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Complexity and transdiscipline: epistemologies for sustainability

Complejidad y transdisciplina: epistemologías para la sostenibilidad

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Abstract

This work constitutes a theoretical revision of contributions of several areas of knowledge throughout the last century to date, among others: natural sciences, social sciences, philosophy, economic critique and international politics, to make evident coincidences between people trying to solve the socio-environmental problems that afflict humanity, closely related to quality of life and well-being. The paper analyzes the academic debate of sustainability concept, which is explained as the way that each social group has built a cultural system around the relation with nature, and argues in favor of recognizing that human life, society and, therefore, its economy as a human subsystem, are completely dependent on maintaining cycles and balances on planet Earth. Human social systems fit the profile of a living system, an autopoietic system as a structural and functional coupling of autopoietic units, dynamic and unstable, going to an unpredictable future. Considerations are offered from the complexity and transdisciplinarity to overcome apparent contradictions in fundamental dogmas and epistemology. Dialogue of knowledge brings out new qualities and possibility to include other areas of culture, such as art, religion, politics, economics and business. It seeks to harmonize criteria for cultural transformation needed to confront the global crisis that human kind are currently facing. We conclude that the dynamic human knowledge system offers opportunities to overcome the current limitations we face in designing and implementing a new vision on sustainable socio-ecological cultural system through space and time, within Earth life support and with culture as an interface between ecosystems and human beings.

Keywords: *buen vivir* (well being), complexity, quality of life, sustainability, sustainable development, transdisciplinarity.

Resumen

Este trabajo constituye una revisión teórica de aportes de diversas áreas del conocimiento a lo largo del último siglo hasta la fecha, entre otros: ciencias naturales, ciencias sociales, filosofía, crítica económica y política internacional, para evidenciar coincidencias entre personas que intentan resolver los problemas socio-ambientales que afligen a la humanidad, estrechamente relacionados con la calidad de vida y el bienestar. El documento analiza el debate académico del concepto de sostenibilidad, que se explica como la forma en que cada grupo social construyó un sistema cultural en torno a la relación con la naturaleza; y argumenta a favor de reconocer que la vida humana, la sociedad y, por lo tanto, su economía como un subsistema humano, son completamente dependientes del mantenimiento de ciclos y equilibrios en el planeta Tierra. Los sistemas sociales humanos se ajustan al perfil de un sistema vivo, un sistema autopoiético, un acoplamiento estructural y funcional de unidades autopoiéticas, dinámicas e inestables, que se dirigen a un futuro impredecible. Se ofrecen consideraciones desde la complejidad y la transdisciplinariedad para superar contradicciones aparentes en dogmas fundamentales y epistemológicos. El diálogo de saberes brinda nuevas cualidades y la posibilidad de incluir otras áreas de la cultura, como el arte, la religión, la política, la economía y los negocios. Busca armonizar los criterios de transformación cultural necesarios para enfrentar la crisis mundial que el ser humano enfrenta actualmente. Concluimos que la dinámica del conocimiento humano ofrece oportunidades para superar las limitaciones actuales que enfrentamos al diseñar e implementar una nueva visión del sistema socio-ecológico sostenible a través del espacio y el tiempo, dentro del soporte vital de la Tierra y con la cultura como interfaz entre ecosistemas y seres humanos.

Palabras clave: buen vivir, calidad de vida, complejidad, desarrollo sustentable, sustentabilidad, transdisciplinariedad.

Background and the debate about sustainability

The way humans constructed their cultures around the resources needed for subsistence –water, food and shelter– was, in the beginning, similar to the other living communities of any species in an ecosystem: adapt to the environment and coupling to the community. Ancestral groups lived closely related to nature, and explained their existence through worldviews that gave meaning to their individual and social life, although obviously their knowledge and practices were not integrated as scientific categories, but some still prevai until today. This view not only recognizes nature as the provider of resources but, in a deeper sense**,** understands nature as sustenance and basic life support. In this sense, it can be understood that sustainability is linked to the way in which different social groups build their cultural system around the relationship with nature. A specific cultural system may be more or less consistent with the natural processes of the planet, where more consistency means greater sustainability.

The Brundtland Report (United Nations [UN], 1987) introduces the environmental issue as a matter of national security; recognizes the interrelationship between economy, environment and society and proposes to balance the three aspects in order to meet current needs without compromising the satisfaction of future generations. The terms sustainable development and sustainability gradually permeated the discourse of social groups, institutions –public and private– in political, economic, academic and media fields. The commission had the merit of putting into the discussion table, in a detailed, documented and meaningful way, social and environmental issues and also, of expressing the risks that humanity faces. Above all, this led to the establishment of a monitoring of environmental deterioration, and, from that time on, studies were carried out and organizations based on that mission were established, such as the United Nations Environment Program (Unep). However, the main criticism to the Brundtland Report is the idea that society or economy can be understood outside the context of nature, and that, in this context, a solution to socio-environmental problems can be the intensification of economic growth (Giddings, Hopwood and Brien, 2002; Lélé, 1991; Mitcham, 1995; Robinson, 2004).

This long time discussion is presented graphically in figure 1. The first diagram represents the commonly accepted sustainability or sustainable development, based on the Brundtland Report (UN, 1987), which provides equal weight to all three components of sustainability: economy, society and environment. Now, more than 30 years after Brundtland's proposal (UN, 1987), the results are clear: we found no evidence of having overcome the socio-environmental problems, because we have greater social inequality (OXFAM, 2017; Piketty, 2014) and greater environmental problems: degraded ecosystems, altered bio-geo-chemical cycles (Millennium Ecosystem Assessment [MEA], 2005), climatic disturbances (Intergovernmental Panel on Climate Change [IPCC], 2014), water crisis (United Nations Development Programme [UNDP], 2006; United Nations Educational, Scientific and Cultural Organization- World Water Assessment Programme [UNESCO-WWAP], 2009), with increases of risks and high economic and social costs (Nordhaus, 1994; Stern, 2007; The Economics of Ecosystems and Biodiversity [TEEB], 2010). The human society of the XXI century faces a convergence of crises: economic, social, environmental, political and ethical in global dimensions, that impact the regional and local levels.

