

# Six Key Drivers for Sustainable Development



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## Abstract

Sustainable development, popularized by the Brundtland report, celebrated its 30<sup>th</sup> anniversary in 2017. This oxymoron for some, or chimera for others, follows the line of the UN reports: Our Common Crisis (Brandt report, 1980), Our Common Security (Palme report, 1982), and Our Common Future [1]. In reports, sustainable development is often reduced to a set of recommendations. If sustainable development is to embody a real paradigm shift, it must be articulated around key drivers enshrined in the scientific community:

- a) a focus on social and controversial issues,
- b) a transdisciplinary approach with reasoning by complexity,
- c) a methodology based on System Thinking,
- d) an overlapping of 5 dimensions (environmental, social, economic, cultural and governance) which are not always compatible with each other,
- e) a redefinition of spatial and temporal scales,
- f) a predominant place for values and principles likely to introduce a change in behaviour.

In the history of ideas and facts, thirty years are generally necessary to convince the scientific community (observation and validation of facts) and bring about changes in ways of thinking. The challenge is: will sustainable development remain in the form of good intentions or embody a real change in life in society?

**Keywords:** Complexity; Principles; System Thinking; Transdisciplinarity; Values

## Research on Sustainable Development

Sustainable development, as originated by the Brundtland *Our Common Future* report [1], celebrated its 30<sup>th</sup> anniversary in 2017. It is difficult to assess such a criticized, contested, and mediatized concept, and yet its definition is now found in all school and university textbooks. Many students do not hesitate to define it: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it 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" [1].

While Brundtland highlighted the need to integrate the ecological, social, and economic dimensions of development, it

also benefited from attention from states, particularly during the 20<sup>th</sup> anniversary of the Stockholm Conference (1972) in Rio de Janeiro (1992). This 1992 Earth Summit restored some vigour to several of the Brundtland report's recommendations [2].

In 2007, in a book entitled "Handbook of Sustainable Development", Altinkson, et al. [3] proposed revisiting the concept of sustainable development popularized by the Brundtland Report, in order to identify its implications "for the conduct of public policy and human nature". In 2014, in the second edition of their book, the authors considered that the concept remained "extremely useful" (2014, p. xxvii), while stressing that it was in competition with other concepts such as the circular economy, the green economy, ecosystem services, resilience, etc.

Since 2015, the United Nations General Assembly has set the tone by adopting a new development programme for the post-

2015 period. The 17 SDGs (Sustainable Development Goals) and their 169 targets are a follow-up to the MDGs (Millennium Development Goals) while seeking to surpass them. Thus, sustainable development displays universal and ambitious principles, which are no less than “achieving human rights for all, gender equality, and the empowerment of women and girls” (United Nations, 2015, p. 2). The SDGs are in line with the Brundtland [1] report, namely “reconciling the three dimensions of sustainable development: economic, social and environmental” (ibid), while also bringing about change!

“We aspire to a world free from poverty, hunger, disease and need, where everyone can flourish. A world free from fear and violence. A world where everyone can read, write and count. A world where all people have equitable access to quality education at all levels, health care and social protection, where physical and mental health and social well-being are ensured. A world where the commitments we have made regarding the fundamental right to safe drinking water and sanitation are met and where there is better hygiene. A world where there is enough food for everyone and where everyone can eat in a healthy and nutritious way, whatever their means. A world where human settlements are safe, resilient and sustainable and where everyone has access to reliable, sustainable and modern energy services at an affordable cost” (UN, 2015, p. 4). The intentions are laudable, they remind us that the eradication of poverty (absolute and relative) is a necessary condition for a better world. At the same time, one cannot help but be sceptical when one sees the implications of such a change. If there is a change!

Like the Brundtland [1] report before it, the United Nations programme stresses the need to create the necessary conditions for “sustained growth that will benefit all and be sustainable, for sharing prosperity and for respecting the principle of decent work for all” (ibid.). We are far from the announced change. On the one hand, the ideology of growth and its benefits continue to fuel the discourse of the major international institutions (OECD, World Bank, UN, IMF, etc.), and on the other hand the utopia of sharing wealth and decent work continues to echo the refrain of a lullaby that has aged badly.

Beyond words and definitions, the question remains, can sustainable development embody a new paradigm? By paradigm, we mean here the idea of a new representation of the world, in its epistemological and sociological dimensions. The epistemological dimension is mainly based on Kuhn’s [4] work and his distinction between two meanings of the concept: “On the one hand, it represents the whole set of beliefs, recognized values and techniques that are common to the members of a given group. On the other hand, it denotes an isolated element of this whole: the solutions of concrete enigmas which, when used as models or examples, can replace explicit rules as the basis for solutions to the enigmas that remain in normal science” [4]. As a result, the paradigm induces several things:

- a) A set of observations or facts,
- b) A set of questions that are sought to be resolved,
- c) The existence of one or more methodologies,
- d) The presentation of results that are open to interpretation.

The sociological dimension, on the other hand, emphasizes the experiences, beliefs and values that influence how an individual or a community of individuals perceives the world (reality). The representation of the world is thus carried out in two stages: a perception of what surrounds us (the environment in the general sense) and a reaction to this perception.

In what follows, we intend to re-appropriate the notion of sustainable development by removing its institutional (and conceptual) clothes, to dress it in a paradigmatic tunic, a symbol of a different way of seeing things. Sustainable development, seen from the perspective of a paradigm shift, would be articulated around 6 key drivers:

- a) Sustainable Development refers to social and controversial issues. The latter have the advantage of challenging the relationship to knowledge since risk, uncertainty, or ignorance are an integral part of reflection. This is the case for climate change, the reduction in biodiversity, the depletion of natural resources, the consumption of energy, the increase in population,
- b) Sustainable Development implies transdisciplinarity and reasoning by complexity (this is the paradigm of complexity dear to Edgar Morin),
- c) Sustainable Development is based on a methodology: System Thinking,
- d) Sustainable Development introduces five dimensions (environmental, social, economic, cultural and governance) that are not always compatible with each other,
- e) Sustainable Development requires a redefinition of spatial and temporal scales - the long term is both synonymous with solidarity between generations and characterised by a certain irreversibility,
- f) Sustainable Development is based on a set of values or principles that imply a change in behaviour.

These six key drivers are closely intertwined and could be part of a scientific approach. The new clothes of sustainable development would definitely bring it into the very restricted circle of scientific paradigms.

### Controversial Issues

Controversial issues have been the subject of extensive literature, particularly in the social sciences [5,6]. Starting from a reflection about the positioning of teachers on major issues of society (the place of democracy in the 1940s and 1950s),

controversial questions generated a debate around the stability of knowledge, the expert's position, and the values that should be mobilized in a discussion. As a result, controversial issues are an interesting tool for debating sensitive issues [7], for stimulating critical thinking, for developing a respectful attitude towards others, or for engaging students in a participatory process [8].

At the end of the 1930s, Alexander Meiklejohn suggested that teachers take a stand on the major controversies arising from the social sciences (in this case the opposition between communism and capitalism), while advocating that both sides be represented at the institutional level: "In America today teachers, in order to do their proper work, must bring before their pupils the conflict between Capitalism and Communism. Second, teachers must, so far as they honestly can, take sides on the issue. The teacher must appear before his pupils as one who is struggling with the essential problems of this time, and who is, in his own way, forming conclusions about them. He must be going left or right. Third, school boards and trustees of colleges have a heavy responsibility. They must see it that among our teachers there is an adequate supply of "Communists", of able, fearless, outspoken advocates of the unpopular view. It must be arranged by the authorities that both sides of fundamental issues be represented by teachers who believe in them" (1938, p. 17). This position of the teacher had to have two virtues: to bring out a democratic culture and to make the class livelier (in many cases, however, the class was victim of excessive animation, difficult for the teacher to control). A few years later (March 1940), Dexter M. Keezer revisited Meiklejohn's comments in an article entitled "The problem of Handling Controversial Issues" published in the Journal of Higher Education. After recalling that the teacher could adopt two types of positions: either seek a "general" way to resolve controversies, or take the dispassion out of the debate by taking the role of an impartial spectator (this is the neutral position), "At one extreme it has been proposed that not merely teachers of social science but all teachers should accept a general formula for solving the social, political and economic problems which harass them... At the other extreme, or at least near it, is the view that in dealing with controversial questions teachers of the social sciences should take no position whatsoever, but be, in fact, dispassionate and objective expositors" (1940, p. 115-116). Keezer noted that it was important for students to have the opportunity to familiarize themselves with different positions on controversial topics. As a result, the teacher could take a position in a controversy if, and only if, his arguments were clearly formulated to the students (which does not prevent them from introducing emotional factors into a judgment or argument) and if they were likely to develop a critical mind: "I would expect the teacher of social science to have as his objective not converts to his opinions, but tough, critically minded students, capable of arriving at their own opinions under their own intellectual steam" (1940, p. 124). The success of such an undertaking requires a high degree of knowledge on the part of the teacher to analyse controversial topics and formulate an appropriate

conclusion (Cline, 1953). The teacher must be able to use "good common sense, tact, courage, caution, and pedagogical skill, each of which will develop more extensively with additional experience and accumulated knowledge" (Cline, 1953, p. 337). They must also be able to interpret facts (without substituting their opinion for information) and to master techniques (mainly the scientific method).

In the 1950s and 1960s, the emphasis was placed on giving teachers the freedom to introduce controversial issues into their classes. Ray Kehoe and Orlando Stephenson (1950) proposed a program for discussing controversies in schools based on six points:

- a) Controversial issues are part of a democratic educational program,
- b) All points of view on a controversial subject must be presented,
- c) For the benefit of students, all solutions to problems must be justified,
- d) To avoid any form of propaganda, it is vital to determine educational values,
- e) The teacher has two types of right,
- f) A democratic policy aimed at establishing a free discussion on controversial issues must be decided by the school institution.

Kehoe and Stephenson emphasized that a free society requires enlightened citizens and students who can identify important issues. This desire to introduce "the free inquiry into Controversial Issues" is largely explained by the climate of the time, with many communities seeking to protect their students from contact with controversial topics (Lieberman, 1960; Lundstrum, 1965).

The 1970s and 1980s focused on standards and methodological aspects. From a methodological point of view, as William Hare (1973) reminds us, it was a question of how a teacher could maintain a neutral position. Such a questioning suggested returning to the proper analysis of the nature of the controversy: "A controversy is necessarily a dispute... in the public forum" (Hare, 1973, p. 52), dissociating debates on values from scientific debates (debates on values imply that everyone has a certain respect for the opinion of the other), accepting the fact that certain controversies can be resolved. From a standards perspective, the questions were how to include controversial issues in the curriculum, (Stenhouse (1970) noted that the decision to present a controversial issue involved a value judgment), and how to define the teacher's responsibilities (and rights) when using controversies in his or her teaching (thus allowing the teacher to contribute to the state of knowledge).

*Controversial Issues (CI) in the Curriculum* by Wellington [9] provides an excellent illustration of the state of research in the

mid-1980s. The author proposes a definition of controversy, a justification for the use of controversies, and a pedagogical approach for teachers. Wellington [9] notes that a controversial issue:

- a) Cannot be resolved by facts or the result of experiments, and value judgments must be used,
- b) Must be considered important by a significant number of people.

The report "Teaching Controversial Issues: A European Perspective" of Children's Identity and Citizenship in Europe (2003) refined this definition with the following five points. A controversial issue

- (i) Brings values and interests into competition,
- (ii) Is politically sensitive,
- (iii) Stirs emotions,
- (iv) Concerns a complex subject,
- (v) Is a topical issue.

Controversial Issues (CI) can be justified as follows: any form of education that ignores them would be inadequate, any discipline that does not mention them would give a poor representation of the subject (the author draws attention, in particular, to the teaching of scientific disciplines, too often confined to the relationship of cause and effect). However, the pedagogical approach based on objectivity, balance of power, and neutrality seems difficult to sustain in the case of Controversial Issues (CI). Value judgments refer to individuals' perceptions, an approach that is difficult to reconcile with the teacher's objectivity.

The 1990s and 2000s marked a change in the way controversial issues were approached. The teacher occupies a secondary role; it is the information and its processing that become the cornerstones of CIs. The analysis of controversial issues aims to present in a synthetic and neutral way, a complex situation where discourse, positions of actors, and issues, are associated

or opposed. In this context, visualizations of the information resulting from the analysis of the controversy are ways of capturing complexity, allowing readers to understand its main elements and the relationships that link these elements (Pinch, Leuenberger, 2006). Bruno Latour's work, particularly his controversy maps used in courses at the Ecole des Mines and Sciences Po (in France), have become teaching tools for learners [10], p. 1] combines this approach with network actor theory).

According to Latour [11], controversy is "the great way to get inside the science that is being done. If we consider controversies not as fights, but as moments when we begin by not knowing, and when we discuss, it is the royal way to enter scientific activity. The term is used here in its narrowest sense: "debate partly concerning scientific or technical knowledge that is not yet assured". Controversy has several virtues. On the one hand, it makes it possible to explore areas left in the shadows by the traditional treatment of problems and helps to make visible forgotten (or underestimated) elements. On the other hand, it puts experts and lay people "on an equal footing" by considering that each has its own expertise. By bringing their expertise to the debate, everyone enriches, moves and broadens it. In addition, controversy implies changing the composition of the collective. By taking stock of all the problems, we have the opportunity to redefine the notion of democracy, which is no longer based on a majority rule, but on taking minorities into account ("In addition to a pedagogical exercise, the mapping of controversies today aspires to constitute a platform for democratic participation, a toolbox to support and encourage public debates on scientific and technological issues", [10]. Finally, controversy allows learners to evolve in a context where knowledge is not stabilized, to consider uncertainty in order to identify all possible solutions and to understand the entire process of reasoning [12]. In the end, the controversy must lead "to the construction of a map of subjects that are the subject of extensive technical expertise and which, at the same time, have become businesses, often confused, mixing legal, moral, economic and social issues to the point that these businesses, "these public things", are becoming more and more the heart of political life" (ibid) (Table 1).

