30-33]).

The literature was purposively sampled with the aim of gaining a broad insight into sustainable development. This required the selection of information rich literature on various sustainability aspects for investigation [34]. According to open coding procedures [35] we compared and clustered relevant information in several emergent themes, represented by the various sections of the paper. In function of the themes that emerged we continued the selection of literature until a sound understanding of each was reached.

2. Terminology

The terms "sustainable development", "sustainability", and "sustainable" are used in several ways and as previously noted often with different connotations. The following section offers clarification of the terms as understood in scholarly literature.

First, the term "sustainable" is often used together with the term "development". In this case, both terms constitute a whole—"sustainable development"—that should be considered together and represent a particular concept that is based on specialized definitions and defining principles [36].

Second, the term "sustainable" can also be used separately from the term "development", for example "sustainable agriculture", "sustainable education", "sustainable forestry", "sustainable fisheries", "sustainable business" and so on. In this case, the adjective usually refers to "sustainable development" and offers the possibility to integrate the concept's fundamental principles into an array of application fields [36].

Third, the term "sustainability" is commonly used as a synonym of "sustainable development". However, sometimes a distinction is made between "sustainable development" and "sustainability". Some scholars assert that "sustainable development" is primarily about development/economic growth, whereas "sustainability" gives priority to the environment. The commonality is that both terms take into account environmental considerations. The difference is that the former refers to "ameliorating" economic growth, taking into account the environment, whereas the latter is about "challenging" economic growth, focusing on the ability of humanity to live within the environmental limits of the planet [15,37]. This debate remains unresolved regarding issues of "how" and even "whether" the terms differ [10]. Linguistically, this distinction seems obvious because otherwise the word "development" would be entirely superfluous, but politically, making a distinction drives a wedge into the strong international consensus for sustainable development [37]. Moreover, it needlessly complicates the sustainable development debate and merely shifts the complex and vibrant interpretational debate to the conceptual level.

Other scholars argue that sustainability stands for the "goal", whereas sustainable development refers to the "process" to achieve it [2,21], but also this view is not consensual.

Throughout this paper we will use the terms "sustainable development" and "sustainability" interchangeably. We do not distinguishing in meaning between "sustainable development" and "sustainability".

3. Genesis

3.1. Historical Roots

Sustainable development is generally considered a new development model that emerged during the late 20th century, however in reality the concept of sustainable development is much older.

Problems, ideas and practices that we currently classify under the sustainability umbrella have roots that can be traced back for many thousands of years. The search for a balance between the demand for raw materials for food, clothing, shelter, energy, and other goods, and the environmental limits of ecosystems is a constant concern throughout human history [38,39].

The terminology is also much older than often thought. Well documented is the appearance of the German term "nachhaltende nutzung" (sustainable use) in 1713, by Hannss Carl von Carlowitz in his publication on sustainable forestry [39].

While development and environment are old problems, they now come together on a global scale and in an urgent timeframe [2,40]. Modern understandings of sustainability have emerged gradually since the 1950s. Soon after World War II economic growth paved the way for renewed optimism about the prospects of rising living standards worldwide [18] and during the last decades of the 20th century many countries made remarkable progress in their development [3,7]. It was also during this period of unprecedented economic growth and scientific and technological innovations, together with a rapid population growth, that humanity began to exceed the environmental limits of the Earth [5,6], destabilizing its environmental state with detrimental consequences and even catastrophic once for the well-being of current and future generations in large parts of the world [2,5,26]. People became aware of these threats and the terrible damage caused to the environment and started to change their views and basic assumptions about economic growth and "successful" development [18], calling for a shift from exploitative industrialism—"business as usual"—to sustainable development [1].

The emergence of sustainable development was mainly an intellectual answer to reconcile the conflicting goals of economic growth with environmental protection [4,25].

Although increased environmental concerns led to the emergence of sustainable development as a new development model, the concept's appearance should be regarded within a longstanding development debate. Sustainable development merges with traditional development objectives, but adds an important environmental objective. For that reason, the concept's originality and newness may not be overestimated as it is often done in the literature, in documents, and by environmentalists [36]. In addition to its environmental roots the concept draws on the experience of several decades of development efforts. During the 1950s and 1960s development focused on economic growth and increased economic output. By the early 1970s, the large and increasing poverty in the developing countries, together with the failure to share the benefits of economic growth with these countries led to increased efforts for more equitable welfare distribution. Later, by the 1980s, environmental protection became the third major objective of development [41]. In fact, sustainable development grew out the melting pot of different ideas about progress, environmental protection, economic growth and development which have developed over many years [18]. Several scholars studied the theoretical foundations or "roots" of modern sustainability, which are related to each other and which all influenced the concept's modern understanding. Kidd [42] distinguished six roots: ecological/carrying capacity, resources/environment, biosphere, critique of technology, no-growth/slow growth, and ecodevelopment. Whereas Quental *et al*. [31] identified four of them: limits, means and ends, needs, and complexity. In turn, Jabareen [30] identifies seven roots: ethical paradox, equity, global agenda, eco-form, utopia, integrative management, and natural capital stock. Sustainability is considered by many the best way to address the vast, complex and interrelated environmental and societal problems and is deemed highly imperative for the sake of current and future generations. In this sense, sustainable development not only represents a solution for environmental and societal problems, but offers a set of principles implying positive objectives, a focus for positive change, and a critique on conventional thinking and practice [10].

3.2. Modern Milestones

In less than fifty years sustainable development grew from an alternative view on development towards a broadly acknowledged and formal politically endorsed development model. Throughout this process political efforts vary and four periods can be distinguished: (1) the starting up period (until the end of the 1970s), (2) the stagnation period (1980–1986), a period with major achievements (1987–1995), and (3) a period of decline (1996–onwards). The following milestones were key:

- United Nations Conference on the Human Environment (UNCHE; 1972)
- World Conservation Strategy (WCS; 1980)
- Our Common Future (1987)
- United Nations Conference on Environment and Development (UNCED; 1992)
- United Nations Millennium Summit (2000)
- Earth Charter (2000)
- United Nations World Summit on Sustainable Development (WSSD; 2002)
- Rio+20 United Nations Conference on Sustainable development (UNCSD; planned in 2012)

Regardless of the period, peaks in political activity coincide with the decennial conference organized by the United Nations (UN) (UNCHE, UNCED, Millennium Summit and WSSD) which is suggestive of their influence as catalysts of more profound societal and political action [25] and underline their importance. Therefore one might expect that the UNCSD will induce the same effect and many hope that the UNCSD will give a new boost to sustainability after a long period of decline—since the mid 1990s.

The *United Nations Conference on the Human Environment (UNCHE)* was held in Stockholm, in 1972. The conference succeeded in creating an increased global environmental awareness [25,43] and put the environment on the international political agenda for the first time [37]. UNCHE produced the Stockholm Declaration with 26 principles on the preservation and enhancement of the human environment and an Action Plan that enriched and complemented the declaration with 109 recommendations. It also led directly to the establishment of UNEP [43], which is the UN body for environmental affairs.

The *"World Conservation Strategy—Living Resource Conservation for Sustainable Development" (WCS)* [44] was published in 1980. The WCS advanced already the idea of sustainable development but, while recognizing the challenge to integrate development and environment it did not succeed in the integration of both objectives [45]. It dealt primarily with the environment—achieving sustainable development through the conservation of living resources.

The famous report *"Our Common Future"* [46] was published in 1987, by the World Commission on Environment and Development (WCED), established in 1983 by the UN General Assembly and chaired by Gro Harlem Brundtland, former Prime Minister of Norway, after whom the report is often called. The WCED was commissioned to formulate a "global agenda for change" [46] and compared with the WCS succeeded to integrate development and environment [45].