In the same figure 1, the second diagram[1] presents the three nested components in different order and recognizes the importance of each one (Giddings *et al*., 2002). The concept of biosphere posed by Vernadsky clarifies that nothing human can be developed outside the biosphere; this idea was first published in 1926 (Vernadsky, 1998)[2], and even spatial inferences are made with terrestrial materials and people. Human life, society and, therefore, its

[1] Some authors call it strong sustainability, Giddings callsit nested sustainable development.

[2] Vernadsky first published his book on the biosphere in 1926 in Russian.

economy, as a human subsystem, making reference to the systems approach (Bertalanffy, 1969), are completely dependent on maintaining cycles and balances on planet Earth. Therefore, it is necessary to recognize that a finite planet cannot sustain human life with an economy that intends to grow in an unlimited way (Georgescu-Roegen, 1971).

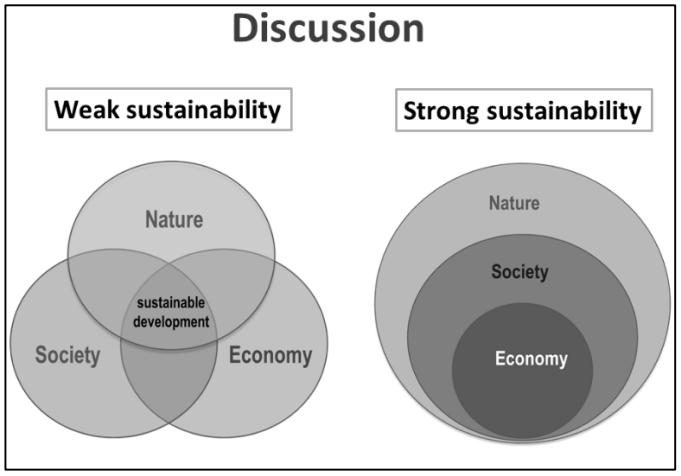

FIGURE 1. Discussion between weak sustainability, developed from the Brundtland Report ideas and nested sustainability (or strong sustainability), consistent with the ideas of Giddings *et al.* (2002), Bertalanffy's theory of systems (1989) and Vernadsky in his concept of biosphere (1926).

Some economic critiques and warnings made by several authors were published before the appearance of the Brundtland Report, but it did not take them into account (Morandín, Contreras, Ortiz Ayala and Pérez Maqueo, 2015), and it is argued by many scholars that they allow a deeper approach to sustainability that emerges from recognizing the ethics of life (Leopold, 1949; Meadows, Meadows, Randers and Behrens III, 1972; Schumacher, 1973). Sustainability, in this sense, is the recognition that excessive and wasteful economic growth is a socio-environmental failure; socio-environmental problems cannot be addressed with small isolated actions**,** they need to be understood in its complexity and taken care of with profound changes (Georgescu-Roegen, 1971; Meadows *et al.*, 1972; Schumacher, 1973). Now it can be understood that human activity should focus on ethics, in its objective and subjective relationship with nature and their fellow humans (Capra, 1996); integrate the scientific knowledge to a better understanding of nature; and adapt the construction of a culture with its associated socio-political-economic system (Max-Neef, 2010; Naredo, 1996). Culture[3] system is the set of knowledge, beliefs and social, political, economic, artistic and religious patterns that individuals linked in social groups construct to relate to each other and to their environment, to solve their existence needs.

Cultural systems are complex and dynamic processes taking place over thousands of years, an irreversible phenomenon in the timeline, with events or turning points that influence more or less the historical development of specific social groups. For example, the first humans were traveling across the territory in search of resources, and the discovery of the germination process allowed some groups to develop agriculture and settle; however, there are now nomadic groups not influenced by this event. Likewise, industrial agriculture is practiced by some groups, while others continue using traditional farming techniques, giving way to the diversity of forms of relationship with the land.

Another example is the discussion that took place in Europe for centuries: the question of whether the earth was flat, if it was moving or if it was the center of the universe; centuries ago, engaging in this discussion could cost your life. Meanwhile the Maya culture was predicting eclipses with startling accuracy. When European expansion took place through conquest, Native American groups were not recognized as human beings with an advanced culture; instead, they were enslaved or exterminated and much of their knowledge was lost. The integration of indigenous groups to the "civilized" society was not accepted by all members of those groups and some of them persist to this

[3] The term Culture has many definitions, the one presented here explains the sense in which it is used in this work.

day, guarding its traditions and worldviews with strong resistance that has lasted 500 years.

So, nowadays still remain the views of some indigenous groups and philosophies around the world (*i.e*., Buddhism) which give nature a sacred status, and recognize the water, air, earth and fire elements with power over the different manifestations of life, interrelated as a whole, that is Mother Earth (Pachamama[4] or Mother Nature) which humans and other species are a part of, and share in brotherhood. Recognizing the central value of Mother Nature (life) in any determination of sustainability only can occur as a result of knowing; then, the question should be: What is a living thing? The research to understand what is life, its organization, structure and functioning is unknowable in its entirety; nevertheless, as a human being, the observer (Human) approaches the understanding of himself.

Years of systematic study and technological advances contribute to a clearer understanding of life, which existed when the socio-political-economic global system prevailing today was conceived (Naredo, 1996). The understanding of life can help to retake not only the economic issue, but the philosophical-religious reflection from the knowledge point of view and with a critical eye. It is important to note that social systems fit the profile of a living system, autopoietic system as defined by Varela, Maturana, and Uribe (1974), that explain life as a structural and functional coupling of autopoietic units. Living systems are dynamic and unstable, going to an unpredictable future. Life unfolds into a new future and increasing complexity (Prigogine & Stengers, 1997). Complex life developed thanks to association, and any complex individual is in itself an entire ecosystem of multiple associative relationships within a community (Margulis, 1998). Lovelock's Gaia hypothesis explains planet Earth as a super organism, with homeostatic activity. Loverlock (2000) defines Gaia as a complex entity, alive, comprising the ground (earth minerals), rivers and oceans (water), atmosphere (air) and terrestrial biota. In a collective publication, edited by William I. Thompson (1987), the Gaia hypothesis is supported and three related elements are offered: a macrocosm (Gaia), a microcosm (bacteria and cellular life) and a mesocosm (mental and language) to explain life (Thompson *et al*., 1987).