**Table 1:** Five rules for choosing a controversy.

<b>Rule n°1</b>	Take a subject that is not closed; it is imperative to choose a subject that will evolve during the year and that the student will be able to follow live since the follow-up takes place over a semester. This rule is imperative because it is the only way to avoid retrospective error by assuming, once the controversy is resolved, that the "real" experts knew well "from the beginning" how it would end.
<b>Rule n°2</b>	Take a subject that is relatively hot, which does not necessarily mean highly publicized, but in which there are enough protagonists to expect opposite results, rebuttals, developments on a school year scale.
<b>Rule n°3</b>	Take a subject that requires you to go through the most heterogeneous forms of literature possible; it is out of the question for a student to limit himself, for example, to reading <i>Le Monde</i> or <i>Le Figaro</i> ; he must go down through the whole range of media, not forgetting specialized professional magazines.
<b>Rule n°4</b>	Take a topic that is small enough to be dealt with in one year by the controversy group.
<b>Rule n°5</b>	Take a subject that is treatable, which implies that specialized literature is accessible. Very often students choose excellent subjects but for which they have no other source than the mainstream press or web forums, the rest being either in the form of grey literature (restricted reports), in a foreign language unknown to the students, or confidential (this is the case of subjects classified as secret defence).

Source : <http://www.bruno-latour.fr/cours/index.html>

The learning concerns the methods of the sociology of science and technology, the study of scientific argument, media analysis, and the new methods of “scientometry” and “virtual geography” which are developing on the internet. The pedagogical sequences develop both qualitative and quantitative survey skills, and systematically build bridges between training in the natural and social sciences. The aim is to explore, through new pedagogical methods and the creation of controversial websites, the types of assemblies that would allow a shared and legitimate form of objectivity to be restored.

From a methodological point of view, controversy mapping can be used for questions, which are interesting and relevant when it comes to “thinking” about a scientific approach and “defining” certain concepts.

- a) The information does not mean knowledge (there may be a significant distance between these two concepts),
- b) As the volume of information available increases, it becomes more difficult to sort, organize, structure, and analyse information,
- c) Controversy mapping implies a great freedom in the positioning of actors or arguments. On the one hand, we can refer to the links, groups, or position in the controversy (important actors, central actors, arguments for or against, shared issues or interests, influence games, etc). First, it is necessary to make a complete list of the actors involved in the controversy. If the controversy is broad, it is possible to list the most important actors in the controversy. Second, it is necessary to summarize the main arguments of the actors involved. These arguments are summarized in one sentence or a short paragraph. It is necessary to be able to identify cases where two or more actors share one or more arguments. Third, from the list of actors, it is necessary to group the actors. In general, it is possible to use the issues associated with the actors (economic, political, societal, etc) and on the arguments shared between the actors (two actors sharing a large part of their arguments are probably in the same group). From all these elements, it is possible to build a map that reflects a controversy. There is not a single map per controversy, everything depends on the entry point (economic, ecological, social, etc) or the variety of possible visualizations (historical map, geographical map, actors’ map, software processing, etc).
- d) The opinions of experts and scientists no longer provide a clear and precise idea of the subject matter being addressed. These opinions may be in opposition, divergent or associated. Mapping controversies provides a synthetic presentation of the different dimensions of the controversy; it also makes it possible to determine the position of opinions and actors; finally it gives individuals the means to quickly obtain information on the elements of the controversy: “Mapping a controversy means listing the positions involved by describing for each of them by whom they are brought,

scientists, industrialists, non-governmental organizations... and with what arguments. The ultimate goal is to help citizens form an opinion on these controversial issues” [12].

e) Mapping is an interesting pedagogical tool in the field of education for sustainable development. On the one hand, it refers directly to our representations of sustainable development and social issues (particularly when it is first associated with a conceptual map and a mental map). On the other hand, it is part of an initiation approach to complexity [13] and to the systemic approach [13].

f) Mapping must enable citizens to participate in public debate and to evolve in an increasingly uncertain environment. As a result, it refers directly to the tools of representation, negotiation, consultation, etc. For [10], “the purpose of controversy mapping is to contribute to the development of these devices through the creative use of digital technologies”. The new information and communication technologies (NICTs) thus play a central role in the mapping of controversies. They make it possible both to collect information (e.g. the Navicrawler software which makes it possible to collect information on the composition of a blogosphere and to visualize the different communities influencing a social subject), and to visualize the final product (constitution of a website). In the end, the controversy map becomes a research tool that brings together education for sustainable development (ESD) and media and information education (MIS).

From a practical point of view, the pedagogical system consists of having students work in groups of 5 or 6. The groups select a controversy and have to accumulate documentation which is as complete as possible, combining the different types of media (newspapers, web, popular magazines, scientific journals, “grey” literature, interviews, blogs, and first-hand data collection, etc). This information is then formatted using the tools available on the web, to constitute around each theme a kind of “virtual parliament” helping to put new “public things” into politics. Students are not asked to take sides or give their expert opinion, but to describe as carefully as possible the range of positions, the dynamics of the debates, the technical arguments, the trajectory of these arguments, their presentation by the various media, and the reasons for these developments. At the end of the year, the study of each controversy gives rise to a publication in the form of a website, available on the internet and hosted on a server. It is about participating in public debate. The emphasis is placed on the quality of the documentation, the ability to work in groups, the relevance of the problematization, and the presentation choices that must be as adjusted, as much as possible, to the specifics of the controversy studied. Each group includes:

- a) A project manager, responsible for project coordination and task allocation. He/she ensures that the study progresses, and that the framework defined by the group is respected,

- b) 2 interviewers, in charge of fieldwork, interviews, and the qualitative exploitation of documents,
- c) A cartographer, responsible for the digital and graphic processing of data and the scripting of the representation of the controversy,
- d) A designer, in charge of designing the presentation of the information and interaction as well as the graphics of the site,
- e) A webmaster, in charge of building the internet site. These roles are provided for information only. They are likely to overlap. Under no circumstances should they be understood as fixed categories that would limit the work of team members.

Because of its complexity Sustainable Development is an excellent arena for controversial issues. The reflections focus on controversial issues which combine scientific and social questions, but also values and ethics [14]. Controversial issues are complex, they are also uncertain. Their resolution requires more than a scientific solution. They promote a debate that makes it possible to get out of “ex-cathedra” knowledge by co-constructing scientific and social knowledge. Finally, they are part of a strong sustainability perspective in as much as teaching about situations aims to develop the critical thinking of learners.

Understanding the issues of sustainable development can thus be achieved by introducing a practice of discussion (learning phase), with questioning taking place in successive stages and highlighting the collective search for solutions to the problem [15]. Sustainable development adds to the debate about how to co-construct knowledge and identities. The notion of identity raises the question of social representations which make it possible to better interpret the arguments deployed by speakers and to identify progress made in reasoning or problematizing.

The analysis of representations of sustainable development (by students and teachers) is a first step towards an assessment of the state of knowledge about sustainable development, at a given time, and in a precise context. This assessment can then be analysed in terms of known information, the precise definition of the field of representation, the organisation and structuring of knowledge, the accuracy of the information in relation to the reality of the “sustainable development” subject. As a result, social representation constitutes an appropriation of the subject “sustainable development” by cognitive reconstruction (it is possible to identify attitudes that slow or accelerate the learning process), which is linked to the social and ideological context.

### Complexity and Transdisciplinarity

While sustainable development is, by nature, included in all disciplines, the scientific division imposed by the classification of 19th century sciences (Ampère, 1834) remains in force. However, this classic classification introduces two important biases [13]. On the one hand, it leads to hyper-specialization

and the withdrawal of disciplines into themselves. On the other hand, it does not (or no longer) make it possible to grasp the complexity of reality (complexity does not sit well with the desire to label, separate, and simplify everything in the body of knowledge).

However, efforts have been made to move towards a definition of science without closing the door to new scientific methods, or to new ways of dividing reality into objects of study. For some (Piaget, Morin, etc.), it is a question, no more and no less, of reconnecting the disciplines which have been divided into classes and subclasses. Multi-disciplinarity is a first step. Several disciplines (economics, sociology, psychology, ecology, etc.) are thus brought together without any attempt at integration or synthesis.

The “classic” approach is for each specialist to work on different aspects of the same problem. In the case of the environmental dimension of sustainable development, the economist will propose a method to take into account the effects of economic activity on the environment and thus outline the scope of environmental economics, the ecologist will show that living organisms and populations are organized in such a way as to form communities or associations whose structure and function cannot be understood by an examination separate from the parts. Such an approach can only generate a juxtaposition of the data produced in each discipline. Interdisciplinarity, on the other hand, goes a step further along the path of reconnecting the sciences, presenting itself as a process in which an attempt is made to develop analytical and synthesis capacity from the perspectives of several disciplines. It is a question of treating a problem, by identifying and integrating all the relationships between the various interrelated elements.

In *Logic and Scientific Knowledge* [16] and *Interdisciplinarity: Teaching and Research Problems in Universities* [17], Jean Piaget was led to conceive a system of sciences (disciplinary fields) no longer as linear but turning back on itself in an endless spiral. Interdisciplinarity thus becomes the very condition for the progress of science, offering many perspectives. It can lead to knowledge mastered by a person in more than one discipline. An economist’s understanding of sustainable development thus requires him to understand the physical (thermodynamics introduces entropy) and biological (competition of species for scarce resources) character of the production process. It can also be understood as the combination of elements from several disciplines to produce new knowledge. In the case of sustainable development, industrial ecology can be presented as a new trend of thought combining engineering sciences (search for technical solutions to environmental problems), ecology (analogies with the concepts of ecosystems, metabolism, symbioses and biocenoses), management sciences (cost-benefit analysis, value analysis), and economics (method for the allocation of scarce resources). In this case, interdisciplinarity is indeed an association of skills for a common project: completing

cycles, reducing waste, dematerializing products, etc. Finally, interdisciplinarity is a holistic teaching method. Students are presented with a problem (waste reduction) through several disciplines (management, economics, ecology, etc.) in order to become “broad vision” thinkers (they will acquire a wide range of skills, intellectual abilities, behaviours, and values).

In a way, sustainable development (and its education) is part of an interdisciplinary approach, which while seeking to go beyond this framework of reflection, to engage in transdisciplinarity, appears to be imposed by the growing complexity of the phenomena studied.

Indeed, a complex situation imposes on researchers, but also on citizens, the need for a global vision of the context, which amounts to considering all the factors involved in the problem they are dealing with, while placing this problem within a broader framework. If complexity is, at first sight, a quantitative phenomenon, it is in fact “the extreme amount of interactions and interferences between a very large number of units” [18], accompanied by unknowns and random phenomena. Therefore, complexity calls for the notion of uncertainty, “it is uncertainty within highly organized systems” [18], which does not mean that complex thinking rejects clarity, determinism, and order. However, complex thinking considers them to be insufficient for understanding reality. In this way, it aims to prepare for the unexpected, and therefore for the development of new solutions. In the case of a crisis, whether financial, economic, social, or environmental, the very idea behind sustainable development would be to abandon the solutions specific to old crises and propose innovative strategies, without forgetting the lessons learned from previous crises.

According to Edgar Morin, three principles can help us think about complexity.

- a) The dialogic principle combines two complementary and antagonistic terms – order and disorder. Complexity would thus be linked to a certain mixture of order and disorder, bringing about a real epistemological rupture. These two terms collaborate and produce organization and complexity.
- b) The principle of organizational recursion (reminiscent of the whirlwind process) is based on the idea that products and effects are both causes and producers of what generates them. Thus, society is the result of interactions between individuals, however, once produced, society retro-acts on individuals.
- c) Finally, the hologrammatic principle refers to the following concept: the part is in the whole and the whole is in the part. In other words, the hologram proposes to move beyond the reductionist approach (which sees only the parts) and the holistic approach (which sees only the whole).

While complexity is an important key to understanding realities, there are several approaches to complexity and not

all are compatible with a project to build an education for sustainable development. Thus, work to develop models in economics based on heterogeneous agents whose behaviour is simulated using computers is not a suitable field for studying sustainable development. On the other hand, the recognition of institutions (which are at the same time actors with formal or informal rules, habits, etc.) as a source of complexity opens the way to interesting avenues of research (role, functioning, way of taking institutions into account), particularly state/market relations (relations which are more complex than they appear). In seeking to theorize complexity, Robert Delorme [19] emphasized that it would be of a dual nature, simultaneously an obstacle and a principle, of knowledge and action. This results in a distinction between “complexity attributed to an object” (which he describes as strictly cognitive complexity) and “cognitive and practical complexity creating a complex situation” (which he called second-order complexity). It is the latter that can constitute a key step in the development of true education for sustainable development. It is at odds with the analytical universe inculcated during current school and university education. Complexity gives priority again to empirical investigation, and above all, it constitutes a complexity of situation that must be contextualised (principle of relativity).

While the teaching of economics is gradually giving way to the sirens of complexity, ecology has developed a real culture of complexity by focusing on understanding all the mechanisms of the global system that is life on earth. This link between the two sciences or disciplines (as seen in the two dimensions of sustainable development: environment and economy) is the cornerstone of education for sustainable development. The aim here is not to integrate ecology into economy, nor to embed economy into ecology, but to accept and integrate complexity as a rule of thumb, as a new way of understanding reality (or “realities”). Education for Sustainable Development (ESD) is therefore part of a paradigm shift approach. Sustainable development is impregnated with complexity. It is fuelled by an explosion of disciplinary research (in neuroscience or psychology, for example), advocates openness between disciplines (relations between ecology and economics) and determines the acceleration of the multiplication of sub-disciplines (informational ecology, political ecology, industrial ecology, cultural ecology, functional economics, etc.).