Our Common Future [46] serves as a vital milestone in current development thinking for at least four reasons: (1) it launched a famous definition of sustainable development; (2) it established sustainable development as a substantial component of international development thinking and

practice; (3) it initiated an explosion of work on the theme [19]; and (4) it represents the worldwide breakthrough and popularization of the sustainability concept.

Synthesizing ideas from previous milestones, the report is less intellectually innovative but is remarkably more political than its predecessors [37]. Our Common Future [46] succeeded in building a worldwide political partnership for sustainable development and provided the concept with a plausible content and a heavy dose of legitimacy. Sustainable development was explicitly conceived as a "bridging" concept that could draw together apparently distinct policy domains, and unite often opposed views and interests of society's stakeholders behind a common agenda. In particular the WCED [46] was able to reconcile the environmental interests of the North with the development needs of the South [25]. The report is a deliberate attempt to transcend differences, construct shared understanding, and build a winning coalition for reform, and not as sometimes argued a naïve denial of opposed perspectives and interests.

Our Common Future [46] paved the way for the *United Nations Conference on Environment and Development (UNCED)* held in Rio de Janeiro, in 1992. The UNCED represents the official worldwide political endorsement of sustainability as new development model, through the adoption of AGENDA 21—the global action plan for sustainable development—and the Rio Declaration with 27 sustainability principles. The conference was generally considered as successful [25] because ever since, sustainable development has become pervasive and a unifying watchword for governments, businesses, non-governmental organizations, labor unions, development agencies, academia, citizens and other stakeholders worldwide.

At the turn of the millennium, in 2000, the UN organized the *Millennium Summit* to discuss a broad agenda that covered both development and environmental concerns [25]. The summit adopted the Millennium Declaration. The declaration reaffirms the support of the international community for AGENDA 21 and the Rio Declaration, and led directly to the formulation of the Millennium Development Goals—a series of time-bound targets which should be achieved by 2015 to reduce extreme poverty and to meet the basic needs of the world's poorest [47].

Together with the Millennium Development Goals, the declaration represents the most concrete commitment to sustainability ever made to the world's most vulnerable people and generated an unprecedented level of partnership in building decent, healthier lives for billions of people and in creating an environment that contributes to peace and security [47].

After a decade-long, worldwide, cross cultural, dialogue on common goals and values, the *Earth Charter* was launched in 2000. The charter is a declaration of "fundamental ethical principles for building a just, sustainable and peaceful global society in the 21st century" and stands for a vision of hope and a call for action.

Originally, the idea of a sustainability charter with ethical principles was launched by the WCED [48]. Indeed, Our Common Future [46] calls for a "Universal Declaration and a Convention on Environmental Protection and Sustainable Development" in the form of a "new charter". [46]. Following on this recommendation a sustainability charter was prepared for the UNCED shortly after, but a political agreement could not be reached at the conference and instead the Rio Declaration was adopted. While the Rio Declaration contains a valuable set of sustainability principles, it lacks an ethical vision that many people hoped to find in the charter [25,48]. In 1994, a new charter initiative was realized which led to the establishment of the Earth Charter in 2000. The Earth Charter's

legitimacy stems from its participatory process involving global civil society. It was the most inclusive participatory process ever associated with the drafting of an international declaration [48]. By 2005, the Earth Charter became widely recognized as a global consensus statement on the meaning of sustainable development, its challenge and vision, and sixteen principles to achieve it. Currently, the charter has over 4800 signatories including the United Nations Educational, Scientific, and Cultural Organization (UNESCO), local and national governments and ministries, non-governmental organizations, businesses, youth organizations, universities, and publicly supported by numerous heads of state, all further enhancing the charter's global legitimacy. Efforts to seek formal political recognition by the UN are on-going [48].

The *United Nations World Summit on Sustainable Development (WSSD)* held in Johannesburg, in 2002 was the first UNCED follow-up conference. The principal objective of the WSSD was to put in place the necessary mechanisms to "really" implement AGENDA 21, since little progress has been made [25]. The WSSD adopted the Johannesburg Declaration on Sustainable Development which reaffirms the international political engagement for sustainable development, AGENDA 21 and the Rio Declaration, and the Johannesburg Plan of Implementation to accelerate the implementation of AGENDA 21 [49]. Furthermore, the conference produced Type II Partnerships (for an overview [50]). The partnerships are projects that allow civil society to contribute to the implementation of sustainable development. They are considered as powerful tools and more democratic instruments for the implementation of AGENDA 21 [49].

For many the conference was disappointing because it generally recalled earlier agreed objectives, particularly the targets set during the Millennium Summit. An agreement on more stringent commitments was not achieved. Furthermore, although several targets were approved there was a notable "implementation deficit" that the international community was unable to counteract, for instance, no agreements, institutional arrangements or financial mechanisms as in the case of the UNCED followed the conference. Based on the outcomes, the WSSD was less influential than the UNCED [25].

In 2012 the UN will organize the second UNCED follow-up conference, *Rio+20 United Nations Conference on Sustainable development (UNCSD)*, again in Rio de Janeiro. The conference aims to: (1) secure renewed political commitment for sustainable development; (2) assess the progress to date and the remaining gaps in the implementation of the outcomes of the major summits on sustainable development; and (3) address new and emerging challenges. The UNCSD will focus on two major themes: (1) a green economy in the context of sustainable development and poverty eradication; and (2) the institutional framework for sustainable development [51].

During its modern emergence and throughout the various milestones sustainability shifted from a clear emphasis on environmental issues to a more balanced position that equally considers human and social development issues [25]. Its environmental roots together with a temporary emphasis on environmental issues, particularly during the (early) 1990s, explain why the concept is often (mis)perceived as an environmental one, while its agenda is much broader.

Despite the many past commitments at the highest international political level, and despite various environmental and development measures taken since, sustainability scholars agree that the implementation of sustainable development falls short. Humanity is far from being on track and in reality sustainability remains in its infancy [13,19,24,25,28,29].

It is truly astonishing that while the world's top scientists warn repeatedly about the catastrophic consequences of current unsustainable development strategies for billions of people around the globe, political responses still range from negligible to ineffective [24]. But, while the world—mainly wealthy nations and their leadership—negate the consequences of their approval, it cannot be denied that global political leadership signed several commitments for sustainable development and—may be not fully aware of their implications—there is no way back [29]. Therefore world politics have not only the duty but also the moral obligation to present and future generations as well as other life on Earth, to execute the signed commitments and strategies for sustainable development.

It would be too reductionist and misleading to evaluate the sustainability transition solely on governmental actions because a new complex decentralized international governance system is emerging, that is characterized by a multitude of actors working at various levels [25]. Indeed, there are also numerous good examples of sustainability efforts by local citizens and communities (*i.e.*, Local Agenda 21 initiatives) that take the sustainability message seriously [19]. However, while pertinent at the local level, local sustainability initiatives will only make a difference at the global level if their experience is disseminated and replicated in many more other places around the globe [4].

It has already been stated in 1987 in "Our Common Future" [46] and since then repeated a thousand times, achieving sustainable development depends essentially on "will" [52]. Particularly, 1) the will of politics which ideally should set the course because it is supposed to serve the common interest, standing above individual stakeholder interests, and 2) the will of present generations because the destiny of the planet may well be in their hands [23].

"Business as usual" sustainability efforts do not suffice. Instead, to succeed what is needed are far reaching socio-economic and institutional system changes, which fundamentally alter our prevailing way of societal organization and behavior. These changes should truly challenge—instead of confirm—fundamental beliefs, values, and assumptions that underpin the prevailing development model of economic growth and consumerism [24]. And the first essential and logic step should be to get rid of clearly unsustainable practices [52]. Yet, it is still hard to believe that "modern" civilization, with its entire intellectual potential, simply neglects the lessons from history, as some ancient civilizations ultimately collapsed due to environmental problems [38,39], while other were able to live sustainably for very long time spans [53].

