



The era of sustainable development and the challenge of climate change

La era del desarrollo sostenible y el reto del cambio climático

José Luis Bustelo Gracia^a

jbustelo@eserp.com, <https://orcid.org/0000-0002-5405-7788>

Albert-P. Miró-Pérez^{b*}

*Autor de correspondencia: prof.amiro@eserp.com, <https://orcid.org/0000-0002-5405-7788>

^{ab} ESERP Business and Law school, Department of Economy, Barcelona, Spain

ARTICLE INFO

ABSTRACT

Received:

20/11/2022

Accepted:

09/01/2023

Available online:

15/02/2023

JEL CODS:

Q01, Q54, O01

Sustainability makes it possible to understand that human beings are facing a world with exhaustible resources, with a constantly growing population and with economic progress based on obsolete technologies that generate overflowing energy consumption, generating billions of tonnes of waste that are added to the ecosystem. These factors trigger catastrophic climatic consequences that have put the “world” on alert as it realizes that there is a planetary carrying capacity limit and that we are approaching the collapse of the ecosystem and endangering future generations. In addition to undermining the quality of life of all living beings present, by exceeding the natural equilibrium capacity of the ecosystems that sustain it. In order to answer this question, this article has reviewed the literature on the subject that is the subject of so much debate. The aim of this article is therefore to analyse the concept in detail, in order to establish its link with climate change, both of which are inseparable factors. It has concluded that climate change today has become a problem of multidimensional proportions, that involves entire institutions and societies, in order to mitigate its catastrophic global consequences, and has been categorized as one of the greatest challenges of this century. Not only that, but social justice is becoming increasingly important for social actors interacting with the environment.

Keywords: Sustainable, climate change, ecosystem, North-South differences.

How to cite: Bustelo Gracia, J. L., & Miró-Pérez, A. P. (2023). The era of sustainable development and the challenge of climate change. *Economía & Negocios*, 5(1), 252-271. <https://www.doi.org/10.33326/27086062.2023.1.1570>



RESUMEN

La sostenibilidad faculta entender que el ser humano está frente a un mundo con recursos agotables, con una población en constante crecimiento y con un progreso económico fundamentado en tecnologías obsoletas y que generan un consumo energético desbordante, generando miles de millones de toneladas de desechos que se añaden al ecosistema. Estos factores desencadenan consecuencias climáticas catastróficas que han puesto en alerta al “mundo” al entender que existe una capacidad límite de sustentación planetaria y que nos estamos aproximando al colapso del ecosistema y a poner en peligro a generaciones futuras. Además de menoscabar la calidad de vida de todos los seres vivos presentes, por rebasar la capacidad de equilibrio natural de los ecosistemas que la sostienen. Para poder dar respuesta a dicho planteamiento, este artículo ha revisado la literatura respecto al tema que suscita tanto debate. Es por ello que este artículo tiene como objetivo analizar pormenorizadamente dicho concepto, para también establecer su vinculación con el cambio climático, ambos factores inseparables. En él se ha concluido que el cambio climático hoy en día se ha convertido en un problema de proporciones multidimensionales, que implica a instituciones y sociedades enteras, con el objetivo de mermar sus catastróficas consecuencias globales, y se ha categorizado como uno de los más grandes retos del presente siglo. No solo eso, sino que la justicia social tiene cada vez mayor preponderancia en los actores sociales que interactúan en el medio ambiente.

Palabras clave: Sostenible, cambio climático, ecosistema, diferencias Norte-Sur.

INTRODUCTION

For the human being, nowadays, one of the most important issues in the economic, social and environmental development of society is sustainability (Rogers et al., 2012). This concept implies values that should be intrinsic to human behaviour, such as understanding the limitation and scarcity of resources in the face of unlimited and heterogeneous human needs and their connection with the limits of economic growth (Salas-Zapata and Ortiz-Muñoz, 2019; Borowski and Patuk, 2021). It is necessary to change the current economic system in order to guarantee that agriculture and industry generate clean energy on the basis of the use of renewable resources (Owusu and Asumadu-Sarkodie, 2016). A new perspective is imperative for a transformation of people's mentality, through a cultural revolution in values and in the education of citizenship (Awais et al., 2019; Wamsler, 2020).

One of the approaches with the greatest consensus is the “sustainable human development” of the United Nations Development Program (UNDP), which shows two essential advances that mark the concept of SD (Iturralde Durán, 2019):

- Strengthening the social dimension using Sen's capabilities perspective instead of the wealth redistribution approach, changing the point of view of equity and social justice. Prior to this, it was understood that two agents with similar earnings have the same well-being and this is not real, since one may have good health and the other lack it, for example. It happens Likewise if assets are taken into account. A person who is prevented from accessing studies for cultural or religious reasons, even if they can afford a house,

clothes or any type of good, will have certain needs resolved but not all, such as a life of self-fulfilment, since they do not have the freedom to develop properly.

- The consideration and inclusion of the environmental dimension, recognizing that resources are limited and non-renewable.

The idea of sustainability appears as a consequence of the study and analysis of the world scenario that Bybee (1991) described years ago as a “planetary emergency”. A threatening circumstance for the present and the future of human beings and biodiversity, an unsustainable situation caused by humans (Duan et al., 2019). Over time, this way of thinking has progressed but with difficulties since, until a few decades ago, the devastation and degradation of the environment has not been very evident for both quality and standard of living have been improving in many parts of the planet. On the other hand, it has been proven that sustainability requires a global and holistic view that is, it needs to consider all the interconnected difficulties that human beings must face and this is only feasible on a planetary level (Barber et al., 2012). In other words: it is unsustainable growth that cannot continue forever in a limited world, but it is possible to favour the transition to SD (Gil Pérez & Vilches, 2019; Fuso Nerini et al., 2019).