The integrative global sciences of systems ecology (Fath, 2017; Odum, 1988), human ecology (Marten, 2001), notions as socio-ecosystems (Folke, 2006) and panarchy (Gunderson & Holling, 2002) coincide in the idea of the planet Earth as a unit (biotic and abiotic) where human beings, social systems and their economic subsystems are nested and are part of the Biosphere. This vision also coincides with some old views about the relationship between Mother Earth and the communities of indigenous peoples. The book of Fritjof Capra (1996), *The Web of Life*, described it as a new scientific understanding of life, which includes living systems: organisms, social systems and ecosystems**;** with implications not only for science and philosophy, but also for business, politics, health, education and daily life. However, in light of the socio-environmental results discussed above, the new scientific understanding, as Capra called it, does not seem to have the great impact needed in global society. The better understanding of life and its complexity forces us to look for new epistemic tools to face it; complexity and transdisciplinarity approaches are useful, and the dialogue they propose establishes bases to continue in the learning process.

Complexity and transdisciplinarity: epistemic tools to sustainability

The intricate relationships between natural, social and economic aspects can only be explained from its complexity. However, it is necessary to clarify that the notion of complexity is not synonymous with complicated or difficult; rather, nothing is isolated, everything is interrelated in the universe. This understanding requires clarity of different concepts.

[4] Name given by Andean people to the deity Mother Earth in South America.

1. Multi-causality.[5] A complex system considers the parts and the whole, cannot know the whole without understanding and knowing the parts, but the whole is not explained by the addition of the parts, because of the structure and function of the parts emerges in different qualities of the whole (Morin, 2002). Life cannot be explained only from the molecules: the quality of life is an emergency of the organization and should be studied from its structure and operation; the structural coupling of the molecules generates cells that are coupled in tissues, organs and individuals. Thereby, the individuals form autopoietic units of the third order in their social engagement (Varela *et al.*, 1974).

2. Relative determinism. Because of multi-causality, and the possibility of reaction of an autopoietic unit, it is impossible to predict the behavior or future of a living system (Maturana & Varela, 1992; Prigogine & Stengers, 1997). Classical science proposes four pillars in the process of learning: 1) Empiricism, to respect the facts; 2) Theory and rationality, that allows the understanding of the relationship of the facts; 3) Verification**,** which allows to prove facts; 4) Imagination**,** necessary in the search for answers to restart the process. Science then is a fed back circular relationship (Morin, 2005). Clarifying that circle does not infer that it is closed, rather that it "travels" from experience to theory and from theory to experience, in a historical process, like an uninterrupted spiral. A fed back circular relationship is consistent with the explanation of knowledge of Maturana and Varela (1992).

Dynamics of knowledge or learning dynamics (Fig. 2) moves between the perceptions and interpretations of the reality by the Self (observer) or collectivity of beings; their understanding (objective and subjective vision) is materialized in their decisions and actions, which are means of building their reality. It is a dynamic circular feedback flow between the reality, interpretation, concrete action and results that interacts with reality and becomes the knowing of the Self (Maturana & Varela, 1992). And like a living system, human knowledge is dynamic and unstable, going to an unpredictable future, unfolding into a new future and increasing complexity.

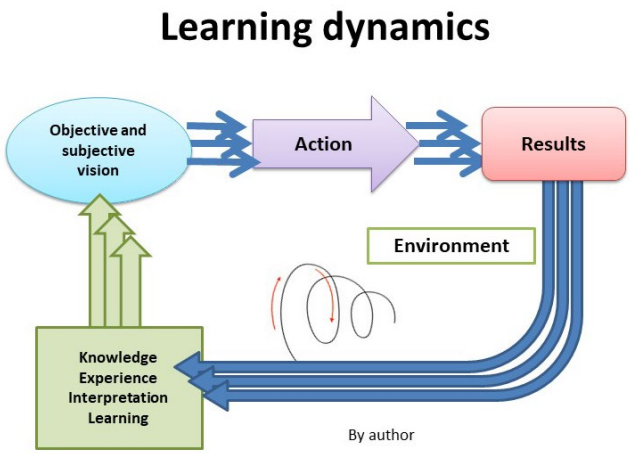

FIGURE 2. Dynamics of knowledge, based on the ideas of Morin (1996) and Maturana and Varela (2003).

But for Edgar Morin, fundamental dogmas of classical science reject complexity, as a result of a confusion of appearances; the real world behind these appearances is a world with clear deterministic laws, but not necessarily predictive (Morin, 2002).

The concept of complexity arises from a group of mathematicians and engineers**,** creators of complex dynamic systems in which there are a number of variables and relationships, from which the emergence of qualities appear in global processes which cannot be identified studying the isolated elements. Dynamics systems and mathematical models, which served the Club of Rome to reach the conclusions in Limits to Growth (Meadows *et al.*, 1972), are cited in many studies on sustainability to highlight its results, but their methodology is rarely mentioned, which is key to the understanding of their contribution.

[5] It is even possible to consider the multi dimension of the causes, because the causes can be generated in different spatial and temporal scales.

The methodologies used to address complex problems are also useful in the search for multi-causality and help to understand such problems. But it is important to consider that a living thing learns and generates ontological[6] changes from environmental influences. A distinction should be made between living (autopoietic) and artificial (mechanical) systems (Fig. 3). Morin's invitation is to overcome reductionism, absolute determinism and to accept uncertainty (Morin, 2002).

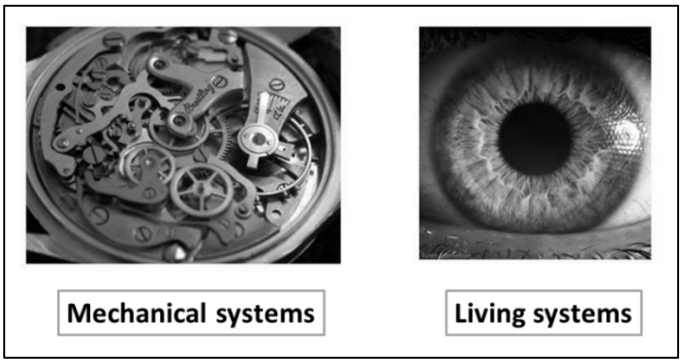

FIGURE 3. Graphic distinction between artificial systems, generated by man, used as tools; and autopoietic systems (live) in which life is an end in itself.