4. Fundamental Sustainability Principles

Intuitively appealing to the common sense of mankind [13], sustainable development is like happiness something that everybody wants and is hard to be "against". But what sustainable development precisely encompasses varies greatly amongst various stakeholders [45,54] and there is certainly no such thing as "sustainable development-ism" [17]. There is great arbitrariness in the concept's interpretation [9] and there are probably as many views and definitions as people dealing with the issue, each with their own focus, suiting the particular view of the stakeholder concerned [17,45] (for an overview [55-57]).

Reasons for this variety include: the normative nature of sustainability; the different disciplinary and professional background of people dealing with the sustainability issue; and, the battle for influence [58,59] over the concept's meaning and the appropriate way to achieve it, given the

importance of the concept for future developments of society and visible in various discourse coalitions.

Such a divergence is especially likely in highly charged normative concepts such as "democracy", "freedom", "justice/equity" and "sustainable development"—sometimes described as the "essential contestability" of widely supported social and political concepts. However the range of understandings hardly prevents the application of such contestable concepts in practice [13].But many of the "so called" sustainability views are in need of conceptual clarification [9,15,18-22] because they are often based on dogmatism and vague assumptions, lacking rational justification and scientific foundation [9]. Sustainable development is for example meaningless and even contradictory when interpreted as "sustained change" or "sustained development" (simply a process of change that can last forever without objectives), "sustained growth" (sustaining economic growth and material consumption, contradicting the general recognition that the planet has ultimate environmental limits) or simply "successful development" [14].

Instead, sustainable development as a concept possesses a precise and unambiguous meaning.

First, and serving as the "sustainability bottom line", sustainable development aims to meet human needs and aspirations, now and in the future, in an equitable way while protecting our environment which we share with other living species on Earth. In other words, ensuring: *"Good lives for all people in harmony with nature"* [40].

Second, in support of the "sustainability bottom line", sustainable development has clear "interpretational limits" and incorporates a more or less stable set of general defining characteristics, which must always be respected, no matter which view one amounts to [14,16]. These characteristics can be termed "fundamental principles" that "embody" sustainable development [16], and offer a meta-perspective on the concept [9]. They represent the "sustainability play field/arena" or some kind of "common denominator/ground" that anyone who justifies a line of action with an appeal to the sustainability should respect and take into account [16].

There is considerable agreement among sustainability scholars about the concept's fundamental principles [9-13,16,17]. Based on their work and further grounded in the scholarly literature, we distinguish four fundamental sustainability principles, also defined as "rules of action towards sustainable development" [16] representing the key changes needed [10,11], which are of equal importance:

- the normativity principle
- the equity principle
- the integration principle
- the dynamism principle

First, the concept of sustainable development is always socially constructed and normative [9,12,13,16,45] or subjective—*the normativity principle*—because ultimately what sustainability means depends entirely on our views regarding the kind of world we want to live in and want to leave as a legacy for future generations—our children and grandchildren. Sustainable development always implies societal and normative choices, which are ultimately based on the values we maintain.

Values are abstract ideals which evoke emotional reactions and are typically expressed in terms of good or bad, better or worse, desirability or avoidance. They define or direct us to goals, frame our attitudes and views, and provide standards against which human behavior can be judged [60]. Values vary between cultures across the globe and over time. Global sustainability values are for example found in the Millennium Declaration and in the Earth Charter.

Consequently, sustainability can never be determined with recourse to objectifiable "theory" [58] nor can it be "empirically proven" [9]. While, science is crucial for sustainable development it cannot resolve the basic question of what is sustainable and what is not [15]. The concept is characterized by what might be called "interpretative flexibility" and allows various views and interpretations to co-exist, of course within the concept's interpretational limits.

However, following the traditional scientific "objective—subjective" dichotomy it is clarifying to distinguish between "objective" and "subjective" views on sustainability, and any combination that appears is likely. The former considers sustainable development as a concept that is "objectively" measurable informed by scientific evidence while the latter considers it as "subjective", being a result of societal preferences, where different opinions can co-exist and which are contextually determined [32]. Taking the "objective—subjective" scientific dichotomy for granted, one can distinguish between (partly) objective and subjective aspects of sustainable development and given the widespread use of the divide this is a reasonable and helpful way to frame the sustainability concept and its debate.

Second, the *equity principle* (or justice/fairness) [10,11,13,16,45,53] is a central principle of sustainable development and could be subdivided into inter-generational equity, intra-generational equity, geographical equity, procedural equity, and interspecies equity [12]. Inter-generational equity refers to the long term or futurity aspect of sustainability, as the concept not only aims to meet present human needs and aspirations but also includes the right of future generations to meet their needs and aspirations [12]. Because we depend on natural resources to meet our needs and aspirations, this principle includes the requirement to keep within the environmental limits of the Earth. In this sense, *"We have not inherited the Earth from our parents, we have borrowed it from our children" [44]*. Intra-generational equity is similar to intergenerational equity but with regard to present generations. It refers to the realization of contemporary social equity—the right of every human being of the present generations for a decent quality of life. Geographical equity or global responsibility refers to the need for cooperation worldwide and from the local level to the global level in a spirit of "shared but differentiated responsibility" in tackling sustainability issues—act locally think globally. Procedural equity refers to democratic and participatory governance systems, involving concerned stakeholders in decision-making. This is particularly essential because of the normative nature of sustainability. Interspecies equity stands for environmental stewardship and refers to the survival of other species on an equal basis to human survival. It highlights the critical importance of preserving ecosystems integrity and maintaining biodiversity, not only utilitarian but also because other species have the intrinsic right to survival [12].

Third, sustainable development is a concept of "integration" [9-11,14,15,17,20,45]—the *integration principle*. As a logical consequence of its modern genesis and in need of whole system's perspective (holism) sustainability should harmoniously integrate various traditional (including socio-economic and institutional) development objectives with environmental ones [15]. This implies

that all sustainability principles should be applied together—integrated—, and that mutually supportive benefits should always be sought. "Integration" contrasts with the idea of "balancing" or "trading-off", suggesting sacrifices among sustainability objectives. This is pernicious because of the objectives' inherent linkages and interdependencies, failure to achieve one or more sustainability objectives undermines the success of the other objectives [10,11].

Fourth, sustainable development is always a process of directed—sustainability oriented—change, and not a defined end-state—the *dynamism principle* [13-15,52]. Society, the environment and their interaction are subject to a continuous flow of change. As a result sustainable development is not a "fixed state of harmony", but instead an ongoing evolutionary process [61]. In other words, sustainability is not a "final destination" but a "destiny-oriented long voyage". Hence it is sometimes argued that sustainability—per definition—can never be achieved, and that its perfect realization is elusive. While this type of reasoning sounds theoretically correct it might be a pitfall and an argument to escape from the societal commitment to the objective. Instead sustainability can and should be achieved—it ultimately depends on societal and political will—and should be regarded as a continuous search for a delicate equilibrium in a dynamic setting.

This dynamism brings about uncertainties and (potential) risks due to unpredictable evolutions and unanticipated effects, underlying the need for precaution. Precaution requires respecting uncertainty, avoiding even poorly understood risks of serious or irreversible damage to the foundations for sustainability, designing for surprise and managing for adaptation. It involves willingness to act on incomplete but suggestive information where social and environmental systems are at risk [10,11].