MATERIAL AND METHODS

The progressive need to protect nature and its resources have been provoking multiple proposals focused on achieving SD. Between the mid-1940s and into the 1950s, problematic relationships arose between development thoughts and many environmental alerts that were the germ of sustainability. To begin with, developing countries were seen as a huge opportunity to access raw materials, especially after the end of World War II. In 1950, Latin American nationalism increased and struggles were taking place for national independence in Asia and Africa. The Cold War also saw the emergence of a “new world order” and a reconfiguration of power. Also, overpopulation, the need for markets, technology or faith in science were elements that marked those years, along with the extreme and massive poverty in Asia, Africa and Latin America. All these events began to be considered in the political agendas of the most developed countries in the world.

In 1948, the International Union for Conservation of Nature (IUCN) was created, with the aim of helping to find practical solutions for the main environmental and development challenges, among others, those mentioned. In 1955, the colloquium called “*Man’s role in Changing the Face of the Earth*” was held to study the role of human beings in changing the earth's surface. In 1962, “*Silent Spring*” was published, a book that contributed significantly to the creation of a new environmental awareness on an international scale.

During the 1970s, the concern regarding the environmental crisis of many governments and civil society increased notably, with scientists alerting with reports about the depletion of natural resources. The Club of Rome, a non-governmental organization, summoned many politicians, academics, economists, as well as other experts in different areas to carry out a detailed analysis of the causes and transformations of the environment.

The environmental problem begins to have a greater relevance when the United Nations conference on the human environment is held in Stockholm (known as the First Earth Summit) and with the creation of the United Nations Program on Environment (UNEP), also in 1972. The

Stockholm conference was a milestone in the environmental movement and its main objective was to show the consequences of industrial activity on human health, environmental degradation and 'transboundary pollution'. Furthermore, it is important to note that, as a result of UNEP, laws, policies and strategies were created and adapted by several countries focused on containing and reversing environmental degradation.

In 1983, the United Nations World Commission on Environment and Development was born and four years later the “Our common future” or Brundtland Report was published, a benchmark for being the precursor of arduous debates about global sustainability and in which is given for the first time a definition of the DS. The report claims that poverty, degradation and justice cannot be tackled in isolation. In this line, it says:

It is in the hands of humanity to make development sustainable, lasting, that is, to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own. The concept of sustainable development implies limits, not absolute limits, but limitations that impose on the resources of the environment the current state of technology and social organization, the capacity of the biosphere to absorb the effects of human activities. But both technology and social organization can be ordered and improved in ways that open the way to a new era of economic growth. Poverty is not only an evil in itself.

This report is the benchmark for SD programs and is considered the first milestone in the international arena since it analyses in detail the main and most worrying causes of environmental degradation, proposing viable solutions in this regard. It confronts and contrasts the approach of economic development together with environmental sustainability and finds practical means to solve environmental problems.

In 1992, the United Nations Conference on Environment and Development (UNCED), popularly known as the “Rio or Earth Summit”, takes place and establishes that: “*Human beings constitute the centre of concerns related to sustainable development. They have the right to a healthy and productive life in harmony with nature*” (Principle 1). One of the main objectives of this conference was the creation of a new and equitable pact through the establishment of new levels of cooperation between different States, key sectors and society in general, with the aim of achieving global pacts in which protect the integrity of the environment, the interests of human beings and world development. Since Rio 92, environmental claims have been increasing exponentially in the political agencies of many multilateral organizations. Six important agreements emerged from this declaration:

1. The declaration of principles.
2. The Convention on Biological Diversity.
3. The United Nations Framework Convention on Climate Change.
4. The Declaration of Forests.
5. Agenda 21 (a document made up of 40 chapters which analyse the existing links between natural environment, economy and society. It is a global action plan towards SD).
6. The Earth Charter.

In addition to:

- The United Nations Framework Convention on Climate Change (UNFCCC), created in 1994.
- The United Nations Convention on Biological Diversity.
- The Convention to Combat Desertification.

As if that were not enough, a participatory and open process began at this summit, giving rise to the gestation of the Sustainable Development Goals (SDGs) that call for action at the global level to end poverty, improve the lives of humanity and protect the planet. The implementation of the SDGs involved long and arduous negotiations with the contribution of citizens and organizations from various fields (economic, national and social) and culminated in 17 major Goals whose main purpose is to solve the compendium of interrelated problems, avoiding that forgetting of one of them blocks real progress in all of them. The adoption of the SDGs occurred in 2015.

In 1994, the First European Conference of Sustainable Cities and Towns was held in Denmark, in which the Aalborg Charter was signed, a document approved by all local administrations that undertake to carry out a Local Agenda 21 process. In the Convention of Agenda XXI, the wise and well-known motto was forged: Think globally, act locally.

A further SD milestone occurred in 1995 with the publication of the Green Paper on the urban environment. This series of publications is intended to encourage the following reflection: *“the increasing urbanization of the world together with the global problems of climate change, water scarcity, environmental degradation, economic restructuring and social exclusion require a more careful consideration of the future of cities European”* (European Commission, 1996, p. 3).

In 1999, the conceptualization of the United Nations “Global Compact” project began and in 2000 its implementation, in which around 10 000 companies from all over the world participated, becoming the largest proposal for corporate sustainability in the world. It focuses on analysing issues related to sustainability. Global Compact's main objective is to create the social and environmental pillars necessary to maintain the global economy, based on a dozen Principles focused on four areas: labour relations, human rights, anti-corruption and the environment.

One of the most important legal tools worldwide in the fight against CC is the Kyoto Protocol (KP) that was celebrated in 1997 and in which industrialized countries agree to reduce their emissions of some greenhouse gases (GHG) responsible for global warming. The KP establishes several tools to reduce the consequences of GHG emissions such as flexibility mechanisms (clean development and joint investment plans), the emission permit markets among industrialized countries or the advance of sinks and absorbers of these gases.

