

Godin, Antoine; David, Anda; Lecuyer, Oskar; Leyronas, Stéphanie

## Article

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# A strong sustainability approach to development trajectories

Antoine Godin,\* Anda David, Oskar Lecuyer and Stéphanie Leyronas  
Agence Française de Développement (AFD), Paris, France

*Sustainable development trajectories are at the heart of many policy debates: CDN and Net Zero trajectories, just transition, climate justice, biodiversity inclusion, etc. These trajectories mostly propose a nexus approach combining climate, ecological, social, technological, economic, and political aspects. In this paper, the authors propose a suite of three guiding principles, inspired by a strong sustainability approach, to construct sustainable trajectories: (i) the a priori refutation of substitutability; (ii) the need to construct multidimensional diagnostics and analyses highlighting synergies and tensions between different indicators; and (iii) the recognition of the importance of building a social construct on the desirable 'good condition' and on the trajectories to reach it. They then show how these principles can be applied in different disciplines and help policymakers in constructing development trajectories.*

**Keywords:** sustainable development, development trajectories, strong sustainability

**JEL codes:** Q01, O20, Q57

## 1 INTRODUCTION

Fifty years after the 'Limits to growth' (Meadows et al. 1972), the IPCC (2022) still feels the need to warn about the need to transit to a low-carbon and resilient economy. In fact, according to their latest report, we have three years to act. Similarly, the IPBES (2019) raises alarms on the worldwide deterioration of the biosphere and of its vital contributions to people. At the same time, the interactions between ecological, social, and economic aspects are getting more and more traction in academic and public policy debates. The IPCC started to include inequality aspects in its report. The Declaration for a Just Transition, adopted at COP26, recognizes the importance of developing climate actions that are fully inclusive and benefit the most vulnerable.

The broad vision of sustainable development as portrayed in the sustainable development goals (SDGs) remains widely recognized. The concept of sustainable development, which was thought to be outdated, is thus coming back to the forefront. In this paper, we argue that the strong sustainability approach, that is, an approach that *a priori* refutes the substitutability between different types of capital (that is, natural, social, and manufactured), to sustainable development can shed new light on the construction of development trajectories. The definition of strong sustainability remains, however, fuzzy, with different stances on the degree of substitutability between the different types of capital for example. We thus propose a set of three guiding principles in order to construct strong sustainability trajectories, namely the

\* Corresponding author: 5 rue Roland-Barthes, 75012 Paris, France; email: godina@afd.fr.

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*a priori* refutation of substitutability, the need to construct science-based multidimensional analyses and diagnostics, and finally the recognition that the ‘good condition’ towards which a society decides to go is a social construct. We then show how these principles can be applied with different examples.

The remainder of the paper is organized as follows: Section 2 traces back the emergence and development of sustainable development; Section 3 discusses the concepts of weak and strong sustainability; Section 4 proposes our guiding principles for the emergence of strong sustainability and highlights their interest through various examples; and Section 5 concludes.

## 2 SUSTAINABLE DEVELOPMENT

### 2.1 Concept emergence and development

The Brundtland Report (WCED 1987: 40) defined sustainable development as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs.’ It is, however, a political notion, not a scientific one. It incorporates a principle of intergenerational justice, onto which has been grafted an objective of solidarity between people or territories (whose ‘needs’ would not be met). It is therefore more a development framework, and the environment only appears as a limiting factor in the future: critical resources must be preserved for the future and to ensure that the capacity of the environment can support the increase in living standards.

The report points out the limits of growth patterns and highlights how environmental constraints have to be added and thus current trends have to be curbed (Tichit 2005). Incorporating the environment will thus redirect development patterns towards sustainable ones, hence accommodating socioeconomic development and environmental sustainability. The report insists in particular on North/South relations and issues such as the fight against poverty, women’s rights, and social equity.

Since the Brundtland Report, the concept of sustainable development has spread and has retained an important place in the design of public policies. In 1992, it brought together, at the United Nations Conference on Environment and Development – the Rio Summit – the largest gathering of heads of state and government at the time. Conventions on climate change and biodiversity were concluded, and Agenda 21, a global program for sustainable development, was adopted. The UN Commission on Sustainable Development was established to advise, monitor, and coordinate the implementation of this agenda.