Any list of fundamental sustainability principles has a number of limitations: (1) principles are only generally stated and their implications should be further elaborated and specified before being implemented in practice; (2) considered together—integrated—the principles are more complex and sophisticated than we are used to manage; (3) although reasonable in theory, in practice it seems to be overly ambitious and unrealistic to realize positive results for all sustainability objectives and principles at the same time in every instance; "Balancing" or "trading-off" are sometimes unavoidable in decision-making but this is only acceptable as a last resort when all other options are considered to be worse and in case the general rule is that trade-offs must not violate the fundamental objective of net sustainability gains. The integrated application of sustainability principles and simultaneous reconciliation of sustainability objectives remains central in achieving sustainability in the short and long term, because the long term can only be achieved via the short term; and 4) no set of principles can be more than a part of the solution and should always be applied and interpreted within a particular context of implementation. This context is at least as important as the principles themselves [10,11,62].

5. Mainstream Sustainability Views

To understand some mainstream views of sustainable development we draw on the highly influential report Our Common Future [46], particularly chapter 2 "Towards sustainable development" which is still instructive and inspiring. In length of Our Common Future [46], sustainability is mostly understood and operationalized in a number of pillars therefore deserves also some attention. Finally, we introduce sustainability through the lens of the Earth Charter because it is a promising document which is already widely acknowledged.

5.1. Our Common Future

Our Common Future [46] provides two inspiring and interrelated definitions of sustainable development. We distinguish between the report's (1) "nominal definition" or "mission statement", and (2) its "operational definition".

The nominal definition is by far the most quoted (and in many instances misquoted) sustainability definition and the starting point of most sustainability initiatives around the globe:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [46].

This definition is very attractive because it is general and broad—as mission statements mostly are—and involves constructive ambiguity as the sustainable development concept itself, explaining its popularity. It demonstrates clearly the goal of Our Common Future [46], which is to build a winning coalition for sustainable development that prefers a broad agreement on an abstract formulation, rather than disagreement over a sharply defined one [59].

Together with its nominal definition, Our Common Future [46] carries a precise and concrete sustainability message, which is mostly neglected.

First, immediately after this definition, the report points out that sustainable development contains two key concepts:

- *"the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs"* [46].

This clarification is mostly left out of quotations. It is, however, important because it prioritizes the basic needs of the large number of people living in extreme poverty and argues that failure to meet (basic) human needs and aspirations does not lie with the environmental capabilities to meet these needs—it is not a problem of physical environmental limits or resource availability—but is due to humanity's social organization and state of technology—or in other words a shortcoming of human decision making.

There should be no misunderstanding; sustainable development is about "development". The satisfaction of human needs and aspirations of all is the primary objective, with particular attention for the basic needs and aspirations for a decent quality of life for the vast amount of people living in extreme poverty—*"poverty [...] is an evil in itself"* [46]. Unlike often thought by environmentalists, environmental protection is not the primary objective of sustainable development, but a precondition to achieve it [63]. To develop in a sustainable way, the satisfaction of human needs and aspirations should be kept within the Earth's environmental limits—*"At a minimum, sustainable development must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings."* [46]. Nevertheless, the environmental objective is not only instrumental but also ethical—*"It is part of our moral obligation to other living beings and future generations"* [46].

In turn, poverty eradication is considered a prerequisite to achieve the environmental objective—*"[...] the reduction of poverty itself is a precondition for environmentally sound development"* [46]. Both, objectives—development and environment—are inherently linked.

Second, the operational definition, which appears less frequently compared with the nominal definition, clarifies the content of the required change processes and as such renders the concept more concrete and operational:

"In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations." [46].

Third, the report proposes eight critical and interrelated objectives for sustainable development to be achieved corresponding to both definitions: (1) reviving growth; (2) changing the quality of growth; (3) meeting essential needs for jobs, food, energy, water, and sanitation; (4) ensuring a sustainable level of population; (5) conserving and enhancing the resource base; (6) reorienting technology and managing risk; (7) merging environment and economics in decision making; and (8) reorienting international economic relations [46].

To meet essential human needs worldwide, economic growth is required. But "business as usual" is impossible for sustainability. Many sustainability scholars emphasize that the quality of growth should be the focus. This implies integrating objectives of equal welfare distribution and equal access to natural resources—growth for the poor—and reducing the economy's energy and material intensity in order to keep within the Earth's environmental limits. Moreover, environmental conservation and enhancement is an objective in itself to ensure that humanity can continue to meet its needs in the future, not merely instrumental but also as a moral obligation to other living beings and future generations [46].

The growing human population should be stabilized at a size consistent with the changing productive capacity of the environment. Technologies should be (re)oriented towards sustainable development and technological innovations should take into account environmental considerations applying risk management in their development and application [46].

Further, environmental and economic considerations should be merged in decision making, which requires a change in attitudes and objectives and in institutional arrangements at every level. Because the compatibility of environmental and economic objectives is often lost in the pursuit of (short term) individual or group gains, wider societal responsibilities in decision making should be enforced. For that reason institutional changes are required that enforce the common interest through community knowledge and support, which entails greater public participation in environmental decision making, including community based resource management, promoting citizens' initiatives, empowering people and strengthening local democracies [46].

International economic relations should be reoriented towards serving the common interest of sustainability. The natural resource base on which the world economy depends should be guaranteed and economic actors should ensure that the basis of exchange is equitable, without any kind of dominance of one over another [46].

Finally, Our Common Future [46] states firmly the overall objective and bottom line of sustainable development—reconciling traditional development objectives with environmental ones:

"In its broadest sense, the strategy for sustainable development aims to promote harmony among human beings and between humanity and nature" [46].

In conclusion, key aspects of the sustainability message of Our Common Future [46] include: (1) the report focuses on how to sustain a broad process of positive societal change—"development"—which is understood as an advance in the material and moral circumstances of humanity, or in other words "progress"; (2) the report employs the idea of "meeting human needs" to characterize the just aspirations of all peoples, in particular emphasizing the legitimate moral claims of the world's poor and future generations; and (3) the report invokes an idea of environmental limits as a potential serious obstacle to development and stresses that the carrying capacity of the planet to support development was not fixed—different limits held for different resources, and improved technologies and social organization could enhance the planet's carrying capacity. But, the report also states that there are "ultimate limits" and in some cases these environmental limits are already exceeded through human behavior [64].

Our Common Future combines radical and reformist elements [15,65]. The report is radical in explicitly linking environment with development [15], debates which were previously separated. As stated in its foreword [46], *"[...] the 'environment' is where we all live; and 'development' is what we all do in attempting to improve our lot within that abode. The two are inseparable"*.

Essentially, the report argues for integrating the vast and complex issue of environmental deterioration with the equally vast and complex issue of human development and poverty. Both should be resolved simultaneously and in a mutually reinforcing way [15].

The report is reformist in its emphasis on development (or economic growth). It calls for more, not less development as a solution to environmental problems, albeit one that is sensitive and not harmful to the environment [15,65].

Naturally, as Robinson [15] states, both radical and reformist elements are closely linked. If under-development is threatening the environment and human well-being, then more development is clearly required. If, however development is an equal threat, then more of the same kind of development is not desired. The answer lies in a new kind of development, "sustainable development".

