SPES Working paper 2.1

The "winds of change": the SPES framework on Sustainable Human Development

September 2023 - v2

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Acknowledgements:

Cite as:

Biggeri, M., Ferrannini, A., Lodi, L., Cammeo, J., Francescutto, A. (2023). *The "winds of change": the SPES framework on Sustainable Human Development*. SPES Working paper no. 2.1, SPES project − Sustainability Performances, Evidence and Scenarios. Florence: University of Florence. Available at: https://www.sustainabilityperformances.eu/publications-deliverables/

Disclaimer

This Working Paper 2.1 for the project SPES has been prepared by the University of Florence (UniFi), as part of Task 2.1 "Elaboration of the theoretical and analytical framework" / Work Package 2. This task has allowed SPES research partners to integrate different critical perspectives and schools of thought on placing economic growth and human progress within social and environmental boundaries, thus obtaining an advanced and robust theoretical and analytical framework to guide research activities and policy engagement.

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Abstract

The general objective of this paper is to provide a novel theoretical framework for Sustainable Human Development, offering a clear integrated vision to sustainability transition processes to reconcile potential contradictions between economic, social, and environmental spheres and better identify its pillars, driving actors and triggering factors. This is done by combining the global policy framework of the 2030 Agenda for Sustainable Development with the theoretical insights of the Human Development paradigm and other critical perspectives and schools of thought.

Taken together, they allow for the integration of the dimensions of social, environmental, and economic sustainability into a new integrated framework – the SPES framework – to consolidate the Sustainable Human Development paradigm for its mainstreaming and uptake at all levels.

Therefore, the ambition of this paper – and the SPES project in general – is to offer a theoretically-grounded and policy-oriented framework, pointing out that the lives of human beings and the sustainability of our societies should be the ultimate concern for any government intervention at all levels. In this regard, the SPES framework is dynamic and centred on collective action, shaped by a clear attention for the common good and underpinned by a normative position on capitalism and structural change, as well as on objectives and factors shaping transition processes.

The SPES framework has relevant implications for academic research on sustainability transition. In particular, it urges the whole global community of scholars to keep the vibrant debate on sustainability at the forefront, to guide measurement systems, research activities and policy discussion in reconciling the multiple facets of sustainability transitions, as well as to support societal actors in the systemic change towards Sustainable Human Development.

1. Introduction

Over the past years, the sustainable development paradigm and the need for a sustainability transition at all levels has gained a broad global consensus on which the world is building several international, supranational, national and sub-national strategies. This is first apparent in the UN 2030 Agenda for Sustainable Development (UN, 2015) with the 17 SDGs and their related targets and in the Paris Agreement (UNFCCC, 2015), as the first-ever universal, legally binding global climate change agreement.

In this global setting, the EU has assumed a leadership role in proposing tools and mechanisms for a paradigmatic change towards a sustainability transition where the vision and narrative for economic, social, and environmental policies in Europe are characterised by a strong commitment to placing the economy on a more environmentally sustainable and socially inclusive path (EC, 2022a). In particular, the European Green Deal, with tools like the Just Transition Mechanism and the Next Generation EU agreed upon in July 2020, aims at boosting the resilience and competitiveness of European economies and the shift towards a clean, circular, competitive and climate-neutral economy, along with the protection of citizens' health and the expansion of human well-being. Encompassing the social dimension into the debate is also the main goal of the European Pillar of Social Rights in which the need for an integration of economic policies and social issues is highlighted through a twenty principles framework. Therefore, even before the COVID-19 pandemic and subsequent recovery initiatives, the European willingness to shift towards a new model of growth and sustainability based on an integrated approach to development able to holistically pursue these three dimensions of sustainability was evident.

However, the real-world scenario is still far from having truly undertaken a sustainability transition path. Since early 2020, human societies all around the world have been fighting the most dramatic global public health emergency of the last century that led to complex economic, social, and human crises (Borio, 2020; Guterres, 2020) touching all the key dimensions of people's lives. The dramatically high costs of the COVID-19 pandemic have coupled with the severe impacts of climate change – especially in the Global South – and, nowadays, also with the worldwide social, economic, and humanitarian consequences of Russia's invasion of Ukraine. In other words, they have been and are exacerbating several structural problems of our economies and societies, which were serious and evident well before it (Anand et al., 2020; Mazzucato and Kattel, 2020; Sen, 2020; WEF, 2020; Ottersen and Engebretsen, 2020; Ranjbari et al., 2021; EC, 2022a), representing a sort of "revelatory shocks". Indeed, their effects have amplified the unsatisfactory development trends over the past decades, characterised by increasing within countries inequalities, persistent multidimensional poverty, increasing migration flows, climate change, and the increasing frequency of extreme events and biodiversity loss (Colglazier, 2015; Sachs et al., 2021; Nalau and Verrall, 2021) and net losses in terms of human security (UNDP, 2022a), among others. All in all, the differential impact of COVID-19, climate change, and more recently the Russia-Ukraine war, in terms of class, generations, social groups, territories and countries is undeniable (Markkanen and Anger-Kraavi, 2019; Ahmed et al., 2020; OECD, 2020a; Stiglitz et al., 2020; Furceri et al., 2020; Bundervoet et al., 2022). This particularly concerns the structural inequalities for the most vulnerable groups of people that were already at risk (Venkatapuram, 2020), as well as for vulnerable territories and countries, threatening both social and territorial cohesion (UNDP, 2020 and 2022).

Some critical experts attribute these unsatisfactory outcomes to the atrophy in the capacity of state institutions (Acemoglu, 2021) due to the domination of policy prescriptions focused too narrowly on

economic growth (Spence, 2011; Reinert, 2012), as well as to the incapacity of global institutions to enforce binding agreements on sustainable development and ensure human security across the world. Taken together, this strong evidence[1] has contributed to the increasing consensus that economic growth, despite being an important driver in improving well-being, is not automatically equivalent to sustainable human development.

For these reasons, the current scenario urges us to make fundamental changes to our economic and social systems (Hepburn et al., 2020; Mazzucato and Kattel, 2020; Sachs et al., 2021; EC, 2022b), with a particular focus on redefining the paradigm on the connection between production dynamics, well-being and sustainability (Ferrannini et al., 2021). The time to act is now, with shifts in the global landscape offering a crucial window of opportunity to make deep structural transformations towards new ways of structuring our economies and production systems, a new social dynamic and more sustainable and innovative forms of development.

In this scenario, the general objective of this paper is to provide a novel theoretical framework for Sustainable Human Development (SHD) by placing economic growth and human flourishing within social and environmental boundaries. This is done by combining the global policy framework of the 2030 Agenda for Sustainable Development with the theoretical insights of the Human Development paradigm and other critical perspectives and schools of thought. Along with opposition by mainstream economists and institutions, going beyond GDP and the measurement of sustainability performances (Stiglitz et al., 2009; Costanza et al., 2014; Hoekstra, 2019; UN, 2023) has been an uphill road also given the initial difficulties in bridging between Sustainable Development and Human Development (Neumayer, 2012; Biggeri and Mauro, 2018). Taken together, they allow for the integration of the dimensions of social, environmental, and economic sustainability into a new integrated framework, in order to consolidate the SHD paradigm for its mainstreaming and uptake at all levels.

In other words, in the current storm of multiple concomitant societal challenges and crises in human, environmental, economic and political domains, we aim at identifying and discussing the "winds of change" that can give a direction and push the world towards a better future for all.

As clearly explained by Thorbecke (2006) and represented in Figure 1, having a sound framework is a key element of this process, thus shaping the whole development doctrine through the key interrelationships among the development definition and objective (i.e., the development vision), the measurement of development performances, and the design and implementation of development policies.

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[1] For instance, increasing evidence shows that the climate crisis is a product of the model of economic development, production, and consumption patterns most countries have followed in the past centuries (IPCC, 2021).

Figure 1. Development doctrine: key interrelationships
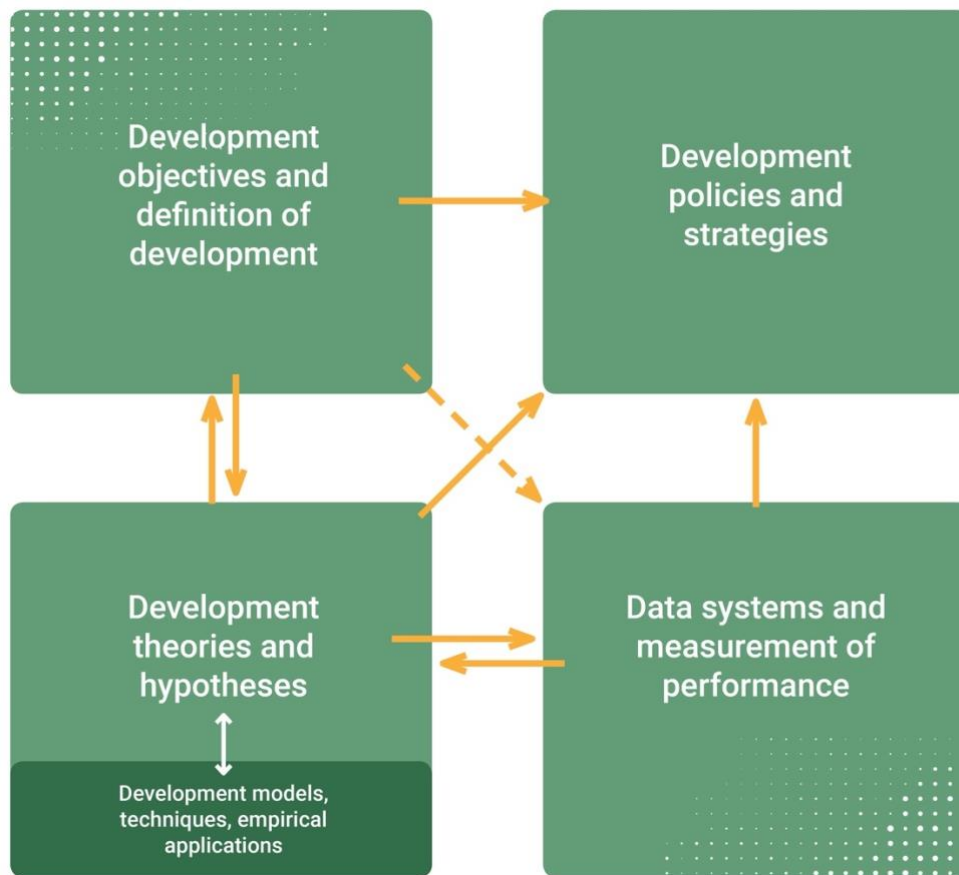
Source: Adapted from Thorbecke (2006, p. 2)

Therefore, the ambition of this paper – and the SPES project in general – is to offer a theoretically-grounded and policy-oriented framework to guide measurement systems, research activities and policy discussion in reconciling the multiple facets of sustainability transitions towards SHD.

After this brief introduction, the working paper is structured as follows. Chapter 2 analyses the state of the art in the debate on sustainability transition based on computational text analysis techniques to identify recurrent themes and arguments, along with gaps, in the vibrant debate on sustainability. Chapter 3 is the core of our original contribution, presenting step-by-step the building blocks of our SPES framework: its theoretical underpinnings, the critical areas of action, the pillars and corresponding objectives, the driving actors and their dynamic role. Chapter 4 complements the discussion by identifying those triggering factors that nurture individual and collective efforts and shape the key means of implementation to foster the sustainability transition towards SHD. Chapter 5 brings our arguments to the policy sphere, highlighting some key principles for policy design and implementation that should underpin governance mechanisms and policy coherence for SHD at all levels. Chapter 6 concludes with some final remarks on measurement and research implications deriving from our arguments.

2. State of the art in the debate on sustainability transition

2.1 Scope and method

The analysis of state of the art in the debate on sustainability transition is a key starting point of the SPES research. Previous literature reviews (see, for instance, Markard et al., 2012; Köhler et al., 2019) show the remarkable increasing attention of the academia towards these issues and the research streams born from seminal contributions (Kemp, 1994; Weber, 2003; Geels, 2004; Smith et al., 2005; Markard, 2011).

The main aim of this section is to analyze the key issues and their evolution within the academic debate on sustainability and sustainability transitions over the years, starting from previous literature reviews and applying a quantitative text analysis technique to understand the links with our theoretical approach. For this reason, computational text analysis techniques are fundamental to process such large amounts of text.

The number of academic publications related to *Sustainab** and *Sustainab* Transition[2]* has been rising since the 1990s (Markard et al., 2012), with significant increases in the 2010s and early 2020s. *Sustainab** publications rose from 607 in 1990 to 3,402 in 2000 and then reached 92,710 in 2022 , while *Sustainab* Transition* had 421 contributions in 2010 and 5,014 in 2022.

Sustainab* is a broad topic involving different subject areas and often a multidisciplinary approach. *Sustainab* Transition* is one of its subfields of analysis but, given its complexity and specificity, would be considered as a standalone research area (Köhler et al., 2019). Here, we focus on the analysis of the literature dealing with *Sustainab* Transition*, since its centrality in the current debate on global and European policies and strategies to foster the twin digital and green transition.

This critical literature review intends to focus and assess to what extent the main concepts and pillars of the Human Development (HD) paradigm – i.e., productivity, equity, sustainability, participation & empowerment – are included in the main contributions of *Sustainab* Transition* studies. In particular, our aim is to study in depth the content and the main issues discussed in the literature, through a statistical analysis of textual data, such as topic modelling. This method is a natural language processing technique that identifies and extracts underlying topics or themes from a collection of text documents (Kherwa and Bansal, 2019).

First, we analyze the occurrence of the main bigrams of the nine research areas in *Sustainab* Transition* classified by Köhler and coauthors (Köhler et al., 2019). We rely on their classification as it contains the literature that is strictly related to the research *on Sustainab* Transition* and it is written by the main experts in the field (Köhler, Geels, Markard and Kemp among others). Moreover, the scholars involved in their literature review come from different scientific fields and disciplines. Thus, their article ensures multidisciplinary content, and, at the same time, it enables us to avoid the issues that could be generated by the Scopus search. Firstly, even if we use *Sustainab** and *Sustainab* Transition* as keywords to collect the literature, some seminal contributions could be omitted. In addition, using thousands of documents makes it difficult to assess if those are strictly connected with the transition literature we are interested in.

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[2] *Sustainb** and *Sustainb* Transition* are the terms used for the search in Scopus database in order to catch contributions that include sustainability or sustainable. We use the same specification in the text.

Then, we apply a structural topic model to explore if additional topics may arise from the classification of Köhler et al. (2019) and then we check if there are considerations regarding the economic and social dimensions of sustainability transition in line with the HD paradigm.

Given the relevance of the current public debate in the understanding and design of *Sustainab* Transition* processes, we argue for a sharper integration of both the economic dimension (related to productivity enhancement and value-added creation) and social dimension (related to well-being and human security). This is important not only to achieve sustainable development goals in an integrated way (not merely environmental) but also to make transitions acceptable by the whole society.[3] In other words, according to the critics of Geels (2011) about the *operationalization and specification of regimes*, embracing a more integrated sustainable human development paradigm would make transitions more effective.

2.2 Stylized facts on *Sustainb** and *Sustainb* Transition* literature

The research on sustainability and sustainability transitions has been thriving since 2000s (see Figure 2). Several disciplines, both social and hard science, have been working on these topics and, in most cases, these contributions take an interdisciplinary approach (see Figure 3). *Sustainab** and *Sustainab* Transition* are related to similar topics and show several similar features and contents (see Figure 4). Even if the latter is a sub-branch of the former, the study of the transitions, for its complexity and relevance in the policy debate, can be considered as a stand-alone field of study (Köhler et al., 2019).