In 2008, the International Forum on Education for Sustainable Development was held in Tokyo and, in 2009, the UNESCO World Conference on Education for Sustainable Development (ESD) in Bonn, Germany. Among the calls to action issued in its statement, the following should be highlighted:

- Take advantage of the expertise available in the UN system to advance ESD in key conventions on sustainable development; for example, those focused on biodiversity, climate change, desertification and intangible cultural heritage.

- Intensify efforts in education and training systems, in order to face fundamental and urgent challenges in terms of sustainability, such as climate change and food and water security, by developing specific action plans and / or programs in the context of the DESD of the United Nations and within the framework of partnerships.

The first universal and legally binding agreement on CC is the Paris Agreement, at the UN climate conference (COP 21) with 195 countries involved. The EU formally confirmed this pact in 2016. To enter into force, 55 countries representing approximately 55 % of global emissions had to deposit their ratification tools. Most of the countries of the world pledged at the 21st Conference the 2015 Paris Agreement to control environmental degradation. The priority objective is to reinforce the CC threat by keeping the global average temperature increase lower than 2 degrees Celsius.

One of the latest events in the fight against CC was the Climate Action Summit at the United Nations headquarters in New York in 2019. It was a relevant event in which world leaders, civil society and the private sector intervened with the objective of increasing and lightening the multilateral process in the measures against this devastating problem.

As it has been seen, the concern about the natural environment has been and continues to be enormous today, since it has been reaching a degree in which the environmental problem has to be placed among those most transcendent in the political agendas of all countries without delay, because degradation is increasing exponentially and seems to have no end if extreme measures are not taken.

Conceptual Approach

The term sustainability is considered a flexible and under construction concept that, over the years, has undergone specific changes and during the last three decades has been positioning itself in a relevant place in the socio-scientific context. Sustainability has been showing its ability to challenge the economic neoclassical approach to human development. For Zarta Ávila (2018, p. 1), *“the indiscriminate use of the term “sustainable” has generated an exhaustion of its initial meaning, losing it and making difficult to analyze it rigorously.”* This conceptualization continues to be accepted by many authors, since despite the quantity and heterogeneity of existing definitions, this one, in addition to being clear and concise, links two fundamental dimensions: on the one hand, the needs of society and, on the other hand, the biophysical limits of the earth. Both axioms are collected as essential premises for SD (Holden et al., 2014). For Zarta Ávila (2018) this definition warns that the generation that inhabits the earth must manage the resources that nature offers us so that the next generations can develop a standard of living with the same or even improved opportunities. That is, it establishes a link through time, the relationship between intragenerational and intergenerational solidarity. This same author indicates that the concept of sustainability implies different factors, among which the following stand out:

- The limitedness of the planet and with the insufficiency and depletion of the earth's natural resources.
- Pollution.
- The exponential growth of the population.
- Clean production, whether from agriculture or industry.

It also points out that “*the effects of the interaction of these phenomena have several implications: on the one hand, natural resources, raw materials and energy used in production processes are exploited faster than they can be restored*” (p. 412).

For Vega Mora (2013) the definition of the Brundtland Report is one of the most recognized since it makes it clear:

- The obvious urgency to conserve natural resources.
- Highlights the need to achieve collective social goals rather than individual ones.
- It assumes the existence of physical limits that make excessive growth impossible, without any type of restriction.
- It is inspired by intra and intergenerational solidarity.

Daly and Farley (2004) raise a definition in which a society based on sustainability is one in which:

- Resources do not have to be used at a rate higher than their regeneration rate;
- Non-renewable resources must be used at a lower rate than the human capital created can replace the lost natural capital;
- Pollutants are not emitted at a rate greater than the environmental system can absorb.

For Bustillo-García and Martínez-Dávila (2008) the concept changes its meaning and form based on the individual and the context used. The most important theoretical approaches addressed by SD are:

- Neoaustriaca-Temporal: theological succession of conscious adaptation and focused on the achievement of goals.
- Neoclassical-Balance: non-growing well-being, sustainable progress based on substitution and technology.
- Physical-Economic: integration of mitigation treatments, waste, product development and recycling.
- Biophysical-Energetic: evolution to energy systems that originate a minimum of polluting effects.
- Ecological-Evolutionary: they sustain the resilience of natural systems, observing margins for cycles and fluctuations.
- Systemic-Ecological: control of direct and indirect human consequences on ecosystems.
- Human ecology: restricted scale of the economy and population, consumption.

Table 1*Parallels of conventional development and sustainable development*

Conventional development	Sustainable development
1. Deregulated market: private capital.	1. Regulated market: share capital
2. Private, individual profit.	2. Private, individual profit.
3. Exchange value.	3. Exchange value.
4. Monoculture (external development).	4. Monoculture (external development).
5. Unique use of the agroecosystem.	5. Unique use of the agroecosystem.
6. Maximum tillage.	6. Maximum tillage.
7. Unsustainable production.	7. Unsustainable production.
8. Anthro-market centric approach.	8. Anthro-market-centric approach.
9. The commodified nature.	9. The commodified nature.
10. Atomistics: separate things.	10. Atomistics: separate things.
11. Denatures society.	11. Denatures society.
12. De-socialize nature.	12. De-socialize nature.
13. Natural resources: fetishist vision.	13. Natural resources: fetishist vision. Conventional.

Note. From Norgaard (1996) in: Martínez Castillo and Martínez Chaves (2016, p. 126).

Currently, it is essential to change the current development model into one that takes the human being and the planet on the path of SD, inclusive, with long-term objectives and focusing on reducing economic and social differences and that enables an ecological Distribution with an Environmental Education (EA) that provides capacity and critical thinking to the citizen's decision to be part of a sustainability project (Aznar Minguet et al., 2017).