Faced with this multiplication of realities, transdisciplinarity can constitute a fertile modality for reflection. Ost & Van De Kerchove [20] proposed the following definition. It is a posture in which “one tries to abandon the particular points of view of each discipline in order to produce autonomous knowledge from which new objects and methods result”. They thus see it as a sign of a desire to integrate disciplines and describe it as “a scientific utopia” (1987, p. 78) by recommending that we distance ourselves from such an approach. However, as Denys de Béchillon [21] points out, transdisciplinarity cannot be limited to the production of autonomous knowledge, which constitutes

new objects. It is both a possibility to usefully transfer certain concepts and, above all, “a privileged way to identify and understand the functioning of the paradigms structuring our mental activities”. Here we find a sense of the complementarity of order and disorder relations, dear to Edgar Morin [22]. The nomadism of scientific concepts makes transdisciplinarity a gratuitous and disordered curiosity in the world of knowledge, where questions relating to philosophy, physics, economics, sociology are intertwined. The supervision of our mental activities by an analysis in terms of paradigms insists on the fact that transdisciplinarity gives us the power and freedom to seek something beyond disciplinary divisions: “It forces the discipline to leave its framework to recharge its batteries in its own field” [23]. It is neither a question of studying an object from a single discipline by several disciplines at the same time, nor of transferring methods from one discipline to another, but rather of being both between disciplines, across different disciplines and beyond any discipline: “its purpose is the understanding of the present world, one of its imperatives being the unity of knowledge” [24].

For Piaget [25], such a conception must take the form of a “general theory of systems or structures, encompassing operational, regulatory and probabilistic structures, and linking these various possibilities through regulated and defined transformations” [25]. In the end, transdisciplinarity is assumed to construct its own contents and methods in order to enable it to grasp a multidimensional reality, structured at multiple levels. It is a cognitive paradigm whose main mission is to build bridges between science and non-communicating disciplines. These places of passage are not like a long quiet river, they push each discipline to its limits, virulently shake up the order of things and focus attention on interactions: “Transdisciplinarity is often characterized by cognitive patterns crossing disciplines” [22].

In the context of education for sustainable development, transdisciplinarity and complexity are the two pillars that structure the operations of logic and impose a new method of organizing knowledge for more effective action. Investigations can then turn to a method tinged with pedagogy, for instance Dewey’s theory of inquiry [26], rooted in philosophy, Lupasco’s principle of antagonism [27] or more operational, Forrester’s systems dynamics [28].

### System Thinking and System Dynamics

System Thinking should not be considered as a science, theory, or discipline, it is above all a methodology “for gathering and organizing knowledge for more effective action” [29]. It was born from the combination of several disciplines, including cybernetics [30], information theory [31] and systems theory [32]. Cybernetics is the discipline that studies regulation and communication in living beings and man-made machines. Information theory makes it possible to imagine the communication process (information source, transmitter, noise source, receiver, destination). Systems theory is:

- a) Part of a general trend towards the integration of the different natural and social sciences,
- b) An integration centered on a general theory of systems,
- c) A means of achieving an “exact” theory in non-physical scientific fields,
- d) The search for unifying principles in the universe of individual sciences (idea of the unity of science),
- e) An integration going as far as science education.

The notions of hierarchical levels, flows, networks, and regulations are essential to understanding system thinking (and its application). System Thinking focuses on interacting elements. It examines structures made up of hierarchical levels of complexity. Each of these levels is made up of components that decompose (from living organisms to atoms). System Thinking studies flows information flows, energy flows, material flows that enter open systems (in the sense of thermodynamics); and takes into consideration information and regulation networks. These networks are formed from loops in which information returns to its source, either in a way that amplifies the effects or in a way that reduces them, in order to maintain a certain stability. In a way, System Thinking is complementary to the traditional analytical approach as shown in the below Table 2.

**Table 2:** Analytical Thinking vs System Thinking.

Analytical Thinking	System Thinking
Isolates, focuses on the elements	Connects, focuses on interactions between elements
Considers the nature of interactions	Considers the effects of interactions
Rely on the precision of details	Is based on the overall perception
Modifies one variable at a time	Modifies groups of variables simultaneously
Independent of time (phenomena are reversible)	Integrates duration and irreversibility
The validation of facts is carried out by experimental proof within the framework of a theory	Models that are not rigorous enough to serve as a basis for knowledge but can be used in decision and action.
Effective approach when interactions are linear and weak	Effective approach when interactions are non-linear and strong
Leads to disciplinary education	Leads to multidisciplinary teaching
Leads to a planned action in detail	Leads to an action by objectives
Knowledge of details, poorly defined goals	Knowledge of goals, fuzzy details.

Source: Rosnay [26].

System Thinking is based on the notion of a system [18]. A system is a set of elements in dynamic interaction, organized according to a goal. It is also a modelling tool for representing



and analysing elements characterized by their high number and a network of interrelated relationships (Forrester, 1968). The notion of system is not really innovative in itself, biology and ecology were the first to refer to it (the human body is better understood thanks to the study of the relationships between the different parts of the body; the ecosystem studies the environment as a whole), it is however its application to socio-economic relations that is new [33]. A systemic approach to ecology and economics would make economics a life science. It would simply be enough to replace cash flows (i.e. the ratio of people to “dead” things) with energy flows, in other words to substitute a universal energy unit (the kilocalorie) for money. This is what Odum [34] did by proposing an energy equivalent of 10,000kcal (energy of one litre of gasoline) per dollar.

However, what we are interested in here is not the system approach per se, but the study of complex systems, which involves five main factors [35]:

- a) Interacting elements or agents,
- b) Very numerous relationships that are established between these elements or agents,
- c) Hierarchical levels forming interdependent networks and including nodes at the level of each network,
- d) Changes in behaviour over time, generally non-linear,
- e) An ability to evolve over time and to take the path of increasing complexity.

Thus, the planet, the ecosystem, the city, the company... are complex systems whose multiple interacting elements must be studied.

To illustrate and demonstrate a complex system, let us take the example of the famous Meadows report [36]. This report, entitled *Limits to Growth*, was commissioned by the Club of Rome (August 1970) from the MIT System Dynamics Study Group. This group sought to define the material limits that prevented the multiplication of human beings and the constraints resulting from their activities on the planet. Five critical factors, population increase, food production, industrialization, depletion of natural resources and pollution, their interactions and interdependencies were studied using the analytical method developed by J W Forrester [37] - system dynamics. System dynamics was used to highlight “the many relationships between elements, forming loops with coupling, and for some with time-shifted effects” (1972, p. 153). A positive loop has an amplifying role. It appears every time you encounter an exponentially varying quantity. This loop causes a sort of vicious circle (example of the demographic loop: the increase in the birth rate leads to an increase in annual births, and therefore to an increase in the population). A negative loop has a regulating role. It aims to maintain at a constant level a function that tends to grow or decrease. It therefore acts in the opposite direction to the variation of the function (example of the food

loop). Population growth - which reduces the stock of natural resources - can thus be captured by a positive and a negative loop. The global system proposed by the Meadows report is based on a network of relationships and loops concerning the five critical factors mentioned above (Figure 1).

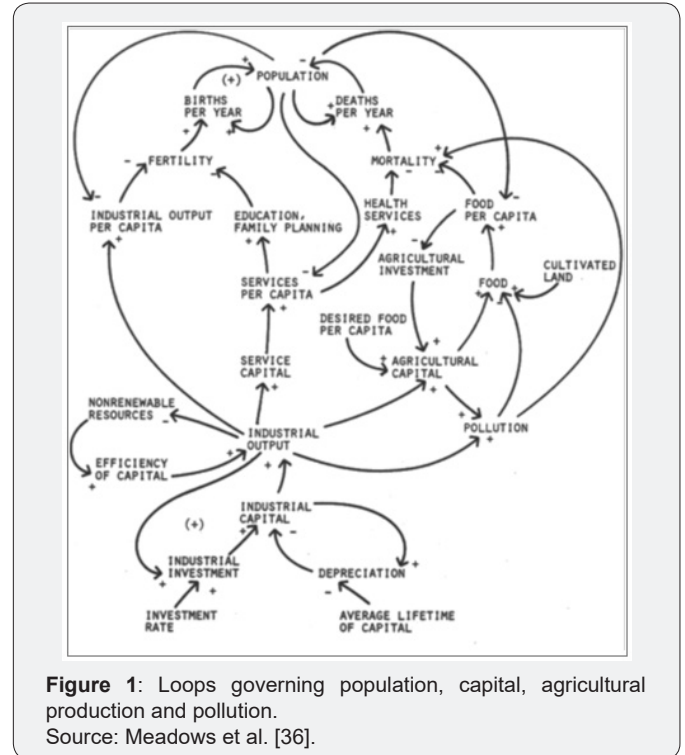


Figure 1: Loops governing population, capital, agricultural production and pollution. Source: Meadows et al. [36].

According to the authors of this report, the global system would inevitably tend towards overheating followed by a collapse, the cause of this collapse being the disappearance of raw materials. Once the investments necessary to maintain a certain level of production can no longer compensate for the depreciation of capital, the entire industrial production system collapses and leads to the collapse of agricultural and service activities dependent on this industrial production. For a time, the situation is extremely dramatic, as the population, given the relatively long response time, continues to grow. A gradual readjustment, but probably to a lower level, can only occur after a period of increased mortality due to food shortages and deteriorating hygiene and control conditions. If the shortage of raw materials seems to be at the root of the system’s collapse, one of the loopholes could be the discovery of new deposits. However, the authors of the report are formal, if it were possible to access new natural resources, growth would stop as a result of pollution. This is therefore the real cause of the collapse of growth and, consequently, of society.

While systemic analysis is indeed a response to the complexity of the world, it is also an intellectual instrument that takes its rightful place in education for sustainable development. On the one hand, answers to questions that are complex in nature are not self-evident. They require considering the system (the actors, their multiple interactions, the context, etc.) and debating different points of view (confrontation of experts, questioning

pseudo-truths, development of critical thinking). On the other hand, the search for solutions cannot be limited to isolating a fact or problem from its context, which is why sustainable development education must use systemic analysis to embrace all realities [13]. The latter creates the conditions for structuring thought and facilitates access to a form of understanding of the world. Thus “system thinking” makes it possible to structure knowledge. In his book *The Process of Education*, Jérôme Bruner [38] mentioned the importance of structure in education: “To grasp the structure of a subject is to understand it in a way that allows many other things to be significantly linked to it. In short, learn how things are related to each other” [28]. More recently, Joël de Rosnay [39] based himself, in his book *L'écologie et la vulgarisation scientifique*, on Piaget's work in order to propose a method likely to structure complex thinking. It consists of five steps - stimulating curiosity, allowing personal exploration, providing research tools, making expert advice available, comparing knowledge through experimentation - and is relevant when used in the context of education for sustainable development. Lastly, Linda Booth Sweeney and Dennis Meadows [40] have published a book entitled “*The Systems Thinking Playbook*”, in which they present systems thinking as a general term used to represent a set of methods and tools that focuses on systems, rather than parts, to define and solve complex problems and to promote more effective learning and conceptualization. They argue that the practice of “System Thinking” “helps us to stop operating from crisis to crisis, and to think in a less fragmented, more integrated way” [40].

Both Sweeney and Meadows even go so far as to define the profile of a “system thinker”. It is someone who sees the whole picture, who changes perspectives to see new leverage points in complex systems, who seeks interdependencies, who considers that mental models allow access to the future, who gives long-term attention and credit, who uses a peripheral vision to learn about complex cause-and-effect relationships, who is interested in the emergence of unexpected consequences, who focuses on structure, who accepts the tension of paradox and controversy without trying to resolve them quickly, who seeks to make the system visible through mental maps (of causality) and computer models, who searches for stocks or accumulations and delays and the inertia they can create, who monitors win/lose states of mind, knowing that they generally aggravate things in situations of strong interdependence, who considers himself/herself part of the system, and not outside the system.

To conclude this section, in our opinion the analysis of complex systems offers a perspective and a field of research which enriches the very idea of sustainable development and would bring us closer to the Anglo-Saxon concept of Sustainability. Sustainable development could thus be defined as “the ability of a complex system to be self-managing and resilient to hazards through appropriate management of the flows of energy, materials and information through it” [33]. This

system can be a planet, a continent, a country, a territory, a city, a company, a household.

### Two, Three, Four, Five... Dimensions of Sustainable Development

While sustainable development remains a controversial concept, it should be recalled that our representation of sustainable development was not made in a day, and that the long and slow emergence of the concept is part of a process that has crystallized (and still crystallizes) several controversies. Sustainable development thus refers to a set of trajectories whose complexity appears today through its 2, 3, 4, 5... dimensions.

#### The two dimensions of sustainable development

While sustainable development is generally associated with the Brundtland report [1], it should be recalled that the Brundtland report referred to only two dimensions, environment and development: “The concept of development provides a framework for integrating environmental policies and development strategies, understood in the broadest sense. Development is often seen simply as the process of economic and social change in the Third World. Yet the integration of environment and development is a necessity in all countries, rich or poor. The pursuit of sustainable development requires changes in the national and international policies of all countries” [1]. Thus, economic and social aspects, more precisely social and economic progress, were linked to development, which “should” lead to a transformation of the economy and society. Despite the proclamation of the 27 principles (polluter pays principle, participation principle, solidarity principle, etc.), the Rio Declaration (Conference from 3 to 14 June 1992) failed in changing this dual representation of sustainable development. Principle 2 stressed that “States have the sovereign right to exploit their resources in accordance with their environment and development policy” and principle 4 specified that, in order to achieve sustainable development, “environmental protection must be an integral part of the development process and cannot be considered in isolation”. However, one striking fact seems to show that the Rio Conference (1992) was not just a follow-up to the Stockholm Conference (1972). In Rio, the business world, absent from the Stockholm debates, invited itself to the negotiating table. Stephan Schmidheiny, a billionaire Swiss industrialist, became the main adviser to Maurice Strong, then Secretary of the United Nations Conference on Environment and Development (UNCED), on industrial and business issues: “One of the best decisions I made was to invite the Swiss industrialist Stephan Schmidheiny to become my main adviser to the business community, to carry out the difficult task of engaging and supporting this community” [41].