Figure 2 shows that the publications related to Sustainability and Sustainability transition have almost the same trend over time. However, the contributions related to *Sustainab** in general, exceed 75,000 publications, considering all kinds of subject areas (from social and environmental sciences to engineering and chemistry), while publications studying transitions include around 5,000 contributions in 2022. In this case, after the increase in the 2000s, they skyrocketed after 2010. This likely happened because the green and digital transition officially entered the policy agenda of global, supranational, and national political entities. The main events related to the publications trends likely include, among others: the *World Summit on Sustainable Development* in 2002; the *United Nations Conference on Sustainable Development* (or Rio+20) in 2012; the 2015 *Paris Agreement* on climate change; the approval of the UN 2030 Agenda 2030 *for Sustainable Development* in 2015.

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[3] See the discussion on values, contestation, and disagreement by Köhler et al. (2019).

Figure 2. Sustainab* and Sustainb* Transition publications trend
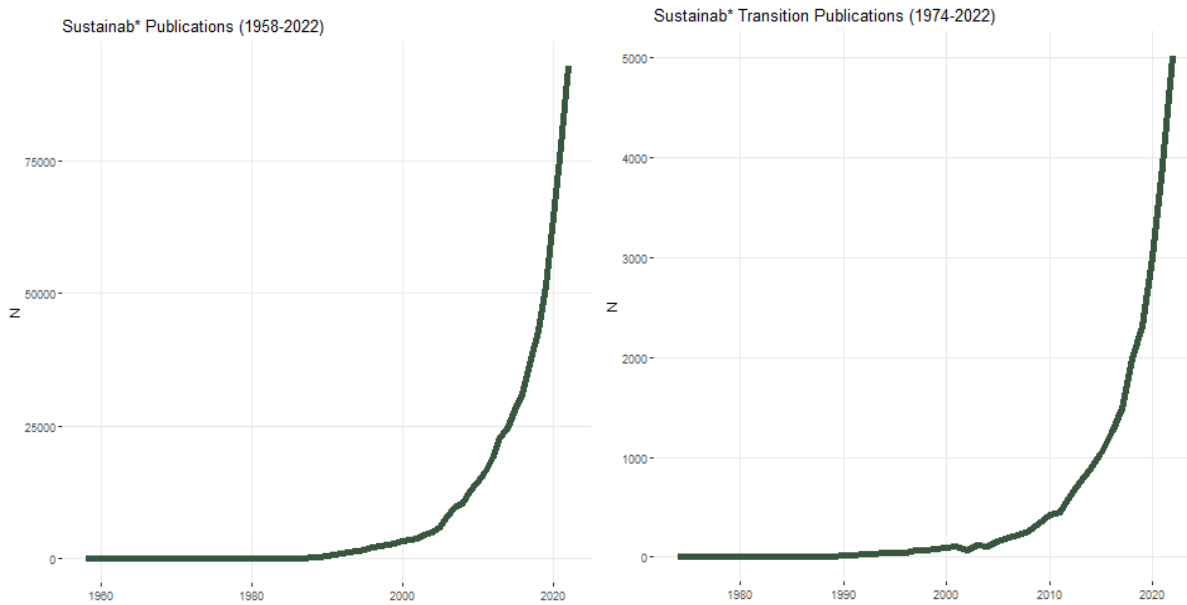
Source: Authors' elaboration on Scopus insights for articles in journals, chapters in books and books.

Figure 3 shows that "Environmental Science" and "Social Sciences"[4] together represent almost one-third of the research areas involved in the study of sustainability and sustainability transitions. "Engineering" appears to be relevant for both, too. Then, "Agricultural and Biological Sciences" focuses more on sustainability in general, while "Energy" matters more for transitions. Another relevant fact emerging from this figure is that "Econometrics, Economics and Finance" and "Business, Accounting and Administration", even if they appear to be in the top 10 research areas for both, show a marginal portion of contributions in sustainability and sustainability transition research.

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[4] The subject areas are defined by Scopus, Social Sciences includes: Archaeology, Development, Education, Geography, Planning, and Development, Health(social science), Human Factors and Ergonomics, Law, Library and Information Sciences, Linguistics and Language, Safety Research, Sociology and Political Science, Transportation, Anthropology, Communication, Demography, Gender Studies, Life-span and Life-course Studies, Political Science and International Relations, Public Administration, Urban Studies.

Figure 3. Subject Area Shares for Sustainab* and Sustainb* Transitions[5]

Subject Areas in Sustainab*

Subject Areas in Sustainab* Transition
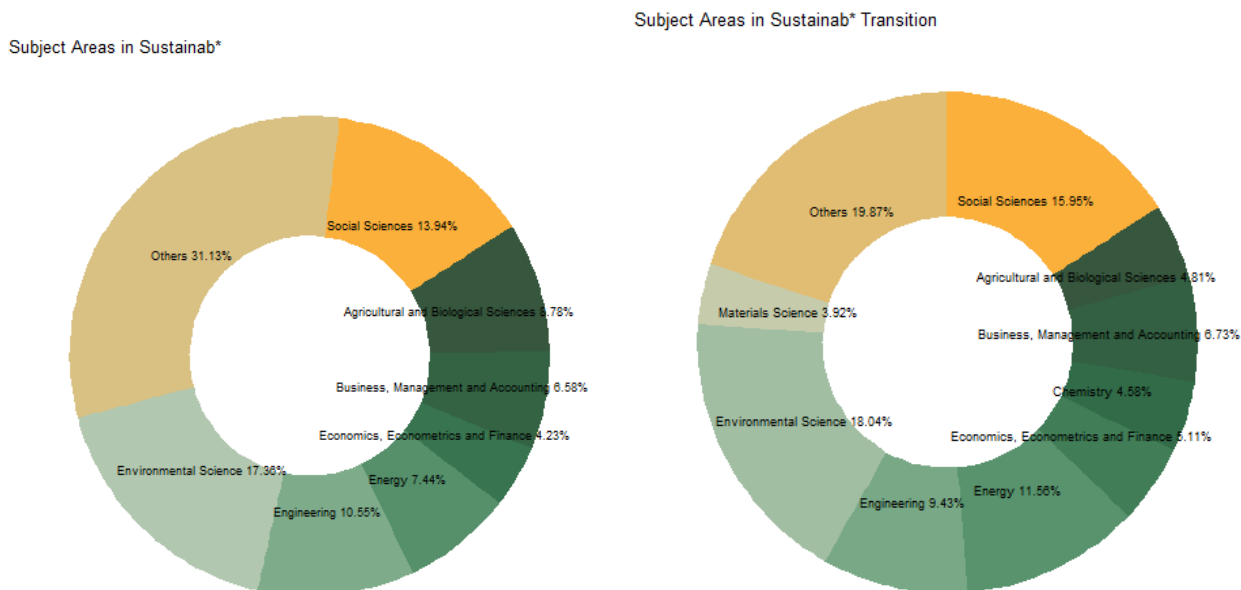
Note: the subject areas are defined by Scopus, they refer to the main classification of the source (journal, book, etc.). The subject areas are not unique each of these may contain other subject areas.

Source: Authors' elaboration on Scopus insights for articles in journals, chapters in books and books.

By looking at the keywords, sustainability and sustainability transitions look very similar in their content (see Figure 4), both mainly dealing with *Sustainable Development* in general. Surely transition is a part of *Sustainab** as a whole. However, as already highlighted, Köhler et al. (2019) points out that sustainability transitions have several features that can make them a per se field for studies.

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[5] To ease the visualization we grouped subject areas with less than 3.66% for *Sustainab** and it contains: Medicine, Materials Science, Chemistry, Computer Science, Chemical Engineering, Earth and Planetary Sciences, Biochemistry, Genetics and Molecular Biology, Arts and Humanities, Physics and Astronomy, Mathematics, Decision Sciences, Multidisciplinary, Immunology and Microbiology, Psychology, Nursing, Pharmacology, Toxicology and Pharmaceutics, Health Professions, Veterinary, Neuroscience, Dentistry, Undefined. For *Sustainab* Transition* we group together subjects below 3.9% and these are: Chemical Engineering, Computer Science, Earth and Planetary Sciences, Medicine, Physics and Astronomy, Biochemistry, Genetics and Molecular Biology, Arts and Humanities, Mathematics, Decision Sciences, Psychology, Multidisciplinary, Nursing, Pharmacology, Toxicology and Pharmaceutics, Immunology and Microbiology, Health Professions, Veterinary, Neuroscience, Dentistry, Undefined.

Figure 4. Top 40 Scopus Keywords

Sustainab*

Sustainb* Transition

Source: Authors' elaboration on Scopus insights for articles in journals, chapters in books and books

In other words, *Sustainab** is a wide concept that can be associated with one or more particular objectives (or goals). *Sustainab* Transition* refers to the complex process leading to a radical paradigm shift and/or a deep socio-technical change. In this regard, as suggested by Köhler et al. (2019, p. 2), the characteristics that make sustainability transition a demanding and complex topic are the following: "*multi-dimensionality and co-evolution*", "*multi-actor process*", "*stability and change*", "*long-term process*", "*open-endedness and uncertainty*", "*values, contestation, and disagreement*". Essentially, *Sustainab* Transition* involves various dimensions and multiple stakeholders, such as individuals, social groups, businesses, and governments. This transition involves profound systemic changes, requiring continuity over time. Moreover, the long-run nature of this transition makes it difficult to determine its completion. Additionally, differing perspectives among individuals, groups, and institutions can result in contrasts and conflicts during this process.

2.3 Previous reviews of the *Sustainab* Transition* literature

In the previous sections, we outlined the main distinctions between *Sustainab** and *Sustainab* Transitions*, with the purpose of highlighting the challenges associated with assembling a comprehensive body of work on these subjects. In both cases, the volume of articles and other scholarly contributions, along with their interdisciplinary nature, complicates the collection of a cohesive literature base. We focused on transition, given the relevance of the actual political debate. Subsequently, we conducted an examination of relevant literature to pinpoint the core of the academic discourse surrounding *Sustainab* Transitions*.[6] As a result, we meticulously reviewed 294 documents from Köhler et al. (2019).

Previous works already provided an analysis of the literature with statistical tools.

The first is the review of Markard et al. (2012) which identifies the intellectual contours of this field when it started appearing in the academic debate. The analysis included 540 journal articles

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[6] As already stated, using solely *Sustainab* Transitions* in the Scopus search does not ensure that all articles, books and chapters in books strictly related to sustainable transition studies are included, potentially risking the exclusion of some seminal papers.

together with basic conceptual frameworks. The aim of this contribution was to further develop the field of study in sustainability transition and to bridge it with other research areas (i.e., geography as discussed in the article).

A recent article by Stefani et al. (2022) found the three main dimensions of sustainability transition literature through a topic modelling analysis. These dimensions contribute to the understanding and implementation of sustainability transition from different perspectives, ranging from socio-economic transformations to socio-technical and multilevel approaches and include:

1. *Social and Capitalism Change, Behaviors, and Values*: here the focus is on increasing individual and collective awareness of sustainability transition. It examines the impact of human behaviours on sustainability transition. It also involves the diffusion of innovative solutions and processes among different stakeholders in society, including public, private, and social actors. Additionally, it acknowledges the importance of local communities in the sustainability transition.
2. *Innovation and Institutional Changes*: it explores the search for new solutions, technologies, materials, and environmentally friendly practices to address societal challenges and enhance human capabilities. It emphasizes the need for institutional changes at national and regional levels to support the transition. The interplay of technical, social, and institutional factors is crucial in achieving systemic changes through sustainable innovations.
3. *Policy and Societal Core Functions*: this provides knowledge for evidence-based policymaking in crucial sectors such as energy, water, mobility, and food. The goal is to improve material flow management and create conditions that encourage individual and collective actions towards sustainability. These sectors are considered socio-technical systems, and their stability and changes have significant implications for achieving sustainability goals while mitigating humanity's impact on the environment.

Our main purpose is similar to Markard et al. (2012) – linking sustainability transitions literature to other research fields – since we want to verify the potential strong connection with the HD paradigm. Therefore, we aim to understand how the literature on sustainability transition is related to the main concept and ideas of HD. More precisely, how economic and social dimensions, and in particular those affecting prosperity and well-being, are linked together with environmental sustainability.

For this reason, we have undertaken a quantitative re-analysis of the entire list of references considered by Köhler et al. (2019). [7] This list provides a comprehensive collection of the key works addressing sustainable transitions. The authors classify the literature into the following 9 relevant categories to conceptually disentangle the above-mentioned complexity:

1. understanding transitions
2. power and politics in transitions
3. governing transitions
4. civil society, culture and social movements in transitions
5. organizations and industries in sustainability transitions
6. transitions in practice and everyday life
7. geography of transitions: spaces, scales, places
8. ethical aspects of transitions: distribution, justice, poverty
9. reflections on methodologies for transitions research.

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[7] The article contains 383 references, but our analysis is based on 294 because we focus on articles, chapters in books and books whose abstract are available.

According to this view of Köhler et al. (2019), *understanding transitions* (category 1) refers to the literature dealing with the conceptualization and the theoretical framework embracing the complexity and multi-dimensionality of sustainable transitions. Categories 2 to 6 cover various topics in social sciences as politics and governance, the economy (including firms), and social groups. Geography, and the spatial level, are considered as a topic per se, to better clarify how transitions happen across different locations. Category 8 focuses on ethics (i.e., equity and justice) related to sustainable transitions, while category 9 presents a general overview of modelling and methodological issues.

In our view, matching the sustainability transition literature with HD, a comprehensive "*understanding of transitions*" mainly encompass the influence of nature and the environment. "*Power and politics*" are to be examined in the context of the "triad" of "politics, polity and policy". Furthermore, "*governing transitions*" should entail a redesign of the roles and capacity of public institutions in fostering the sustainability transition through effective new form of governance. "*Culture*" would represent the values shaping individual and collective agency (i.e., commitment), while "*social movements*" refers to the empowerment by which "*civil society*" commits to transitions. "*Organizations and industries*" would define the private sector's role to enhance productivity and value-added creation towards sustainability. "*Transition in practice*" relates to participation in policy-making processes. "*Ethical considerations*" involve issues of solidarity and equity. "*Reflections on methodologies*" would encompass theories and models involving academia and its interconnections with civil society, institutions, and private sectors.

This classification, hence, is able to disentangle the complexity of sustainability transition distinguishing among different actors, processes (at individual, community and country levels), the values and culture that shape behaviours and choices, as well as the role of power and governance in the political economy discourse.

2.4 Descriptive analysis of the *Sustainab* Transition* literature

To ascertain the degree to which the sustainable transition literature aligns with the HD paradigm, we analyze key concepts derived from Köhler et al. (2019). We use the references in Köhler et al. (2019) to identify the core literature on transition and avoid complexity in a large amount of contributions that contain *Sustainab* Transition* as keywords. The authors classified contributions into the nine topics above mentioned, and we provide a textual analysis based on this classification looking at *bigrams* occurrence among themes, then redefining themes through a structural topic modelling analysis to check if there are other hidden topics that link sustainable transition with HD.