Uncertainty is widely accepted in the business world**;** one must deal with it, weigh the risks and identify the potential deviations. It is assumed that with varying degrees of uncertainty, we live in a changing world that is accelerating to unfamiliar surroundings. It is said that although there is some prediction, perfect planning does not exist; good planning contains flexible components that can face the unexpected and decisions are always taken with a degree of uncertainty.

3. The apparent dichotomy. The world is divided by religious and political ideologies, social classes, nationalities, gender, races, traditions to mention only the relevant**,** and those divisions are the result of the perception of separation, not understanding parts of life and the whole (Capra, 1996). However, these dichotomies are materialized in conflict and fragmentation, which are truly serious. Even scientific society is not free of divisions and internal fighting. The challenge is to overcome the apparent dichotomy between two or more ideas. Ideas seen as antagonists can be interpreted as complementary (Morin, 2002). This notion is not new and is present in ancient philosophies (*i.e.*, in China with the approach of the yin-yang). Thus, the logical complexity does not represent a phenomenological disorder, but rather requires understanding life with order-disorder, life-death, unity-diversity, independence-dependence, part-whole, male-female, object-subject and a long list of disjunctions appreciated by humans, many of which are co-existences and makes no sense to confront them; instead, it is better to make space for the diversity that is generated by the multiple possible combinations.

From Hegel's dialectic, the conflict generates a new stadium as a result of facing an idea to its opposite: a synthesis. Conflict is also seen as an opportunity to find a new stadium. Morin proposes, based on this idea**,** to use the dialogic to overcome the apparent contradictions in the fundamental dogmas and epistemology (Morin, 2002); a dialogue that brings out new qualities. Disciplines and authors in accordance with dialogue as public reasoning are: Amartya Sen (1993), buen vivir (Caudillo-Félix, 2012; Gudynas, 2011), south epistemologies (Santos, 2014), ecological economics (Daly & Farley, 2010; Martinez-Alier & Schlupmann, 1993) and political ecology (Leff, 2012; Martinez-Alier, 2002). Ilya Prigogine even goes further by proposing a new dialogue between human beings and nature (Prigogine & Stengers, 1997).

Basarab Nicolescu (2008) proposes *the logic of the included middle*[7], a notion that solves the disjunction between

[6] Ontological is the adjective that indicates that something is, on the branch of philosophy that studies the nature of being qua being, and seeks to determine the fundamental categories of existence and reality, and how these are related to each other. In other words, it refers to being, and how it defines itself.

[7] The notion of the included middle is attributed to Lupasco (1900-1988) who has influenced the work of Basarab Nicolescu.

A and non-A, in the emergence of an S, which is A and not A. To Leff, the dialogue of knowledge is the communication of Being with the knowledge (self-knowledge) and the Self with the *Other* (alterity); it takes the risk of dissolving certainties and gives the opportunity to find "what is yet to be thought"[8]. An example of apparent disjunction, simple and enlightening, is day and night, perceived as a contradiction if we are in a specific place on earth. From a larger perspective, with sufficient distance into space, we can say that day and night are a phenomenon determined by sunlight, and the rotation of the earth, and as in one part of the planet it is day, it is night in the other. There is no further discussion on the matter**,** given the position of earth in relation to the sun, there is no day without night and vice versa. To exclude or ignore contradiction does not eliminate it. To deal with it, through dialogue, accepting the complementarity part and to find a vision that includes the two options expands the possibilities.

In the case of scientific disciplines, it is necessary to make a clarification and accept that it is unquestionable that specialization provides a degree of detail that would not be possible without certain isolation, it is the invaluable contribution of each discipline, branching into specialties. But each specialty alone and isolated is an incomplete knowledge; so interdisciplinary is not a simple aspiration, it is necessary, but may be approached systematically as proposed by Rolando Garcia (2006) who defines that an interdisciplinary team tries to study a complex system in a common conceptual and methodological framework, derived from a shared conception of science-society relationship**;** it will define the problem to study under a single approach resulting from the specialization of each member of the research team. For Garcia, specialization is a necessity and a generalist research can lose quality; however, the association of specialized visions can strengthen an analysis. Also, including the scientific disciplines and interdisciplinary groups brings up a broader level (Garcia, 2006).

A dialogue within the framework of the transdisciplinary should not be confused with interdisciplinarityy, which helps establish dialogue between different scientific disciplines, but can keep science isolated of other practical knowledge and of the general public. Max-Neef (2005) also addresses the importance of recognizing transdisciplinary knowledge as a network that should be articulated to find solutions to specific problems. The transdisciplinary option and the dialogue of knowledge offers more a comprehensive possibility to include other areas of culture, such as art, religion, politics, economics, business and science**,** of course. The idea is to recognize human knowledge as a system, which cannot be reduced to its parts, or understood with dissociative parts. The sum of the parts generates a supra-addition that expands the horizon and opportunities.

The emergence of contributions from different disciplines and areas of culture looking to rebuild a worldview that recognizes the importance of nature, human beings and the value of life can be conceived as proof of progress. We find amongst many others: ecological economics (Costanza, Cumberland, Daly, Goodland and Norgaard, 1997; Daly & Farley, 2010), deep ecology (Boff & Berryman, 1977; Capra, 1996), ethics of liberation (Dussel, 2013), political ecology (Escobar, 1996; Leff, 2012; Martinez-Alier, 2002; Porto-Golnçalves & Leff, 2015), buen vivir (Altmann, 2016; Caudillo-Félix, 2012; Endara *et al.*, 2014; Gudynas, 2011; Monni, Pallottino and Pallotino, 2013; Vanhulst & Beling, 2014), eco-feminism (Puleo, 2008; Shiva, 1988), environmental education (Sauvé, 1999) international politic (UN, 2014), promoted by the Andean people and Latin American environmental thinkers (Heyd, 2005; Leff, 2012), and, more recently, Catholic religion (Pope Francis, 2015).