In 1997, a special mission of the UN General Assembly met to assess the implementation of the resolutions taken at the Rio Conference. This ‘Rio+5’ meeting stressed the mixed results observed, as the 1990s had indeed seen many economic crises in developing and emerging economies, further exacerbating inequalities between countries and shifting the light away from environmental concerns. The story is rather different for developed economies with many examples of implementations of programs, policies, and strategies such as the strategy of sustainable development adopted by the European Union in 2001 and revised in 2006.

In 2012, the Rio+20 Conference, also in Rio de Janeiro, set in motion the process that was to lead to the adoption in 2015 of the SDGs, a central element of the United Nations 2030 Agenda. Its universal reach, compared with previous initiatives such as the Millennium Development Goals, not only recognized the common challenges such as climate change and the rise of inequality, but also highlighted that high-income countries are increasingly faced with similar problems to low- and middle-income ones and need to rethink their development paths.

## 2.2 Several definitions of sustainable development

In spite of the consensus immediately reached worldwide on the definition of sustainable development, its practical application remains an enigma, as emphasized by Jacques Theys (2002). It is by construction impossible to know what the needs of future generations will be, what limits they will face, and more generally to find simple criteria for arbitrage between generations or dimensions of development.

Jacobs (1999) argued that sustainable development, like other political terms such as democracy, freedom, and social justice, has two levels of meaning: a core of fundamental ideas that elicit consensus about their relevance to the concept, and a secondary set of contested interpretations of those ideas. In his core set of ideas fundamental to sustainable development, the author lists:

- Environment–economy integration: the requirement in policymaking to consider the economy and the environment together.
- The future: the requirement in policymaking to consider the impact of current activities on future generations.
- Environmental protection: the obligation to reduce the depletion and degradation of environmental resources.
- Equity: the requirement to seek social justice within and between generations.
- Quality of life: the recognition that the quality of human life is not only material and a function of economic growth.
- Participation: the requirement to allow people to be involved in the decisions and processes that affect their lives.

One can clearly see two guiding principles behind these core ideas: multidimensional analysis and the social construction of a final objective. The multidimensional nature is perceived along different axes: multidisciplinary perspectives (for example, environmental, social, economic) with multidimensional indicators (for example, within different ecological footprints such a carbon, land-use, or water use), different time horizons (infra- and inter-generational), and different geographical and spatial considerations (local, national, international, or poly-centric). The last idea of Jacobs stresses the importance of participatory approaches to construct the final objective of sustainable development.

## 2.3 Current debates

Sustainable development remains criticized for its rather fuzzy nature (Chartier 2004). Is it only an *operator of neutralization of conflicts* (Krieg-Planque 2010), allowing conciliating different orthogonal objectives under a branding, or can it lead to transformative processes and deliver on its promises? The literature on the interaction between SDGs and their targets highlights the importance of having a systemic and integrated approach: see Pradhan et al. (2017), Pham-Truffert et al. (2020), and Swain/Ranganathan (2021), among many others. Most papers insist that synergies among SDGs are more important than negative feedbacks between them. It is, however, interesting to note that most of the negatively impacted SDGs by the positive development of other SDGs are within the environmental range (SDGs 11–15, that is: sustainable cities and communities, responsible consumption and production, climate action, life below water, and life on land; for more information, see United Nations General Assembly 2015), and that the strongest synergies lie mostly within non-environmental SDGs. For example, Pradhan et al. (2017) show that within the top ten synergies only one is related to environmental SDGs (11 and 13 reinforcing each other), while all of the top ten trade-offs are connected to one or two environmental SDGs.

Some of the trade-offs between targets of SDGs relate to historical non-sustainable development trajectories where social and human development are correlated with a larger environmental footprint. Addressing these trade-offs while leveraging on the synergies is thus crucial. One sees that the economic part of sustainable development is often predominant, leading sometimes to positive impacts on social sustainability when synergies exist.

The environmental aspects and the definition of environmental sustainability have developed their own path via the process of IPCC and IPBES. Accommodating economic and climate sustainability is, however, a complex exercise with tensions between what is considered as economically desirable and what is considered as sustainable from a climate-science perspective. A good example of these tensions relates to the economic consequences of climate change (what is often called damage functions). When conducting a survey, Nordhaus (1994) confronted academics from a different field with the question: ‘what would be the economic consequence of a rise of 3°C of average global temperature with respect to the pre-industrial period?’ Natural scientists gave answers 20 to 30 times higher than those of economists. (See Keen 2021 for a discussion on the discontent between economists and climate scientists.)