RESULTS AND DISCUSSION

The study of SD must be carried out from a holistic and systemic perspective, with the aim of approaching it as a whole that is greater than the sum of its parts, and where its three dimensions (economic, social and environmental) are interrelated. Therefore, the conceptualization of the SD is in permanent progress and application and its proposals should guide the design and implementation of public policies.

Economic Dimension

The traditional approach to DS has always minimized environmental factors. As the human being continues with its activities, resources, renewable or not, are being depleted and, consequently, the impact on the environment is negative. The economic dimension has been

established both by the technological, scientific and productive models, as well as by the energy, productive, technological and financial infrastructures. Economic progress aims to create a maximum flow of income in terms of rational use and efficiency. From this perspective, the main concern is linked to how countries develop their economies. Rapid economic growth is evident, with the pursuit of maximum benefits, specifically in developed countries, creating a heavy load on the planet's capacity, which it cannot bear. Economic growth based on SD must be such that the environmental impact is limited. Development must be understood as a multidimensional process, which implies relevant changes in national institutions, social structures and citizens' attitudes, with the aim of guaranteeing a balanced and sustainable economic environment, reducing inequality and eradicating poverty (Stefanescu et al., 2009).

Environmental Dimension

As Tábara (2001) points out, studies about concern for the environment, behaviours towards it and its processes of change have been increasing over the years. The data resulting from these studies confirm the progressive sensitivity towards the environment (Almeida et al., 2018). In other words, a gradual attachment to the economic, social and political debate and dialogue is being created due to the gradual concern of society towards sustainability and socio-environmental problems (Anghel et al., 2014; López et al., 2018).

This dimension recognizes that non-renewable resources are limited and renewable resources have a production and reproduction cycle that does not correspond to market demand, resulting in their overexploitation to later return waste from production and consumption processes to a depleted natural system. And, although the Environmental Kuznets Curve (CAK), which explains the association between economic growth and environmental impact, establishes that environmental damage increases according to the development of the country until reaching a degree in which the situation becomes an inverse relationship in which a higher level of development implies a lower volume of emissions, it has been shown that, empirically, this hypothesis is far from reality and it is even contradictory.

Finally, it should be noted that sustainability from this approach implies the implementation of the so-called Circular Economy (CE), which implies the closing of cycles as it happens in nature itself and its objective is to establish appropriate productive systems to use the maximum possible of renewable resources and minimize waste as much as possible through biological and technical cycles.

Social Dimension

With the continuous advance of the SD concept, the social dimension is involved, which requires the full participation of all citizens in the formulation, application and evaluation of sustainable development the decision-making process that establishes the functioning and well-being of society. In the words of Redclift (1995):

Management and environmental conflicts are related to two processes: the dominance of a group of people over other groups and of people over nature. It is not surprising that the development or continuation of more sustainable livelihood strategies has important consequences for understandings of power between groups of people and for the environment itself. (pp 51-52)

The social dimension of SD includes the social and cultural factor, which notably intervene in the development of communities. The results of this dimension go through eradicating poverty and satisfying the fundamental needs of the human being. This dimension must be linked to economic progress, since it is of little use to have individuals duly prepared in the various professions, techniques or specialities, without providing sources of work where they can develop as people and assert their dignity and, in addition, satisfy their own needs and generate benefits for society through decent and equitably paid work.

The concept of equity (goal 10 of the SDGs) is implicit in this dimension and it is a principle widely discussed in the literature, both from theory and from its empirical manifestation (Castellanos Cereceda et al., 2016). This principle is based on equal access to existing resources on the planet and has been focused within the context of SD, basically on its distributive consequences, which have especially affected those people who suffer from social exclusion. That is why equity is shown as a fundamental element of environmental policies, so that any policy implemented by governments to reduce the damage to the environment would have to be assessed for its distributional effects (López, 2014; Silvestre & Tirca, 2019).

There are three types of equity:

- Intergenerational equity is the first type and corresponds to the definition of SD raised in the Brundtland Report. It implies considering in the current economic development costs the demand of future generations.
- Intragenerational equity corresponds to the second type and involves including the most disadvantaged groups up to now, such as people with functional diversity or women, in economic, social and environmental decision-making.
- Finally, the third type is equity between countries and, for this, it is essential to transform the abuses of power by the first world countries over the underdeveloped ones. It is about satisfying the fundamental needs of every human being and in order to carry out this objective it is of the utmost importance to give much more relevance to the underprivileged than has been given so far.

For Hák, et al. (2016), the basic principles of SD appeal to the equitable distribution of the planet's natural resources, which are not eternal. The objective is to reduce the consequences that this limit and scarcity implies on people and on social entities and structures. From current ecological economics, it has been pointed out that the lack of equity is the reason for the degradation of the environment and, consequently, that social equality would not only be relevant as an end in itself, but also as a means to the conservation of the environment. Justice and social equity are among the essential principles established in the SD concept set out in the Brundtland Report, as well as in different Conferences, among which the Stockholm and Rio conferences stand out due to their greater impact worldwide. The social approach has been present, albeit to a greater or lesser degree.

To achieve SD, a balance between the aforementioned dimensions is essential, without one imperiously imposing itself on the others. That is why it is necessary to reach a balance between human being activities, the use of the resources found in the environment, the economic development that natural capital contributes and the defence of the environment and, all this, in a context of equity and balance. This can be achieved by maintaining and valuing environmental

services and conserving the planet's natural heritage for the sake of future generations, as today's society has a responsibility to leave them a better planet. To progress with this objective, heterogeneous tools are available such as Public Policies, which are presented through environmental management and legislation in different organizations, the promotion of clean and renewable industries and technologies and the focus of the States and individuals towards the use of what is sustainable (Holden et al., 2014).