[8] Explore the unprecedented, ethical-aesthetic creativity, the poetic that approaches us to the art of living in harmony among beings who share the planet.

These ideas form a network of knowledge that have a lot of coincidences, but give the impression to swim against the prevailing economic view, and seem to be doubling the number of disciplines, apparently creating more separation. However, there is growing recognition amongst them. Contingencies and crisis emergencies make clear their importance and extend the possibility for them to become bridges of communication with the disciplines of origin. We will have to overcome the contingency when there is no more the need to differentiate with the Eco reference; when human knowledge is oriented to life and is reflected in the socio-political-economic-cultural system.

4. The three axioms of the methodology of transdisciplinarity

Nicolescu (2014) provides an opportunity for unification based on:

The ontological axiom: There are, in Nature and in our knowledge of Nature, different levels of Reality of the Object and, correspondingly, different levels of Reality of the Subject.

The logical axiom: The passage from one level of Reality to another is insured by the logic of the included middle.

The epistemological axiom: The structure of the totality of levels of Reality is a complex structure: every level is what it is because all the levels exist at the same time (Nicolescu, 2014, p. 191).

Then, the transdiscipline approach, to understand the correspondence between the external world (object) and inner world (subject), needs to develop an analytical intelligence to harmonize body, mind and emotions, by including values rather than accumulating knowledge, to help the understanding among subjects-objects (Nicolescu, 2014).

5. Contextualization. Another focus for transdiscipline and complexity is contextualization. For example, in the chaos-order disjunction, the apparent chaos, irregular and disorderly process, can be interpreted as a condition for the continued creation. Chaos makes possible order, it is its precursor and partner, and not it's opposite (Prigogine & Stengers, 1997). Short timelines or spaces could be looked at as stable events, but they are not, at longertimescales like geological time, or larger spaces; chaos means a condition of the order. So, the phenomena must be contextualized at larger scales.

For example, if the economy reduces human life to sophisticated calculations, but does not take into account human beings, their psychology and their passions, it makes decisions without historical and biological context; the results could not be better than those we are seeing. Contextualization also needs to be extended to the biosphere and oneness with it. The long timescale and large space, such as geological time, help to visualize that the assessment made by the Brundtland Report (UN, 1987) was, at least, an incomplete link with economic growth based on consumption as a solution to environmental and social problems.

Based on a broader vision, it is possible to review the goals that international politics and local governments are proposing.

Change of economic goals

The development model establishes economic growth goals for nations and focuses aspirations on industrialization and markets, even though it has been widely criticized and interpreted as a way to violate cultural diversity and the exclusion of other worldviews (Dussel, 2013; Escobar, 2007; Max-Neef, 1991; Naredo, 1996). The peasant and indigenous economies respond to a different logic, families and groups extended as communities, seek the satisfaction of their needs, rather than to obtain additional profits. The ecological variations constitute the physical basis of the cultural and economic diversity of each region (Shanin, 1972). The survival of this social groups depends more on the health of their ecosystems than on international markets, and in the same way, life in the cities, although it is not so obvious; but the markets exert increasing pressure on ecosystems. Developing countries and vulnerable groups are encouraged to work for international markets where they have little chance, and not instead of meeting their own needs and being self-sufficient.

The development as economic growth proposal is included in the United Nations agreements, from Stockholm in 1972 (UN, 1972), through the Brundtland Report in 1987 (UN, 1987), the Rio Principles in 1992 (UN, 1992), Agenda 21 (UN, 1997), Johannesburg in 2002 (UN, 2002), Rio+20 in 2012 (UN, 2012), to the objectives of sustainable development in 2015 of the 2030 agenda (UN, 2015). In all of that, there is a constant, the component of economic growth considered necessary for development, with a formula of technological advice and financing for the condition of delay of the most disadvantaged countries.

In 2014, the importance of harmony with nature was recognized (UN, 2014) and the report of the Secretary General of the United Nations acknowledged that the economic growth model is not congruent with harmonization with nature (UN, 2013), but these ideas did not have enough impact to change the economic focus of goals.

In the resolution of Rio + 20 , *the future we want*, recognition is given to the value of cultural diversity, but the proposals are still around economic development (UN, 2012). In the objectives of sustainable development in 2015 of the 2030 agenda (UN, 2015), although, there is talk of strengthening efforts to protect and safeguard the world's cultural and natural heritage, the economic approach prevails, culture is mentioned as a resource for attracting tourism, but culture has more profound meanings than handicrafts, outfit or a religious rite. A culture or cultural system is a way of being in the world, in an ontological and philosophical sense.

The "economic logic" has been imposed in all countries, even those considered poor; the middle classes assess their success according to their level of consumption and this is increasing. In a global, regional and local "economic logic" Mother Nature is equal to *natural resources* and human beings as *human resources*, which are used to generate and accumulate financial capital. Nature and people are used, and objects and money are loved. According to this, humans organize society, politics and economy in a hierarchical structure; a vision that allows corruption to be a way of life with a number of inconsistencies, which are clear for students of political science, but do not achieve a solution from the viewpoint of "economic logic" which translates everything into monetary units and allows us to add or subtract pears and apples. A viewpoint that allows the belief that what matters is how much money is earned, not how money is earned, what is its purpose and what outcomes have these actions, ethics and aesthetics, in the life of people and the planet.

As discussed here, it can be recognized that a humanism that does not consider the central role and value of nature is anthropocentrism**,** when humans trample the rights of Mother Nature and other species fails to explain the real relationship of humans with Nature. An observer who does not recognize his position and falls into the illusion of being disconnected from life, from other species and his own, considers his own "intelligence" to have authority over life.