Recently, social sustainability has been brought back to light as a consequence of the increase of inequality. The combination of social and environmental sustainability is also in the forefront of the political debate, with calls for just transition or climate justice. The concept of just transition emerged in 1973 within the Petroleum, Chemical and Atomic Workers Union in North America, with the realization that the environmental and social crises are linked, and that the ecological transition must take into account the workers and the poorest populations. Adopted by a growing number of institutions, the concept is expanding, evolving, and taking on fundamentally different forms. From the 2000s onwards, the just transition gradually gained ground in international bodies up to the recent declaration for a just transition signed during COP26 (see, for example, ILO 2015; UNFCCC 2016). The concept of just transition is, however, used by different actors, with definitions ranging from ‘a simple demand for job creation in the green economy, to a radical critique of capitalism and the refusal of market solutions’ (Barca 2015: 392). One can synthesize the different positions into two extreme approaches: an ‘affirmative’ just transition, insofar as it seeks to redistribute environmental, economic, and social burdens within the given socioeconomic paradigm, and a ‘transformative’ just transition, insofar as it seeks to restructure the entire system of production and ownership with a view to democratizing the distribution of environmental risks and reintegrating the economy into society.

### 3 REVISITING SUSTAINABLE DEVELOPMENT UNDER THE LENS OF STRONG SUSTAINABILITY

Approaches trying to provide a nexus perspective conciliating two or more of the sustainability aspects (environmental, social, and economic) are currently widely debated. It is, however, useful to see how the economic literature has historically led to the emergence of two schools of sustainable development economics – neoclassical environmental economics and heterodox ecological economics – with competing interpretations of sustainability called ‘weak’ or ‘strong’ environmental sustainability.

#### 3.1 Economic growth models with natural resources

This distinction between environmental economics and ecological economics emerges initially in response to the seminal work, ‘Limits to growth,’ by Meadows et al. (1972).

The critiques to the Meadows report can be broadly categorized into three aspects (see Beckerman 1972; Nordhaus 1973; Solow 1974, among others):

1. lack of empirical considerations such as lack of empirical validation of most of the functional forms in the model, but also the fact that what is perceived as desirable from environmental scientists is not acceptable from an economic point of view and hence is not empirical or realistic;
2. lack of technological progress and hence a pessimistic point of view of future prospects; and
3. lack of market-based mechanisms and of substitutability between resources and capital, again leading to too-pessimistic perspectives.

Nonetheless, the 'Limits to growth' launched a literature on the inclusion of natural resources, mostly seen as exhaustible, in growth models; see Solow (1974), Stiglitz (1974), and Hartwick (2017), among others. At the core of these exercises lies the idea of dealing with scarcity and inter-generational compensation mechanisms, substituting the depleted natural resources with another manufactured capital. Most of the dynamics of these models respond to the limitations pointed out by Meadows et al. First, the environment was included as a capital stock, along with manufactured capital, and social or human capital. Second, capital in all its forms is perceived as the main source of income, and hence needs to be maintained. Third, inter-generational compensation rules allow the replacing of depleted natural capital. Fourth, technological progress allows the removing, at least partially, of the dependence to capital and is an important source of growth.

Substitution between the different forms of capital plays a crucial role in this literature. It is because elements of capital are substitutable that compensation mechanisms between generations are possible. This substitution can take place between different types of capital, within the same type of capital (between exhaustible and renewable resources), spatially (between stocks of the same type of capital in different places), or within time (see Tichit 2005 for more details). This form of sustainability was called 'weak' by its detractors.

### 3.1.1 *Critics of weak environmental sustainability*

Weak environmental sustainability is popular because it is in theory easy to put into practice. It underpins the widely used 'inclusive wealth' indicator, the 'new wealth of nations' (World Bank 2021), and the ecosystem services value accounts being pushed by the European Union, the United Nations, and the World Bank (European Commission 2020; United Nations 2021). It has a very optimistic view of sustainable development; see Victor (2020) for example. It underestimates ecological constraints because of the possible substitution between natural capital and manufactured capital, and trusts the market (prices allowing the adequate disposal of natural capital) and technology (productivity gain reducing the criticality of natural capital) to solve problems. It proposes a simple way of distributing the constraints between actors, at the level of countries, individuals, or generations. One important advantage is that it does not impose very strong constraints on present generations, except in terms of investment and taxation, and that it is therefore socially and economically acceptable, *a priori*. This, however, comes at the cost of a series of strong assumptions (Theys/Guimont 2019):

- the fact of being able to value natural capital via external effects;
- the right prices reflecting correctly externalities (that is, abolition of subsidies and inclusion of ecological taxation);
- continued growth in resource productivity, through significant investment in technology;

- the possibility of deploying efficient substitution strategies (for example, replacing non-renewable resources by renewables, products by services, etc.);
- the perfect knowledge of what constitutes natural capital;<sup>1</sup>
- a well-known yield of this natural capital (with a reliable monetary estimate); and
- the mathematical regularity of the accumulation or decumulation of this capital.