5.2. Sustainability Models

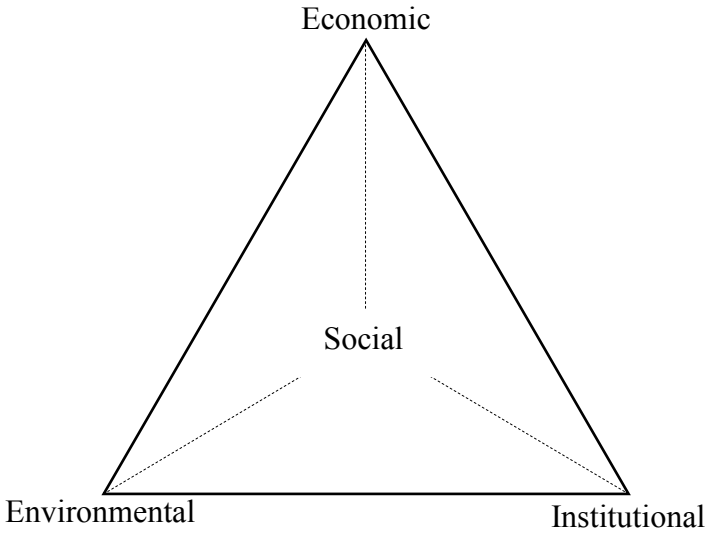
In a variety of fields and daily life, models as simplifications of the complex reality are used to understand the world, to make decisions and act upon them. Models are acquired by various ways of learning during life. For sustainable development appropriate models are needed and old—unsustainable—models (*i.e.*, solely considering economic growth as a measure for development/"progress") should be unlearned, because models are not only part of the solution but also part of the problem [20].

Various sustainability models are proposed (for an overview [17,21]) but it is common practice to "model"/operationalize and understand sustainable development in a number of so called "pillars" (or "dimensions"), commonly three (economy, environment, society/social). The three pillar sustainability

model is usually depicted in the form of an equilateral triangle or as three intersecting, equally sized circles. Each angle (or circle) stands for one of the three pillars and the sustainability area is located in the middle. The model is also popularized as "3Ps" or "triple bottom line", standing for "people-planet-profit". One of the first introductions of the three pillar model was made by Munasinghe [41], distinguishing between an "economic objective", an "ecological objective—natural resources" and a "social objective—poverty/equity", and their interaction.

In recent years, the institutional dimension of sustainable development, also referred to as "democracy" or "governance", has increasingly been emphasized and included as a fourth pillar in the model (Figure 1) [64]. This approach reveals the importance of institutional change for sustainable development, as explained in "Our Common Future" [46] and stated in its operational definition, and as already internationally agreed on in 1992 in Agenda 21 where the institutional dimension is a separate chapter next to a socio-economic and environmental one.

Figure 1. Four pillar sustainability model.



Similar to the fundamental sustainability principles the model aims for the harmonious integration, in a dynamic setting—as "a process of change"—of four pillars: (adapted from [66]).

- Economic: economic growth as an engine for long-term welfare creation to satisfy essential needs for jobs, income, food, energy, water, sanitation, social security, and consumption opportunities;
- Environmental: environmental protection to conserve and enhance the resource base and to keep within the Earth's environmental limits for a long term perspective;
- Institutional: institutional change to merge environment and economics in decision making and to enforce the common interest through greater public participation, locally and internationally;
- Social: social justice to achieve an equal distribution of welfare, equal access to natural resources and equal opportunities between people (gender, social groups, *etc*.).

As Spangenberg [66] argues, Our Common Future [46] justifies the conceptualization of sustainable development as a "dynamic optimization process" of these four pillars but at the same time safeguarding the essential interests of each one.

Opinions on the "right" number of pillars diverge. Some advocate two (environment and socio-economic), three or four as previously discussed or five adding culture as a separate dimension. But this is essentially about emphasis [10] and conceptualization. What is important is that every approach should encompass the essential aspects of sustainable development. Therefore, some scholars also add a time dimension in the model, representing intergenerational equity and to demonstrate the dynamics of the sustainability process over time [21].

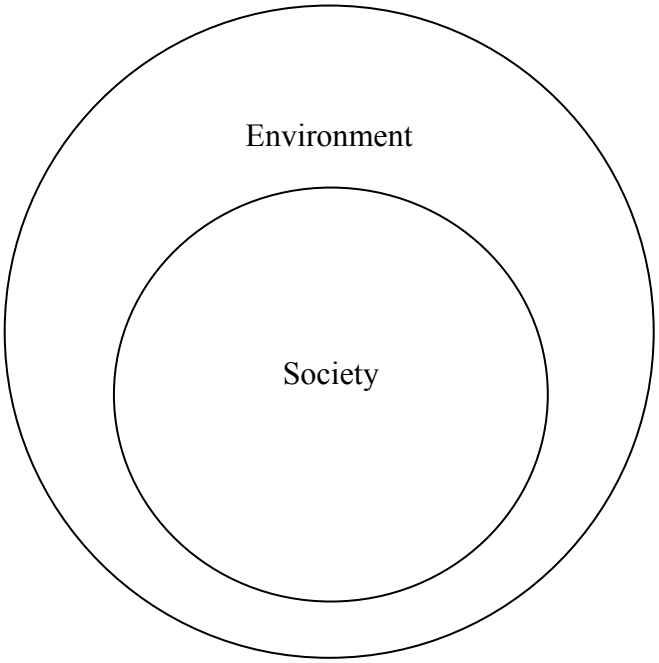
This type of pillar thinking is appealing and popular because they reflect traditional disciplines and policy fields.

While multidimensional sustainability models prevail they are also criticized and increasingly replaced by models which take into account these critics.

First, some interpretations of the model assume the separation and even autonomy of the dimensions, fostering compartmentalized and sectoral approaches to sustainability [17]. They focus attention on the different dimensions as competing objectives—in particular economy *versus* environment –, fostering reasoning in terms of "balancing" and "trading-off" rather than on needs and opportunities for positive accommodations of interconnected human and environmental interests—"integration" [10]. As such, strengthening conventional reductionism, while employing a holistic approach and integration between different sectors and actors, is required [17]. In reality, as argued before, the economy is largely favored over the other dimensions. Second, the model places humanity outside the environment, while humans are inherently part of it and fails to recognize humanity's place within the environment. The environment is the ultimate foundation of any economy or human well-being and must be considered at a different, more significant level representing the Earth's outside limits. Simply, because the environment is the source on which human development ultimately depends, in contrast the environment would continue without society [17,67]. This necessity expresses the duty of everyone to protect and restore the integrity of the planet, places decision making within these limits, and should be considered as a fundamental legal principle. Its basic idea is on first determining the environmental limits and then establishing what development is feasible within those limits to achieve sustainable development. Once the limits are agreed upon, the balancing and trade-offs between environmental protection and development issues still occur but within the carrying capacity of the planet. As a guiding ethic this idea is already gaining recognition and one of its strongest formulations is found in the Earth Charter [68].

Both, criticisms are fundamental and increasingly recognized as a weakness of the model. Instead "nested" models (Figure 2) are proposed. First, the model places human well-being central and accordingly does not separate the economy and (material) welfare from other development objectives. Second, it locates society within the environment and its limits. It is argued that such "nested" models are more in favor of integration and holism, reducing the theoretical justification of trade-offs and encouraging the search for "integration" and "win–wins" [17].

Figure 2. Nested sustainability model (Source: adapted from [17]).



5.3. The Earth Charter

In its preamble the Earth Charter states that the people of the world *"must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace."* [48]. It is further stated that humanity's choice is to *"form a global partnership to care for Earth and one another or risk the destruction of ourselves and the diversity of life."* [48]. Therefore, according the charter's preamble what is needed is *"a shared vision of basic values to provide an ethical foundation for the emerging world community"*[48]. And the 16 sustainability principles of the Earth Charter (box 1) exactly serve that purpose. They are clustered in four categories, and should be considered together: (1) respect and care for the community of life; (2) ecological integrity; (3) social and economic justice; and (4) democracy, nonviolence, and peace.

Each of the 16 principles is further elaborated in a number of sub-principles, in total 62.

6. Governing Sustainability: Governance, Participation, Transition Management and Resilience

One of the greatest challenges to succeed is to set up adequate sustainability governance systems and policies [25], which is one of the major themes that will be addressed during the up-coming UNCSD.