Human beings in any of their roles, whatever their ideology, constantly make decisions, which materialize into concrete results; objective realities, measurable and evaluable (*i.e.*, people living in poverty, degraded ecosystems, water and air quality, tons of waste among many others). Here the role of science is relevant, because the study of phenomenology explains their qualities and quantifies them. Thanks to this, we know that the human impact is generating a geological change known as Anthropocene (Steffen, Grinevald, Crutzen and McNeill, 2011) and that planetary limits are being exceeded (Rockström *et al.*, 2009; Steffen *et al.*, 2015).

Human society, both individuals and groups, should know the consequences of their decisions and actions, both positive and negative**,** to reach congruent learning. The illusion of the war against nature must be aborted because the human being as a living thing fights the war against himself, which in case of winning it, he would attain his own extinction.

Another viewpoint is needed. The goals, then, should be to see life and human being as ends and, economic capital only as means to that end. So, the next step is to situate the human beings in the right place, with their value, integrity and dignity. Quality of life and human wellbeing

of this generation and those to come are a central part of the discussion of sustainability, but it is essential to define the core objective of the quality of human life and its relationship with nature and biological processes that sustain life on the planet to understand that science should have an important place.

Each individual and each discipline can contribute to global understanding and the practical realization of sustainability. For example, many of the administrative tools (*i.e.*, strategic planning, performance by objectives) have military backgrounds. With some adjustments**,** they were transformed into powerful tools of the business world. The difference lies in rethinking the objectives. Similarly, these tools can be adapted to articulate sustainability concepts at regional and local level, with different objectives and clear goals. So, the new objective is to use human knowledge, tools and skills to build a culture that harmonizes human needs with the natural cycles of the planet, that recognizes complexity and values cultural diversity.

Cultural diversity as biological diversity, is a strength which allows human society to be more flexible and resilient (Capra, 1996), which means that there are many ways of seeing and being in the world, and the global culture must give space to all, each one with the central objective of obtaining wellbeing in harmony with its territory and the forms of life that inhabit it. And there is probably much to learn from cultures that are today excluded from modernity.

Well-being, a multi-dimensional goal

Well-being is a multi-dimensional issue. To The Commission on the Measurement of Economic Performance and Social Progress the dimensions that should be considered are, at least: i. Material living standards (income, consumption and wealth); ii. Health; iii. Education; iv. Personal activities including work; v. Political voice and governance; vi. Social connections and relationships; vii. Environment (present and future conditions); viii. Insecurity, of an economic as well as a physical nature (Stiglitz, Sen and Fiutoussi, 2009). The Commission recognizes that well-being depends also on equity in the human condition and on objective and subjective aspects; it work is based on the contributions of Amartya Sen, to whom the quality of life of a person should be assessed in terms of their capabilities. A capability is the ability or potential to become and do something you think is valuable, to what is technically called a functioning (Sen, 1993).

Valuable functioning, for Sen**,** is divided into four categories overlapped: 1) well-being achievement, 2) achievement agency, 3) well-being freedom and 4) agency freedom. Freedom is the possibility for a person to choose amongst various alternatives and, agency is defined as the ability to achieve their valuable functioning (Sen, 1993). In other words, freedom reflects the ability of a person to choose between different ways of life and their ability to achieve valuable functioning and develop their potential (Sen, 1993).

Capacity building is related to the extension of people's rights to access goods and services they need, meet their needs and improve their living standards. The goal is that the rights become capacities. People should participate in the definition of their rights; this places the conversation in the field of political participation as part of development (Sen, 1993) and it is consistent with the contributions of Ethical practice (Cortina, 2012). To achieve this, a system of government and a State which allows it is requiredAlong with a conscious population, which inevitably links us to the role education should play (Sauvé, 1999).

The capability approach proposed by Sen (1993) substantially modifies the terms in which the development is proposed. It recognizes that goods and services are valuable, but not by themselves, but for what social actors can do with them. The development of the individual is determined by the possibility to develop their capabilities and increasing not only goods and services (Sen, 1993).

Based on the ontological and logical postulates of transdiscipline, we must recognize that overcoming inequality is necessary a broader vision to act accordingly. Subsidies and government programs, whether national or local, as well as altruism and aid from rich countries, should consider that if a person or company has the habit to

depend on external support, the capabilities can't be developed. In this order of ideas, the means employed are equally or more important than the ends. The challenge of addressing the needs helps to develop capacities. Funds and assistance programs should be directed in this sense to provide justice and dignity, not charity. Buddhist compassion is applied in the direction of empathy, identification of sentient beings, mutual support and respect. It is often confused with compassion as synonymous with pity and mercy related to the hierarchical power criticized by Nietzsche (1918). "It is justice, not charity, that is waiting in the world": a phrase of Mary Wollstonecraft, 1792, cited by Anand and Sen (2000) that expresses equity not recognized by the privileged sector of society. Inequity was documented by OXFAM (2017) and Piketty (2014). Sen (1993) is focused on performances, on the positive aspects that make the lives of human beings worthwhile. There are many similarities between this concept and the potentiality of the approach of Foro Latinoamericano de Ciencias Ambientales (FLACAM) school (Pesci, Pérez and Pesci, 2007) and on the strengths of the tool known as SWOT[9] (Coman & Ronen, 2009). From the perspective of the dynamics of life posed by Capra (1996), performance or functioning are more important than the structures seen statically.

The contribution of Anand and Sen aims to a more equitable society, to provide justice and dignity to humans; nonetheless their work designing the Human Development Index for the United Nations (Anand & Sen, 2000), agrees with the Brundtland Report (UN, 1987) and it states that economic growth is necessary to solve social and environmental problems related to sustainable development. This is because, for traditional economics, the human development can be achieved by financial abundance, an idea that permeated most of the countries and people on the planet. Even Stiglitz considered in the first term, material living standards (income, consumption and wealth) (Stiglitz *et al.*, 2009).