In a way, CC is an emergency of enormous and multidimensional proportions affecting governments, organizations, global agencies, and entire societies. It is a problem of huge depth and resonance. Many experts on the subject, the majority of citizens and political actors recognize the magnitude of the problem and the urgency of actions to alleviate it (Valencia Hernández et al., 2015). CC has become one of the worst humanitarian disasters for the future, with causes and effects on a global scale, and all of this has resulted in it becoming one of the greatest and most relevant challenges of the present century (CEPAL, 2018). For González Alcaraz (2015) it is:

A process of planetary scope linked to the alteration of the chemical composition of the atmosphere and the consequent rise in average temperatures (global warming), which has triggered a process of changes in the climate system [...]. In essence, it is a complex problem whose causes go back to the western civilization and industrialization process, and whose socio-environmental effects or consequences are not immediate or identifiable in isolation, but rather in series and observations over periods of time that include decades or centuries. (p. 310)

The United Nations (1992, p.7) defines it as “*climate change attributed directly or indirectly to human activity that alters the composition of the world atmosphere and that adds to the natural variability of the climate observed during comparable periods of time*”. This conceptualization includes the causes whose origin is anthropogenic and not the natural ones that originate the climate swaps. Human causes have been analysed in detail by multiple entities, organizations and international forums such as the United Nations agency responsible for food and agriculture issues (FAO), the Intergovernmental Group on Climate Change (IPCC) or the Kyoto Protocol, as noted. These organizations consider that the GHG emission is the main reason for the CC.

The meteorological variations, the alteration of the biological and socioeconomic systems, the degradation of the ecosystems, the irregularities of the precipitations or the abrupt changes of temperature (Upadhyay, 2020), in sum the CC is only one more proof of the State of the world in the present. All this has caused heterogeneous consequences in different natural, human and hydrological systems and, in many parts of the planet, there have been thawing of high regions, extinctions of species, changes in ecosystems or negative impacts of crops, among others.

This is why global warming should be a priority for governments (Rasiah et al., 2018). Consequently, for these authors, it is essential to mitigate global warming and address the CC problem by shaping the global initiatives that have took place and are taking place in this regard.

The referred Kyoto Protocol:

- Affirms the existence of an evident risk that the climate changes hastily in the next decades and centuries, with the effects of CC being unpredictable. To reduce this risk, it

sets GHG concentrations to a level that stops human interference in the climate system. This must be achieved in a certain time so that, on the one hand, it is feasible for ecosystems to adapt naturally to CC and, on the other hand, to have the certainty that food production is not endangered and to make viable sustainable economic development (Tacon et al., 2022).

- Establishes a generic framework and actions to agree on essential concrete measures and promote studies, research and analysis on CC.
- Estimates that the CC problem increases inequality between North-South countries, since the most industrialized countries have been the main responsible for the increase in GHG. Therefore, it attributes to first world countries most of the bill to pay, either through technology transfers or contributions to carbon funds. In unison, it recognizes the vulnerability of the consequences of CC in developing countries, as well as their right to economic development.
- Recognizes that as a result of all the aforementioned, the traditional development model must face sustainability, for which it encourages the promotion and sharing of practical environmental knowledge, technologies and the public dissemination of information about CC.

The signed Protocol entered into force in 2005 and the intention to promote SD by restricting and reducing GHG emissions, specifies the following:

- Among the GHG it establishes as main:
 - Carbon Dioxide (CO₂)
 - Methane (CH₄) Nitrous Oxide (N₂O)
 - Hydrofluorocarbons (HFCs)
 - Perfluorocarbons (PFCs)
 - Sulphur Hexafluoride (SF₆)

The consequences of each of these gases on CC are different, although CO₂ is the most relevant.

- The report affirms that GHG emission reductions must be verifiable, an aspect that implies that all countries must have an efficient national system to evaluate emissions and ratify the reductions.

For Zhenmin and Espinosa (2019), the Paris Agreement and the Sendai Framework for Disaster Risk Reduction 2015-2030 share the objective of establishing a more resilient, healthy, sustainable and productive context for present and future generations. Countries need to address the huge CC problem in order to accelerate SD. Furthermore, CC is the environmental problem that is causing more refugees and will continue to do so worldwide.

The effects of floods and increasingly intense and repeated rainy seasons are factors that affect millions of people living in coastal areas who are forced to move due to rising sea levels. The Sendai Framework for Disaster Risk Reduction 2015-2030 tries to fulfil and renew the debt of the States to face the reduction of the dangers of disasters, establishing

as a basis the SD and the eradication of poverty as two elements that have huge consequences on the vulnerability of peoples to threats from the natural environment. The following priority areas are those that should focus on disaster risk reduction efforts, according to said Framework, between 2015 and 2030.

These are:

“Priority 1: Understand disaster risk.

Priority 2: Strengthen disaster risk governance to manage disaster risk.

Priority 3: Invest in disaster risk reduction for resilience.

Priority 4: Increase disaster preparedness for an effective response and to better rebuild in the areas of recovery, rehabilitation and reconstruction.” (p.14).

The Paris Agreement covers the following areas considered essential for the achievement of its objectives:

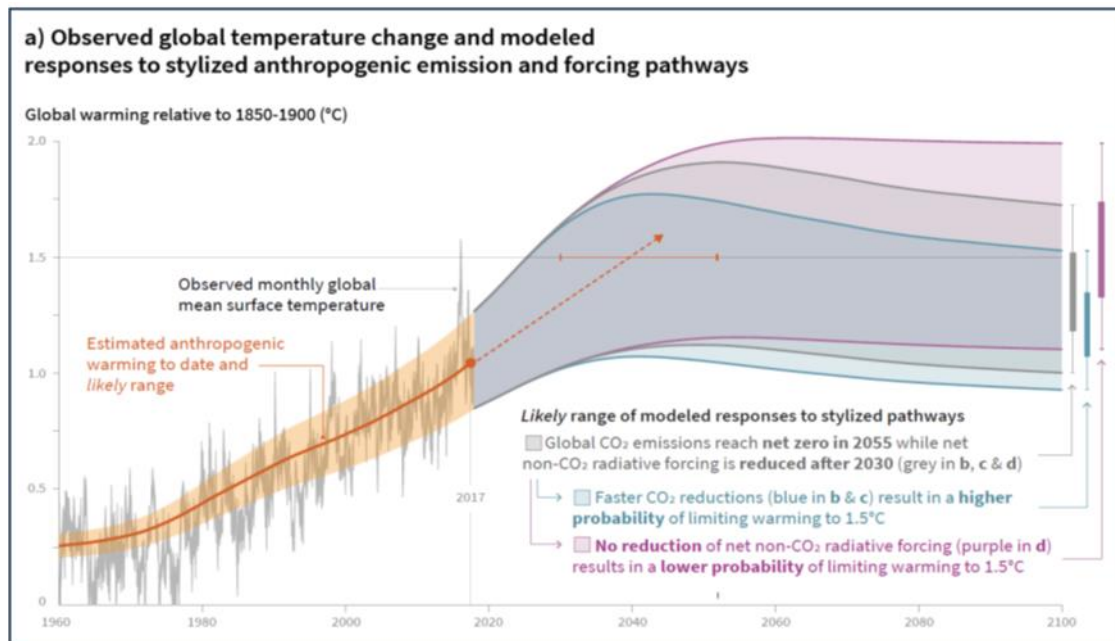
- Mitigation: reduce emissions quickly enough and thus achieve the temperature target.
- A method of transparent and global balance; an accounting for climate action.
- Adaptation: strengthen the ability of countries to cope with climate impacts.
- Loss and damage: strengthen the ability to recover from climatic impacts.
- Support: includes financial support for countries to create clean and resilient futures.

In 1988, the Report of the United Nations Intergovernmental Panel on Climate Change (IPCC), a body of the World Meteorological Organization (WMO) and UNEP, was founded. Today, the IPCC has the participation of scientists from almost 200 member states and, therefore, it can be asserted that there is an extended agreement within the world scientific community that these changes are caused by global warming, derived from the increase of the planet's temperature as a result of the so-called “greenhouse effect”. In the atmosphere, CO₂ concentrations have exceeded their highest level in the last 800 000 years (Teso et al., 2018).

In 2018, a report called “Global Warming 1.5°C” was published, which points to a set of CC impacts that could be avoided by limiting the planet's average temperature to + 1.5°C instead of 2°C, or more. This would reduce, according to experts, the problematic consequences on ecosystems and on human health and well-being, in addition to moving us towards the achievement of the SDGs. As can be seen in the following figure, if the current level of emissions continues, the 1.5°C line will have been exceeded in 2040. Although if zero emissions are achieved as of 2030, it would mean not exceeding 1.5°C in the year 2100.

Figure 1

Changes in global temperature and the three response contexts projected by climate models



Note. Source: IPCC (2018).

Ultimately, CC influences fundamental human rights, including the right to life, food, health, an adequate standard of living and culture, and education, among other factors. It can also undermine a country's ability to achieve SD, by weakening the sustainability of livelihoods, especially rural livelihoods (Lofts et al., 2017).

CONCLUSIONS

The worldwide emergence of new SD planning and coordinating institutions and bodies represents promising progress. SD is an urgent matter that requires immediate action and change on the part of industry, governments and society as a whole. SD constitutes a set of restrictions on human behaviour, including limitations on economic activity. It is essential to find a balance between social, economic and environmental objectives and, with this, satisfy human needs, guarantee social equity and respect the limits of the natural environment (Kaul et al., 2022).

The objective of the SD is that the human footprint does not exceed the thresholds that are harmful to it, with the CC estimated as the main element of impact. In various political statements, in scientific evidence, in environmental groups and associations or in the awareness of the dangers of the economic world, it is known that CC is one of the main global challenges.

Regarding the SDGs, it is necessary to reflect on the thinking of several authors when they point out that with such an abundance of objectives and goals, interaction is inevitable. That is, the possible interactions range from cancellation (the achievement of one SDG makes the development of the other less or less feasible) to invisibility (success in one SDG depends on the success of another). Along the same lines, others indicate that while progress has been made towards the SDGs, interactions between them remain limited (Nilsson et al., 2016; Allen et al., 2018).

One of the future proposals is that large companies continue to maximize their interest in making their business activities known in terms of their economic, environmental and social impact. Interest in environmental issues has been increasing in recent years, allowing companies to manage issues related to their environmental aspects (Murillo-Avalos et al., 2020; Bux et al., 2020).

Another highly relevant approach to obtaining an ED is the one referred to environmental justice. It is an international activist movement that was born in the United States in the 1970s, as a result of Afro-American struggles against spatial, racial and environmental discrimination. The premise of this theory is that environmental damage is unevenly distributed in racial, geographical and social class terms. A central element of environmental justice is that as a social movement it demands greater equanimity, inclusion and recognition of those who are placed in situations of environmental disadvantage with respect to how the environment is used and managed (Klemmer and McNamara, 2020). To achieve social justice, it is essential that activists have access to information and environmental participation and in addition they can mediate, through environmental management and sustainable conservation of the natural environment, as affected ecological actors.

It should not be forgotten how the latest crisis caused by COVID-19 has led nations to reposition themselves in terms of SD (Clemente-Suárez et al., 2022). And, so the international data show it clearly and concisely (Sachs et al., 2022).

Finally, note that for some the balance between nature and human beings has been unravelling. First, because the humans have moved away from an identity of belonging to the natural environment that surrounds them and value it. And furthermore, because “the rationality of the modern world” leads directly to a devastation of nature and degradation of humanity for the sake of progress (Lastra Romero & Ramírez Pachón, 2013). However, and as it has been seen, in recent years a series of global commitments and responsibilities have been established focused on putting human development on a more sustainable path. It is true that the damage caused to the Earth and its devastating effects will be very difficult to alleviate, but it is the responsibility of everyone to solve this problem, recovering environmental and nature trust and possess a general feeling of caring for our planet.