At first, we run a descriptive analysis exploiting the classification made by the authors and we analyze the occurrence of *bigrams*[8] in the abstract of the references. The main evidence shows that the section[9] "*Understanding Transitions*" (see Figure 5 – left side), which regards the conceptualization of sustainability transition, is based on the framework of the "Multi-Level Perspective" (MLP) (Geels, 2002, 2011) and its fundamental analytical levels: niches and Strategic Niche Management (SNM) (Kemp et al., 1998), socio-technical regimes (STR), and the sociotechnical landscape, along with a specific focus on Technological Innovation System (TIS)

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[8] *Bigrams* are arguments that tokenize by pairs of adjacent words rather than by individual ones (Silge and Robinson, 2017).
[9] The categories from Kohler et al. (2019) are also the sections of the article. Each of them discusses the specific themes. We collected the citation of each section to classify the references. Some references appear in more than one section.

(Hekkert et al., 2007). Then, the main elements of studies are how a society/economy assimilates it and the transitory progress. The focus is mostly on technical innovation and new energy sources.

Also, the themes of politics, power and governance (see Figure 5 – right side and center) are characterized by the MLP elements. It is interesting noting that the role of social groups and movements ("*social movement*" and "*grassroot innov*") is widely considered in politics and power. For governance of transitions, other crucial elements are "*policy mix*" and "*policy instrument*", as the interaction of different policies affects diverse dimensions of a socio-economic system. On the bottom of the graph an interesting term appears– "*creativ destruct*" – which explains the application of creative destruction to policy mixes for sustainable transitions, and how strategies and intervention foster the generation of something new, undermining the old system (Kivimaa and Kern, 2016).

Figure 5. Bigrams from Kohler et al. (2019) classification (1/3)
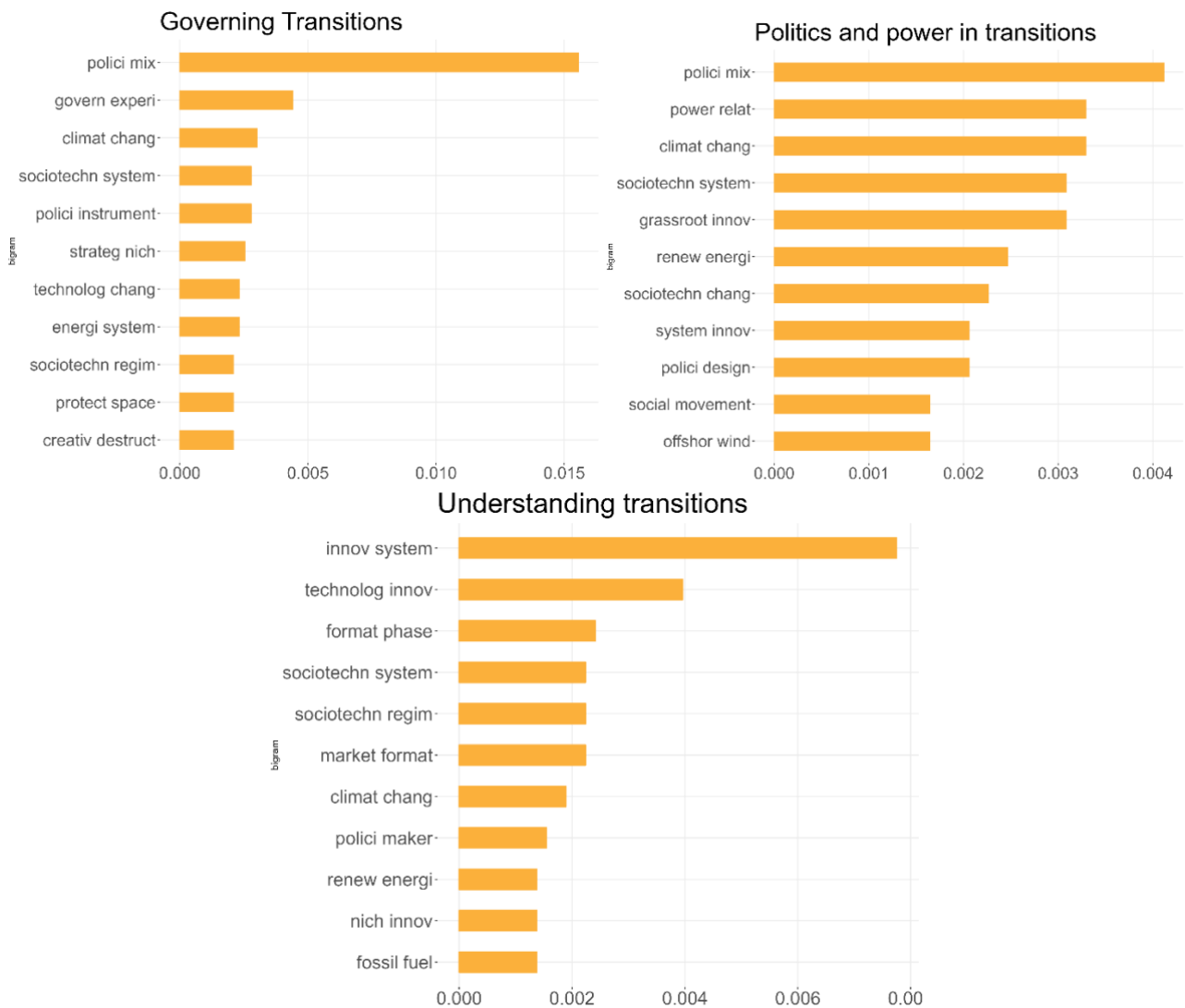
Note: On the horizontal axis, the relative frequencies represent the number that each bigram appears in a section / theme over the total number of words of each section/theme. A document may appear in more than one category, according to the classification made by Köhler et al. (2019). To do this, we used the statistical software *R* and the packages *tm, tidytext, stm* to prepare the textual data and *ggplot2* to create the graphs.

Source: Authors' elaboration on Scopus insights

The categories mostly related to HD are the "*Civil society, culture and social movements*", "*Business and industries*" and "*Transitions in practice*" (see Figure 6) and "*Ethical aspects of transitions*" (see Figure 7). In this view, participation and civil society play a relevant role, and bigrams as "*grassroot innov*" and "*collect action*" suggest that the role of community and participatory practice are relevant to "*social change*". Especially for the ethical aspect, relevant objects of analysis are fuel poverty and energy justice. However, in these themes, the social dimension related to well-being concerns mostly the issues directly related to climate change and energetic provision.

Figure 6. Bigrams from Kohler et al. (2019) classification (2/3)
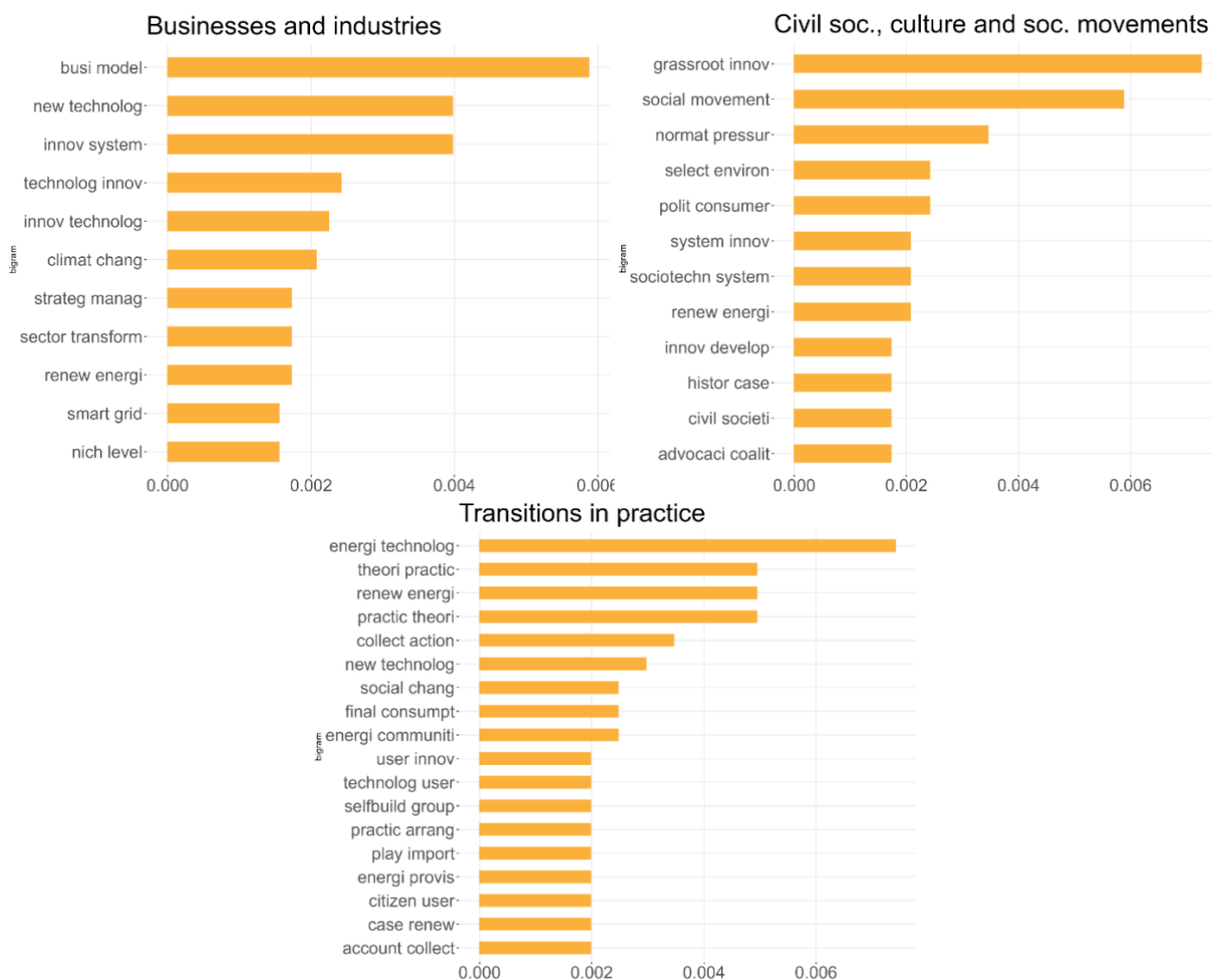

Note: On the horizontal axis, the relative frequencies represent the number that each bigram appears in a section / theme over the total number of words of each section/theme. A document may appear in more than one category, according to the classification made by Köhler et al. (2019). To do this, we used the statistical software *R* and the packages *tm, tidytext, stm* to prepare the textual data and *ggplot2* to create the graphs.

Source: Authors' elaboration on Scopus insights

Also, the other themes (business and industries in Figure 6, and geography and methodologies in Figure 7) are strongly grounded in the MLP framework. The spatial level suggests a crucial role in understanding international network ("*transnat linkage*" and "*infrastructure network*"), and the role of cities and urban development for effective transitions.

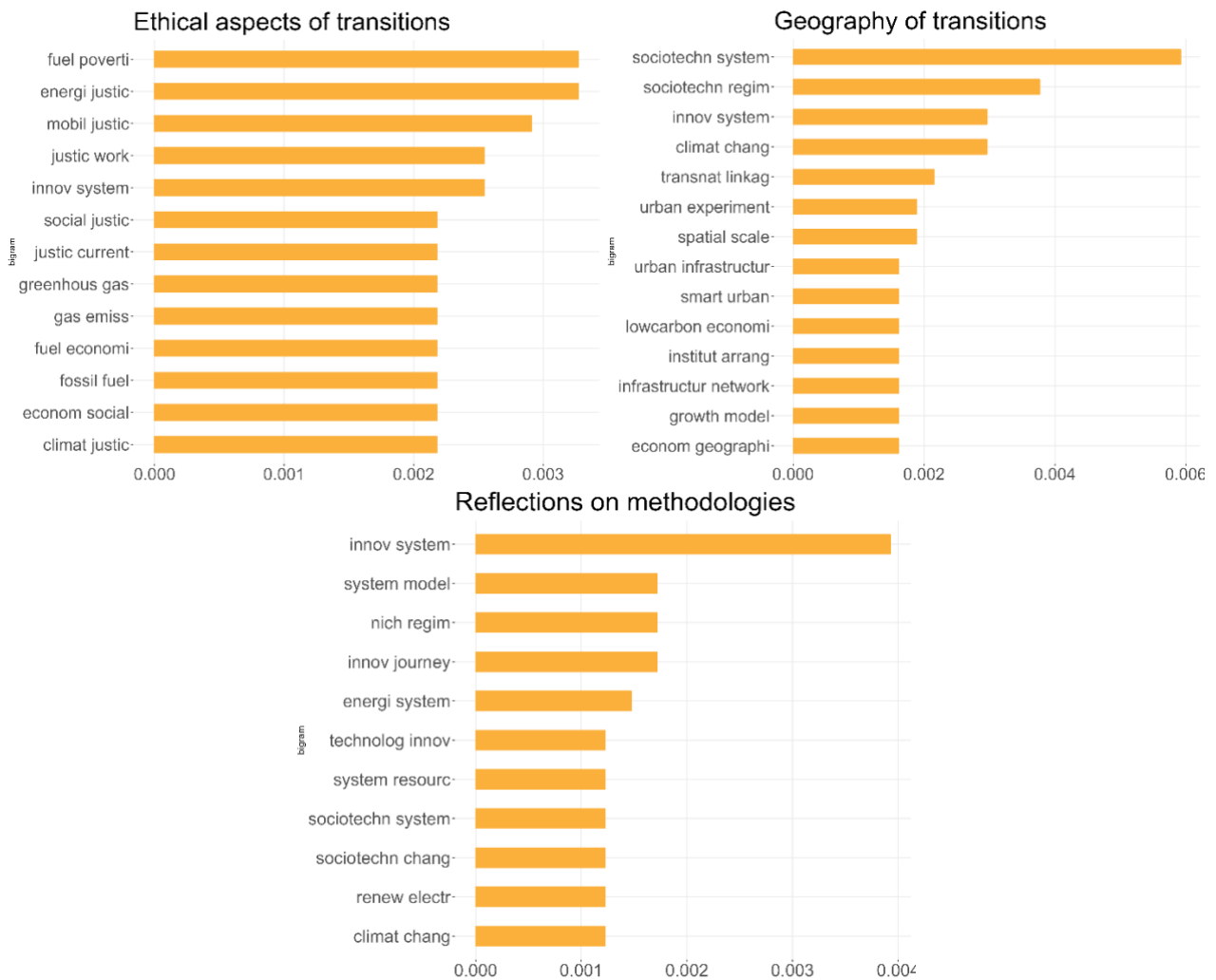*Figure 7. Bigrams from Kohler et al. (2019) classification (3/3)*

Note: On the horizontal axis, the relative frequencies represent the number that each bigram appears in a section / theme over the total number of words of each section/theme. A document may appear in more than one category, according to the classification made by Köhler et al. (2019). To do this, we used the statistical software *R* and the packages *tm, tidytext, stm* to prepare the textual data and *ggplot2* to create the graphs.

Source: Authors' elaboration on Scopus insights

Figure 8 sum up the main finding of our analysis, i.e., the pairwise counts the number of times two *bigrams* appear within documents. As we already stated, at the core there are the pair of words associated with MLP and environmental and energy issues ("*renew energ*"). Around these the other themes are built. Looking at the top left of the network, it is evident that topics Politics and Power and Governance and Civil Society are strongly correlated. The cluster of business and industries ("*busi model*", "*sector transform*", "*smart grid*" etc.) stays in between the MLP and the transitions in practices clusters. The ethical issues remain in a peripheral cluster (at the bottom of the network), as it is related to the core of MLP, but it does not associate with the other clusters.