Schmidheiny [42] took on this task, opened an office at his own expense, and began recruiting other business leaders to form a new organization: The Business Council for Sustainable Development (BSCD). Schmidheiny's [42] investment was such

that in less than a year, he succeeded in recruiting 50 senior executives (including business leaders representing ABB, Alcoa, Chevron, Ciba-Geigy, Dow, DuPont, Mitsubishi, Nippon Steel, Nissan, Shell and Volkswagen) from different industries. At its conference on 5 June 1992, Stephan Schmidheiny [42] presented the results of the Council's reflection in a report entitled *Changing Course*. Reconciling a company's development with environmental protection, it quickly became a bestseller translated into nearly 15 languages. The philosophy of this book was as follows: "The functioning of a system of free and competitive markets where prices integrate environmental costs with other economic components is the foundation of sustainable development".

If the market was a factor of efficiency in the use of resources and in the reduction of pollution, Schmidheiny [42] intended to put the market at the service of the environment through the internalisation of external effects. If the market became the reference economic tool, eco-efficiency (a concept dear to industrial ecology [43]) and ecological efficiency were

presented as the strategies for change. Indeed, only competitive (and therefore most profitable) companies were seen as being able to move towards recycling activities, (i.e. the reuse of materials in the same products), thus limiting the consumption of raw materials and saving the energy required to transform these raw materials. For Schmidheiny, such a process "had to" be accompanied by a radical change in attitudes in the business world and a break with the traditional logic that tended to ignore human or ecological considerations.

### The three dimensions of sustainable development

Sustainable development thus takes on a specific connotation, that of the Anglo-Saxon business culture (just like Corporate Social Responsibility), which became institutionalized with the creation of the WBCSD (World Business Council on Sustainable Development) in 1995 and the media coverage of the Triple Bottom Line (TBL), popularized by Elkington in 1994 [44]. Sustainable development is therefore presented in the form of an interdependence between three spheres: economic, social, environmental (Figure 2).

The late 1990s saw the term 'triple bottom line' take off. Based on the results of a survey of international experts in corporate social responsibility (CSR) and sustainable development (SD), Figure 1.1 spotlights the growth trend over the two years from 1999 to 2001. As originator of the term, I have often been asked how it was conceived and born. As far as I can remember – and memory is a notoriously fallible thing – there was no single eureka! moment. Instead, in 1994 we had been looking for new language to express what we saw as an inevitable expansion of the environmental agenda that Sustain Ability (founded in 1987) had mainly focused upon to that point. We felt that the social and economic dimensions of the agenda – which had already been flagged in 1987's Brundtland Report [1] (UNWCED, 1987) – would have to be addressed in a more integrated way if real environmental progress was to be made. Because Sustain Ability mainly works, by choice, with business, we felt that the language would have to resonate with business brains. By way of background, I had already coined several other terms that had gone into the language, including 'environmental excellence' (1984) and 'green consumer' (1986). The first was targeted at business professionals in the wake of 1982's best-selling management book *In Search of Excellence* (Peters and Waterman, 1982), which failed to mention the environment even once. The aim of the second was to help mobilize consumers to put pressure on business about environmental issues. This cause was aided enormously by the runaway success of our book *The Green Consumer Guide*, which sold nearly 1 million copies in its various editions (Elkington and Hailes, 1988).

But back to the triple bottom line (often abbreviated to TBL). Like Paul McCartney waking up with *Yesterday* playing in his brain and initially believing that he was humming someone else's tune, when the three words finally came to me, I was totally convinced that someone must have used them before. But an extensive search suggested otherwise. The next step was whether we should take steps to trademark or otherwise protect the language, as most mainstream consultancies would have done. Counter-intuitively, perhaps, we decided to do exactly the reverse, ensuring that no one could protect it. We began using the term in public, with early launch platforms, including an article in the *California Management Review* on 'win-win-win' business strategies (Elkington, 1994) [44], Sustain Ability's 1996 report *Engaging Stakeholders* and my 1997 book *Cannibals with Forks: The Triple Bottom Line of 21st Century Business* (Elkington, 1997). In 1995, we also developed the 3P formulation, 'people, planet and profits', later adopted by Shell for its first Shell Report and now widely used in The Netherlands as the 3Ps.

**Figure 2:** Enter the Triple Bottom Line  
Source: Elkington [44].

The Triple Bottom Line was thus to lead the various organizations to focus not only on the economic value of what they were creating but also on the environmental and social values they were adding or destroying. According to Elkington [45], such a transition could only be achieved through a global cultural revolution. Seven keys were to play an important role in this transition phase:

- a) Markets - companies operate in markets that are increasingly open to competition,
- b) Values - more humane, more focused on society,
- c) Transparency - company commitment, openness to stakeholders, demand for information, etc.
- d) Technology life cycle - manufacturers' responsibility for product recycling,
- e) Partners - new forms of partnership between organizations,
- f) Time - sustainable development moves the cursor from the short term to the long term,
- g) Corporate governance - which would no longer focus on shareholders but on stakeholders.

A few years later, the United Nations endorsed the Triple Bottom Line through point 5 of the Johannesburg Declaration on Sustainable Development [46]: “In this way, we assume our collective responsibility to advance and strengthen, at the local, national, regional and global levels, the interdependent and mutually reinforcing pillars of sustainable development: economic development, social development and environmental protection”.

While this representation of sustainable development is now part of everyday language, it should not be forgotten that the objective of sustainable development is to question our (economic) growth models in order to reduce the imbalance between concerns for society (rising inequality and poverty) and ecology (climate change, pollution, overexploitation of certain natural resources, etc.). This reminder seems necessary because some might see behind sustainable development, the search for a hypothetical balance (a kind of compromise) between the economic, social and environmental dimensions. The representation of the three spheres is in line with this logic, and it may seem very utopian, somewhat idyllic, even ideological! (Figure 3).

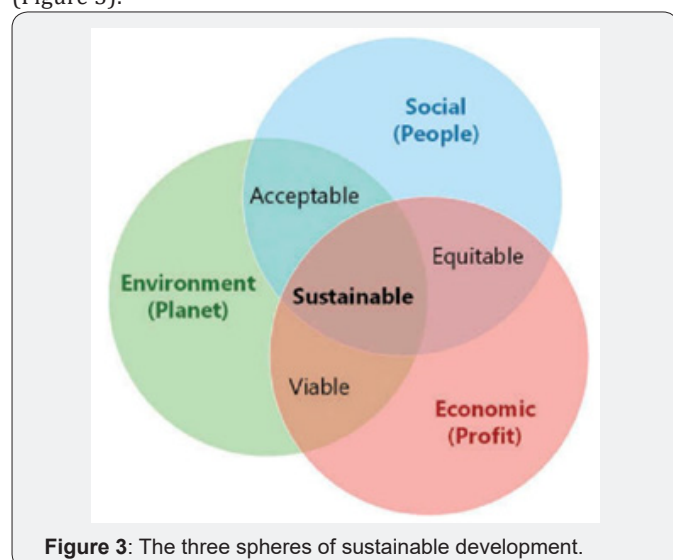


Figure 3: The three spheres of sustainable development.

As a paradigm, sustainable development must attract the support of a community of researchers (but also of citizens and organizations) likely to forge a critical mind, to imagine new alternatives, to extricate themselves from the narrow field of disciplines and the pressure of routines.

Sustainable development has to ask us about the conditions that can ensure the long-term viability of our production and consumption models. Several schools of thought can be mobilized, which use different conceptual tools and various disciplines. Eco-development, promoted by the United Nations Environment Programme (UNEP, 1972) and initiated by Ignacy Sachs [47,48], postulates that the purpose of development is social and that its success is measured by the well-being of populations; that solidarity with future generations requires that ecological constraints be taken into account; and that

economic efficiency (although purely instrumental) is required to make the most of resources and efforts engaged in production. The harmonization of these three objectives requires the search for diversified socio-economic and spatial strategies that closely reflect local realities and involve populations in their development and implementation, populations who are called upon to define projects themselves and share their practical knowledge. Eco-development therefore requires concerted action by all social actors, a rebalancing of powers and roles in the economy between civil society, the state and businesses [49]. The ecological economy found in authors such as Nicholas Georgescu-Roegen [50-52], René Passet [53], and Herman Daly [54] links economic growth models to the physical and biological laws of the world. The bio-economy embodies the idea that the economy must recover the logic of the natural environment, physical and biological, in which it develops. The discourse about life allows us to situate the economy in a twofold general movement: that of fighting against the entropy (energy and information) that living organisms live in order to maintain and reproduce their structure; that of complexifying evolution (behavioural biology) in which behaviours (being rather than having) play a significant role. The neoclassical economy has sought to integrate environmental issues into the economic calculation by distinguishing two distinct fields: that of environmental economics and that of natural resources. The economics of environmental economics is based on the analysis of the effect of environmental constraints on models of optimization of well-being over time. The aim is to restore the conditions for commercial exchange by proposing solutions aimed at internalizing or eliminating external effects. While the environment is often seen as a collective good (non-appropriable, non-exclusive, often free, bringing well-being to the community), economists have not hesitated to refine their methods (willingness to pay, willingness to receive) in order to give a value (and especially a price) to the environment. The economics of natural resources is based on the problem of optimization of scarce resources over time. It refers to Hotelling’s [55] model, the stock of resources (renewable or not) that must be managed optimally over time (relationship between extraction rates and sales of natural resources, competitive or monopolistic market structure, discounting of future profits, etc.), production functions with substitutable factors (if the price of a natural resource increases, this resource is replaced by an abundant and inexpensive production factor), and the myth of technological progress (technology always provides a solution).

Sustainable development is at the crossroads of eco-development and the bio-economy. Bio-economy because it claims a transdisciplinary approach while insisting on the limited assimilative capacity of ecosystems and challenging the very idea of perfect substitution between different kinds of capital (patrimonial rather than market approach). Eco-development because it implies that populations organize and educate themselves to better understand the specific possibilities of their

ecosystem and develop them using appropriate techniques. The concept of eco-development emphasizes ecologically appropriate development styles, encompasses both the natural environment and the socio-cultural context. In a way, it can be concluded that, about these two approaches, sustainable development should be

based on a re-engagement of the economy in the biosphere and society. In this way, we are moving away from a spherical and perfect representation of the three dimensions of sustainable development (Figure 4).

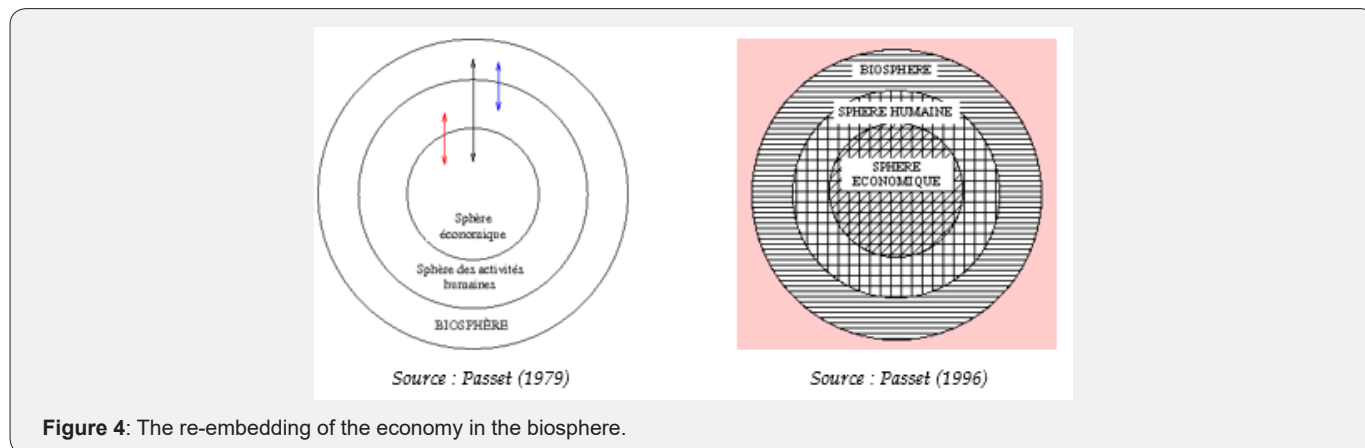


Figure 4: The re-embedding of the economy in the biosphere.

### Culture - the 4<sup>th</sup> dimension of sustainable development

It is difficult to miss such an important dimension, and yet, while culture plays an important role in understanding, accepting and disseminating sustainable development, it is often relegated to the rank of a curiosity and evokes in some people a sense of archaism and tradition that undermines all forms of modernity. Such a position says a lot about the road ahead [56]. In a book published in 1871 entitled *Primitive Culture, Researches into the Development of Mythology, Philosophy, Religion, Language, Language, Art and Custom*, Edward B. Tylor defined culture (or civilization) as «complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society» [57].