The process from moving from a current—unsustainable—situation ("Where are we now?") towards a desirable—sustainable—situation ("Where do we want to go?") should be governed and answers the manager's slogan "How do we get there?". Within this respect, at least the following key concepts are gaining popularity: governance, participation, transition management and resilience. These concepts are the most useful when considered together, as mutually strengthening each other in view of a sustainable society.

Box 1. The 16 sustainability principles of the Earth Charter.

I . Respect and Care for the Community of Life

1. Respect Earth and life in all its diversity.
2. Care for the community of life with understanding, compassion, and love.
3. Build democratic societies that are just, participatory, sustainable, and peaceful.
4. Secure Earth's bounty and beauty for present and future generations.

I I . Ecological Integrity

5. Protect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life.
6. Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.
7. Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being.
8. Advance the study of ecological sustainability and promote the open exchange and wide application of the knowledge acquired.

I I I . Social and Economic Justice

9. Eradicate poverty as an ethical, social, and environmental imperative.
10. Ensure that economic activities and institutions at all levels promote human development in an equitable and sustainable manner.
11. Affirm gender equality and equity as prerequisites to sustainable development and ensure universal access to education, health care, and economic opportunity.
12. Uphold the right of all, without discrimination, to a natural and social environment supportive of human dignity, bodily health, and spiritual well-being, with special attention to the rights of indigenous peoples and minorities.

IV. Democracy, Nonviolence, and Peace

13. Strengthen democratic institutions at all levels, and provide transparency and accountability in governance, inclusive participation in decision making, and access to justice.
14. Integrate into formal education and life-long learning the knowledge, values, and skills needed for a sustainable way of life.
15. Treat all living beings with respect and consideration.
16. Promote a culture of tolerance, nonviolence, and peace.

First, it is generally agreed that sustainable development requires a special kind of governing, referred to as "governance", which requires changes in traditional dominant governing models and their accompanying institutions.

While some traditional definitions describe "governance" as a synonym for "government", recently various scholars redirected the definition and use the term "governance" for a "changed way of governing" [69]. Scholars agree that "governance" refers to modes of governing in which boundaries between and within public and private sectors have become blurred. In essence, "governance" represents governing systems which do not rest on resource to the authority and sanctions of "governments" but instead are the result of the interaction of a multiplicity of governing and each other influencing stakeholders. "Governance" represents a shift in responsibility, a stepping back from the state and a push of increased responsibility of private and voluntary sectors, and more broadly the citizen [70]. It stands for an overall system of collaborative steering mechanisms in society towards a common objective—in this case sustainable development—as a shared responsibility of the various stakeholders involved, and not limited to traditional "government" steering. As such, "governance" contrasts traditional governing with "governments" representing hierarchical power and top-down steering [32,70,71]. A governing system involving other stakeholders besides governments is also referred to as "multi-actor governance" [72] and different typologies have been proposed (see [32,73].
The shift to governance can be explained by the complex nature of sustainability problems and by the plurality of stakeholders—in fact the whole society—involved in the sustainability transition process [32,71,74]. Increasingly, stakeholders take up their responsibility and engage in governance systems at multiple levels, *i.e.*, the partnership resulting from the WSSD [71,74]. Such decentralized networks of governance are expected to improve global governance and advance the prospects for achieving sustainable development [74].

Second, and through its very nature, the "governance" debate is closely related with the need for (more) participation in decision-making of democratic governing systems, as already argued embedded in the sustainability concept itself. Jänicke [73], for example, puts participation at the centre of governance for sustainable development.
Participation in the context of governance for sustainable development is essentially about the inclusion of non-governmental stakeholders in the public decision-making process.
It represents the idea that stakeholders and citizens have a voice in decision-making processes and policy choices, and it always comes down to a sharing of power and responsibility between "the governed" and "the government" [75]. While definitions of the concept vary [75], O'Faircheallaigh [76] adopts a broad definition and defines participation as *"[…] any form of interaction between government and corporate actors and the public […]"*.

Because degrees vary, participation is not a single act but instead a scale of possibilities. Generally, participation can be classified on an implicit continuum, with on the one end participation as "symbolic consultation" and on the other end participation as "full citizen control" [75]. Scholars agree that the main reasons for participation include: (1) an ethical rationale stating that the public should be involved because they are the ultimate source of value within society, and because these values should be expressed in decision- and policy-making; (2) a political rationale stating that public involvement strengthens the legitimacy of decisions; and (3) a knowledge rationale stating that the public should be

involved because citizens have knowledge, which differs from the knowledge of experts and politicians [77].

Participatory processes should be carefully managed because otherwise they can have negative consequences, as a—perceived—lack of participation might lead to a sense of alienation between decision-makers and citizens [78] or as participation might then be perceived by the public as a sophisticated tool for those in power to reach their objectives [77].

Third, "transition management" is increasingly proposed as a concept to understand and govern (or manage) the societal process towards sustainable development and to accompany this mission.

A transition is a gradual and continuous process of structural change from an initial dynamic equilibrium within society to a new one [79,80] and has four different, so called "transition phases": (1) predevelopment: a phase of dynamic equilibrium where the status quo does not visibly change but there is a lot of experimentation; (2) take-off: a phase where the process of change gets under way because the state of the system begins to shift; (3) acceleration: a phase where visible structural changes take place through an accumulation of socio-cultural, economic, environmental and institutional changes that react to each other. During this phase, there are collective learning processes, diffusion and embedding processes; and (4) stabilization: a phase where the speed of social change decreases and a new dynamic equilibrium is reached.

The concepts of "speed" and "acceleration" are relative, all transitions contain periods of slow and fast development, typically spanning at least one generation (25 years) [79]. Raskin *et al*. [81] argues that we are currently in the early acceleration phase and that the take-off took place during the 1980s and 1990s, a period in which the consequences of unsustainable developments became increasingly visible. However, as earlier discussed it is still unsure whether the transition persists and sustainable development will be achieved.

Fourth, the dynamic interactions between the environment and society, where the future is unpredictable and surprise is likely, require adaptive forms of governance [82,83]. Within this respect, the concepts of "resilience", "adaptability" and "transformability" of socio-ecological systems are important. Resilience is the capacity of a socio-ecological system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks. Adaptability is the capacity of actors in a socio-ecological system to influence resilience, which amounts to the capacity of humans to manage resilience. Transformability is the capacity of a socio-ecological system to create a fundamentally new system when ecological, economic, institutional or political conditions make the existing system untenable [83]. Vulnerability is the flip side of adaptive governance, where even small changes may cause dramatic effects for society [82].

7. Conclusions

Sustainable development has a longstanding history in human society. Nevertheless, in this era of modernity it continues to be misunderstood and interpreted somewhat randomly amongst individuals, organizations and governments, often in favor of one's own agenda and interests. This is arguably one of the reasons that little progress has been made in the practical implementation of its original meaning, and why in many cases social and environmental situations have deteriorated. Since it is proposed that we are still in the early acceleration phase of transition, it remains unclear whether or not

society will we able to steer itself towards the path of sustainable development. While the possibility to become sustainable exists, it is largely dependent on global societal and political "will" and a clear sense of global direction. If, sustainable development continues to be used as a "smokescreen" to justify "business as usual", the realization of its original intent will be impossible. A further conundrum exists in that the longer we wait to move society toward a sustainable future, the more difficult it will be to achieve sustainable development and to avoid societal and environmental collapse. Essential in this process is a proper understanding of sustainable development.