Figure 8. Pairwise count of top bigrams
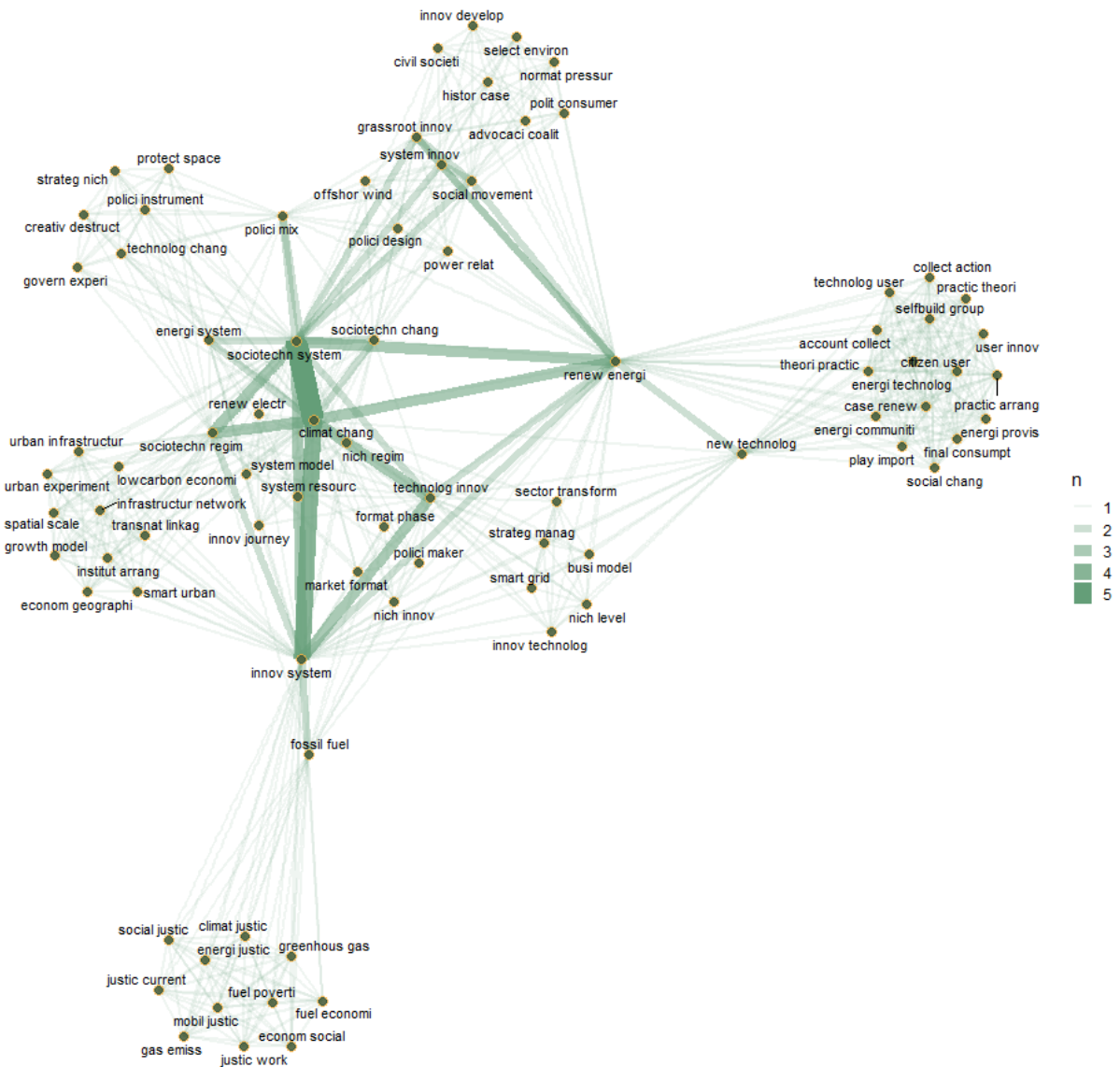
Note: *n* is the number of time that two bigrams appear together, when *n=1* means that a pair appear in one abstract and *n>1* the bigram pair belong to more than one abstracts. A remark, an abstract (document) not necessarily refers to one dimension, but it may be included in more than one category meaning that it deals with several dimension at the same time and it bridges the various themes identified by Köhler et al. (2019). To run this analysis we used the statistical software *R* and the packages *tm, tidytext, stm* to prepare the textual data, *widyr* to compute the bigram pairwise and *igraph + ggplot2* to create the graph.

Source: Authors' elaboration on Scopus insights

2.5 SPES topic model

Using the reference from Köhler et al. (2019), we ran a structural topic model[10] that identifies latent topics while accounting for the hierarchical structure of the selected articles[11] from it. We use structural topic modeling to reveal relationships between topics and metadata variables (we use the time of the publication to control for timing of the narratives of sustainable transition literature), providing insights into the content and structure of the documents' abstracts.

We aim to uncover hidden topics within the classification by Köhler et al. (2019) and examine if it considers economic and social dimensions related to prosperity and well-being in line with the HD paradigm. We opted for structural topic modelling for this analysis because it helps us discover underlying patterns in textual data, going beyond word frequency to reveal topics not explicitly tagged or predefined, aligning perfectly with our research question. We can achieve this while considering document metadata, focusing solely on the publication year since our primary interest lies in conceptualization rather than other aspects such as journal or authorship.[12]According to the structural topic modelling diagnostic as discussed in Roberts et al. (2019), we choose the twelve topics balancing between *Semantic Coherence[13]* and *Exclusivity[14]*.

Figure 9 shows the new classification we made, with twelve topics, presenting the top words[15] for each topic. These are ranked by the natural log of the probability of finding each word conditional on the topic. Therefore, looking at the top ten words that are more likely to appear in each topic, we find that our classification is not much different from the one proposed by Köhler et al. (2019). Even here we can see that the study of niches would be considered a topic per se. The economic component would be split into business-related studies and others more focused on industrial organizations. This suggests the divide between economics and management studies.

A relevant topic that we found is *institutional change*, where terms such as lock-in mechanism (Geels, 2011), pathway, actor and diffusion refer to a set of articles that study how to unlock institutions to drive a radical technological change for a more sustainable production and consumption patterns and habits. This topic also emerged from the topic modelling analysis of Stefani et al. (2022), further highlighting its importance in understanding the transition processes and designing effective policies.

The ethical aspects are slightly different from the original classification. This branch of the literature likely focuses more on the understanding of the processes needed to change paradigms and to create a breakthrough for a more environmentally sustainable society starting from an inner transformation. And, as we saw in the descriptive analysis, this theme is slightly marginal compared to the others.

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[10] To run the analysis, we use the R packages *stm* from Roberts et al. (2019).

[11] We use 294 abstracts for the same number of articles, chapters in books and books. We reduced the original number of references (383) according to abstract availability and our focus on academic works.

[12] See Stefani et al. (2022) for a discussion on these kinds of document metadata.

[13] The measure for semantic coherence refers to one provided by Roberts et al. (2019). It is a criterion established by Mimno et al. (2011), and has a strong association with pointwise mutual information, as indicated by the work of Newman, et al. (2010). It attains its highest value when the most likely words within a particular topic frequently appear together.

[14] Exclusivity also is measured using the Roberts et al. (2019) based on the FREX metric developed by Bischof and Airoldi (2012) and Airoldi and Bischof (2016), which computes exclusivity as the weighted harmonic mean of the word's rank in terms of exclusivity and frequency.

[15] In this analysis we rely on single words for computational reasons.

Given the relevance of the current public debate, in the understanding and design of sustainability transition processes, we claim a sharper integration of both the economic dimension (related to productivity enhancement and value-added creation) and social dimension (related to well-being and human security). The effort of including ethical aspect such as justice, equity and social inclusion in all levels of analysis (micro, meso and macro) will be crucial for the understanding of sustainability transition processes, developing sound theoretical frameworks and designing policies for the successful pursuit of sustainability transition.

The importance of adding more incisively the social and economic dimensions of sustainability transitions and the pillars of HD are crucial in achieving sustainable goals in an integrated way (not merely environmental). It also makes transitions acceptable by the whole society (see *values, contestation, and disagreement* by Köhler et al., 2019), and it is probably the key to breaking some lock-in mechanisms embedded in societies. In other words, according to the critics of Geels (2011) about the *operationalization and specification of regimes*, embracing a more integrated Sustainable Human Development paradigm would make transitions more effective. This is the main scope of the next chapter.

Figure 9. Structural Topic Model: Top Words 12 Topics
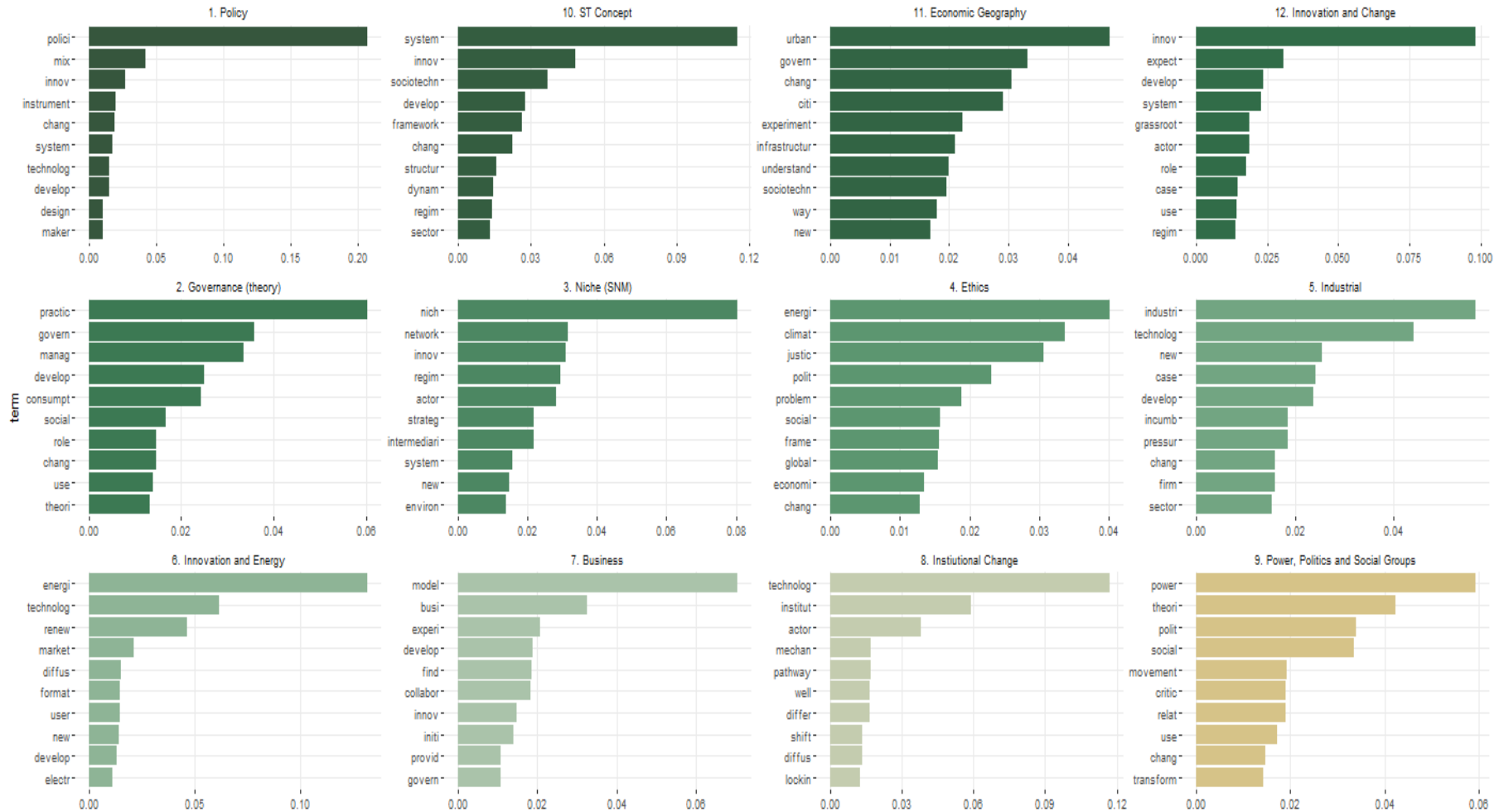
3. A new framework on Sustainable Human Development

3.1 SHD Vision and its theoretical underpinnings

As widely recognized in the literature, the transition towards sustainability entails a systemic change that involves multi-level and multidimensional processes, experimentation and adaptation. However, different dimensions, facets and elements of sustainability transition emerged in the debate (see previous Chapter 2) have not been fully integrated and harmonized, yet. Similarly, the interpretation of sustainability given across countries and stakeholder categories may differ depending on interests and power, leaving the most vulnerable social groups, regions, and countries suffering from the unsustainability of our economic and production models.

Therefore, there is the need of a fundamental shift in the socio-economic systems to fulfill societal needs while respecting planetary boundaries (Raworth, 2017; O'Neill et al., 2018). In other words, there is the need of changing the development vision at all levels.

Since the 1990s, the shift towards a more inclusive and sustainable notion of development has been built largely on the theoretical foundations of two development paradigms: sustainable development (SD) and human development (HD).

The SD paradigm has emerged and acquired momentum in the public debate over the last several decades, becoming an essential element of international organisations' strategies regarding socioeconomic development and environmental protection. Nevertheless, a comprehensive definition of SD is difficult to develop due to its complexity and holistic nature. Basic principles of SD that unite the numerous definitions proposed are: a) the inclusion into the discourse of the environmental, economic, and social dimensions of sustainability (Rockström et al., 2023) and b) the importance of intragenerational justice in the use of ecosystems services (Baumgärtner and Sievers-Glotzbach, 2012), as already suggested in the 1987 Bruntland Report.

Indeed, the SD paradigm has its roots in the 1987 Brundtland Report, which famously defined it as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987,) and identifies the importance to address together economic, social and environmental aspects of development processes and their long-term impacts. The emergence of ecological economics (EE) in mainstream academia led to an alternative to the neoclassical growth theory by emphasizing the role and interconnections between the economy and ecosystems.[16] Seminal works in this field highlighted the planetary boundaries of economic activity and emphasizes the need of a reconfiguration of economic systems to have a

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[16] Also, EE proposed some key concepts that led, as shown below, to a different conceptualization of "sustainability" and "development", such as i) the irreversibility and the unidirectional path of actual phenomena; ii) non-commensurability (i.e., acknowledging that basic ecosystem functions cannot be monetized and then "translated" in monetary terms), iii) the qualitative change of the material (and organic) universe which is involved in an evolutionary process, and iv) the inescapable absolute scarcity of low entropy and the unavoidable natural laws and limits.

smaller ecological impact to ensure sustainable and prosperous development for future generations (Costanza and Daly, 1987; Daly, 1991, 1996; Daly and Cobb, 1994).

Based on these elements, the SD paradigm has been broadened in a consistent way, achieving a paradigmatic status in development studies and among global institutions (Cobbinah et al., 2015). In this regard, the United Nations General Assembly adopted a set of 17 interconnected and interdependent global goals (Sustainable Development Goals - SDGs) and related 169 targets in the 2030 Agenda for Sustainable Development (UN, 2015). The SDGs framework is built to include every aspect of SD, in terms of poverty eradication, improvements in quality education, fight against climate change, reducing inequalities, etc. A vital element of the SDGs is, therefore, to promote socioeconomic development that not only considers economic productivity but also limits growth, which is a brake on the well-being of global society and a risk to ecosystems (Costanza et al., 2016). The academic and policy arena often link this paradigmatic change to the idea of sustainability transition.