AUTHORS' CONTRIBUTION

José Luis Bustelo García: Conceptualization, data curation, formal analysis, research, methodology, project administration, writing - original draft.

Albert-P. Miró-Pérez: Supervision, validation, resources, visualization, editing, writing - review and editing.

FUNDING SOURCE

Own resources were used to finance the study.

CONFLICTS OF INTEREST

The authors express that there are no conflicts of interest.

ACKNOWLEDGMENT

Does not apply.

REVIEW PROCESS

This study has been double-blind, peer-reviewed.

STATEMENT OF DATA AVAILABILITY

The data is housed together with the other files of this article, it can also be requested from the corresponding author.

REFERENCES

- Allen, C., Metternicht, G., & Wiedmann, T. (2018). Initial progress in implementing the Sustainable Development Goals (SDGs): A review of evidence from countries. *Sustainability science*, 13(5), 1453-1467. <https://doi.org/10.1007/s11625-018-0572-3>
- Almeida, S. C., Moore, D., & Barnes, M. (2018). Teacher identities as key to environmental education for sustainability implementation: A study from Australia. *Australian Journal of Environmental Education*, 34(3), 228-243. <https://doi.org/10.1017/aee.2018.40>
- Anghel, A. G., Drăghicescu, L. M., Cristea, G. C., Gorghiu, G., Gorghiu, L. M., & Petrescu, A. M. (2014). The social knowledge—a goal of the social sustainable development. *Procedia-Social and Behavioral Sciences*, 149, 43-49. <https://doi.org/10.1016/j.sbspro.2014.08.187>
- Awais, M., Samin, T., Gulzar, M.A., & Hwang, J. (2019). The Sustainable Development of the China Pakistan Economic Corridor: Synergy among Economic, Social, and Environmental Sustainability. *Sustainability*, 11(24), 7044. <https://doi.org/10.3390/su11247044>
- Aznar Minguet, P., Ull, M. A., Martínez-Agut, M.P., & Piñero, A. (2017). Evaluar para transformar: Evaluación de la docencia universitaria bajo el prisma de Sostenibilidad. *Enseñanza de las Ciencias*, 35(1), 5-27. <https://doi.org/10.5565/rev/ensciencias.2112>
- Bustillo-García, L., & Martínez-Dávila, J. P. (2008). Los enfoques del desarrollo sustentable. *Revista Interciencia*, 33(5), 389-395. http://ve.scielo.org/scielo.php?pid=S0378-18442008000500014&script=sci_arttext
- Bux, H., Zhang, Z., & Ahmad, N. (2020). Promoting sustainability through corporate social responsibility implementation in the manufacturing industry: An empirical analysis of barriers using the ISM-MICMAC approach. *Corporate Social Responsibility and Environmental Management*, 27(4), 1729–1748. <https://doi.org/10.1002/csr.1920>
- Bybee, R. W. (1991). Planet Earth in Crisis: How Should Science Educators Respond? *The American Biology Teacher*, 53(3), 146-153. <https://doi.org/10.2307/4449248>
- Castellanos Cereceda, R., Ramírez Hernández, S., & Orozco Rivera, E. D. (2016). Los Objetivos de Desarrollo Sostenible y los retos para su implementación. *Revista Pluralidad y Consenso*, 5(26). <http://www.revista.ibd.senado.gob.mx/index.php/PluralidadyConsenso/article/viewFile/295/298>
- CEPAL (2018). *La economía del cambio climático en América Latina y el Caribe*. Síntesis 2016: una visión gráfica. <https://repositorio.cepal.org/handle/11362/42228>
- Clemente-Suárez, V. J., Rodríguez-Besteiro, S., Cabello-Eras, J. J., Bustamante-Sanchez, A., Navarro-Jiménez, E., Donoso-Gonzalez, M., Beltrán-Velasco, A. I., & Tornero-Aguilera,

- J. F. (2022). Sustainable Development Goals in the COVID-19 Pandemic: A Narrative Review. *Sustainability*, 14(13), 7726. <https://doi.org/10.3390/su14137726>
- Daly, H. E., & Farley, J. (2004). *Ecological Economics: Principles and Applications*. Island Press.
- European Commission (1996). *Ciudades europeas sostenibles*.
- Fuso Nerini, F., Sovacool, B., Hughes, N., Cozzi, L., Cosgrave, E., Howells, M., Tavoni, M., Tomei, J., Zerriffi, H., & Milligan, B. (2019). Connecting climate action with other Sustainable Development Goals. *Nature Sustainability*, 2(8), 674-680. <https://doi.org/10.1038/s41893-019-0334-y>
- Gil Pérez, D., & Vilches, A. (2019). La comprensión e impulso de la Sostenibilidad: un requisito imprescindible para una acción educativa y ciudadana eficaz. *Revista de Educación Ambiental y Sostenibilidad*, 1(2), 2101. <https://revistas.uca.es/index.php/REAyS/article/view/5320>
- González Alcaraz, L. (2015). Causas, consecuencias y “soluciones”. Ciencia y cambio climático en el discurso informativo de Clarín. *La Trama de La Comunicación*, 19, 307-328. <https://www.redalyc.org/articulo.oa?id=323936839017>
- Hák, T., Janoušková, S., & Moldan, B. (2016). Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators*, 60, 565-573. <https://doi.org/10.1016/j.ecolind.2015.08.003>
- Holden, E., Linnerud, K., & Banister, D. (2014). Sustainable Development: our common future revisited. *Global Environmental Change*, 26, 130-139. <https://doi.org/10.1016/j.gloenvcha.2014.04.006>
- IPCC (2018). Global Warming of 1.5 °C. IPCC special report on the impacts of global Warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. <https://www.ipcc.ch/sr15/>
- Iturralde Durán, C. A. (2019). Los paradigmas del desarrollo y su evolución: del enfoque económico al multidisciplinario. *Retos Revista de Ciencias de la Administración y Economía*, 9(17), 7-23. <https://doi.org/10.17163/ret.n17.2019.01>
- Kaul, S., Akbulut, B., Demaria, F., & Gerber, J. F. (2022). Alternatives to sustainable development: what can we learn from the pluriverse in practice? *Sustainability Science*, 17(4), 1149-1158. <https://doi.org/10.1007/s11625-022-01210-2>
- Lastra Romero, D. E., & Ramírez Pachón, A. G. (2013). La enseñanza ambiental como propuesta de formación integral. *Tecné Epistemé y Didaxis: TED*, (34), 71-87. <https://doi.org/10.17227/01213814.34ted70.90>
- Lofts, K., Shamin, S., Zaman, S. T., & Kibugi, R. (2017). Brief on Sustainable Development Goal 13 on taking action on climate change and its impacts: Contributions of international law, policy and governance. *McGill Journal of Sustainable Development Law*, 13(1), 182-192.