There is the belief of when capital is big enough, it will have the opportunity to support, through altruism, the environmental and social issues. We should note that there is no evidence to support that idea: as mentioned here, the economic growth of the past 40 years has not solved the problem of inequality, on the contrary, it has increased (OXFAM, 2017; Piketty, 2014; Vakis, Rigolini and Lucchetti, 2016). Economic growth essentially measures the increase in capital account, which is in the hands of an unrepresentative minority of society, while increasing territorial conflicts around the world[10] (Leah, Bene and Martinez-Alier, 2015; Martinez-Alier, Del Bene and Çetinkaya, 2015; Porto-Golnçalves & Leff, 2015). It is indisputable that the human being has the need to cover certain minimum standards of consumption, food, clothing and objects that ensure the physical and intellectual development. These minimum requirements are not covered in much of the world's population, and this population group's priority is to satisfy their basic needs. But chronic poverty has quality problems that go beyond low incomes (Vakis *et al.*, 2016), which can not even be eradicated by simply increasing income. The phenomenon of globalization is generated from the communication between human beings on the planet and with current technologies is accelerated and streamlined. Human population has exceeded 7618 million people and is rising[11]. The number of people on the planet is important, but it is equally or more significant what they do and how these people live.

There is a waste of resources (Mother Nature and human labor) in many countries and cultures that consume disproportionately, where people acquire and accumulate large amounts of clothing, appliances, toys and unnecessary items. This situation today is not exclusive to the developed countries**,** it is present also in middle and low-income

[9] Means SWOT Strengths, Weaknesses, Opportunities and Threats and is a powerful tool used in the situational analysis in the business world.

[10] See http://ejatlas.org/ Environmental Justice Atlas, which documented cases worldwide.

[11] Follow-up on http://www.worldometers.info/

families. The increase in the Consumer Credit has stimulated the "potential market", which borrows to consume superfluous goods.

A growing number of products exist on the market with low real value**,** from "junk" to truly expensive objects. Buying them is stimulated by marketing, fashion, dates created for the purpose of gift-giving and many other tactics, which generate social and emotional pressure aimed to increase consumption. Marketing uses perception and subjectivity, involving human emotions to generate demand (*i.e.*, lack of love, low self-esteem, uncertainty as to the appearance, need for belonging and acceptance, among others) and makes brands through media processes that cost millions of dollars.

The quality of these products is programmed to be in use in a given period of time, and then it is easier to buy a new product instead of repairing it. It contributes to the generation of wastes that threaten the health of the natural environment and increasing raw material taken from the same natural environment (Mother Nature), which ends degrading and brings with it the loss of quality of life.

Moreover, the dynamics of distribution and the growing number of products in the global market encourages the use of increasingly sophisticated packages. In some cases, these packages consume more resources than the product it contains, with great impact on the environment, by generating more waste volume. These tons of garbage are a real problem in cities around the world and increase the entropy noted by Georgescu-Roegen (1971).

Large companies can reduce their costs with the punishment of labor devalued in the poorest countries and exploiting its ecosystems. The products travel thousands of kilometers and, yet, companies manage to lower prices to its local equivalent with which it shares the shelf. This overrides local production, as local consumers, now globalized, decide for the best price or the most publicized brand**,** two issues that are out of control of the local producers and, thus, expel them from their natural market.

Paradoxically, small and medium enterprises (SMEs), which forme a key part of the economy and job creation, today have serious problems of subsistence**,** probably because they also believed in the "mirage of credit" in addition to being destroyed by corporate giants in "free markets". The excessive and irrational consumption does not generate progress in terms of human development, does not raise the quality of life; however, it aggravates environmental problems and decreases the ability of society to achieve the goals of sustainability. Environmental degradation, depletion of Mother Nature, generates loss of quality of life.

According to Max-Neef, development is about people, not objects. Human development, therefore, requires a redefinition of true human needs, which are identified and matched in different times and cultures. The difference lies in the way these needs are solved in every society and should not be seen as lacking, but as impulses that drive to overcoming (Max-Neef, 1991), when the capacities are developed.

Max Neef (1991) classifies needs according to two criteria: existential and axiological. For him, existential needs are: Be, Do, Have and Being. According to axiological criteria (relating to the establishment of the Self), he distinguishes the needs of Subsistence, Protection, Creation, Participation, Affection, Identity, Understanding, Leisure and Freedom[12]. All, according to the author, should have an equal weight. And most are not solved with objects.

He also emphasizes that even if most of the needs were covered, if any of them is not covered, it leads to pathologies (Max-Neef, 1991), many of which today we can see materialized in people and modern society (*i.e.*, lack of trust between individuals, stress, bulimia, anorexia, alcoholism, drug addiction, bullying, family violence, crime, suicide, among others). The entertainment industry is attracting money and attention, but not always contributes to aesthetics, art, creativity, harmony, love of knowledge

[12] Max-Neef's analysis of needs could expand the list proposed by Stigitz of the dimensions of well-being

and higher human aspirations. A society of appearances, empty and unhappy**,** is built.

With the "belief" that the power of money accomplishes everything, people use all their time and effort in getting it, leaving out very important aspects of life. The concentration in the consumption and the accumulation of wealth leads to dilution of ethics, mistrust and the difficulty to generate healthy and cooperative relations. Such society is conducive to social fragmentation and generates more pathologies, as prophezied by Schumacher (1973) when he affirmed:"If human vices such as greed and envy are systematically cultivated, the inevitable result is nothing less than a collapse of intelligence. A man driven by greed or envy loses the power of seeing things as they really are, to see things in their roundness and integrity and their own successes become failure. […]".The waste that is made of natural resources and our inability to recognize that the modern industrial system, with all its intellectual sophistication, consumes the same basis on which has been erected (Schumacher, 1973).

It can be discerned that human development is closely related to ethics guidelines that influence individual and collective decision-making. Individuals cannot escape the responsibility that derives from their freedom of choice and is determined by acting in any sense. But if the cultural system that establishes the goals is based on consumption, it is not evident to the people, who then neglect and lose all the elements that offer quality of life, but, that in monetary terms, do not enter into the equation (i.e. fraternity, cooperation, respect, care for children and the elderly, homework, clean air and water, among many others). There are already new proposals for the measurement of quality of life that integrate opportunities, human needs, subjective well-being and happiness (Costanza *et al*., 2007; Stiglitz *et al*., 2009), and contributions from other disciplines that offer information on how to improve the human condition.