The HD paradigm, pioneered by Mahbub ul Haq and the UNDP (1990), puts people at the center of development and is grounded on the seminal contributions of Amartya Sen on the Capability Approach (CA) as well as on the basic needs approach (e.g., Streeten, 1984; Stewart, 1989).[17] Indeed, the CA and HD paradigm have been fundamental in robustly challenging a mainstream vision of development, distinguishing between the means and goals and thus questioning the vision of development, its institutions and its processes. In particular, the CA underlines that societal welfare is derived not from maximizing consumption- or income-derived utility, but rather by the capabilities to function (Sen, 1985, 1999). Therefore, the CA proposes a fundamental shift from concentrating on the means of living to the actual opportunities of living in itself, that is, human flourishing in terms of expanding the capabilities of people to lead the kind of life they have reason to value (Sen, 1999). In contrast to the neoclassical model of economic development defined solely based on economic output and growth, the HD paradigm stresses that *the basic objective of development is to create an enabling environment for people to enjoy long, healthy and creative lives"* (UNDP, 1990, p. 9) and is built on four pillars – productivity, equity, sustainability, and participation (UNDP, 1990 and Haq, 1995) – that stand on an equal level.

In other words, the HD paradigm, which emphasizes the importance of people's actual freedoms in daily life, helps to conceptualize the multidimensionality of development as the process of enlarging people's choices (UNDP, 1990, p. 1).

These two major paradigms have resulted in shifting global institutions, policymakers (primarily UN, OECD, and European Commission) and academic debate from concentrating solely economic growth to the well-being of people and of the planet.

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[17] The Capability Approach (Sen 1985, 1999) has incorporated many of the concerns inherent in the basic needs approach into a full-fledged conceptual framework with an additional emphasis on empowerment and well-being (Clark 2006). The recent Decent Living Standards (DLS) approach to measure poverty also has its roots in the basic needs approach (Max-Neef, 1991; Doyal and Gough, 1991), however, while it positively clarifies the meaning of "decent" (Rao and Min, 2018; Natarajan et al., 2021), it focuses primarily on the material prerequisites for human well-being. *"We see the DLS as a set of material conditions that people everywhere ought to have, no matter what their intentions or conception of a good life, or what other rights they may claim. These material requirements have no intrinsic value of their own. They are justified as entitlements only to the extent they are essential preconditions to meet basic needs or provide central capabilities."* (Rao and Min, 2018, p.226).

The vision underlying the SPES project and framework, reconciling these two paradigms and relative theoretical approaches, points out that the lives of human beings – as agents, beneficiaries and adjudicators of progress – and the sustainability of our societies in terms of Planet, People, Prosperity, Peace and Partnership (see also Sachs, 2015; UN, 2015; UNDP, 2022b) should be the ultimate concern for any government intervention at all levels. Therefore, the SHD vision is capable of reconciling potential contradictions between economic, social and environmental spheres, being underpinned by a normative position on capitalism and structural change, as well as on objectives and factors shaping transition processes.

It follows that prosperity and productivity should no longer to be confused with the narrow and exclusive goal of economic growth, nor that economic growth would automatically deliver benefits for all, as massive persistent inequalities show. In other words, global market structures and attitudes, such as consumerism, which keep people in unsustainable practices, are what drive the actual and dominant market system. Therefore, policy interventions should focus on those factors that can lead to improve productivity and value-added enhancing processes while reducing inequalities and mitigating the risk of reaching environmental tipping points (Schwab, 2019). In this regard, the Sustainable Livelihoods Framework (Natarajan et al., 2021) sheds light on these processes and power at work distinguishing between different type of capitals in action, e.g., human, social, natural, physical and financial.

In other words, these points also question the ability of technological innovation and capitalism alone to achieve sustainability transition and SHD. Rather, in the interpretation given by the SPES project, they clear point at the importance of involving all societal actors in governance, innovation and investment processes that push transition toward SHD.

Taken together, these arguments imply the transition from a logic of "shareholder capitalism" towards a logic "stakeholder capitalism", moving to a global economy that works for progress, people and the planet (Schwab and Vanham, 2021) but including also peace and partnership. This resonates with an integral ecology perspective[18], which is inseparable from the notion of the common good – a long-lasting argument by many religious ontologies and traditions across the world that current leaders[19] are urging on today, in order to take into account every aspect of the global human and environmental crisis.

All in all, we argue that the Sustainable Human Development paradigm, on which the SPES project is built, offers a clear integrated vision to sustainability transition processes, which should be completed with an in-depth discussion on its pillars, driving actors and triggering factors. In this way, as we are going to explain in the next sections, it may offer a useful and integral guiding vision for policymakers based on sustainability and human development including material and immaterial dimensions of life and well-being.

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[18] Integral Ecology is an integrated and holistic approach that sees the interconnectedness of environmental, economic, political, social, cultural, and ethical issues and, thus, it calls for comprehensive solutions to what is both an environmental and human crisis. It requires social peace, stability and security and it includes taking time to recover a serene harmony with creation, reflecting on our lifestyle and our ideals towards distributive justice).

[19] See Pope Francis (2015), as well as the books and teachings of the 14th Dalai Lama and Gandhi among others.

In short, the novel SPES framework is built as follows:

1. We refer to the 5 Ps of the 2030 Agenda – People, Prosperity, Planet, Partnership, and Peace – as the main critical areas of action, thus referring to sustainable development as overarching policy framework at global level.
2. We identify the corresponding objectives – productivity, equity, environmental sustainability, participation & empowerment, human security – reinterpreting the original formulation of the pillars of the human development paradigm to better link them to the 5 Ps, thus fully embracing a SHD vision.
3. We rely on the Quintuple Helix model to introduce the constellation of actors – government, business, academia, civil society, natural environment[20] – potentially driving the transition towards SHD, assigning them a dynamic role for all pillars.
4. We stress the importance of inner transformation and reflexivity as transformative elements allowing to trigger the transition towards SHD by shaping different means of implementation.

It is important to remark that these building blocks together allow combining the global policy framework of the 2030 Agenda for Sustainable Development with the theoretical insights of Sustainable Human Development, making our original contribution both theoretically-grounded and policy-oriented. Similarly, they allow making our framework dynamic and centred on collective action shaped by a clear perspective for the common good and a consequent normative position on capitalism as well as on objectives and factors shaping transition processes.

These building blocks of the SPES framework are presented step-by-step in the following sections.

3.2 Areas of action and pillars of SHD: a new theoretical contribution

The 5 Ps of the 2030 Agenda represent the starting point of our framework (see Figure 10), as they introduce the areas of critical importance for humanity and the planet through the pursuit of goals and targets that are integrated and indivisible, global in nature and universally applicable.

The 5 Ps refer to People, Prosperity, Planet, Partnership, and Peace, each representing a critical area that needs to be considered to achieve the SDGs.

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[20] To better clarify, while Planet represents a critical area of action and environmental sustainability represents its corresponding objective, the natural environment is conceived as a live actor affecting – directly and indirectly – all pillars of SHD and related processes.

Figure 10. The 5 Ps / areas of action of the 2030 Agenda
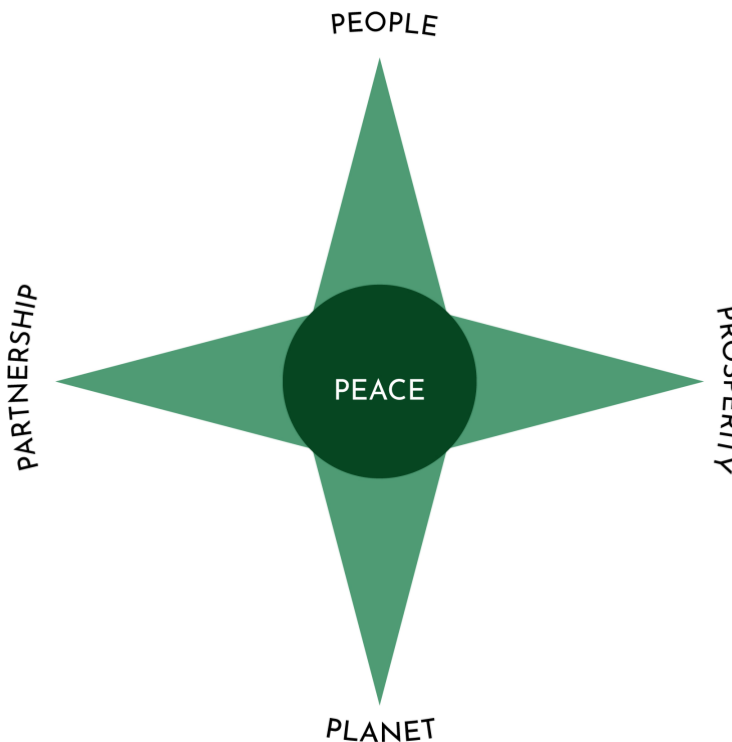
Source: Authors' elaboration

Each P as a critical area of action can be briefly presented as follows.[21]

People: This area acknowledges the diverse needs, aspirations, and vulnerabilities of different populations and strives to ensure no one is left behind in transitions towards sustainable development. Therefore, it emphasizes the importance of ensuring social inclusion, equity, and well-being for all individuals by placing attention on addressing issues related to poverty, hunger, health, education, gender equality, and social justice.

Prosperity: This area focuses on guiding economic growth, job creation, and sustainable livelihoods that promotes social and environmental sustainability. It seeks to ensure that the processes of economic development benefits everyone, especially the most vulnerable and marginalized, without compromising the nature and the well-being of future generations.

Planet: This area recognizes the crucial role of Earth's limited resources and ecosystems and the urgency to protect the environment for current and future generations. It involves promoting regenerative economic practices including sustainable consumption and production patterns, conserving biodiversity, combating climate change, managing natural resources responsibly, and

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[21] For the sake of synthesis, we mostly refer here to the 2030 Agenda, notwithstanding the long-lasting academic debate and literature on each of the 5 Ps.

protecting ecosystems to ensure the planet's resilience, keeping into account the limits given by planetary boundaries.

Partnership: This area acknowledges that achieving the SDGs requires collaboration and coherence among the various actors in governments, the private sector, civil society, and international organizations. It involves fostering inclusive and effective partnerships at the local, national, and global levels in order to promote the knowledge-sharing, technology transfer, and capacity-building required to leverage collective efforts for sustainable development.

Peace: This area highlights the fundamental role of peace, justice, and strong institutions as a prerequisite for enabling sustainable development. This dimension seeks to address the root causes of suffering and conflicts, promote good governance, rule of law, and human rights, as well as ensure social cohesion and inclusivity to create an environment conducive to sustainable progress.

Nowadays, these 5 Ps of the 2030 Agenda must be taken at the forefront of any interpretative framework concerning sustainability and sustainability transition, due to their fundamental role in setting global, national and local development agendas and strategies. Nevertheless, it is not by chance that, in the figure representing our SPES framework, Peace has been centrally placed while the other four areas, despite being obviously fundamental, represent the cardinal points of SD. Indeed, in our interpretation, Peace is a vital standpoint, with a much broader meaning than simply the absence of conflicts: rather, it refers to the harmonious coexistence between humans as well as between the ecosystem and human beings. In this sense, it enables the protection and the participatory regeneration of the common good, being both a mean and an end as implied by the 2030 Agenda itself: *"there can be no sustainable development without peace, and no peace without sustainable development"* (UN, 2015, p. 2).

As a second step, an element of novelty of SPES framework is linking these 5 critical areas of action with the pillars of SHD, which represent the objective to be pursued for each area in an integrated way.

In the original formulation proposed by UNDP (1990) and Haq (1995), the four essential components of the HD paradigm were productivity, equity, sustainability, and empowerment, allowing to distinguish the HD paradigm from the more traditional economic growth models.[22]

In our SPES framework, we re-interpret these four pillars to adjust them to current societal challenges while also introducing a new fifth pillar to take into account for the role of social relations, stability, and peace: the notion of human security (Gomez and Gasper, 2021; UNDP, 2022a). Having this additional pillar is fundamental for two main reasons, among others: first, because many of the current human insecurity threats are a by-product of the human choices in the pursuit of unsustainable and unbalanced growth (UNDP, 2022a), resulting in social imbalances and

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[22] Taken together, the five pillars of SHD jointly highlight that the quality of growth matters. Indeed, there are different types of unsustainable growth: *jobless* growth (growth that does not create new employment opportunities with it), *ruthless* growth (growth that only benefits the rich, and leaves the poor in their poverty), *voiceless* growth (growth without improvement in democracy or social inclusion), *futureless* growth (growth that undermines future generations by depleting resources or destroying biodiversity) (UNDP, 1996), along with rootless growth (growth at the expense of cultural identity, or the loss of minority identity, as in UNDP, 2016), *peace-less* growth (Fukuda-Parr, 2007) and *health-less* growth, as the Covid19 pandemic has shown (Ferrannini et al., 2021).

environmental degradation; second, because it allows to identify a primary one-to-one linkage between the 5 Ps and the five pillars (see Figure 11), notwithstanding the integrated and indivisible nature of our framework.

Figure 11. The five pillars of SHD
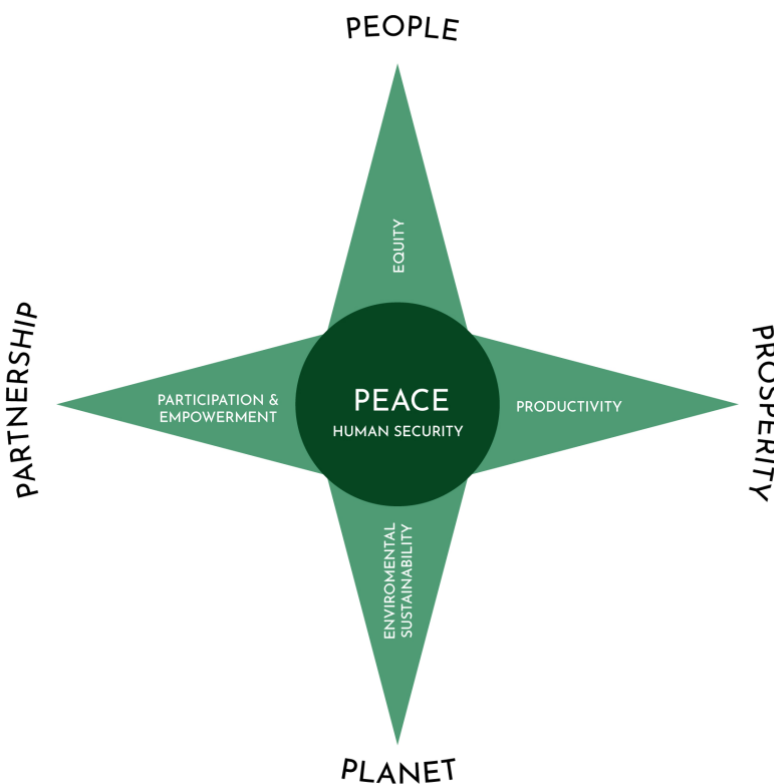
Source: Authors' elaboration

In other words, we slightly reinterpret the original four pillars of the HD paradigm to better dialogue with 5 Ps of sustainable development by adding a new one based on the human security concept. Taken together, the 5 pillars of SHD represent a novel contribution of our SPES framework in the academic and policy debate.

Each pillar is described in detail and newly understood in its proper perspective.

Productivity

The efficient use of economic, human and natural resources for the provision of goods and services, expanding human capabilities and increasing the standards of living for all.