- López, I. (2014). Justicia Ambiental. *EUNOMIA: Revista en Cultura de la Legalidad*, (6), 261-268. <https://e-revistas.uc3m.es/index.php/EUNOM/article/view/2214/1149>
- López, I., Arriaga, A., & Pardo, M. (2018). La dimensión social del concepto de desarrollo sostenible: ¿La eterna olvidada? *Revista Española de Sociología*, 27(1), 25-41. <https://doi.org/10.22325/fes/res.2018.2>
- Martínez Castillo, R., & Martínez Chaves, D. (2016). Perspectivas de la sustentabilidad: teoría y campos de análisis. *Pensamiento actual*, 16(26), 123-145. <https://doi.org/10.15517/pa.v16i26.25188>
- Murillo-Avalos, C. L., Cubilla-Montilla, M., Celestino Sánchez, M. Á., & Vicente-Galindo, P. (2020). What environmental social responsibility practices do large companies manage for sustainable development? *Corporate Social Responsibility and Environmental Management*, 28(1), 153-168. <https://doi.org/10.1002/csr.2039>
- Nilsson, M., Griggs, D., & Visbeck, M. (2016). Policy: map the interactions between Sustainable Development Goals. *Nature*, 534(7607), 320-322. <https://doi.org/10.1038/534320a>
- Rasiah, R., Kari, F., Sadoi, Y., & Mintz-Habib, N. (2018). Climate change and sustainable development issues: arguments and policy initiatives. *Journal of the Asia Pacific Economy*, 23(2), 187-194. <https://doi.org/10.1080/13547860.2018.1442140>
- Redclift, M. (1995). Desarrollo sostenible: ampliación del alcance del debate. En A. Cadenas Marín (Ed.), *Agricultura y desarrollo sostenible* (pp. 39-70). Ministerio de Agricultura, Pesca y Alimentación. https://www.mapa.gob.es/ministerio/pags/Biblioteca/fondo/pdf/569_all.pdf
- Sachs, J., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2022). *Sustainable development report 2022*. Cambridge University Press.
- Silvestre, B. S., & Tirca, D. M. (2019). Innovations for sustainable development: Moving toward a sustainable future. *Journal of Cleaner Production*, 208, 325-332. <https://doi.org/10.1016/j.jclepro.2018.09.244>
- Stefanescu, D., Herman, E., & Georgescu, A.M., (2009). *Sustainable development and Business Opportunities*. Series: European Entrepreneurship Education.
- Tábara, J. D. (2001). La medida de la percepción social del medio ambiente. Una revisión de las aportaciones realizadas por la sociología. *Revista Internacional de Sociología*, 59(28), 127-171. <https://core.ac.uk/download/pdf/229425207.pdf>
- Tacon, A. G. J., Metian, M., & McNevin, A. A. (2022). Future feeds: suggested guidelines for sustainable development. *Reviews in Fisheries Science & Aquaculture*, 30(2), 135- 142. <https://doi.org/10.1080/23308249.2020.1860474>
- Teso Alonso, G., Fernández-Reyes, R., Gaitán Moya, J. A., Lozano Ascencio, C., & Piñuel Raigada, J. L. (2018). *Comunicación para la sostenibilidad: el cambio climático en los medios*. Fundación Alternativas.
- United Nations (1992). *Convención Marco de las Naciones Unidas sobre el Cambio Climático*.

- Valencia Hernández, J. G., Aguirre Fajardo, A. M., & Ríos Sarmiento, M. (2015). Desafíos de la justicia ambiental y el acceso a la justicia ambiental en el desplazamiento ambiental por efectos asociados al cambio climático. *Revista Luna Azul*, (41), 323-347. <https://revistasojs.ucaldas.edu.co/index.php/lunazul/article/view/1279>
- Vega Mora, L. (2013). Dimensión Ambiental, Desarrollo Sostenible y Sostenibilidad Ambiental del Desarrollo. Eleventh LACCEI Latin American and Caribbean Conference for Engineering and Technology (LACCEI'2013). "Innovation in Engineering, Technology and Education for Competitiveness and Prosperity".
- Zarta Ávila, P. (2018). La sustentabilidad o sostenibilidad: un concepto poderoso para la humanidad. *Tabula Rasa*, 28, 409-423. <https://doi.org/10.25058/20112742.n28.18>
- Zhenmin, L., & Espinosa, P. (2019). Tackling climate change to accelerate sustainable development. *Nature Climate Change*, 9(7), 494–496. <https://doi.org/10.1038/s41558-019-0519-4>

Copyright (c) 2023 José Luis Bustelo Gracia and Albert-P. Miró-Pérez