The problem is that it is based on largely invalidated hypotheses, and that the confidence it places in the market and in technology has long since been invalidated to a large extent by what is happening in the real world (Keen 2011):

- many of the functions performed by nature and even many of its components cannot be substituted or even evaluated;
- their substitution, if possible, requires the use of other resources;
- the truth of prices is not realized and they do not reflect long-term rarity;
- the fiscal corrections that should be made are not made; and
- the signals produced by the market do not allow for timely investments and changes in activity that would be necessary.

The result is that actions under such a conception are reduced to win–win or immediately acceptable strategies that do not ensure sustainable development for future generations at all. One could say that this is because effective market mechanisms are not in place. For the proponents of strong environmental sustainability, it is however an illusion to think that they could ever be (Victor 2020).

Victor (1991) notes that it has been recognized in economics since Marshall that manufactured capital is fundamentally different from environmental resources. The former is manufactured by humankind and can be reproduced in desired quantities; the latter is the ‘free gift of nature’ and in many categories its supply is fixed or limited. The destruction of manufactured capital is very rarely irreversible (it would only happen if the human capital, or knowledge, that created the manufactured capital had also been lost), whereas irreversibility, with processes such as species extinction, climate change, or even the burning of fossil fuels, is common in the consumption of natural capital. Moreover, to the extent that manufactured capital requires natural capital for its production and that its normal use always leads to a form of depreciation, it can never be a complete substitute for resources.

Strong environmental sustainability approaches will seek to dispense with these assumptions, and consider in particular that substitution possibilities are often limited.

### **3.2 Strong environmental sustainability and substitution between types of capital**

Strong environmental sustainability thus criticizes the mathematical assumptions imposed by weak environmental sustainability approaches. Proponents of this approach will consider that the substitutability between different types of capital, for example natural capital and manufactured capital, is severely limited by environmental characteristics such as irreversibility, uncertainty, and the existence of ‘critical’ components of natural capital, which

1. This item is different from the first one because of the uncertainty regarding natural capital. Many natural processes are highly uncertain, in the sense that the conditions for their continued existence and functioning are not always known. Natural capital, as considered for example by environmental accounting, thus sometimes simplifies the contributions from nature. La Notte (2022) discusses for instance how different frameworks for ecosystem services influence the overall valuation of natural capital.

make a unique contribution to well-being and to the possibility of life on earth. Clive Spash (2012) advocates the embedding of the economy in biophysical processes and stresses the importance of social factors to avoid ontological reductionism.<sup>2</sup>

### 3.2.1 *A whole range of nuances of strong environmental sustainability*

A whole spectrum of possible critical positions exists between proponents of perfect substitutability of capital and proponents of zero substitutability such as Herman Daly. For Daly (1992), the stock of natural capital must be kept constant, defining a 'conservationist' approach. This position thus proposes a hierarchical vision where economic and social concerns are secondary to environmental constraints.

Victor et al. (1998) identify the elements of natural capital, such as water, air, minerals, energy, space, or genetic material, that are essential for life as we know it. Some substitution of these essential elements by manufactured and human capital can be envisaged, but their total substitutability, as implied by weak environmental sustainability, seems unlikely, at least with current knowledge and technology. In fact, if the process of industrialization is considered as the application of human, social, and manufactured capital on natural capital to transform it into human and manufactured capital, it is possible to consider the current environmental problems as evidence that this substitutability is not complete.<sup>3</sup> Ekins (2003) distinguishes between critical capital whose destruction is irreversible and non-substitutable and non-critical capital whose potential degradation is reversible on a small scale and can be treated with traditional economic efficiency criteria.

There are different ways in which the criticality of natural capital can be assessed. Among the first to work on the topic, Pearce/Turner (1990) propose to set rules by broad categories (pollution, renewable, non-renewable, biodiversity, ...). Following this concept, Rockström et al. (2009) define global limits, based on nine earth processes (climate change, biodiversity loss, biogeochemical, ocean acidification, land use, freshwater, ozone depletion, atmospheric aerosols, and chemical pollution), which if transgressed would lead to dramatic impacts for life on earth.