Culture has certain characteristics

- a) It is related to a traditional mode of transmission. Tradition is defined as “what from a past persists in the present where it is transmitted and remains active and accepted by those who receive it and who, in turn, over generations, transmit it” [58].
- b) There is no cultural tradition that is not linked to a given society, historically and geographically located. A culture cannot live or be transmitted independently of the society that nurtures it. Conversely, there is no society in the world that does not have its own culture. Thus, every culture is said to be socialized.
- c) Cultures appear to be localized (it is in the Pacific Trobriand Islands that the ceremonial exchange called the Kula developed). In most cases, this location is geographical. However, it is likely to have a more social than spatial dimension. In the context of the globalization of culture, the social units that seem most relevant are nation-states (France, Hungary, Malaysia, Japan, Mexico, etc.) or ethnic

groups (straddling several borders or dispersed throughout the world). However, in these different localities, different languages are spoken.

d) The concepts of culture and language are closely linked. Thus, assimilating a culture is first of all assimilating a language (some things that are well expressed in one language, have no equivalent in another language – an example is the translation of the words sustainable development). The multiplication of exchanges on a global scale opens an arena where languages are in a state of compartmentalization, translation, and competition with each other. Conversely, some linguistic communities are losing speakers to widely spoken languages that allow intercultural communication such as Spanish, English, Hindi, Arabic.

e) The notions of culture and language are also at the heart of identity. The notion of identity has been increasingly successful in the social sciences since the 1970s. Identity is defined as “the set of repertoires of action, language and culture that enable a person to recognize his or her belonging to a certain social group and to identify with it”. Identity not only depends on birth or the choices made by people, groups can also assign an identity to individuals. The French tend to amalgamate Asian immigrants into a single identity, while individually the Asian immigrants do not always recognize each other because they speak different languages (e.g. Japanese, Chinese, Vietnamese, Cambodian, etc). This emphasizes that it is more relevant to talk about identification than identity, and that identification fluctuates and is contextual. In the context of the globalization of culture, the same individual may assume multiple identifications that mobilize different degrees of language, culture and religion depending on the context. Of course, this does not mean

that an individual can lose his language, his eating habits, his culture, in an instant. Tradition, through which culture is transmitted, permeates everyone from birth. The corollary of individual and collective identification by culture is the production of otherness in relation to groups with different cultures. Inter-community contact gives rise to very diverse reactions: idealization of the other, attraction of the exotic, but also contempt, misunderstanding, and rejection, which can lead to xenophobia (hatred of the foreigner).

f) Culture makes it possible to establish meaningful relationships between the elements of the environment: people, institutions, events. Thus, culture provides an ability to implement references, actions, and communication plans. By providing action and representation repertoires to our choices, culture, tradition and identification processes fulfil a guiding function, allowing individuals to act in accordance with group standards. So, culture is the capital of embedded habits which structures the activities of those who possess it.

g) Cultural tradition is not the identical reproduction of a set of fixed habits. Languages and cultures change because they are immersed in the turbulence of history. To fulfil their guiding function, they must integrate change. British historians Hobsbawm and Ranger (1983) illustrated how traditions evolved in response to the political context. During the 19th and 20th centuries, Scottish and Welsh traditions were created by mobilising elements of the past to fight against the centralizing aggressions of European monarchies and states.

Thus, as Warnier [59] points out, culture is “a complex whole made up of norms, habits, repertoires of action and representation, acquired by man as a member of a society. All cultures are singular, geographically or socially localized, objects of discursive expression in a given language, factors of identification for groups and individuals and differentiation with regard to others, as well as orientation of actors with regard to each other and their environment. All cultures are transmitted by traditions reformulated according to the historical context” [59]. Cultures are made up of religious, educational, food, artistic, and recreational practices and beliefs. They also concern the rules of organization of kinship, family, and political groups. Practices and beliefs concerning the body, health, and illness also play an important role.

In a book entitled “History, culture, styles of development”, Christian Cornelius & Ignacy Sachs [60] stated that politics and economics, culture and society were closely intertwined in the development process and its driving forces were located in all these characteristics of society: “We are in the presence of a totality that does not easily break down into successive layers and even less into sectoral tranches” (1988, p. 14). Every culture is characterized by certain choices of forms of

expression and conduct [61], habits and values that distinguish it from others. Under these conditions, recalls Sachs [60], the specificity of a culture “cannot be grasped at the level of this or that isolated trait. It is rather to be found in the dosage of the different characteristics that make up a civilization”. The cultural dimension of sustainable development (perhaps we should say eco-development) is therefore unequivocal, all solutions proposed or recommended must be culturally acceptable! This points to one of the most difficult problems for political decision-makers (and major international institutions) to solve: that of proposing change in cultural continuity by avoiding imposing exogenous models while refusing to be locked into immobility and traditionalism. The cultural criteria for an ecological transition thus require a balance between respect for traditions and a transition to modernity (status of innovations and new techniques), the maintenance of personal autonomy, self-confidence, openness to the world, and cultural freedom.

At the risk of sustainable development being seen as a chimera, this clearly means taking time back from socially necessary working time. However, such a development requires an irreversible reduction in working time and, ultimately, in consumption. We are thus entering the era of responsible consumption and the questioning of consumerism. If supporters of eco-development and degrowth would enthusiastically subscribe to this final solution (the anti-consumerism law), it would seem that not all stakeholders in sustainable development are yet ready to make this leap. Nevertheless, culture has become the fourth dimension of sustainable development as a result of two independent events.

a) First, the book published by David Yencken & Debra Wilkinson [62], “Resetting the Compass: Australia’s Journey Towards Sustainability” brings to light the idea of a 4th pillar of sustainable development: “Sustainability, as it has become formally adopted around the world, has not one but three pillars: ecological sustainability, social sustainability and economic sustainability. Some would argue that there should be four pillars and the cultural sustainability should always be included. We agree with this view” (2000, chap 1, The four pillars of sustainability). Yencken and Wilkinson propose an original approach to cultural sustainability, which includes both the artistic and cultural features of a civilization, the goals and belief systems of a particular group (or society), the refinement of the spirit, tastes and ways in a society, but also the practice of culture (resource production) and soil maintenance, the practice (tradition) in the production of a particular culture or the process involved and the growth of bacteria or tissues in a given environment. Thus, the notion of culture is closely intertwined with that of the environment. Yencken & Wilkinson [62] use four aspects of culture to illustrate the links between cultural and environmental sustainability, such as the Australian Aboriginal culture of living in communion with the land (“Culture is the

land”), multiculturalism and respect for difference (perception of ethnic, religious or linguistic minorities, importance of indigenous knowledge and knowledge in ecological and anthropological research). In 2001, Jon Hawkes [63] popularized the notion of the cultural pillar in a summary article “The four pillar of sustainability, culture’s essential role in public planning”. According to the author, the purpose of his article was to demonstrate that the concept of culture was an invaluable but largely ignored tool in national sustainable development strategies, particularly when individual governments were seeking to assess the past and plan. One explanation for this lack of consideration by policy makers, according to Hawkes, comes from the confusion in public discourse between two very different visions of culture: culture related to the arts; culture as a social production and transmission of values. However, it is the latter that must be at the heart of the public planning process: “My starting point is the fact that all acts of public intervention (plans, policy, services, whatever) are fundamentally informed by sets of values. Sometimes these values are formally expressed, more often, they are simply assumed. Sometimes it is even denied that they exist at all” [63]. These are the values that today define the cultural dimension of sustainable development and cement a society around high aspirations: “Sustainability can only be achieved when it becomes an enthusiastically embraced part of our culture” [63].

b) It was the UNESCO [44,64] & Ouagadougou [65] declarations that brought cultural diversity into the field of sustainable development. Cultural diversity has been a prominent theme of cultural policy for several years. Many reports, Our Creative Diversity: Report of the World Commission on Culture and Development [66], In From the Margins (Council of Europe, 1997), and The Power of Culture: Final Report of the Intergovernmental Conference on Cultural Policies for Development [67], have identified cultural diversity as an essential element for the future of cultural policies and their elaboration. In general, these reports link diversity to social, cultural, and political programs which are considered positive, if they are achievable and enriching for all. In November 2001, the UNESCO Universal Declaration elevated the concept of cultural diversity to the status of “the common heritage of humanity”, recalling that it was “as necessary for humankind as biodiversity is for life” (Article 1). Its defence is seen as an ethical imperative, inseparable from respect for the dignity of the human person. Cultural diversity refers to the need to apply culturally sensitive development models (art 3: cultural diversity as a factor of development) so that local populations can take ownership of them (art 5: cultural rights). There can therefore be no sustainable development without considering people, their creative capacities (art 10), their freedom of choice, their practices, and traditions (art 7: cultural heritage). On 20 October 2005, the UNES-

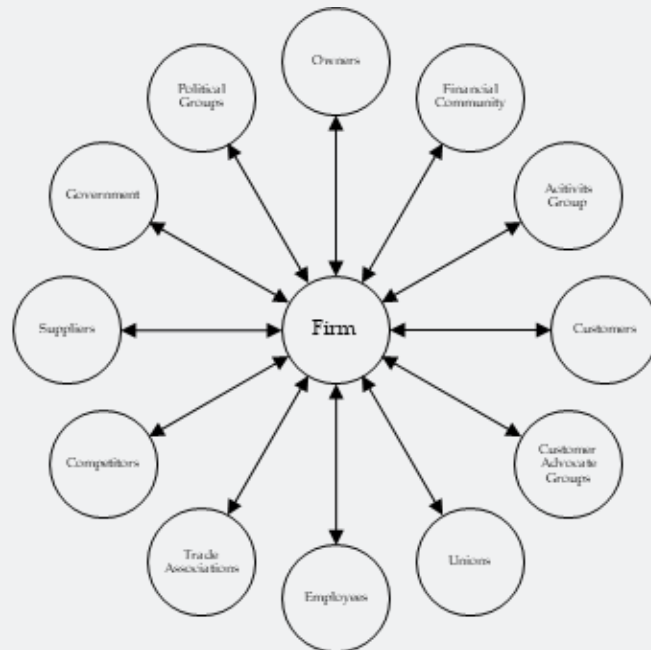
CO Conference adopted a Convention on the Protection and Promotion of the Diversity of Cultural Expressions. Among its eight guiding principles, the principle of sustainable development states that cultural diversity “is a great asset for individuals and societies. The protection, promotion and maintenance of cultural diversity is an essential condition for sustainable development for the benefit of present and future generations” (2005, p. 5).

### **Governance and stakeholders - the 5<sup>th</sup> dimension of sustainable development**

If culture is one of the foundations of sustainable development, and from this point of view, a dimension in its own right of the idea of sustainability, there is another dimension that has more recently come into play in the debates, namely governance and the inclusion of stakeholders in the act of deciding. In a broad sense, governance refers to the organization and distribution of powers between the different parts of a state, an institution or an organization, whether private or public, for-profit or not-for-profit, regional, national or international. Initially, governance should therefore mean how a government exercises its authority (political, economic, etc.), how it manages its resources (natural, human, etc.), and how it adapts to its environment (globalization, financial globalization, climate change, etc.).

It was only in the 1980s that this concept was extended to businesses (characterised by a separation between management, ownership, and shareholders), and then to all organisations. Serge Raynal [68] (2009, p. 19) defines it as “effective coordination when resources, information and power are widely distributed”. Thus, the problem of governance could be reduced to a simple question: how can we ensure effective coordination of the business so that shareholders and other stakeholders in the company can harmonize their objectives and win all the time, rather than fall into the prisoner’s dilemma? The financial scandals (Enron, Vivendi, Lehman Brothers), the 2008/9 financial crisis, environmental incidents (Exxon Valdez oil spill, tsunami and nuclear incident at Fukushima), health problems (H2N1 flu, mad cow disease, Spanghero horse meat case) and social issues (extensive network of fraud involving unemployment and family benefits), which have occurred in recent years illustrate, in our opinion, the complexity of governance and the multiple failures in terms of cooperation.

This also raises the protean nature of cooperation [68], it is necessary to separate the willingness to cooperate (the values that stimulate the spirit of cooperation), the ability to cooperate (the individual and collective skills that must be sought), and the power to cooperate (decision-making and the structure of the organization that must be put in place). As a result, governance is associated with all the measures, rules, decision-making, monitoring, and information bodies that ensure the proper functioning of an organisation and transparent communication with stakeholders (Figure 5).



**Figure 5:** Stakeholders' Mapping of an Organization. Source: Freeman [72].

Governance is thus the result of an awareness: businesses, organisations in the broad sense, and states must be accountable and integrate into their policies (strategies) the interests of the beneficiaries (shareholders, but also employees, suppliers, users, citizens, public authorities, etc.). This awareness marks a "turning point" in the life of organizations. It is a question of both giving a central position to meaningful action, rehabilitating the intentionality and justifications of the actors in a reciprocal determination to do and say, and building society on values shared and accepted by all. Stakeholder theory can be mobilized here to both operationalize the concept of sustainable development [70] and create a bridge, via the notion of governance, between the economic world dominated by self-interest and opportunism,

and an ethical world marked by the search for the common good and equity [71].

Stakeholder refers here to "any group or individual who can affect or is affected by the achievement of an organization's purpose" [72]. According to Freeman, an organization's ability to implement "effective" stakeholder management would depend on its ability to:

- a) Define precisely who are the stakeholders and what are the perceived issues,
- b) Understand the organizational processes used implicitly or explicitly to manage an organization's relationships with its stakeholders,

1. The nature of the many academic works in the social sciences on the subject of "governance" makes it possible to affirm its now conceptual nature.  
 2. For a coordination mode to be qualified as "governance", three types of actors must be present around the table, representing the State, the market and civil society.  
 3. Governance is not intended to replace government but to coexist with it in the same way as other forms of coordination. Only the weighting of the different coordination modes varies over time.  
 4. Since governance does not replace government, it does not have a "generalist" vocation, but is set up to solve a specific collective action problem. It is therefore "thematic", like the concept of "regime". Dedicated to solving this problem, the coordination that is being put in place is not necessarily intended to be sustainable, unlike the regime.  
 5. Governance allows the endogenization of the territory, and thus of its actors of different natures, to the process of building collective action in the field of sustainable development.  
 6. Governance, which generates compromises between the actors involved, confirms the asymmetries of power between these actors. In this way, it does not necessarily guarantee the general - or public - interest, which must therefore be preserved by the hierarchical form of the elaboration of public action. In other words, in the context of a mature (and therefore complex) democracy, governance is intended to complement government, with participatory democracy thus accompanying representative democracy, without replacing it.