While sustainability allows various views to co-exist, there are four fundamental sustainability principles that must be respected to move the global sustainability agenda forward: (1) the normativity principle, (2) the equity principle, (3) the integration principle, and (4) the dynamism principle. These principles represent the interpretational limits of the concept and are essential to sustainability no matter which view and interpretation is employed. In essence, representing the concept's bottom line, sustainability aims for a fair and just society, with respect for the integrity of the planet—its living species, life support systems and non-living elements.

The sustainability message of Our Common Future [46], pillar and nested sustainability models and the sustainability principles of the Earth Charter further translate the precise fundamental sustainability principles into mainstream directives and implications to implement the concept in practice and to move forward towards a (more) sustainable global society.

In addition, the global sustainability transition should be governed, backing the fundamental sustainability principles and the various views that operationalize them. Appropriate sustainability governing that implements sustainability in practice is one of the greatest challenges and a major theme at the forthcoming Rio+20 United Nations Conference on Sustainable Development. It is expected that political activity will peak again with the conference and many hope that a new momentum will be reached that considerably accelerates the sustainability transition towards a new dynamic equilibrium between humanity and the environment.

Finally, we call upon all stakeholders in society to take the sustainability message seriously and to act accordingly in order to secure the well-being of current and future generations.

Acknowledgments

We acknowledge the support of the Research Platform Climate Change and Development Cooperation KLIMOS and the Flemish Policy research centre on Sustainable Development for this paper for this paper.

Conflict of Interest

The authors declare no conflict of interest.

References and Notes

1. Carley, M.; Christie, I. *Managing Sustainable Development*; Earthscan: London, UK, 2000.
2. Reid, D. *Sustainable Development—An Introductory Guide*; Earthscan: London, UK, 2005.
3. Dalal-Clayton, B.; Bass, S. *Sustainable Development Strategies: A Resource Book*; Earthscan: London, UK, 2002.
4. Rogers, P.; Jalal, K.; Boyd, J. *An Introduction to Sustainable Development*; Earthscan: London, UK, 2008.
5. Rockström, J.; Steffen, W.; Noone, K.; Persson, A.; Chapin, F.S.; Lambin, E.F.; Lenton, T.M.; Scheffer, M.; Folke, C.; Schellnhuber, H.J.; *et al*. A safe operating space for humanity. *Nature* **2009**, *461*, 472-475.
6. World Footprint: Do we fit on the planet? Global Footprint Network Web site; Available online: http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/ (accessed on 23 September 2011).
7. UNDP. *Human Development Indices—A Statistical Update 2008*; United Nations Development Programme: New York, NY, USA, 2008.
8. Ewing, B.; Goldfinger, S.; Oursler, A.; Reed, A.; Moore, D.; Wackernagel, M. *The Ecological Footprint Atlas 2009*; Global Footprint Network: Oakland, CA, USA, 2009.
9. Christen, M.; Schmidt, S. A Formal Framework for Conceptions of Sustainability—A Theoretical Contribution to the Discourse in Sustainable Development. *Sustain*. *Dev*. doi:10.1002/sd.518.
10. Gibson, R. *Specification of Sustainability-Based Environmental Assessment Decision Criteria and Implications For Determining "Significance" in Environmental Assessment*; Canadian Environmental Assessment Agency—Research and Development Monograph Series: Quebec, Canada, 2000.
11. Gibson, R.; Hassan, S.; Holtz, S.; Tansey, J.; Whitelaw, G. *Sustainability Assessment—Criteria and Processes*; Earthscan: London, UK, 2005.
12. Haughton, G.; Environmental justice and the sustainable city. *J*. *Plan*. *Edu*. *Res*. **1999**, *18*, 233-243.
13. Lafferty, W.; Meadowcroft, J. *Implementing Sustainable Development. Strategies and Initiatives in High Consumption Societies*; Oxford University Press: Oxford, UK, 2000.
14. Lélé, S. Sustainable development: A critical review. *World Dev*. **1991**, *19*, 607-621.
15. Robinson, J. Squaring the circle? Some thoughts on the idea of sustainable development. *Ecol*. *Econ*. **2004**, *48*, 369-384.
16. Hugé, J.; Waas, T.; Eggermont, G.; Verbruggen, A. Impact assessment for a sustainable energy future—Reflections and practical experiences. *Energ*. *Policy*, in press.
17. Giddings, B.; Hopwood, B.; O'Brien, G. Environment, economy and society: Fitting them together into sustainable development. *Sustain*. *Dev*. **2002**, *10*, 187-196.
18. Du Pisani, J. Sustainable development—Historical roots of the concept. *Environ*. *Sci*. **2006**, *3*, 83-96.
19. Sneddon, C.; Howarth, R.; Norgaard, R. Sustainable development in a post-Brundtland world. *Ecol*. *Econ*. **2006**, *57*, 253-268.
20. Rosner, W.J. Mental models for sustainability. *J*. *Clean*. *Prod*. **1995**, *3*, 107-121.
21. Lozano, R., Envisioning sustainability three-dimensionally. *J*. *Clean*. *Prod*. **2008**, *16*, 1838-1846.
22. Kuhlman, T.; Farrington, J. What is sustainability? *Sustainability* **2010**, *2*, 3436-3448.

23. Dahle, K. Toward governance for future generations: How do we change course? *Futures* **1998**, *30*, 277-292.
24. Rees, W. What's blocking sustainability? Human nature, cognition, and denial. *Sustain. Sci. Pract. Policy* **2010**, *6*, 13-25.
25. Quental, N.; Lourenço, J.M.; da Silva, F.N. Sustainable development policy: goals, targets and political cycles. *Sustain. Dev* **2011**, *19*, 15-29.
26. MEA. *Ecosystems and Human Well-Being: Synthesis*; Island Press: Washington, DC, USA, 2005.
27. UNEP. *Global Environmental Outlook 4—Environment for Development*; Progress Press: Valetta, Malta, 2007.
28. Fergus, A.; Rowney, J. Sustainable development: Lost meaning and opportunity? *J. Bus. Ethics* **2005**, *60*, 17-27.
29. Verbruggen, A. *Addressing Climate Change and Nuclear Risks*; University of Antwerp: Antwerp, Belgium, 2007.
30. Jabareen, Y. A new conceptual framework for sustainable development. *Environ. Dev. Sustain.* **2008**, *10*, 179-192.
31. Quental, N.; Lourenço, J.; da Silva, F. Sustainability: Characteristics and scientific roots. *Environ., Dev. Sustain.* **2011**, *13*, 257-276.
32. Van Zeijl-Rozema, A.; Cörvers, R.; Kemp, R.; Martens, P. Governance for sustainable development: A framework. *Sustain. Dev.* **2008**, *16*, 410-421.
33. Princen, T. Speaking of sustainability: The potential of metaphor. *Sustain. Sci. Pract. Policy* **2010**, *6*, 60-65.
34. Patton, M.Q. *Qualitative Research and Evaluation Methods*; Sage: Thouasands Oaks, CA, USA, 2002.
35. Strauss, A.; Corbin, J. *Basics of Qualitative Research, Techniques and Procedures for Developing Grounded Theory*; Sage Publications: Thouasands Oaks, CA, USA, 1998.
36. Zaccaï, E.; *Le Développment Durable—Dynamique et Constitution d'un Projet*. Peter Lang: Bruxelles, Belgium, 2002.
37. Dresner, S. *The Principles of Sustainability*, 2nd ed.; Earthscan: London, UK, 2008.
38. Ponting, C. *A New Green History of the World—The Environment and the Collapse of Great Civilazations*, 2nd ed.; Penguin Books: London, UK, 2007.
39. Van Zon, H. *Geschiedenis en Duurzame Ontwikkeling—Duurzame Ontwikkeling in Historisch Perspectief; Enkele Verkenningen*; Universitair Centrum Milieuwetenschappen, Katholieke Universiteit Nijmegen: Nijmegen, The Netheralnds, 2002.
40. Meadows, D. *Indicators and Information Systems for Sustainable Development—A Report to the Balaton Group*; The Sustainability Institute: Vermont, USA, 1998.
41. Munasinghe, M. *Environmental Economics and Sustainable Development*; The World Bank: Washington, DC, USA, 1993; p. 112.
42. Kidd, C. The evolution of sustainability. *J. Agr. Environ. Ethics* **1992**, *5*, 1-26.
43. UNEP. *Global Environmental Outlook 3*; Earthscan: London, UK, 2002.
44. IUCN; UNEP; WWF. *World Conservation Strategy—Living Resource Conservation for Sustainable Development*; International Union for Conservation of Nature and Natural Resources: Gland, Switsersland, 1980.
45. Pearce, D.; Markandya, A.; Barbier, E. *Blueprint for a Green Economy*; Earthscan Publications: London, UK, 1990.