On a different line, Hueting (1991) and others subsequently (for example, Ekins et al. 2003; Moldan et al. 2012; Häyhä et al. 2016) propose using sustainability norms, or, in other words, 'minimum safeguard norms,' or 'environmental sustainability standards.' Sustainability norms are broader than the planetary boundaries both in scope (some include social or economic aspects for example) and scale (the norms can be defined at very granular dimensions). From this perspective, environmental goods and services are no longer considered as natural capital, but as a collection of possible uses called 'environmental functions' (see De Groot 1992 for the first definition of environmental function). The use of one function leads to losses of environmental functions if it is at the detriment of another function or of itself. They then estimate sustainability costs based on preservation costs.

2. Spash (2012: 43) explains reductionism, citing Georgescu-Roegen: 'That elephants are constructed of physical and chemical components does not mean elephants' behaviour can be understood by analysis of or reduction to those components (Georgescu-Roegen 1979 [2009]: 109).' He thus argues that embedding economics within social sciences (and biological within physics) is required to understand planetary boundaries.

3. Of course, one could always argue that the fact that there has not been any substitutability in the past does not mean that substitutability is impossible. Evidence regarding decoupling between economic growth and environmental footprints in general however indicates that even when there are efforts to try to substitute natural capital for manufactured capital, these are usually fruitless; see Parrique et al. (2019) for a comprehensive survey on the matter.



The great difficulty of strong environmental sustainability approaches lies in fact in the definition of sustainability: what exactly should be conserved for future generations? The notion of a global stock of 'natural capital' has only a very limited meaning; it mixes elements, functions, spaces, and temporalities that have nothing to do with each other. Under the strong sustainability paradigm, there is no aggregator, such as currency for weak environmental sustainability, allowing for comparison and compensations. It is therefore necessary to keep track of all the critical components of natural capital in order to monitor and control its sustainability. Usubiaga-Liaño/Ekins (2021a) survey the literature and find a whole series of proposals of what is important to maintain in a strong environmental sustainability approach, ranging from maintaining capital (Goodland 1995) to maintaining nature's services at an appropriate level (Moldan et al. 2012). The need for different concepts emerges notably from the fact that maintaining a capital stock constant is impossible for abiotic (that is, physical rather than biological) resources, which cannot be replenished.

### 3.2.2 *To what extent is natural capital really substitutable?*

Which perspective of sustainability more validly describes reality? The resolution of this question should be empirical rather than theoretical or ideological. Cohen et al. (2019) review the empirical literature on the degree of substitutability between natural capital and other forms of capital. They find that most available substitutability estimates do not stand up to scrutiny, and that it is particularly difficult to produce accurate substitutability estimates for unpriced or poorly priced resources. Given the above, they try to proxy the level of substitutability with an assessment of efficiency of input factors, particularly natural ones, in two specific cases: use of energy in industrial sectors (pulp and paper, iron and steel, and cement). They show that the substitutability of natural capital with other forms of capital is low to moderate at best. In the industrial energy case, energy intensity has been decreasing by approximately 1–1.5 percent annually while energy demand has increased by 1.3 percent annually, suggesting low substitutability. In the case of land use they observe closing yield gaps in different regions in the world, suggesting that 'further increases in yield may prove to be costly on already well irrigated and intensely fertilized lands' (ibid.: 428).

What is more, if substitutability is assumed *a priori*, it is impossible to show *ex post* whether this assumption was justified or not. The underlying assumption of weak environmental sustainability is that there is no essential difference between different forms of capital or between the types of welfare they generate. This allows, in theory at least, all types of capital, and the services and well-being they generate, to be expressed in the same unit, for example, monetary. In practice, there may be insurmountable difficulties in carrying out the necessary monetization and aggregation across all the components involved, but the theoretical position is clear and considerable efforts are being made to make it operational; see, for example, Spash/Hache (2021). The figures that emerge from these efforts can, however, only show whether or not weak environmental sustainability has been achieved, that is, whether overall well-being has been maintained. They cannot explain whether the initial assumption of commensurable and substitutable capital was justified. By assuming at the outset of the economic analysis that there are no differences, there is no way to establish later whether these differences were significant.