Positive psychology, a new field addressed by Seligman (2007) and Csikszentmihalyi (2014), has studied happiness in humans. Their results show that people who achieve flow with life are creative, cooperative, productive, give importance to personal relationships and are significantly happier than those who compete and seek material goods. Property, beyond the necessities of life only offers a short-term "wellness", and consumption becomes an addiction, such as substances that provide momentary pleasure.

Building a healthy society requires healthy individuals, happy humans, connected, and able to live in a community. This is the sense, and just as a very good example, of the proposal made by indigenous leaders from Ecuador and Bolivia, El Buen Vivir or *Sumak Kawsay* or el Vivir Bien *Suma Qamaña* (Altmann, 2016; Caudillo-Félix, 2012; Endara *et al*., 2014; Gudynas, 2011; Monni *et al*., 2013; Vanhulst & Beling, 2014), an idea that represents a way of life in community, based on respect for Mother Nature and the other, as a complement of the differences and prioritizes dialogue and consensus.

Seeking balance with nature, knowing how to work, how to communicate, how to eat, how to drink, how to dance, a dance that relates to the planting and harvesting, which honors Pachamama (Mother Earth) with music and dance**.** To retake the Abya Yala is an indigenous term Tule-Kuna (Panama and Colombia West) which means "Land at full maturity", "Land of vital blood"; and is used by indigenous communities to name the Americas. Words that invite people to join in a great family, a great community. *El Buen Vivir* is consistent with the concept of community used in ecology, including populations and species that share the vital space (or share the ecosystem, landscape or territory); it is a poetic, creative and humanist vision to live in community, to be fair and work for the common good. It is not about finding a solution that solves all the problems, but a process that facilitates the learning process in each cultural group, in the space and time in which it is found, related to its own socio-ecosystem (Folke, 2006). Cultural diversity forces us to accept that there are many different ways of relating to the earth and therefore to build the cultural system, which includes politics, economy, religion, art, among others. There are many traditional ethnic groups worldwide, which are seedbeds of alternative ideas to the "economic logic" or development, some of them have persisted for thousands of years (Shanin, 1972).

On a desk in the Social Forum of the Americas 2008, the Maya indigenous women spoke: "Our position is focused on living well and this means to be in balance with ourselves in our self individually and collectively, so we must undress the enemy, the oppression of these more than five hundred years that has affected our energies. Oppression which we carry inside but that does not belong to our being as humans, it does not belong to our being as a people and everything that hurts us from inside, fear, terror, guilt, shame, extreme sentimentality"[13].

The construction of a humanistic and intelligent society requires informed, critical and capable individuals. But also loving, sensitive, conscious subjects who decide and carry out concrete actions with goals for life and the common good. This view is consistent with the proposals of Eco-Feminism (Puleo, 2008; Shiva, 1988).

Given the concern of some who think that accepting Indigenous People's ideas is "going back in time", it is necessary to clarify that any revision to the formal disciplinary philosophy, historical processes and worldviews of living or historical groups must be done from the present in the light of knowledge and discoveries made through specialization, critical thinking, with an inclusive attitude, being sure that cultural diversity is a richness, a value and stronghold now. Obviously, one cannot judge the past from the present, but we can learn from hits and mistakes in the search for a better present and future; in the same way that today the Greek ideas of more than two thousand years ago are read.

Final reflection

Scientific advances show that the development model focused on economic growth has caused greater inequality and alarming environmental situation. Pollution of soil, air and water, degradation of forests, extermination of species, to name a few examples, are objective and measurable realities that indicate that humanity is exceeding planetary limits. It is not a question of ideologies, environmentalist and humanist ideas that go against "development" understood as economic growth, but understood development as a more evolved society.

At one time, it was thought that environmental problems would be faced by future generations, but today it is clear that they are faced by this generation. The inconsistency in the actions to ethics, the lack of dialogue and respect for the rights of others are the "elephant in the room" of our society.

The industrialized society standardizes culture through unlimited consumption and the aspirations of economic accumulation have caused a crisis of global dimensions in less than 200 years. The social and environmental decomposition endangers the whole humanity, this decomposition is a symptom, the origin of the problem is in the untying of the cultural system with the cycles of the natural system, the necessary corrections depends on this compression.

The strong sustainability and its critical attitude towards the economic role are based on scientific advances in terms of the explanation of life and its complexity, and are based on a long list of authors cited throughout this text that coincide in that human beings and its cultural systems are part of the biosphere.

Modern advances also make it possible to understand complexity, the interconnection between biological and cultural aspects; the biosphere as a complex and dynamic system, with homeostatic processes, that sustains life, of which human beings are a part.

A cultural system is a nested subsystem of the biosphere and includes social, political, economic, legal, artistic and religious elements; it is also a complex and dynamic system, constantly learning. It is recognized that there are many different cultural subsystems and sustainability can be understood as an attribute of these cultural subsystems, according to the degree of coupling of

[13] Social Forum of the Americas (2008) Document: Mayan Women Chnab'jul, peoples, land and territory. Towards the Good Life, to live in harmony cited in (Caudillo Felix, 2012).

their structure and function to natural systems and its survival depends on that link.

Each individual has a specific area of action within one or more territories and the choices their capacities allow them to make, in a gradient of influence from their community life. Decisions and practical actions of each individual may or may not be consistent with ethics and aesthetics of life; however, the complexity makes the individual and isolated efforts not strong enough to reverse the socio-environmental results. It is necessary that the cultural system recognize the knowledge, the ethics of life and the links to its organization, structure and function. Only then will individual efforts make significant contributions to social advancement.

It is in the hands of international public policy to make the necessary changes in the economic objectives, to return to the ideas that were already recognized in 2014 on harmony with nature, and to contribute enormously to the construction of a more sustainable cultural system. The dynamic human knowledge system offers opportunities to overcome the current limitations we face in designing and implementing a new vision on sustainable socio-ecological cultural system through of space and time, within Earth life support and with culture as an interface between ecosystems and human beings.

Cultural diversity allows us to glimpse that there are many ways to build societies and that ancestral worldviews had a better connection, with economies and community organizations that have allowed them to survive for hundreds and thousands of years. Transdiscipline helps to integrate human knowledge for a better understanding of nature, its structure and process, to integrate that knowledge into cultural restructuring.

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