46. WCED. *Our Common Future*; Oxford University Press: Oxford, UK, 1987.
47. UN. *The Millennium Development Goals Report 2010*; United Nations: New York, NY, USA, 2010.
48. ECI. *The Earth Charter Initiative—Handbook*; Earth Charter International Secretariat: San José, Costa Rica, 2008.
49. Hens, L.; Nath, B. The Johannesburg Conference. *Environ., Dev. Sustain*. **2003**, *5*, 7-39.
50. UN Partnership for Sustainable Development. UN Web site. http://www.un.org/esa/dsd/dsd_aofw_par/par_index.shtml (accessed on 23 September 2011).
51. UN Rio+20 United Nations Conference on Sustainable Development. UNCSD 2012 Web site; Available online: http://www.uncsd2012.org (accessed on 23 September 2011).
52. Cairns, J. Will the real sustainability concept please stand up? *Ethics sci. environ. politics* **2004**, *2004*, 49-52.
53. Cairns, J. Equity, fairness, and the development of a sustainability ethos. *Ethics sci. environ. politics* **2001**, *2001*, 1-7.
54. Palmer, J.; Cooper, I.; van der Vorst, R. Mapping out fuzzy buzzwords—Who sits where on sustainability and sustainable development. *Sustain. Dev*. **1997**, *5*, 87-93.
55. Murcott, S. Appendix A: Definitions of sustainable development. In *Proceedings of AAAS Annual Conference, IIASA "Sustainability Indicators Symposium"*, Seattle, WA, USA, 1997.
56. Pezzey, J. *Sustainable Development Concepts: An Economic Analysis*; The World Bank: Washington, DC, USA, 1992.
57. Hopwood, B.; Mellor, M.; O'Brien, G. Sustainable development: Mapping different approaches. *Sustain. Dev*. **2005**, *13*, 38-52.
58. Hajer, M. Politics on the move: The democratic control of the design of sustainable technologies. *Knowl. Tech. Policy* **1995**, *8*, 26-39.
59. Mebratu, D., Sustainability and sustainable development: Historical and conceptual review. *Environ. Impact Assess. Rev*. **1998**, *18*, 493-520.
60. Leiserowitz, A.; Kates, R.; Parris, T. Sustainability values, attitudes, and behaviors: A review of multinational and global trends. *Ann. Rev. Environ. Resour*. **2006**, *31*, 413-444.
61. Hodge, R.; Hardi, P. The need for guidelines: the rationale underlying the Bellagio principles for assessment. In *Assessing Sustainable Development—Principles in Practice*; Hardi, P., Zdan, T., Eds.; International Institute for Sustainable Development: Winnipeg, Canada, 1997; pp. 7-20.
62. Gibson, R. Sustainability assessment: basic components of a practical approach. *Impact Assess. Project Appraisal* **2006**, *24*, 170-182.
63. Langhelle, O. Why ecological modernaization and sustainable development should not be conflated. *J. Environ. Policy Plan*. **2000**, *2*, 303-322.
64. Meadowcroft, J. Sustainable development: A new(ish) idea for a new century? *Polit. Stud*. **2000**, *48*, 370-387.
65. Kemp, R.; Martens, P. Sustainable development: How to manage something that is subjective and never can be achieved? *Sustain. Sci. Pract. Policy* **2007**, *3*, 1-10.
66. Spangenberg, J. Reconciling sustainability and growth: criteria, indicators, policies. *Sustain. Dev*. **2004**, *12*, 74-86.
67. Dawe, N.; Ryan, K. The faulty three-legged-stool model of sustainable development. *Conserv. Biol*. **2003**, *17*, 1458-1460.
68. Ross, A. Modern interpretations of sustainable development. *J. Law Soc*. **2009**, *36*, 32-54.

69. Van den Brande, K.; Happaerts, S.; Bruyninckx, H. *The Role of the Subnational Level of Government in Decision-Making for Sustainable Development—A Multi-Level Governance Perspective*; Steunpunt Duurzame Ontwikkeling—Katholieke Universiteit Leuven: Leuven, Belgium, 2008.
70. Stoker, G. Governance as theory: Five propositions. *Int. Soc. Sci. J.* **1998**, *50*, 17-28.
71. Van Huijstee, M.M.; Francken, M.; Leroy, P. Partnerships for sustainable development: A review of current literature. *Environ. Sci.* **2007**, *4*, 75-89.
72. Bachus, K. Governance for sustainable development and civil society participation. In *The World Summit on Sustainable Development—The Johannesburg Conference*; Hens, L., Nath, B., Ed.; Springer: Dordrecht, The NetherlandsCountry, 2005.
73. Jänicke, M. Evaluation for sustainable development: The Rio model of governance. In *Impact Assessment and Sustainable Development—European Practice and Experience*; George, C., Kirkpatrick, C., Eds.; Edward Elgar: Cheltenham, United KingdomCountry, 2007.
74. Haas, P.M. Addressing the Global Governance Deficit. *Glob. Environ. Polit.* **2004**, *4*, 1-15.
75. Bishop, P.; Davis, G. Mapping public participation in policy choices. *Au. J. Public Adm.* **2002**, *61*, 14-29.
76. O'Faircheallaigh, C. Public participation and environmental impact assessment: Purposes, implications, and lessons for public policy making. *Environ. Impact Assess. Rev.* **2010**, *30*, 19-27.
77. Andersson, K. *Transparency and Accountability in Science and Politics—The Awareness Principle*. Palgrave MacMillan: Bassingstoke, United Kingdom, 2008.
78. Hartley, N.; Wood, C. Public participation in environmental impact assessment—Implementing the Aarhus Convention. *Environ. Impact Assess. Rev.* **2005**, *25*, 319-340.
79. Rotmans, J.; Kemp, R.; van Asselt, M. More evolution than revolution, transition management in public policy. *J. Future. Stud. Strategic Think. Policy* **2001**, *3*, 15-31.
80. Kemp, R.; Loorbach, D. Transition management: A reflexive governance approach. In *Reflexive Governance for Sustainable Development*; Voss, J.-P., Bauknecht, D., Kemp, R., Eds.; Edward Elger: Cheltenham, United Kingdom, 2006.
81. Raskin, P.; Banuri, T.; Gallopin, G.; Gutman, P.; Hammond, A.; Kates, R.; Swart, R. *Great Transition: The Promise and Lure of the Times Ahead*; Stockholm Environment Institute: Boston, MA, USA, 2002.
82. Folke, C. Resilience: The emergence of a perspective for social-ecological systems analyses. *Glob. Environ. Change* **2006**, *16*, 253-267.
83. Walker, B.; Holling, C.; Carpenter, S.; Kinzig, A. Resilience, adaptability and transformability in socio-ecological systems. *Ecol. Soc.* **2004**, *9*, article 5.