The approach of assuming strong environmental sustainability at the outset does not suffer from this serious flaw in scientific methodology. By keeping the different types of capital distinct from one another from the start, it can examine the particular contribution of each of them to well-being. This examination may reveal that, in some cases, the welfare derived from one type of capital is fully commensurable with the other types of welfare derived from production and can be expressed in monetary form. In these cases, substitutability with

other forms of capital exists and the weak environmental sustainability condition of a non-decreasing aggregate capital stock is sufficient to maintain welfare. In other cases, the outcome of the examination may be different. The important point is that, starting from a strong environmental sustainability assumption of non-substitutability in general, it is possible to move to a weak environmental sustainability position when appropriate. But starting from an assumption of weak environmental sustainability does not allow us to identify exceptions. In terms of scientific methodology, strong environmental sustainability is thus greatly preferable as an *a priori* position.

#### 4 A STRONG SUSTAINABILITY FRAMEWORK TO CONSTRUCT LONG-RUN TRAJECTORIES

Dietz/Neumayer (2007) list four reasons why the strong approach to environmental sustainability may be preferred to the weak one: risk and uncertainty, irreversibility, risk aversion, and the ethical non-substitutability of natural capital consumption. We argue that in the context of long-term strategies, these four reasons are even more relevant, particularly when considering the low-carbon transition (see, for example, Bachner et al. 2020 on the impact of uncertainty on the results of integrated modeling studies of the low-carbon transition). Aware that the concept of strong sustainability might carry different perceptions, we propose three guiding principles rather than a precise definition:

1. *No a priori substitutability*, although substitution might be possible in some cases and according to some principles. This does not mean that there is no space for arbitrage across different types of objectives.
2. *Multidimensional diagnostics and analyses* to be understood in the sense of indicators with different units and measuring potentially related but different concepts, but also in geographical, time, and multidisciplinary senses. These science-based diagnostics and analyses should allow for the identification of synergies and tensions between different indicators.
3. The need for a *social construction* of a 'good condition,' that is, standards describing a desirable sustainable condition (taking environmental, social and economic perspectives) based on the multidimensional diagnostics and analyses mentioned before and of one or many trajectories towards such a good condition. This construction inevitably takes place around a social contract explicitly addressing the synergies and tensions identified beforehand and needs to be adapted and revised to different spatial and temporal contexts.

These three principles can be found, on their own or combined with others, in the literature discussing sustainable development in general, and strong sustainability in particular. We believe that using them when designing and implementing development trajectories will help give a strong backbone to the supporting policies. These principles can be applied in all contexts while recognizing that these contexts are different and hence might require differentiated approaches when implementing these principles.

##### 4.1 How to start constructing strong sustainability trajectories?

Using the proposed framework, one can start building a multidimensional diagnosis highlighting the constraints, arbitrage, and opportunities entailed by development trajectories. This section presents three different approaches: a multidimensional inequality analysis,

the ESGAP indicator of environmental sustainability, and an analysis of socioeconomic vulnerabilities of countries in the context of a low-carbon transition. These examples will show how the first two principles can be applied in different fields. The existence of such multidimensional analyses and diagnostics is critical to allow a policy debate around the construction of a desired ‘good condition’ and the different paths to reach it. The ways in which such a participatory approach can be built will be discussed in the next section.

#### 4.1.1 *Multidimensional inequality*

The reduction of inequality has made its way as a clear objective of development strategies and inequality not only is no longer seen as a natural phenomenon accompanying development processes (Milanovic 2016), but its role as a constraint for prosperity is widely acknowledged (see IPSP 2018: ch. 3). However, the concept of inequality is highly complex and lacks the comprehensive and normative approach that related concepts, such as poverty, have. While most of the debates, policies, and discourses seem to focus on income inequality, the questions of inequality among whom, and inequality of what, quickly appear. Taking Sen’s (1992) capability approach as a point of departure, Oxfam and the London School of Economics proposed the Multidimensional Inequality Framework<sup>4</sup> (MIF), which aims to bring together these questions under a multitude of indicators grouped under seven life domains going from financial security and dignified work to participation, influence, and voice. Similarly, the Inequality Diagnostics, developed by the African Center of Excellence for Inequalities Research in partnership with the Agence Française de Développement (Shifa/Ranchhod 2019), are comprehensive reports on multidimensional inequalities which provide an in-depth analysis of the trends and patterns of socioeconomic inequality in a given country. These inequality diagnostics take income (or consumption) inequalities as a starting point of analysis and further examine how different types of inequalities, such as those linked to the labor market, to land, or to access to basic services, intertwine across different groups and geographical boundaries. These approaches thus apply the first two guiding principles in that inequality is not reduced to a single indicator substituting different forms of inequality and offer multidimensional diagnostics and analyses highlighting the synergies and tensions between the different forms of inequalities, leading to more relevant policy questions as we will see below.