Productivity is one fundamental pillar of SHD (Haq, 1995; Biggeri and Ferrannini, 2014; Ferrannini et al., 2021), primarily referring to the area of Prosperity. Here, same as Sen (1980) asked *"Equality of what?",* we want to raise the question *"Productivity of what?",* summarizing the various approaches to define and measure productivity, understand synergies and trade-offs within and between various methods and asses the strengths and limitations of these different views. The point is that, as stated by Sen (1990, p. 41):

> *"Human beings are the agents, beneficiaries and adjudicators of progress, but they also happen to be − directly or indirectly − the primary means of all production. This dual role of human beings provides a rich ground for confusion of ends and means in planning and policy-making. Indeed, it can − and frequently does − take the form of focusing on production and prosperity as the essence of progress, treating people as the means through which that productive progress is brought about (rather than seeing the lives of people as the ultimate concern and treating production and prosperity merely as means to those lives)"* .

The aim is to reconcile the definition of economic productivity with the concept of sustainability in a broad sense, meaning that, productivity must be "sustainable" not only from the environmental point of view but also paying attention to various well-being dimensions (Rogers et al., 2012). In addition, we should adopt an operational definition that allows us to measure it, provide rigorous evidence to advance in the academic debate on sustainability and sustainability transition and to help policymakers to design and implement sustainable policies and actions (Zenghelis et al., 2020).

Undoubtedly, productivity is one of the crucial determinants of economic growth. It is fostered by technological and organizational innovation, and then capital and investments play a crucial role in its improvements. Moreover, it is a relevant element of the labor market since it is one of the key determinants of the wage levels and then workers' retributions.

Usually in economics, the level of productivity measures the efficiency of using a certain volume of inputs to produce an output, thus being defined by the ratio between total output and inputs (both measured in monetary terms). It represents the capacity of an economy to efficiently employ its own production factors and determines its performance in terms of volume and values of the output produced and the relative growth over time. However, inequality and depletion of environmental resources may arise even with efficient economic performance as: a) efficiency (conceived as functioning competitive markets) does not prevent inequalities to skyrocket, and b) efficiency (conceived, for instance, as lack of waste) does not prevent the ecosystem to collapse.

In this regard, Costanza et al. (2016) provides a comprehensive review of the existing approaches to measure consumption, production, and wealth-based indicators. This seminal paper represents a relevant contribution to the existing literature that already suggested new frameworks to measure productivity considering a more sustainable notion of growth.

Before developing novel methods to define and measure productivity, it is necessary to determine a proper outcome variable from which we can compute productivity metrics. In our view, this means adjusting GDP and economic growth measures to include other well-being and sustainability dimensions.

Nevertheless, the neoclassical and mainstream operational definition of productivity is often associated with total factor productivity and multifactor productivity which is the residual contribution of intangible inputs that are not labor and capital, such as technology, organizations, institutions, natural advantages, and other potential latent factors that explain cross-country differences in growth performances.

The OECD proposed an approach to measure the *Environmentally Adjusted Multi-factor Productivity*. The work of Cárdenas Rodríguez et al. (2018) describes a growth accounting approach including a pollution-adjusted measure of output growth into the contributions of production factors such as labor, produced capital and adding natural capital. However, this approach, although could be considered a good starting point lacks a comprehensive and multidimensional view of well-being and based on myopic neoclassical assumptions including weak sustainability (Guarini, 2023). Therefore, the challenge of attempting to standardize all dimensions under a single unit of measurement, such as monetary value, raises doubts about the effectiveness of such an endeavor. This is due to the potential for such simplifications to result in misguided interventions. In essence, acknowledging the inherent incommensurability is a crucial step in formulating nuanced policies that simultaneously support economic imperatives while also safeguarding the critical biophysical processes that underpin these activities.

A sustainable (in a broad sense) view of productivity is important because many countries are facing at the same time a double challenge concerning the twin transition, i.e., green and digital transitions (EC, 2022b; Muench et al., 2022). The latter leads to an improvement in technology which is likely to make production more efficient, but less clear is the effect on the environment and employment. In this regard, the debate on green innovations that are supposed to enhance growth while also protecting the planet life-support system is very animated (Abbas and Sağsan, 2019; Rehman et al., 2021; Wang et al., 2022), despite these outcomes may not be taken automatically for granted. Similarly, focusing on the well-being dimensions, the digital transformation may have a controversial effect on those countries or economic activities with limited access to digital technologies and for those endowed with inadequate levels of human capital (or unskilled workers).

This is especially true considering that the increasingly widespread use of Artificial Intelligence (AI) is having a major impact on the world of work, as the trend towards automation prevails over the enhancement of work itself and it has also induced changes in the composition and quality of both work activities and the skills employed. Indeed, machines are more and more capable of performing human activities, even better than humans themselves, and have generated increasingly strong pushes towards the replacement of the latter. On the one hand, this dynamic has certainly produced very positive effects: an increase in labor productivity (in terms of value added) and growth in incomes and living standards. On the other hand, however, it has generated negative consequences since wealth is distributed in a highly asymmetrical way, creating economic, social and power inequalities (Autor et al., 2022; Biggeri, 2023).

For all these reasons, we define productivity in an integrated way, to keep into account the multifaceted nature of innovation, value-addition and growth processes: the proper and desirable use of economic, human and natural resources for the provision of goods and services, expanding human capabilities and increasing the standards of living for all.

Equity

Ensuring equitable access to economic, political, social and cultural opportunities for all.

The HD paradigm puts people as the central objective, arguing that the basic purpose of development is to enlarge people's choices regarding economic, social, cultural, and political opportunities. For this to happen, people must enjoy equitable access to these capabilities (opportunities and abilities), which is a key pillar of the HD paradigm and considered a fundamental human right (UNDP, 1990; Haq, 1995). Based on the theoretical foundations of the CA of Amartya Sen (1985, 1999), the focus of equity is on capabilities as opportunities, rather than on results – a key distinction to highlight that what matters is that people are equally able to develop their capabilities and flourish but have the freedom and agency to choose what the final results are and how to live the lives they value. It is important to point out that equity of capabilities implies careful consideration of inequalities in conversion factors. A special focus must therefore be placed on ensuring that individuals have the required ability, knowledge and support to be capable of converting their resources into desired functionings. This aligns with the philosophical foundations of the universalism of life claims for everyone, which argues that human life should not be valued solely because people can produce material goods, but rather because of the assumption that all individuals must be enabled to develop their capabilities to the furthest and be able to make the best use of them throughout their lives (Haq, 1995). Therefore, clearly, the pillar of equity primarily refers to the area of People.

From the HD perspective, equity is a multidimensional concept going beyond solely economic aspects, highlighting that "*from a normative perspective, the inequalities that matter intrinsically are inequalities in capabilities*" (UNDP, 2019, p. 31). As Snower (2018) argues, there needs to be more than just an equitable distribution of material wealth, highlighting the importance of equity in terms of opportunities for personal achievement and social embeddedness. Attention must therefore be placed on the multiple sources of social inequity, in particular disparities between gender and other social groups, all while taking into consideration current and future generations (Samman and Roche, 2015).

This requires an analytical approach based on intersectionality, as the same person can face multiple forms of inequalities simultaneously, leading to various and complex modes and forms of social exclusion and discontent, which play a role in determining the level of freedom they have to choose what they want to be and do (de Santiago et al., 2022). Issues of equity are becoming increasingly salient given the complex forces of globalization and technological process which have led to increasing sentiments of economic disempowerment and social estrangement among the public (European Parliament Research Service, 2023). Moreover, financial capital ownership based on current market principles has concentrated, rather than broadened, income/wealth inequalities. These outcomes have a clear political nature as they strongly reflect the preferences of the most

affluent, while the preferences of poor or middle-income citizens are neglected (Biggeri, 2023). This vicious circle, together with other factors, create a structural bias at the disadvantage of decent work and it is one of the main causes of inequality.

Development without equity means a restriction of the choices of many individuals in a society, and depending on how inequitable the development process is, it can disenfranchise whole sections of society (Haq, 1995, p. 17). From this view, attention must be placed on the distribution and cohesion of development processes also from a territorial perspective (Biggeri and Ferrannini, 2014). Inequalities in opportunities due to circumstances beyond individual control are deemed unfair and justify intervention to ensure all individuals in a society have the means required to flourish (Brunori et al., 2013). In combination with the other pillars of the SHD paradigm, the focus on equity offers a sound theoretical framework for understanding and justifying many policy initiatives aimed at tackling many of today's complex issues and challenges facing local, regional, national, and global communities.

Sustainability transitions have at their core the fundamental pillar of equity, both in terms of inter- and intra-generational equity (Vojnovic, 1995). They call for equality of opportunity in benefiting from development processes among different populations/regions as well as between present and future generations by focusing on and ensuring that the ecological health of our planet is maintained and not threatened through impactful economic processes. Given the crucial – albeit often overlooked – role of ecosystem services in enabling and sustaining life and economic activities on our planet, the notion of equity can also be extended to incorporate equitable access of current and future generations in all parts of the world to the opportunity to benefit from ecosystem services to sustain and promote nature-based human development (Haq, 1995; UNDP, 2020, ch. 6). In addition, the importance of equity has been the focus of policies for a just transition, a call originating from labour unions advocating for a fair and equitable sustainability transition through targeted support to those most vulnerable individuals, sectors, and regions to ensure that no one is left behind (ILO, 2008, 2018).

Balancing the calls for equity between and within generations is a complex and highly challenging issue for policymakers requiring a thorough and comprehensive analysis of the dynamic, multi-actor, and multi-level synergies and trade-offs. The SHD paradigm offers a suitable approach for tackling such problems, highlighting, in particular, the importance of individual empowerment for all to ensure this process occurs in a holistic way with people at the core.

Environmental sustainability

The practice of responsibly managing and preserving natural resources and ecosystems, ensuring a balance between current and future well-being.

Environmental sustainability[23] is the third pillar of Sustainable Human Development (UNDP, 1990; Haq, 1995), concerning both the human impacts on the environment (natural resources and

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[23] As compared to its original formulation by Haq (1995), here we stress the "environmental" dimension of sustainability, as the economic and social dimensions are already embraced by the other SHD pillars.

ecosystems) as well as the effects of global warming and climate change, and thus primarily referring to the area of Planet.

Two opposing points of view on the meaning of sustainability can be found in the formulation of the concepts of "weak sustainability" and "strong sustainability" (Boda and Faran, 2018), characterized by several theoretical differences outlined by Bebbington (2001):

- Weak sustainability is: a) achievable with adjustments of the current system, b) characterized by the pursuit of continuous economic growth made possible thanks to innovations and technological development, and c) focused on ecological issues of the Global North;[24]
- Strong sustainability: a) requires structural change, b) questions about the current paradigm of economic growth that need to abandoned, c) claims that certain sorts of "natural capital" are deemed critical (e.g. water), and not readily substitutable by man-made capita, and d) is focused not only on ecological issues but also on intragenerational equity and inequalities at world level[25], coherently with the "Common But Differentiated Responsibilities" principle, also called "historical polluter-pays" principle. This concept, in our SPES vision, needs to be further integrated to the integral ecology notion of unity presented later in chapter 4.

A similar ambiguity concerns the concept of describing sustainable development. According to Daly (2007), to define it, it is necessary to underline what is supposed to be sustained in sustainable development. Two answers are provided in this respect. According to neo-classical economists, development is sustainable when the economic utility of future generations is maintained at the same level as the previous generations. Alternatively, according to ecological economists as Georgescu-Roegen, development can be considered sustainable when the physical throughput – the flow of matter–energy from the environment as low-entropy raw materials and back to the environment as high-entropy wastes, (see Cumberland et al., 2015, p. 90) – is sustained and the natural capital is kept intact. The idea behind the latter interpretation of sustainability is related to the "bioeconomy" theory, according to which significant economic growth has determined an increase in the exploitation of resources and a rise in world production and consumption (Georgescu-Roegen, 1984). The bio-economic perspective is still in the minority among academics but has seen increasing interest from European and international institutions (El-Chichakli, 2016; Patermann and Aguilar, 2018; European Parliament Research Service, 2023).

In the past few decades, the issue of global warming has increased in salience and taken a prominent position within the scientific community and, subsequently, in the public debate and within national and international institutions (Swim et al., 2022). This discourse comes from the acknowledgment by scientists of an unusual increase in global temperatures in the last century and of an escalation in climate extreme events in recent decades (Olabi and Abdelkareem, 2022).[26] While consensus regarding climate change caused by human action emerged as early as the early 2000s,

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[24] According to Guarini (2023), environmental adjusted multifactor productivity assumes weak sustainability.

[25] These arguments also resonate with Mahatma Gandhi's famous quote "*The world has enough for everyone's needs, but not everyone's greed.*"

[26] The growing awareness of the importance of global warming has led to the establishment in 1988 of an intergovernmental body of the United Nations, the IPCC (Intergovernmental Panel on Climate Change), specifically focused on facing the consequences of climate change, such as sea level rise, melting polar ice, and temperature of the oceans; in addition, since 1992 an international environmental agreement has been approved by United Nations, namely the UNFCCC (United Nations Framework Convention on Climate Change).

the widespread belief among the general public in the existence of climate change has only occurred more recently, even with the continued exceptions of individual cases (Lynas et al., 2021). However, the implementation of appropriate climate change assessment and mitigation strategies, on the other hand, is an issue where key actors – such as policymakers, entrepreneurs, researchers, civil society – are not in agreement (White and Noble, 2013).

The debate on environmental sustainability cannot be separated from its measurement. Among the widely used measures of the planet's conservation status are greenhouse gas emissions (tonnes per capita), namely carbon dioxide (CO_2), methane (CH_4), and, to a lesser extent, nitrous oxide (N_2O). Despite its dated use, this indicator is one of the most reliable among all sustainability indicators (EC, 2023). The ecological footprint is a further pivotal measure of environmental sustainability (Wackernagel and Rees, 1997), estimating the environmental impact of population, country, or individual activities on the planet.[27] The Environmental Performance Index (EPI) is an alternative comprehensive metric that evaluates countries' environmental sustainability and performance worldwide. The co-evolution of economic growth with ecological issues is the subject of several specific indices proposed in recent years, by the idea that greater environmental sustainability does not have to lead to a slowdown in the development dynamics of global wealth (Visvizi et al., 2018). In this vision, more accurate use of resources and the contribution of technological innovation should favour so-called green growth. According to the green growth perspective, environmental protection and combating climate change can coexist with pursuing global economic development.

In this regard, awareness of the criticality of the situation has led those most responsible for the deterioration of the environment in recent decades to establish a set of shared mechanisms for mitigating the effects of climate change, with the aim to favour emissions reductions while facilitating the transition to a more sustainable and low-carbon economy. Carbon markets are an effective tool for combating pollutant emissions, although they present some critical issues, such as the distributional effects that such systems can cause (Wang et al., 2019). This issue, combined with the need to include elements beyond measuring pollutants in the environmental sustainability dimension, must be considered not to limit the scope of responses to the current climate crisis, opening to an integral ecology perspective.

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[27] Besides the carbon footprint, which represents the amount of greenhouse gas emissions produced directly or indirectly by human activities, several other key indicators are used to calculate and assess the ecological footprint (Costanza, 2000; Lin et al., 2018): energy consumption per capita; land, water, and energy used in food production; water use in the production processes of goods and services and for direct consumption; land area required to support human activities; the impact on biodiversity and habitat loss; solid waste produced by human activities, including household waste, industrial waste, and electronic waste, and waste disposal methods such as landfilling, recycling, and incineration.