**Figure 6:** Six proposals for progress in defining the concept of governance as part of a reflection on sustainable development Source: Figuière Rocca [69].



c) Identify all transactions and negotiations between the organization and its stakeholders. Stakeholder theory is based on the idea that organizations must ensure that all managerial processes “fit with the rational stakeholder map” (ibid) (Figure 6).

With this stakeholder map, Freeman proposes a two-dimensional analytical grid. The first dimension defines stakeholders by interest or issue. The aim is to identify the issues raised by all stakeholders. Thus, it is possible to seek a form of equity in relationships, to seek to influence others or to have some interest in a stakeholder knowing that what they do will have consequences for them. The second dimension introduces the power or ability to use resources to make an event happen. It can be a voting power, an economic power, or a political power. This analytical grid, coupled with the question of governance, proposes an original interpretation of sustainable development, it makes it possible to identify the different mechanisms and systems that coexist (capitalist companies, associations, cooperatives, etc), to understand their mode of operation, and to evaluate the effects of their policies on sustainability (environmental, social, cultural, economic); then to question the different possible scenarios for cooperation with stakeholders.

We would add that the stakeholder map also makes it possible to identify the main organizational levers leading to sustainable development: partnership logic and collaborative chain in purchasing and logistics; fair trade for consumers and producers; social responsibility and fair remuneration for employees, trade unions, shareholders, and the state.

As Emmanuelle Dontenwill [70] rightly points out, stakeholder theory with its connection to with governance provides an interesting framework for reflection on sustainable development. On the one hand, it is present in all five dimensions of sustainable development. If consumers, shareholders, and banks are more involved in the economic dimension, associations and NGOs can be part of the environmental dimension, and employees and trade unions invest in the social dimension. Therefore, the issues and interests of stakeholders are considered in their interaction and complexity. On the other hand, considering stakeholders within an organisation can transform it into a place of mediation in which compromises and consensus emerge. Finally, it offers a new approach to a business, which can be defined as the expression of a collective project: “We can therefore briefly summarize that the stakeholder approach would put people back at the heart of the collective action for which the company is the privileged place” [70].

### Spatial and Temporal Scales of Sustainable Development

A mode of development is said to be sustainable if, with regard to a certain number of economic, ecological, social, and cultural parameters, “it can be maintained over time, and also - we should add - in space” [73]. While long term and wide space seem to be well characterized by sustainable development, a

better understanding of these two scales is needed to capture the challenges they raise for sustainable development.

First, the long term of the environment, social and cultural aspects must be contrasted with the short term of the economy. Several illustrations are worth mentioning here [33]. First, it is the timeless framework of models that prevails in economics. These models have long been inspired by mechanics and have favoured a static approach in terms of balance (general or partial). The case of production is symptomatic. The production function does not describe a process over time, but rather a technical combination of two factors of production, labour and capital). This combination can be modified over time depending on substitution or complementarity effects. In other words, the producer can modify his technical combination as many times as he wishes. Time is thus reversible. It is then the principles of economic calculation, via discounting and capitalisation techniques, that allow economists to move from the present to the past, and from the present to the future. In the end, the very notion of the future is assimilated to a risk or uncertainty, it therefore becomes probable or likely also to be so via expectations (extrapolative in the context of forecasts, adaptive or rational). Finally, it is the pace of economic activities that tries to escape from the time factor, automation and machinery impose rates aimed at achieving ever higher levels of marginal productivity, the functioning of financial markets is now controlled by the computerized orders of stock exchanges with day traders who have day-to-day positions or who bet on the day (scalper days), the profitability of capital for shareholders must come very quickly and the short life cycles of products are driven by innovations and programmed obsolescence.

This vision of economic time, continuous and reversible, contrasts sharply with the visions of the other dimensions. Cultural diversity has its roots in the long term (stemming from tradition, the transmission of a heritage), the social question insists on the idea of solidarity between generations, i.e. the responsibility of the current generation towards the next generation. The need for solidarity implies political and social choices whose consequences will be felt in the long term. The environmental question requires biological rhythms and relatively long geochemical cycles (water cycle, carbon cycle). These dimensions also strongly implicate a belief that the delayed consequences of current decisions are not irreversible (e. g. greenhouse gases on climate, technological progress on employment, growth on inequality and biodiversity).

Second, there is the question of opposing the global and globalizing scope of the economy to the localism of life, social and cultural life. The economic dimension is based on an extension of its (commercial) organisation, guided by consumers (market conquest logic) and international specialisation processes (cost minimisation, relocations, fragmentation of tasks). Space is approached by the cost of distance, a travel time or a psychological cost.

Sustainable development involves connecting the global and local levels [73], while expanding the space into different fields. Thus, space can refer to a tangle of territories (countries, regions, municipalities, countries, regional natural parks, national parks, etc). The environment can lead to the emergence of new spaces. This is what Valérie Boisvert et al. [74] note in the context of biodiversity conservation: “new types of spaces have become the focus of development interventions: protected areas, habitats of remarkable or threatened species, areas considered rich in biodiversity, wild or cultivated, or the catchment areas of major rivers” [74]. Areas long considered marginal or peripheral in development policies and ignored in traditional conservation policies have received renewed attention: family farms, agroforestry sites, man-made landscapes. In the agricultural sector, the development of agrarian systems, varieties or local breeds, or traditional food products within the framework of local development and heritage policy, has led to the identification and recognition of “terroirs”. Space can also be thought of as a relational concept, i.e. a set of relationships, functional, hierarchical and cooperative, developed within the geographical space. The aim would be to stress the ability of the actors to propose new forms of cooperation which, in addition to generating positive economic, environmental and social results, can also, and above all, contribute to the resurgence of the collective interest between actors in the same territory. The Agenda 21 framework illustrates the difficulty of connecting the different scales of action and integrating the imperatives of sustainable development into local spaces: “The implementation of local Agenda 21 requires consultation between all stakeholders to reconcile environmental, social and economic concerns, to articulate short and long term and local and global actions” [75].

### Values and Principles

If sustainable development embodies a paradigm shift, it is mainly because it is guided by a set of values (objective and subjective) and broad principles that give meaning to its vision

**Table 3:** New values for Society.

Criticism of Authority	
Traditional Attitude	Emerging Attitude
Authority based on power, power, knowledge not shared (secret).	Authority based on influence, influence, transparency of motives, competence.
Respect for the institutional hierarchy, devolution to established institutions, sense of duty and obligations.	Ongoing evaluation of a competency-based hierarchy, importance of institutional innovation, need for motivation, internal.
Elitism and dogmatism, centralization of powers. Power relations.	Participation, openness and criticism. Decentralization of responsibilities, competence reports.
Labour Criticism	
Traditional Attitude	Emerging Attitude
Importance of diplomas, responsibility based on age, theoretical background, social rank.	Importance of experience, responsibility based on the ability to solve problems and motivate people.
Linear career, programmed trajectory, competition, honours, success.	Multiple careers, a succession of choices and objectives. Cooperation, personal joys, personal achievement.
Valuation of personal contribution and effort, hard work, devotion to one’s organization Valuation of external signs of work.	Valuation of creation and collective merit. Creative work at your own pace, commitment to a cause, valuing efficiency to achieve a given objective.

of society. It is these values and principles that bring us into the Ethics and Politics of Sustainable Development, and which therefore constitute forms of regulation of the 5 dimensions (environmental, social, cultural, economic and governance) of sustainable development.

Max Weber (1959) introduced the distinction between value judgment and relationship to values. This distinction is made at two levels. First, Max Weber dissociates factual judgments from value judgments in the production of scientific knowledge (choice of object and method): “Every time a scientist makes his own value judgment, there is no longer a complete understanding of the facts” [76]. Second, he introduced the concept of relationship to values, which he defined as follows: “the notion of relationship to values simply refers to the philosophical interpretation of the specifically scientific interest that requires the selection and formation of the object of empirical research” [77]. Thus, it is not contrary to the scientific approach for a researcher to choose his research object, his problem, his methodology, etc. according to a relationship to values that could find its foundations in any personal commitment, a vision of the world or a form of personal adherence. A researcher can mobilize his values upstream (choice of methodology, definition of the object) or downstream (dissemination of knowledge) of scientific production. However, the mobilization of these values must respect two assumptions:

- a) The existence of this relationship to values does not imply the formulation of value judgments [78],
- b) The scientific approach (and the objectivity of knowledge) regains its rights when it comes to producing a certain form of knowledge.

The issues raised by sustainable development contribute to the emergence of new values and a social project. In the Macroscopic, Joël de Rosnay [79] associated these new values with targeted criticisms: criticism of authority, criticism of work, criticism of reason, criticism of human relations (Table 3).

Physical security of the situation needs for hierarchical domination and discipline. "Work" specialized.	Freedom provided by the acceptance of risk and the diversity of functions. Need for cooperation and communication. Role in social and human responsibility.
<b>Reason Criticism</b>	
<b>Traditional Attitude</b>	<b>Emerging Attitude</b>
Logic of exclusion (Manichaeism). Unidirectional, causalist, sequential.	Association logic (eco-systemic). Mutualist, global.
Principle of enough reason. Assumption of objectivity. Analytical method.	Contribution of shared subjectivity. Complementarity of objective facts and lived experience. Systemic method.
Pure knowledge.	Inventive thinking.
No questioning of the purpose of science and technology.	Criticism of the aims of science and technology.
Acceptance of technological progress, growth and economic power, domination of nature.	Acceptance of technological progress according to social needs. Balance and distribution. Partnership with nature.
<b>Criticism of Human Relations and the Project of Society</b>	
<b>Traditional Attitude</b>	<b>Emerging Attitude</b>
Sectarianism, intransigence.	Tolerance.
Aggressiveness, cynicism, scepticism.	Openness, naivety, enthusiasm, sense of usefulness.
Use of others for personal purposes. To give an image of strength, hardness.	Respect for others. To be true to yourself.
Domination, private interests.	Cooperation, community of interest, Search for a group morality.
Uniformity, Homogeneity.	Pluralism.
Quantitative.	Qualitative.
National power, Individual well-being. Economic growth.	National outreach, No longer being individuals. Balance and distribution.
Patriotism, Chauvinism, Nationalism, Imperialism.	Internationalism. Interdependence of nations and cultures. Contribution of religions and beliefs.
Wild capitalism, Bureaucratic communism.	Conviviality, leftism, Maoism, ecologism.

Source: Rosnay [26].

The mention of these emerging values deserves some comment, especially when we try to associate them with sustainable development. These new values are not intended to replace traditional values, quite the contrary, they complement them, giving them a dynamic and evolving character. The project of society would thus take the form of a new thinking. Both complex and liberated, it would seek to highlight the paths that should be taken. The aim is to mobilize resources to respond to different possible situations (and not to use knowledge in contextualized situations).

These criticisms result in some principles:

- a) Criticism of relationships of authority and power is necessary to free minds. The mobilization of skills (the quality of expertise) and an "accumulated/shared" knowledge capital give back a certain motivation and a participative momentum to learners. To this end, the language of sustainable development mobilizes the attractive precepts of eco, co and auto: eco-citizen, eco-efficiency, eco-design, co-management, co-responsibility, collaboration, self-accomplishment, self-management, self-discipline.
- b) Criticism of work is based on a liberation of working time [80,81]. It consists in being able to interrupt one's working life without losing one's income, in invoking the right to chosen time and self-management of working time,

in wondering why so much is being produced (increase in hourly labour productivity) when one no longer has time to consume the goods and services produced, and wondering why one is degrading nature. According to Rosnay [79], this criticism has repercussions on a whole set of hitherto accepted conformism and rules: the importance of diplomas, career, competition, success, work, etc.

c) Criticism of reason entails the following point: the analytical (Cartesian) method is not the only basis of knowledge. In the case of sustainable development, the analytical method may even be ineffective. Indeed, all knowledge generally operates by selecting significant data and rejecting non-significant data. We would thus be under the influence of the simplification paradigm [18], composed of the following three principles: disjunction, reduction, and abstraction. This approach leads us to reason in opposite, mutually exclusive terms, and to seek stumbling blocks: true or false, trial or error, gain or loss, etc. But nature and life in society tend to show us that there are no such clear-cut oppositions. The disciplines (biology, ecology, economics, sociology, etc.) are part of this perspective. They recall that all situations of balance or imbalance describe relationships based on diversity, association, complementarity, mutual causality. In terms of sustainable development, such a posture makes it possible:

(i) To identify the myths: that of unlimited growth, that of technological progress falling from the sky, that of self-made man (a sign of Anglo-Saxon success),

(ii) To subordinate economic rationality (maximization of yield and profit in capitalist society) to an eco-social rationality: self-limitation of needs (decrease in the sense of [50]), democratic reorientation of economic development, reduction of working hours, extension of collective or community facilities, etc.

(iii) To rethink the concept of rationality: Fourez's (1994) work, through the notion of an island of rationality, makes it possible to design a model that aims to respond to a situation that we want to solve (concrete case) and to not generalize a paradigm or extend the scope of an existing model.

d) Criticism of human relations refers to the erosion of values (altruism, sympathy, empathy, respect for others, trust, etc) and denounces the rise of a certain withdrawal into oneself (domination, self-interest, uniformity, mistrust, etc) rather than promoting new attitudes (cooperation, pluralism, sense of belonging to a community, etc). Human relations are thus based on an individual morality, a morality of groups, a justice that is both redistributive and commutative, a social ethic [82]. The projects of society insist on the poverty of human relations, call for an awareness [83], and invite us to engage in conviviality [84], in the reconstruction of a lived world [80] or ecological restructuring [85].

Beyond the criticisms mentioned above, these new values lead us to seek a global vision of nature and life in society compatible with a social ethic and a theory of action, both individual and collective. Sustainable development, as a paradigm, can thus be rooted in two complementary visions. Like Dewey's work [86-89], it is a question of opening the black box of values in order to propose a general theory of their formation [90]. Following on from Jonas [91] and his principle of responsibility, there would be universal principles defining the new philosophy that sustainable development should embody.