Initiatives such as these two indeed allow us to analyse how different inequalities overlap and mutually reinforce each other. Low levels of consumption inequality can hide highly unequal access to the labor market and to basic services, which can result in an overall perception of high inequality and contestation of policy changes needed for a transition to more equitable and sustainable societies. For a long time, the profession thought that reducing inequality should not be an objective *per se* as it will be reduced during the development process. We know today that not only is that not true, but that patterns of growth which are built on unequal distributions of outcomes and opportunities contribute to entrenching inequalities. Understanding the various dimensions of inequality is key not only because they determine deprivation and vulnerabilities, but because climate responses and sustainability trajectories will be shaped by institutions which reflect these structural imbalances. Economic inequality more often than not comes with political inequality, which means that those who make the political choices concerning the transition scenarios will be more inclined to protect their own interests, thus perpetuating the concentration of wealth

4. URL: <https://sticerd.lse.ac.uk/inequality/the-framework/media/mif-framework.pdf>.

and voice. This is also true of gender inequality, for instance because if climate adaptation scenarios are developed without a gender lens, gender inequalities will increase as women are more vulnerable to climate change across different dimensions: they have less access to resources such as land (which would enhance their coping capacities), they are more dependent on natural resources, and they represent the majority of the poor.

#### 4.1.2 *ESGAP*

The discussion in Section 3 highlighted both the importance of including environmental dynamics and their interactions with socioeconomic dynamics and the difficulty of constructing indicators that allow us to reflect these environmental dynamics and their consequence for life on earth (see Ekins et al. 2019 for a comprehensive discussion on the limits of existing indicators).

Major global environmental assessments – for example, the UN Global Environmental Outlook (GEO) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) – highlight the extent to which human activities result in a widespread and increasing degradation of the components of natural capital. Thus, for development to be sustainable, it should ensure that critical environmental functions provided by nature persist over time, which requires maintaining the capacity of the natural capital stock to provide those functions. To reflect the extent to which countries are close to environmental sustainability, indicators need to meet three conditions. First, they need to take the form of a distance-to-target indicator, that is, the indicator needs a reference point against which performance can be compared. Second, this reference point needs to represent the conditions under which the provisions of critical functions of natural capital are maintained. Third, the indicator needs to be defined at the national level, as it is the level at which most environmental policy is implemented.

These conditions also ensure that the approach fulfills the first two guiding principles set out above. The range of environmental functions to be monitored represent the different environmental dimensions that require our attention when constructing development trajectories, without substituting them. Each one of them is important in itself, so aggregation needs to be done as a distance-to-target. But this target is not always well known, requiring specific processes to devise legitimate targets based on science.

The Environmental Sustainability Gap (ESGAP) framework sets out the basis of measuring countries' environmental sustainability performance, based on standards meant to represent the situation at which natural capital can maintain its functions over time. It is composed of 21 indicators, all supported by scientific standards of environmental sustainability, which can ultimately be aggregated into a single index (the SESI, for Strong Environmental Sustainability Index) that represents absolute environmental sustainability performance or progress over time. See Usubiaga-Liaño/Ekins (2021a; 2021b) for a detailed description of the framework and the indices.

For all the identified critical components of natural capital, the ESGAP framework computes the gap between the current state and a sustainable state, a state compatible with a sustained functioning of the underlying critical processes necessary for preserving life, human activities, and welfare. The sustainable states, or 'standards of good environmental condition' are conceptually related to the 'science-based targets' developed in the wake of the Paris Agreement for climate (Andersen et al. 2021). The ESGAP uses broad sustainability principles as a provisional way of deriving environmental standards across a wide range of relevant environmental and resource issues, with the standards expressed in most cases as indicators of the condition of natural capital or as the pressure exerted upon it. Setting environmental standards is not a straightforward task, and in the ESGAP

studies, even if 21 standards were found (at least one per sub-topic, and suited only to European countries in most cases), more environmental standards need to be set, suitable for a range of situations and country contexts where either data availability is an issue, or where the representation of a good condition of environmental functions is not well integrated in policies or development strategies.