Participation and empowerment

Enabling individuals and communities to be active agents of their own future by ensuring a level playing field for the societal engagement of citizens and stakeholders.

All societal stakeholders play a fundamental role in the generation, shaping, and maintenance of sustainability transition, and are in consequence partly responsible for the effective pursuit of a SHD vision at local, national and global levels.

In other words, the sustainability transition – and, more broadly, the structural change of modern economies and societies towards SHD – can only pass through societal partnerships based on individual and social empowerment with the participation of people in public reasoning and debate (Sen, 2009). Therefore, clearly the pillar of participation primarily refers to the area of Partnerships.

According to Frediani et al. (2019), the role and concept of participation are at the heart of current development thinking and practice. The 2030 Agenda and its SDGs recognise in several instances the importance of participatory processes and partnerships for achieving many of their targets in an effective, accountable and inclusive manner. This has been pushed by clear theoretical arguments (Freire, 1997; Chambers, 1997), primarily stressed in the human development debate (UNDP, 1990; Drèze and Sen, 2002; Mehrotra, 2008; Clark et al., 2019a).

Participation is at the core of the concept of human development as "*people are both the beneficiaries of such development and the agents of the progress and change that bring it about. This process must benefit all individuals equitably and build on the participation of each of them*" (UNDP, 2004, p. 127).

Haq (1995, pp.19-20) highlights that "*The human development approach is neither paternalistic nor based on charity or welfare concepts […] a strategy that would be neither consistent with human dignity nor sustainable over time*". Indeed, people, communities, social groups and firms are not passive objects of socio-economic policies and welfare provisions, but are active and responsible subjects deciding and shaping what kind of development they want.[28] Therefore, SHD focuses on development by the people, thus giving a central role to participation and to the ability of people to be agents of their own lives (Alkire and Deneulin, 2009). In this view, people are both the ends as well as the means to SHD, and the issues of "who decides" and "how it is decided" are as equally important as "what is decided" (Alkire, 2002a).

In their seminal book on the capability approach, empowerment and participation, Clark et al. (2019a) highlight – based on extensive literature review – that participation has both an intrinsic value, as an aspect of the quality of life, and an instrumental value for human development and capabilities, as a means of bringing about economic, social and environmental change in tune with people's priorities and aspirations (Hart et al., 2014). As for the former (intrinsic value), Amartya Sen's capability helps to recognise the intrinsic value of participation as a basic human freedom for people to make decisions in matters that affect their lives, or, more broadly, the freedom that we have to transform the world we live in, both for ourselves and for others. As for the latter (instrumental value), participation is highly relevant both for allowing people and stakeholders to act

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[28] In Sen's words: "*the people have to be seen, in this perspective, as being actively involved – given the opportunity – in shaping their own destiny, and not just as passive recipients of the fruits of cunning development programs*" (1999, p. 53).

for social change at the local level as well as for safeguarding international public goods (Clark et al., 2019b). For instance, participation may contribute to achieving a better design and implementation of public policies in different ways: it may generate greater technical success due to access to local information in policy design; it lowers implementation costs due to supportive behaviours and attitudes; it supports sustainability as individuals and communities may continue the improvements after the cessation of policies; it encourages empowerment and self-determination as participants set their own objectives; and it is sensitive to local cultural values because people influence the initiatives in all stages (Alkire, 2002a).

All in all, Frediani et al. (2019, p. 4) argue that "*the original motivations for bringing participation to the heart of the development process has been to enable a personal, collective and structural process of empowerment*". A comprehensive concept, empowerment means that stakeholders are in a position (and perceive themselves as entitled) to exercise choices of their own free will, and to exercise the voice and agency required for social and political change (Haq, 1995; Alkire, 2002a; Alkire and Deneulin, 2009; Clark et al., 2019a). However, participation is sometimes used merely as a tool for achieving pre-set objectives and not as a process to empower groups and individuals to take leadership, envision their futures and improve their lives (Frediani et al., 2019).

Whether at the level of policy-making or implementation, according to Sen (1999) this principle implies that stakeholders need to be involved at every stage not merely as beneficiaries but as active agents of change who are able to pursue and realize goals that they value and have reason to value. Additionally, it implies looking into new strategies for promoting interaction and partnerships within and across communities and countries.

In other words, this requires ensuring democratic engagement of all levels in the sustainability transition process and building ownership of a SHD vision and associated policy measures (European Parliament Research Service, 2023). Therefore, stakeholders must be given the power to define their own local priorities and select the most appropriate ways to achieve them.

In this regard, the concept of "participatory capabilities" was developed by Frediani (2015) and is concerned with people's choices, abilities and opportunities to engage in the process of participation. It is motivated by the need to avoid paternalism in participation, strengthen democratic practices as well as individual and collective forms of action and critical awareness. This emphasizes the need for participatory processes to focus also on background conditions for participation as well as the democratic ideals associated with participatory practices, rather than just people's abilities and capacities to engage in public reasoning (Frediani et al., 2019).

In a nutshell, society should aim to form critical, responsible and capable agents and this requires action on several fronts. People need to be free to pursue an education, speak in public without fear, express themselves freely, form associations, among others, in order to be agents of their own lives. In turn, as these crucial capacities and skills are acquired and strengthened over time, the process of participation and empowerment facilitates "evolving capabilities" over the life-course (Ballet et al., 2011; Hart et al. 2014).

These arguments are aligned with UNDP (1990) and Haq (1995), who stresses that the empowerment of people distinguishes the human development approach from other development concepts with which it is normally confused. Requiring investment in people as a prelude to

participation, human development models are not basic needs models, which require only the provision of basic social services, normally by the state.

Human security

> *The sum of capabilities "freedom from want, freedom from fear, and freedom to live with dignity".*

Adding this fifth pillar to the SHD paradigm is an original contribution of our SPES framework. Indeed, the concept of human security[29], renovated by UNDP (2022a), is strongly connected with the HD paradigm and the CA. In this framework, we consider human security as a new pillar and a foundational element for SHD, referring to the area of Peace as "*it addresses the basic aspirations of every human being (i.e., in a word, the capability to live in peace and to flourish)*" (Biggeri and Tapia, 2023, p. 253). In particular, human security is the cornerstone of stability, peace and progress. In other words, enhancing human security everywhere will facilitate the construction of a space for dialogue to resolve collective societal challenges within our societies and across the globe.

Indeed, the world is going through turbulent times in the third decade of the 21st century due to multiple, concomitant and interconnected crises causing deep uncertainty about the futures where different threats interact and compound one another. There are several interconnected layers of uncertainty affecting human security: the climate emergency is looming; the prevalence of violent conflict has increased, with every tenet of human security being violated in wars across the world (Afghanistan, Iraq, Ukraine, being the most famous recent examples); political polarization is increasing in most countries in the world deteriorating democratic systems; the digital divide is exacerbating human development gaps and new technologies are raising new ethical issues; inequalities are persistent, eroding human dignity.

In the Anthropocene, many of these pressing current threats are a by-product of the human choices in the restless pursuit of economic growth (UNDP, 2022a), resulting in social imbalances and environmental degradation. In other words, countries have been pursuing (economic) Prosperity at the expense of all other Ps, particularly Planet, People and Peace. Moreover, ill-designed security responses can lead to more human insecurity, and, according to Biggeri and Tapia (2023, p. 254), "*some of the current societal challenges are likely linked to failed security approaches, with a focus on the defense of States or economic interests, rather than on humanity at large and nature.*"

Thus, the rise in human insecurity is not only damaging people's fundamental freedoms (from want, from fear, and from indignity). It is also deeply destabilizing, inducing a vicious cycle where people's responses to the current crises are likely to exacerbate the situation. People with high levels of perceived human insecurity have diminished trust in others and are more likely to hold politically extreme positions (UNDP, 2022a). This process erodes the social mechanisms for deliberation and collective action. Particularly in societies with low levels of trust and confidence in government institutions, weak democracies and political polarization, collective responses are less likely to bring societies together to face common challenges.

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[29] The modern formulation of the term "human security" comes from the Human Development Report 1994 (UNDP, 1994), led by Mahbub Ul Haq with Amartya Sen as per of the team, and was further elaborated in the report of the Commission on Human Security in 2003 led by Sadako Ogata and Amartya Sen.

In this scenario, human security is added as a central fifth pillar of SHD in our framework and, together with Peace as a critical area of action, can be used for directing policy formulation (Gómez and Gasper, 2021).

Following the HD paradigm and CA, human security responses are people-centred (as opposed to State-centred), comprehensive (drawing together all necessary actors), context-specific (acknowledging that there is no "one size fits all" in policy making across different realities), and prevention-oriented (focused on causes and anticipation) (UNTFHS, 2016).

The Ogata-Sen report in 2003 proposed *protection* and *empowerment* as two main elements for advancing human security (UNTFHS, 2016). Protection strategies serve to shield people from threats, recognizing that people and communities are "*deeply threatened by events beyond their control*" (Ogata and Sen, 2003, p. 11). Protection requires that people's basic rights and freedoms are consistently and comprehensively upheld. Meanwhile empowerment strategies enhance "*people's ability to act on their own behalf −and on the behalf of others*" (Ogata and Sen, 2003, p. 11) which contributes instrumentally to developing people's resilience against threats.

The UNDP Special Report on Human Security in 2022 (UNDP, 2022a) proposes an updated human security framework, incorporating *solidarity* as a third element alongside protection and empowerment. Solidarity denotes a commitment to systematically consider that the security of some people and groups is linked inextricably with that of others — evoking the idea of "common security" (Gómez and Gasper, 2021) — and to craft responses that advance security for all when navigating the challenges of the Anthropocene. In devising human security responses, solidarity takes an instrumental role, going beyond its intrinsic value in supporting collective action.

A new social pact centred on human security is critical both for defending people's integrity and for facilitating effective collective action. In other words, the expansion of human development tomorrow depends on building robust human security systems – based on empowerment, protection and solidarity – today.

Indeed, an intervention that focuses on protection and not on empowerment is a security intervention, but not a genuine human security action. Protection without empowerment can result in creating inequities in power that can lead to abuse. Similarly, an intervention that focuses on empowerment and not on protection falls short of meeting the requirements of a human security action. Empowerment without protection from negative events beyond the control of the individual or the community can leave people exposed to costly human shocks. Moreover, protection and empowerment strategies highlight the importance of keeping people at the centre of human security responses. If communities focus only on empowerment and protection without considering the consequences of their actions on others (i.e., the solidarity element), a likely result is a "the tragedy of the commons": the expansion of national human development with an increase in global human insecurity, where the security of some groups can come at the expense of security for others. This is surely another central issue in the changing global order, urgently calling for an enhanced role on human security – in all its three elements – by international (e.g., UN system) and supranational (e.g., European Union) institutions.

The nexus, synergies and trade-off among the 5 Ps and the SHD pillars

The SPES framework described so far comprises the 5 Ps (People, Planet, Prosperity, Partnership, and Peace) of the 2030 Agenda as critical areas of action, while the five pillars of SHD – namely, productivity, equity, environmental sustainability, participation & empowerment, human security – represent meaningful / procedural objectives, i.e., generated by a clear perspective for the common good and a consequent normative position on capitalism and on factors behind sustainable human development processes.

The 5 Ps represent a comprehensive and complex policy framework to address all sustainable development challenges. Thus, it is necessary to think of its dimensions in a holistic and integrated way, as suggested by the 2030 Agenda itself and by the SDG-related literature and research (Costanza et al., 2016). Indeed, the richness and complexity of the SDG framework lies in the nexuses and interdependence of its goals. Achieving one goal requires often considering multiple targets simultaneously, and actions taken to advance one target can have implications for others.

Biggeri et al. (2019) highlighted the existence of synergies and trade-offs between different goals. A similar exercise is proposed by De Neve and Sachs (2020), who investigated the interactions between the SDGs and human well-being. In both cases, research shows a strong synergy between specific goals, such as poverty reduction (SDG 1), fighting hunger (SDG 2), improving individual and collective health (SDG 3), and access to clean water (SDG 6). At the same time, it is clear that there are trade-offs both between SDGs and within some SDGs. SDG 8 (decent work and economic growth), for instance, set some mutually but somehow contradictory targets (Biggeri et al., 2019), while the achievement of SDG12 (responsible production and consumption) and SDG13 (climate action) could negatively impact human well-being (De Neve and Sachs, 2020). Generally, the co-evolution of the economic dimension of sustainable development with the environmental and social ones is tricky (Costanza et al., 2016).

Synergies and trade-offs also exist between the five pillars of SHD that directly reflects the 2030 Agenda. For instance, on the one hand, the objectives of participation and equity may favourably influence the increase in human security. On the other hand, just as productivity can negatively correlate with environmental sustainability, pursuing the latter can lead to distributional effects that affect equity, as long discussed about the well-known tension between discounting and sustainability in the long-term management of environmental resources.

Energy issues represent an illustrative example of links among SHD pillars. Energy efficiency is surely important for productivity and can be positively affected by technological improvements. Energy poverty is becoming an increasingly central policy issue in terms of equity, justice, and participation. Clean energy is fundamental for environmental sustainability and climate change purposes, while energy sources can be – and often are – causes of conflicts affecting human security.

Some trade-offs between SDGs and between pillars are not impossible to overcome (Kroll et al., 2019), and our contribution here intends providing a framework to reconcile them both in theoretical and policy terms. Indeed, the transition to sustainability is a complex and dynamic process (Loorbach et al., 2017), where it is possible to transform some trade-offs into synergies, despite a few trade-offs may be considered inevitable within the sustainability transition. Balancing and optimizing its components is critical for realizing the full potential of sustainable development and

transforming societies towards a more equitable and resilient future. The successful implementation of this transformation from trade-offs to synergies requires the involvement and interplay of all potential players in each society, as discussed in the next section.

3.3 The Quintuple Helix model for SHD

Once we embrace a SHD vision based on its five pillars, the next key question to build our SPES framework is the following: who drive the sustainability transition towards sustainable human development?

The participation of constellations of actors from different societal sectors is necessary for a systemic change in the society towards sustainability, according to studies on transformative research and innovation (Schot and Steinmueller, 2018). Among the possible configurations of partnerships and networks, the Quintuple Helix model stands out as a cooperative governance mechanism capable of involving in knowledge creation and innovation processes government, business, academia, and the civil society (Carayannis et al., 2019),[30] all of them embedded in the natural environment (Terstriep and Rehfeld, 2020).

In their systematic literature review, Galvao et al., (2019) highlights that the Quintuple Helix model builds upon the fundamental principles of the Triple Helix model and its later extension to the Quadruple Helix.

The Helix models of knowledge production and innovation have been developed as a useful way to explain how societies produce, diffuse, and marketize knowledge. These models are based on the complex, dynamic, and evolutionary interactions between the subsystems in our societies. Analogous to how the double helix of DNA produces living cells in biology, the helix models of innovation describe how knowledge and innovations are produced in contemporary societies (König et al., 2021). At the core is the role of academia and their interaction with business, which together, can implement the knowledge generated through higher education and research activities into the economy. These two actors are fundamental in providing the decent jobs required for a strong, cohesive, and prosperous society and are also the engines for the production and distribution of marketable goods and services fundamental for human well-being.