### A theory of value formation

The word value comes from Latin, *valorem*, which means "to be strong", Patrick Viveret [92] speaks of life force. The question of value(s) is nowadays found in all fields; we refer to moral, cultural and aesthetic values, but also to real and fictitious values, intrinsic and instrumental values, and economic values. In the special issue of *Truly Sustainable* (Fall 2013), entitled *What Values for Sustainable Development?* Bettina Laville & Gilles Berhaut [93] evoked the schism of values, emphasizing on the one hand, the commodification of the world (and the uncomplicated forms of economic value) and on the other hand, the financial valuation of nature. If economic value has succeeded in shifting the debates on the idea of a monetary quantification of things and people (exchange value, market value) and in extracting itself from the limits set by the value of use (utility),

it must be admitted that what characterizes the notion of values most is obviously that it would have entered into common sense and would therefore no longer be part of the scientific field.

This observation is made by John Dewey in an article entitled "The theory of valuation" published in *The International Encyclopedia of Unified Science* [88]: "A review of the literature reveals points of view on the question going from one extreme, the conviction that what are called values are only emotional epithets or simple exclamations, to the other, where a priori rational values, necessarily standardized, constitute the principles from which art, science and morality draw their validity. Between these two conceptions, there are also many intermediate points of view... In this context, it is very difficult to find a starting point that is not immediately biased" (1949, [2011, pp. 67-68]). However, John Dewey intended to demonstrate that there is an objectivity of values that can be the subject of experimentation, criticism and revision: "Any theory of value necessarily amounts to entering the field of criticism" [94,95]. Thus, their training must be subject to the methods of the inquiry. John Dewey defends the idea that values are above all facts (value facts). They emerge as the result of an appreciation or disaffection (good or bad, pleasant or unpleasant) related to the immediate qualities of an object, situation or event: "Values are values, in the sense that they have certain intrinsic qualities. Considered as such, there is nothing to say [94,95]. His analysis is based on three concepts: valuing, valuation and evaluation. Valuing refers to a set of behaviours to which the term prizing can be attached, i.e. to consider as precious, to cherish. According to Dewey, the emphasis here is on something in reference to a defined person, it is an immediate appreciation, which brings us into the presence of a so-called emotional quality [88,96]. Evaluation involves putting a value on, assigning a value to something. According to Dewey, these are judgments (evaluative) that are formed from observed behaviours. As a result, appraisal refers to a relational property of objects, which implies measuring and comparing. Valuation encompasses these two concepts (immediate assessments as facts and evaluative assessments as judgments, are the two sides of valuation) and proposes a reasoned approach (considering existential contexts) to the formation of desires, interests and facts.

a) "The double meaning is significant because it implicitly covers one of the fundamental problems concerning valuation" [88,96].

b) "Defining valuation as a desire implies conceiving it in the light of the existential context in which it appears and operates" [88,96].

c) "The word interest strongly evokes the active relationship that ties personal activity to conditions that must be taken into account by valuation theory" [88,96].

Since desires and interests are observable in themselves and through the effects they generate, Dewey proposes to start from

the theory linking valuation to desire and interest in order to formulate valuation proposals (in other words, proposals about facts) based on observations. Beyond the proposals themselves, it should be noted here that while Dewey associates values with desires, and for the purposes of action, he rejects any distinction between values, standards and rules [91]: “Any recurrent form of activity, whether artistic or professional, develops rules that indicate the best way to achieve the ends-in-view of this activity. These rules serve as criteria or standards for judging the value of different modes of conduct. It cannot be denied that there are rules for evaluating modes of conduct, which make it possible, in different areas, to determine whether they are prudent or not, economic or expensive, useful or futile” [88,96].

The objectivity of values leads Dewey [88,96] to three conclusions:

- a) There are proposals that do not simply focus on past evaluations but describe and define certain things as good or appropriate in a contextualized existential relationship. These proposals can be generalized as they take the form of rules specifying how to use certain elements.
- b) This existential relationship is a relationship of means to ends or consequences.
- c) These proposals are based on empirical, scientifically validated proposals, which can themselves be tested based on a comparison between actual and expected results.

Applied to sustainable development, Dewey’s approach seems to us to be rich in lessons:

- a) First, it implies that values are concrete events. Desires and interests related to them can thus be associated with observable patterns of behaviour and conduct. If sustainable development embodies a paradigm shift, it implies a change in behaviour that goes beyond small actions (sorting waste). This is a real challenge to our existence in society (the question of consumption and its usefulness remains fundamental here).
- b) Second, the values are related to our immediate experience and submitted to our reflection. This is a very important point. It emphasizes that direct assessments are expressed in active behaviours (and attitudes). Thus, the positive value (the benefits of a regional nature park) or the negative value (noise pollution) that we attribute to things, are directly manifested in the fact that we seek to preserve it (the environment) or to remove it (eliminate noise). It then assumes that these direct assessments are subject to introspection. So, we will be able to decide to maintain or modify them based on a methodology induced by the surveys. They are the ones who will have to confirm or reconfigure the values produced by the direct assessments.
- c) Third, these values introduce us into the field of ethics and politics because they invite us to “explore the immanent

normativity to act” (in the words of Alexandra Bidet, Louis Quéré and G r me Truc, 2011, p. 46). It is in our behaviour, that is, in action, that we establish what is beautiful, good, just, unjust, and that we form a certain idea of democracy.

Let us pause for a moment to understand Dewey’s thinking and translate it into the context of sustainable development. The fact that Dewey considers that values and valuations must be analysed in a social and cultural context (values are essentially cultural facts) raises two types of reflection.

First, this is consistent with the idea we have put forward throughout this article. The cultural dimension of sustainable development could embody this symbiotic vision of life and give rise to a new competence, “willingness to act”. Indeed, culture encompasses:

- a) Our values and aspirations,
- b) The processes and means by which we develop, receive and transmit these values and aspirations,
- c) The tangible and intangible manifestations of these values and aspirations in the real world. This would make it possible to define a set of fundamental and universal values that a contemporary society could adopt unanimously.

Without doing an exhaustive inventory, there would be different nexuses:

- a) participation, engagement and democracy,
- b) tolerance, compassion and inclusion,
- c) freedom, justice and equality,
- d) peace, safety and security,
- e) health, well-being and vitality,
- f) creativity, imagination and innovation,
- g) love and respect for the environment (Figure 7).

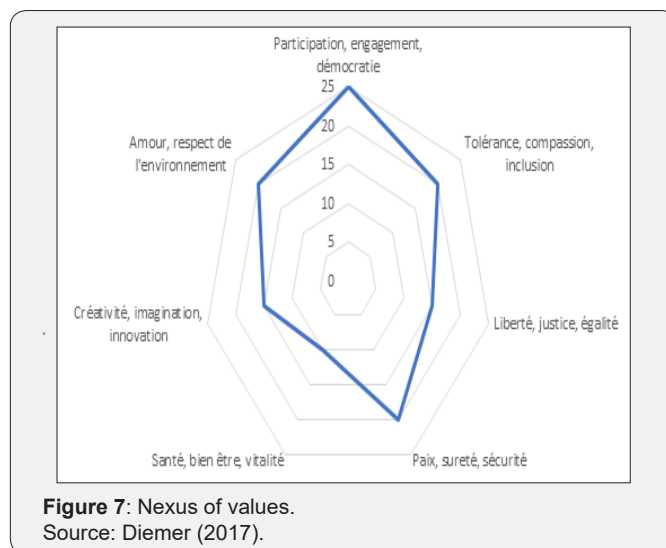


Figure 7: Nexus of values. Source: Diemer (2017).

Second, it reinforces the idea that immediate assessments are induced by provisions tinged with diverse traditions, mores, customs and prejudices. The paradigm shift can therefore come up against what Donella Meadows [97] calls leverage points. Existing institutions and authorities can reinforce this feeling by imposing ultimate values. Dewey considered that it was necessary to know the role of these institutions and to understand the socio-cultural context in order to identify their influence on valuations. He even called for the creation of social and cultural conditions that could transform immediate assessments into evaluations. Only democracy, combined with experience, seemed to him to be able to create these conditions.

The democratic issue is the cornerstone of Dewey's work [98] and raises many sustainable development issues. Indeed, democracy in the Dewey sense refers to a way of life, individual or collective: "To conceive democracy as a personal, individual way of life... means that only the creation of personal attitudes among individuals can successfully confront the powerful enemies of democracy" [88].

Democracy refers first and foremost to the human purposes according to which institutional arrangements (Constitution, institutions, laws, standards, rights, etc.) have been selected and put in place, and not a mode of governance of society or a political regime. It specifies that when human beings are placed in favourable conditions, they can judge and act intelligently. This democracy is based on purposes and a scientific method. Indeed, democracy aims to involve "every adult human being in the formation of the values that regulate living together" (Dewey, 1937). As a result, it questions the meaning of events, connects things and people, explores the characteristics of the situation, anticipates the consequences, etc. Experience, through experimentation, reinforces the status of democracy in that it consists in establishing a connection between feeling something and engaging in an activity. Dewey thus puts the two principles of experimentation, interaction and continuity, at the service of democracy: "Of all the ways of life, democracy is the only one that grows unreservedly in the process of experience as the end and means, as that which is capable of generating science, the only authority on which to base itself to guide future experience, and as that which releases emotions, needs and desires in order to bring about things that did not exist in the past" [88].

Put in the context of sustainable development, Dewey's contributions make democracy governed by personal faith in daily collaboration between individuals (and not competition exacerbated by the economic dimension): "Democracy is the conviction that, even if needs, ends and consequences differ from one person to another, the habit of friendly cooperation - which does not exclude rivalry and competition as found in sport - is in itself an invaluable addition to life" [88]. Therefore, if sustainable development is to embody a new paradigm, it is necessary to invent this new way of life, to stimulate creative activity, to promote attitudes conducive to change. To use

Dewey's expression, it is a question of engaging in a process of "creative democracy" [88].

Finally, it is difficult to talk about value formation without raising the issue of a community's collective identity. What we now call eco-citizenship embodies the very idea of paradigm shift. It is about questioning what we value, what binds us, and creating the socio-cultural environment that can encourage new attitudes and new ways of interacting. Once again, experimentation may well be the appropriate method to settle and solve problematic situations.

### **Ethical and universal principles for sustainable development**

If sustainable development can be based on a set of eco-citizen values designed to change our behaviour, there are also ethical principles such as responsibility, solidarity, precaution, and participation which embody this new philosophy of a more sustainable world.

a) *The principle of responsibility*, through the link between generations, is contained in the definition of sustainable development proposed by the Brundtland Report: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It is about preserving our living conditions and passing them on naturally to our children. However, this responsibility can be understood in several ways.

(i) On the one hand, it embodies all the rights and obligations (in the legal sense) that the state must guarantee and protect. The state's responsibility is thus engaged through the principle of intergenerational equity - "States shall preserve and use the environment and natural resources for the benefit of present and future generations" (1987, Annex 1, principle 2) - which leads it to enact laws and define standards designed to maintain harmony between human activities and the universal laws of nature.

(ii) On the other hand, it reproduces this imaginary North-South line, recalling the responsibility of the countries of the North in many social, environmental and economic disasters (climate change, biodiversity loss, or intensive agriculture) affecting the countries of the South. In the 1970s, Ignacy Sachs [48] introduced the principle of responsibility on several occasions by popularizing the notion of eco-development. The aim was both to underline the responsibility of the countries of the North to those of the South "The North must help the South and the East to accelerate their social and economic progress while avoiding an exorbitant cost for the environment" (1997, p. 39) and to call local authorities to greater responsibility (*principle of subsidiarity*).

(iii) Finally, the principle of responsibility is often compared to the work of Hans Jonas (1979) who introduced it in his

book *Das Prinzip Verantwortung*. Aware of the fact that human technologies could lead to the extinction of all life on earth [99], Hans Jonas considers that such a possibility (the realm of the possible and not the improbable), combined with the fear it can provoke, must make it possible to establish a new ethic of protection, inviting humanity to prevent the worst from happening: “Modern technology has introduced actions of such a new order of magnitude, with objects so new and consequences so new that the framework of previous ethics can no longer contain them” (Jonas, 1990, p. 30). The principle of responsibility therefore invites us to push back the limits of the imputation of the act (causal relationship between the act and its consequences) in order to focus on the duties that bind the present generations to future generations (a form of responsibility “by anticipation”). The principle of responsibility leads to a better control of man’s growing powers over nature and to the renewal of contemporary ethical thought: “Nature as the object of human responsibility is certainly a novelty that ethical theory must reflect on” (Jonas, 1990, p. 31).

b) *The principle of solidarity* reminds us that sustainable development must benefit everyone, and the disadvantaged, the excluded and the weakest. Against the backdrop of positive discrimination and international solidarity projects, the principle of solidarity is expressed at different levels of territory, from the local level (neighbourhoods, municipalities, regions, countryside, cities, etc.) to the global level (from countries in the North to countries in the South) but also between generations (intergenerational logic). According to Jean Louis Guigou [100], the need for sustainable development and intergenerational solidarity implies a transition from an individual to a collective ethic. Humanity is seeking a compromise between growth, respect for the environment and the solidarity of local populations: “It is the community group that must control pollution and the preservation of nature” (2001, p. 331).

(i) The ethics of sustainable development would therefore be more humanistic, it would have its origins in the work of Karl Polanyi [101]. The notion of solidarity has been mobilized by some economists to analyse the different modalities of exchange that characterize contemporary societies. The aim is to rethink the place of the economic and to question the impact of practices described as “solidarity” on the reformulation of social ties (the principle of reciprocity over the principles of the market and redistribution). This proposal is fundamentally in line with the eco-development project, which systematically insists that “the place of the economy is only instrumental” (the economy providing the means to achieve objectives that are always social), and the field of the social and solidarity economy, which would reflect at the same time a democratization of the economy, a civic commitment, a re-engagement of exchanges in a socio-cultural structure and a re-reading of value formation.