#### 4.1.3 *Socioeconomic vulnerabilities to the low-carbon transition*

The low-carbon transition is *de facto* an important restructuration of our economies with sunrise industries benefitting from it and sunset industries seeing loss of production and even facing disappearance. In order to understand the current socioeconomic exposure of all the economies to such a restructuration, Espagne et al. (2021) have constructed a model based on environmentally extended multi-regional input–output matrices. The model computes three vulnerability indicators (share of net exports, share of employment and wages, and share of production dependent on sunset industries). Their results show how the vulnerabilities faced by developing economies vary in magnitude and in nature. Some countries, such as Algeria or Saudi Arabia, might face external vulnerabilities while others, such as France or Madagascar, are not displaying any vulnerabilities or on the contrary might be exposed to all three aspects in the cases of Bolivia or Venezuela.

The approach highlights the fact that countries are facing multidimensional vulnerabilities to the low-carbon transition, with both magnitude and nature depending on their context. The first guiding principle proposed above thus allows the authors to first recognize that policymakers have multiple objectives, such as sustainable balance of payments, public debt, or employment levels, when conducting macroeconomic policies, and these cannot be meaningfully synthesized into one aggregate objective. Furthermore, by proposing a multidimensional diagnostic and analysis, the authors show how policymakers, when deciding to construct long-term strategies, will face different arbitrages regarding environmental ambition, economic development, and social protection. Understanding how these vulnerabilities pan out is thus crucial to identify, design, and implement different transition policies.

## 4.2 The ‘good condition’ as a social norm: a participatory approach

Widespread concerns about our planet’s limited resources and current changes in the perception of nature contribute to making the operationalization of strong sustainability appear achievable. When it comes to sustainable development, there is however often a gap between the policies as they are expressed on paper and the way in which they are implemented in practice across various territories (Theys 2002). This is mainly due to two factors. First, sustainable development policies tend to be insufficiently detailed on social objectives and their temporal implementation. Second, their operationalization is frequently reduced by the use of regulatory or economic instruments that do not by themselves guarantee sustainable development. The processes of social construction of both objectives and instruments are therefore key to strong sustainability’s political implementation.

Defining a good (ecological and social) condition, agreeing on what should be done in the short, medium, and long term, and connecting immediate emergencies with the needs of nature and future generations call for citizens to participate alongside states and the private companies. This collective intelligence should contribute to building, territory by territory, answers to the following operational questions: who decides, establishes, and enforces ecological limits; who decides what essential functions must be preserved and

how this is debated; and how is the definition and monitoring of compliance with these limits organized, at what scales, by whom, and according to which time-frame?

By relying on the capacities of all actors to organize themselves and define *ad hoc* governance mechanisms, the commons approach is centered on the search for negotiated consensus. It allows the identification of reforms and public policies that support the implementation of specific sustainable development paths. First of all, it makes it possible to recognize, beyond state action and market mechanisms, the many forms of direct actions that create, preserve, or access goods and services ‘in common’ (Ostrom 1990). It also allows us to broaden our reflections towards polycentric governance, where different social institutions for decision and action contribute to governance, from states to user groups, inhabitants, and citizens (Ostrom 2009). Finally, it opens up alternatives to exclusive property rights in the form of shared rights and rights of use (Ostrom/Hess 2010), and thus offers a new way of ‘dwelling’ in or inhabiting the world (Vanuxem 2018).

## 5 CONCLUSION

Sustainable development is back in the spotlight. Recent policy debates around sustainable development goals, just transition, climate justice, or the alignment of climate and biodiversity objectives, etc., highlight the importance of nexus approaches combining environmental, social, and economic perspectives, hence going back to the roots of the definition of sustainable development. Sustainable development is, however, a fuzzy concept and can be interpreted in many different ways, thus leading to very diverse policy recommendations. Fundamentally, the question of substitutability between objectives of different natures is at the core of the debate, returning to the economic literature of the 1970s and 1980s.

In order to start designing strong sustainability trajectories, we proposed in this paper a set of three guiding principles: *a priori* refuting substitutability between objectives, conducting multidimensional diagnostics and analyses, and finally recognizing that the desired ‘good condition’ and the trajectories to reach it are a social construct, based on the diagnostics and analyses conducted beforehand. These three principles, we argue, allow us to make explicit the tensions or synergies between environmental, social, and economic objectives and can thus help in proposing adequate policy recommendations, following a participatory approach. While it is difficult to offer a one-size-fits-all set of policies to ensure the emergence of sustainable development, we think that the proposed principles will ensure that policy recommendations will make decisive steps towards strong sustainability.

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