(ii) Finally, showing solidarity means placing one’s actions and decisions in a long-term perspective. The consequences of our actions must not harm others or generate irreversible environmental effects. The principle of solidarity can thus be associated with the precautionary principle.

c) *The precautionary principle* is expressed as follows: “it may be justified, or it is imperative to limit, control or prevent certain potentially dangerous actions without waiting for the danger to be scientifically established with certainty” [102]. This is a decision-making principle in the absence of established scientific certainty. The precautionary principle, which appeared in Germany in the 1970s, was applied in the 1985 Vienna Convention on the Protection of the Ozone Layer. In 1987, it became the founding principle of environmental law with the Brundtland Report on Sustainable Development: “States shall take all reasonable precautionary measures to limit risks when carrying out or permitting certain hazardous but useful activities and shall ensure that compensation is provided if significant transboundary damage occurs, even if the harmfulness of the activities was not known at the time they were undertaken” (1987, annex 1, principle 11). In 1992, it was presented by the United Nations Conference on Environment and Development (UNCED) (see Chapter 1) as the 15th of the 27 main principles: “To protect the environment, precautionary measures must be widely applied by states according to their capabilities. In the event of a risk of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing the adoption of effective measures to prevent environmental degradation.

In France, it was introduced into law by the Barnier Act of 2 February 1995, then by the 2005 Environmental Charter. Article L 110-1 of the Environment Code, part of the Barnier Act, specifies that:

i) Land and marine spaces, resources and natural environments, sites, day and night landscapes, air quality, living things and biodiversity are part of the nation’s common heritage. This heritage generates ecosystem services and use values. Biological processes, soils and geodiversity contribute to the constitution of this heritage.

Biodiversity, or biological diversity, refers to the variability of living organisms from all sources, including terrestrial, marine and other aquatic ecosystems, as well as the ecological complexes of which they are part. It includes diversity within and between species, ecosystem diversity and interactions between living organisms.

ii) Their knowledge, protection, enhancement, restoration, rehabilitation, management, preservation of their capacity to evolve and safeguarding of the services they provide are of general interest and contribute to the objective of sustainable development, which aims to meet the development needs

and health of the present generations without compromising the ability of future generations to meet their own needs. They are based, within the framework of the laws that define their scope, on the following principles:

The precautionary principle, according to which the lack of certainty, considering current scientific and technical knowledge, must not delay the adoption of effective and proportionate measures to prevent a risk of serious and irreversible damage to the environment at an economically acceptable cost.

For the precautionary principle to be evoked, it is therefore necessary that there exists:

- An absence of certainty (as we have pointed out above, sustainable development is characterized by scientific and societal controversies),
- Linkage to current scientific and technological knowledge (this point is important because in some fields, biotechnology, climate change, biodiversity loss, etc., changes are very rapid),
- No delay to the adoption of effective and proportionate measures (the precautionary principle is indeed a principle of action),
- Aims to prevent risks of serious and irreversible damage to the environment (the principle only applies to serious situations and prevents any return to the initial state, it also assumes that it is always possible to assess the risk, which raises the problem of uncertainty),
- An economically acceptable cost (this cost must be estimated, as economists use the discounting technique and made acceptable to society, which refers to the notion of social acceptability).

Article 5 of the Environmental Charter emphasizes that: "Where the occurrence of damage, although uncertain in the light of scientific knowledge, could seriously and irreversibly affect the environment, public authorities shall, in accordance with the precautionary principle and within their fields of competence, ensure that risk assessment procedures are carried out and that provisional and proportionate measures are adopted to prevent the damage from occurring". The additions to the Barnier Act are not insignificant, Article 5 insists on two important points:

- Public authorities are required to act,
- They only implement risk assessment procedures and adopt provisional measures.

Despite all these institutional arrangements, it was not until 2008 that the Maastricht Treaty introduced the precautionary principle into European law. The Treaty on the European Constitution (TEC, 2008) specifies in Title XX Environment, Article 191 that

- "The Union's environmental policy shall contribute to the pursuit of the following objectives: the preservation, protection and improvement of the quality of the environment, the protection of human health, the prudent and rational use of natural resources, the promotion at international level of measures to deal with regional or global environmental problems, and in particular the fight against climate change.

- The Union's environmental policy aims at a high level of protection, considering the diversity of situations in the different regions of the Union. It is based on the principles of precaution and preventive action, the principle of remedying environmental damage at source as a priority and the polluter pays principle. In this context, harmonisation measures meeting environmental protection requirements shall, in appropriate cases, include a safeguard clause allowing Member States to take provisional measures for non-economic environmental reasons subject to a Union control procedure.

- In formulating its environmental policy, the Union shall take into account: the scientific and technical data available, the environmental conditions in the various regions of the Union, the benefits and burdens which may result from action or lack of action, the economic and social development of the Union as a whole and the balanced development of its regions".

To conclude on this question of the precautionary principle, it should be noted that while it advocates caution in the light of scientific knowledge, it is in no way incompatible with an economic system characterised by free enterprise, the pursuit of profit, the market economy (and in particular the development of financial markets) or technological progress. On the contrary, it is a means of reconciling personal development, participatory democracy, present and future generations, and economic growth. From this point of view, sustainable development is far from embodying a paradigm shift, it rather places our society on a new change of trajectory.

d) *The principle of participation* stipulates that citizens must have access to information, be able to take decisions and exercise their free choice. If we look at sustainable development, the participation of civil society is more essential as sustainable development implies a profound cultural change, a reorientation of consumption and production models. In his book, co-authored with Christian Comélieu, *History, Culture and Development Styles* [103], Ignacy Sachs focuses on the social roles of citizens and invites young citizens to assume their responsibilities as decision-makers. In the 1990s the United Nations Capital Development Fund (UNCDF), launched a vast participatory eco-development project [104] aimed at creating a specific field of action focused on social environments not well structured by the state (mainly rural communities).



In the Brundtland Report, public participation is also one of the strengths for achieving sustainable development: “The World Commission on Environment and Development therefore invites suggestions, participation and support to help it urgently... to raise the level of understanding and active participation of individuals, voluntary organizations, businesses, institutes and governments” (1987, p. 297). However, political and economic actors still have difficulty grasping its true significance.

The concept of participatory democracy is symptomatic of the growing paralysis of decision-making and the reluctance of decision-makers to implement it. Nicolas Buclet [105] reminds us that many actors only mobilise participatory democracy to promote the social acceptability of projects on a basis of unchanged collective choice construction. The presence of the public would thus be required, provided that the public in question adheres to the dominant values and the progress they imply. As a result, democratic debates initiated by decision-makers very often move away from substantive issues and lead to deadlocks.

However, sustainable development can only be conceived if it is accompanied by a permanent debate on the major economic and social issues. Debate is an act of education for democracy and citizenship because it broadens the political awareness of participants, leads them to dialogue, acquires a culture of consultation (role of NGOs) and dialogue (example of the application of the Natura 2000 Directive).

The principle of participation is the 10th principle of the Rio Declaration: “Environmental issues can best be addressed by ensuring the participation of all concerned citizens at the

appropriate level. At the national level, everyone should have appropriate access to environmental information held by public authorities, including information on hazardous substances and activities in their communities, and should have the opportunity to participate in decision-making processes. States should facilitate and encourage public awareness and participation by making information available to the public. Effective access to judicial and administrative proceedings, including reparations and remedies, must be ensured”.

In France, the law of 8 August 2016 (article L110 - 1 of the Environmental Code) defined the scope of the principle of participation: “The principle of participation according to which all persons are informed of draft public decisions having an impact on the environment under conditions allowing them to formulate their observations, which are taken into consideration by the competent authority”.

Once again, all these institutional arrangements seem to underestimate an important fact. While the 6 assumptions we have analysed in this article are translated in the field into sustainable development projects and decision-making involving very heterogeneous actors (associations, political decision-makers, citizens, NGOs, companies, etc.), debates involve conflicting positions, compromises or consensus. Thus, the principle of participation must not only consider citizens, it must also provide them with tools and methods that break with traditional approaches to data collection or group dynamics (the famous brainstorming). In the 1970s, Paulo Freire [106] suggested a critical pedagogy based on field diagnosis and awareness raising [107], it is at this price that sustainable development will be likely to embody a paradigm shift and bring about changes in behaviour.

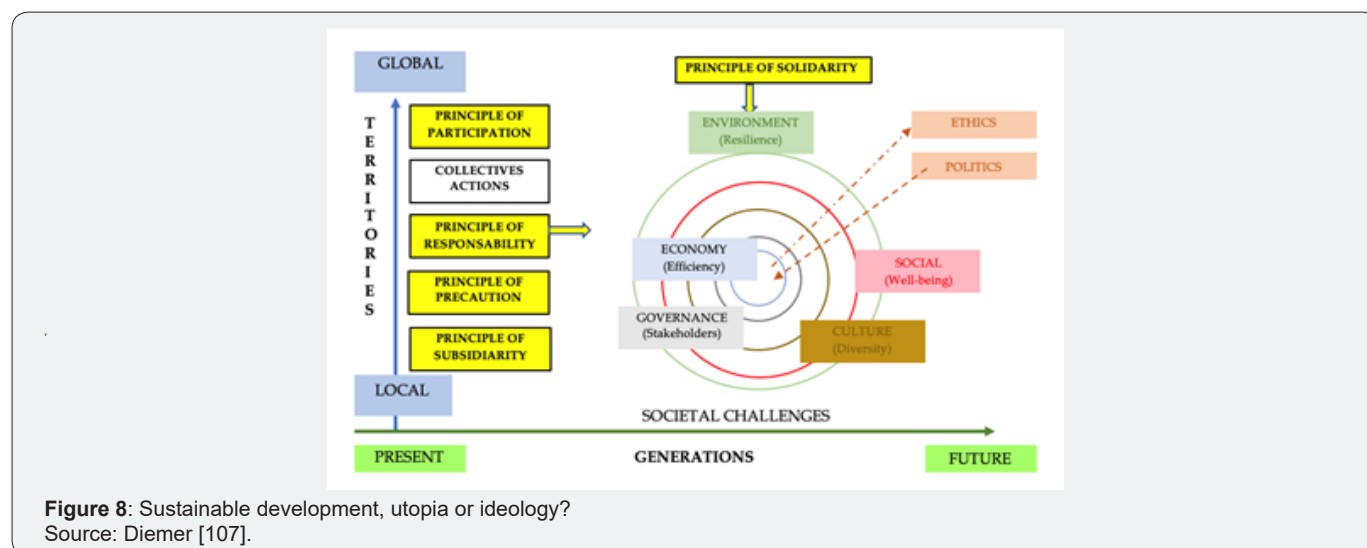


Figure 8: Sustainable development, utopia or ideology? Source: Diemer [107].

### Conclusion

Sustainable development has been developing for nearly 30 years, with many controversies, the most important being perhaps the omnipresence of economic growth in the debates and recommendations of the major international institutions.

If sustainable development is to embody a paradigm shift, it is in this field that it must first and foremost prove its worth. The six key drivers presented in this article must be accepted by the scientific community. It is necessary to start from the challenges of society and to treat them in the form of socially

“live” questions; to mobilize a transdisciplinary approach to identify the different workings of complex thinking; to immerse oneself in the dynamics of systems and “system thinking” as a scientific methodology; to identify the different dimensions (environmental, social, economic, cultural and governance) of sustainable development; to redefine the spatial and temporal scales (Planet Boundaries) and to give prominence to the values and principles likely to bring about a change in behaviour (Figure 8) [108-155].

In our opinion, the crux of the problem lies mainly in the interweaving of the 5 dimensions (economic, social, environmental, cultural, governance) of sustainable development. Indeed, if these 5 dimensions are interdependent, they are also part of relationships of domination, or even “cannibalization”. If sustainable development is to be presented as a new paradigm, it is necessary to redefine its contours. First, the sphere of influence and size of the economic dimension must be reduced. Today, the many fields of the economy, environmental economics, social economics, cultural economics, health economics, speak volumes about the vampirization process that has been in place for more than half a century. At the risk of mixing genres, sustainable development must engage our societies in an exit from the economy (this is where we agree with Serge Latouche’s theses and the decline), it is at this price that we can change our consumption and production behaviour. Second, this exit from the economy implies a break with the ideology inherited from the thirty glorious years, that is our addiction to property, growth, technologies, material consumption, full employment, productivity, leisure. Sustainable development requires more sobriety (voluntary), more conviviality. Thirdly, this ideological break is based on a non-negotiable premise, a radical reduction in working time. This decline must not be offset by additional productivity to maintain unchanged wages (as was the case in France when the thirty-five-hour working week was introduced). The reduction in working time must mean a reduction in wages and lead to a reduction in consumption. The decline in working time must lead society towards more social, more environmental, more cultural life. Fourthly, this reduction in working time must be accompanied by a new economic pact, aimed at establishing a real political economy. In concrete terms, it is a question of moving from a profit/cost logic (a kind of budgetary mechanization) to a tripartition (consumption, distribution, redistribution) of the economy, of placing use values (and not exchange values) at the heart of our societies.

Sustainable development has a history and contextual framework that leaves little room for a real paradigm shift. This is a big constraint, especially when trying to activate the various levers that boost society. The light of hope lies in accompanying change, as citizens we do not need certainty, but a real humanist project. Beyond words and controversies, sustainable development is (and will be) what we do with it. Faced with the excess of pessimism of some, and the prophecies of collapse of others, there is a path that we know well, since it

characterized the Age of Enlightenment - it is the path of reason, intellectual curiosity, and openness towards others. The values it embodies are humility, temperance, respect for others, altruism, friendliness, sobriety...

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