The original Triple Helix model (Leydesdorff and Etzkowitz, 1996), builds on these two subsystems to incorporate how the government interacts with academia and business to design, regulate and implement knowledge-based economic and industrial policies. The model posits that universities, business, and government play distinct yet interconnected roles in a knowledge-based society (Etzkowitz and Leydesdorff, 2000). The government plays a pivotal role in managing and mediating the conflicting interests among business actors on behalf of the public interest. They are crucial in stimulating and incentivizing innovations emerging from academia and business and are

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[30] Within the debate on Helix models, different labels have been used for the subsystems / helices. Here, we use the broader labels (e.g., "academia" instead of "university", "business" instead of "firms") to better include a wide variety of actors.

increasingly being called on to play a more direct and positive role in working with academia and business by driving public innovation-based missions (Mazzucato, 2016). Government facilitates partnerships, provides funding opportunities, and establishes supportive policies to address societal challenges (Leydesdorff, 2012). The focus on the interactions between these actors highlights and captures the complex synergies between three main domains of contemporary societies, namely science, economics, and politics, providing a wealth of opportunities for understanding and addressing complex societal problems through innovative solutions (Galvao et al., 2019). The model stresses how these three helices are intertwined and interact to generate innovation systems at different scales (König et al., 2021). Furthermore, they are able to take advantage of complementarities enabling them to take the roles of the other in addition to their more traditional functions, leading to more adaptable and reflexive innovation processes (Cai and Etzkowitz, 2020).

However, although the Triple Helix has long been conceived as a valuable theoretical framework (Cai and Amaral, 2022) incorporating three of the main subsystems in contemporary societies, Carayannis and Campbell (2009) argue that it may need to adequately account for other essential actors, such as the civil society.

Therefore, the Quadruple Helix model is an extension of the triple helix model: alongside academia, business, and government, it recognizes the critical role of societal actors and emphasizes the importance of citizen engagement in innovation processes, incorporating civil society as a fourth helix. This model highlights the importance of public values and cultures in shaping how innovations are diffused and accepted by the people living in a knowledge society. These shape the position of the government whose role in democratic societies is to represent the interests and visions of its citizens and play an informal role in guiding how firms chooses what, where, and how to innovate. Furthermore, citizens are not seen as passive recipients of innovation, but rather as active contributors through a participatory approach to co-creating knowledge (Carayannis and Campbell, 2009). By fostering public participation, inclusivity, and responsiveness, the Quadruple Helix model contributes to developing more sustainable and socially impactful innovation ecosystems (Galvao et al., 2019). To successfully implement this transformative change, all actors should be able to navigate between conflicting visions (within and across the different helices) and generate awareness and trust within the co-design and co-creation processes (Bellandi et al., 2021).

A further expansion of the framework is the Quintuple Helix model, which has been advanced in the debate to incorporate an additional helix: the natural environments of society (Carayannis and Campbell, 2010), particularly emphasising socio-ecological connections in an interdisciplinary and transdisciplinary manner. Indeed, the Quintuple Helix underlines the necessity for sustainability transition in the twenty-first century, making it ecologically sensitive (Carayannis et al., 2012) and expanding the understanding of collaborative innovation and its impacts on sustainable development (König et al., 2021). In other words, the Quintuple Helix model can be used to frame how the natural environment becomes established as a central and equivalent component of and for knowledge production and innovation (Carayannis et al., 2012), defining opportunities, constraints and priorities.

Relying on a Quintuple Helix model allows complementing our SPES framework by identifying the actors and interactions driving the sustainability transition towards sustainable human development. Therefore, the five helices – namely, government, business, academia, civil society, natural environment – are added in Figure 12, showing the dynamic role of human actors for all

pillars and in all areas of action, along with the overarching role of the natural environment. Indeed, while Planet represents a critical area of action and environmental sustainability represents its corresponding objective, the natural environment is conceived as a live actor affecting – directly and indirectly – all pillars of SHD and related processes.

Figure 12. The SPES framework on Sustainable Human Development
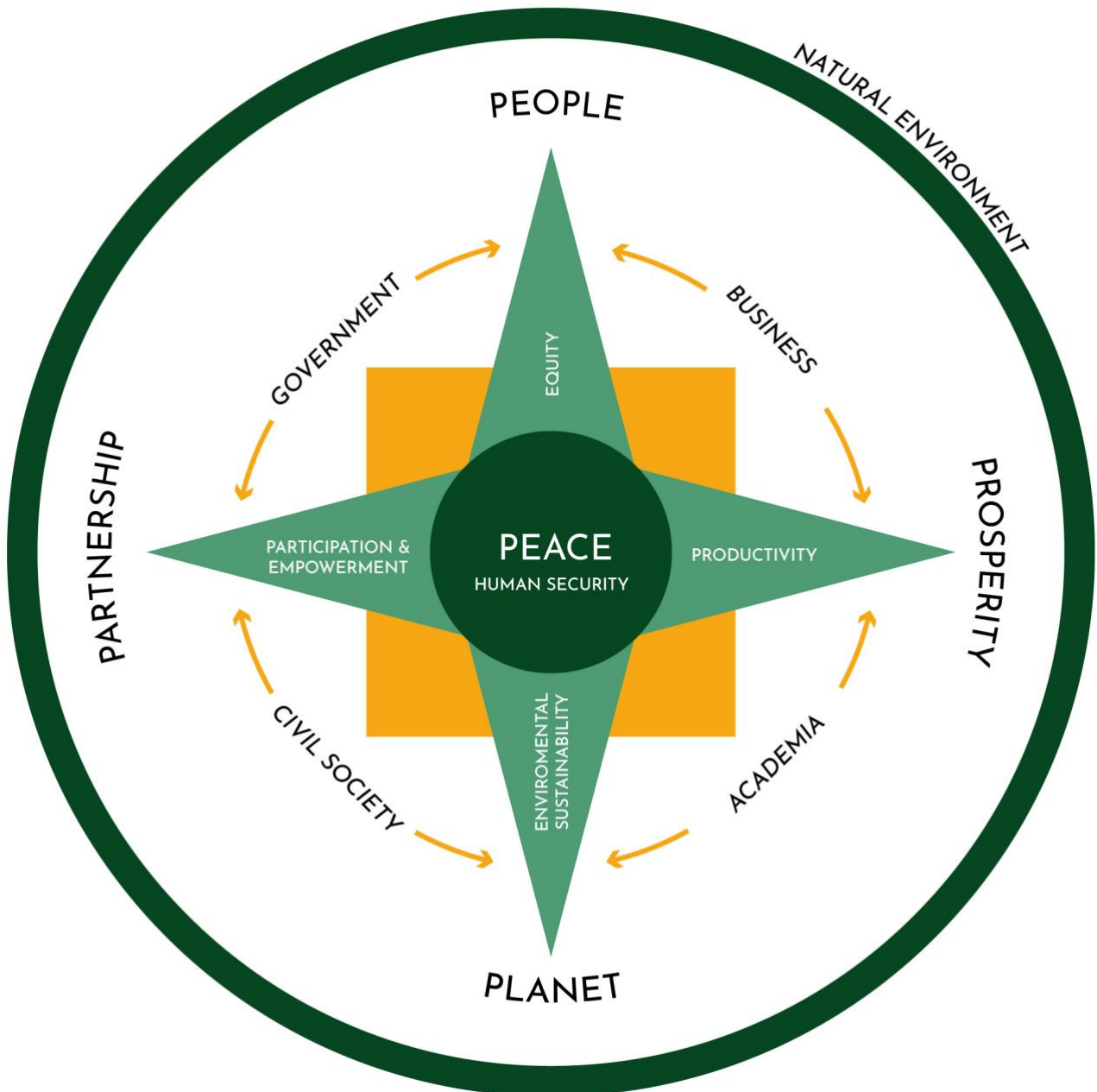
Source: Authors' elaboration

Here, it is fundamental to clarify that there is not a specific and unique correspondence between helices and pillars. For instance, Figure 12 does not intend at all to convey the idea that the civil society only contributes to the pillars of "Participation & Empowerment" and "Environmental Sustainability", same as business do not only contribute to the pillars of "Productivity" and Equity", just to raise a few examples. Rather, as shown in Figure 13, all helices – and constellations of actors within them – may play a role for each SHD pillar, obviously interacting with the interests, power and actions of the other.

In a nutshell, the Quintuple Helix model provides the necessary transformative dynamics to foster sustainability transition processes towards sustainable human development, through the continuous interplay of roles by all societal actors in their different domains shaping the integrated pursuit of the different SHD pillars.

Figure 13. The SPES framework on Sustainable Human Development: the dynamic role of the five helices
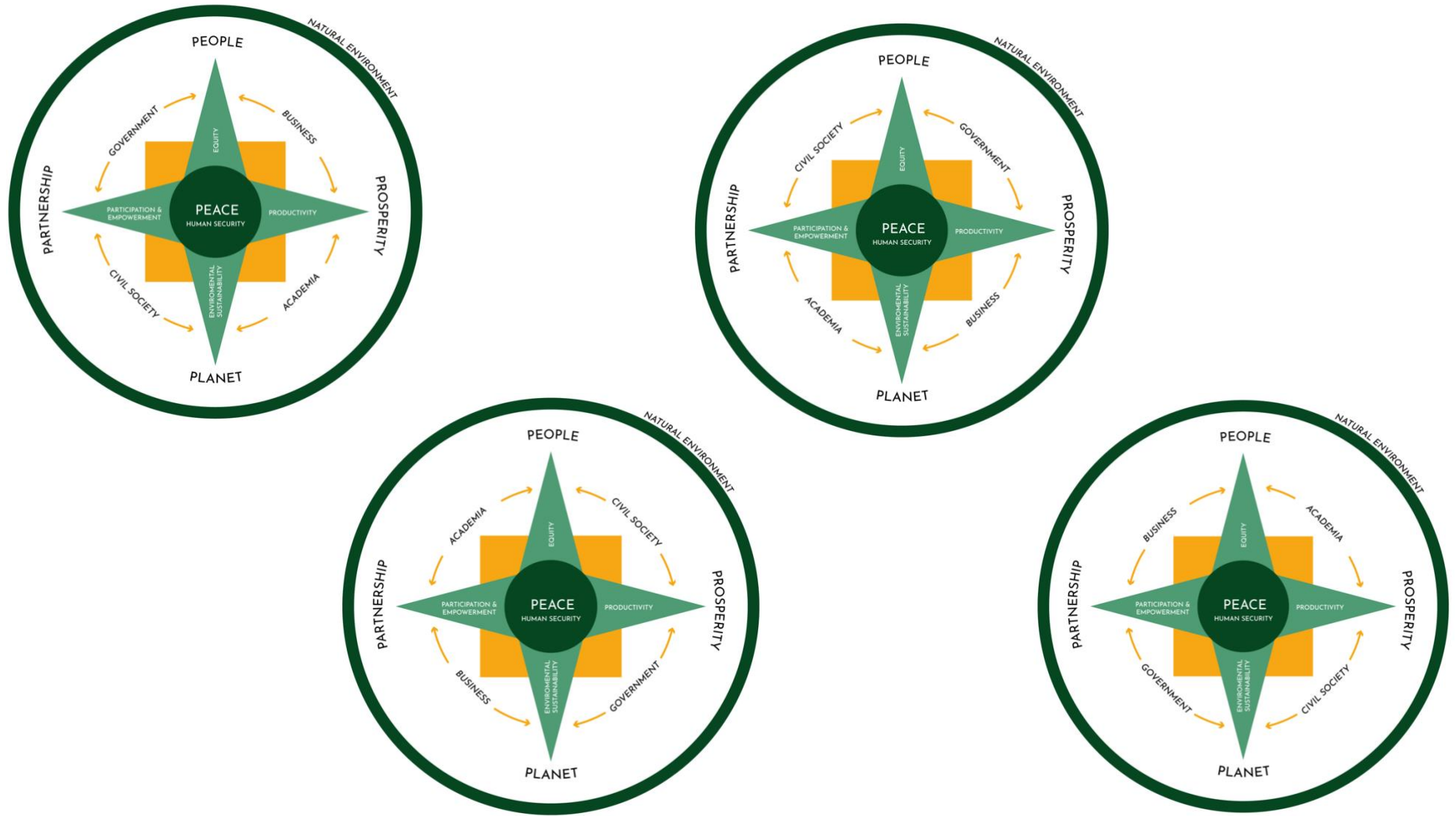
Note: These four figures differ in the position of the helices, which move around working on and affecting all pillars of SHD.

Source: Authors' elaboration

Each helix – government, business, academia, civil society, natural environment – is described in detail in the following pages, followed by a short discussion of the main interactions among them.

Government

Government and the public sector represent the state subsystem (Cai and Etzkowitz, 2020), which is responsible for resolving failures, adjusting public policies, and providing incentives for sustainability transition and innovation processes.

Government institutions can play a significant role in fostering high rates of transformative innovation by supporting higher education, invest publicly in R&D, expanding access to venture capital, and establishing regulatory frameworks that make it easier for businesses focused on sustainability-related products and services to get off the ground. The business culture may change as a result of these initiatives, becoming more entrepreneurial, environmentally conscious, and innovative – all essential components of creating a thriving entrepreneurial ecosystem (Galvao et al., 2017), especially when focused on sustainability transition.

In addition, the government is in charge of ensuring human rights, maintaining peace in its territory, effective decentralization and governance mechanisms, coherent institutional and regulative frameworks, and the harmonized provision (in terms of quality and accessibility) of basic social services, among others (Oxfam and ARCO, 2016). All together, these represent enabling conditions to set a favourable environment for human flourishing and sustainability transition.

Therefore, Carayannis et al. (2012) argues that the political system is of crucial importance, because it formulates the direction, where the state (or region, etc.) is heading toward in the present and future, thereby also defining, organizing as well as administering the general conditions of the state (or region, etc) toward such a direction.

First, the government is in charge of formulating industrial policies – conceived in a systemic sense, thus including competition, education and training, environment, research and innovation, health, employment, territorial cohesion, entrepreneurship, trade, etc. (Aiginger, 2007) – based on a SHD vision (Ferrannini et al., 2021). In doing so, the government should develop policies and initiating sustainability-oriented priorities combining a top-down manner with a bottom-up approach, thus initiating, encouraging and coordinating the initiatives of different actors whose roles, services and activities have an impact on sustainability transition, providing them with strong direction towards joint goals.

Second, the government provides regulations, stability and rules (Galvao et al., 2017), thus setting the rule of law on sustainability transition and innovation processes.

Third, the government has a prominent role in promoting knowledge-based economic development. This is realized by means of promoting and supporting research partnerships to correct market failures in R&D investment, and by providing incentives to marketable research that helps companies develop new products and solutions (Galvao et al., 2019). Governments also take part in the helix structure as public entrepreneurs and venture capitalists, e.g., by making available venture capital to start new enterprises, particularly for high-risk businesses (Cai and Etzkowitz, 2020). Moreover, as one technological paradigm becomes obsolete, a new one is required as the foundation for new economic endeavours. As a result, governments' (along with academia's) role in setting the stage for the next wave of innovation is once again prominent (Galvao et al., 2019), as in the current

framing of transformative R&I policies towards sustainable development (Schot and Steinmueller, 2018; Biggeri and Ferrannini, 2020).

To conclude, in line with Cai and Etzkowitz (2020), it is important to remark that government cannot be conceived as one single actor, considering the different layers of government (in terms of vertical integration) as well as different sectors of government (in terms of vertical integration) may and should intervene on sustainability transition and innovation processes (UN-Habitat, 2022).

Business

Firms are the agents that determine productivity and value-added creation, and contribute also, in our view, to shared prosperity and well-being. In particular, they may favor or damage the change for a more sustainable economic system.

Since they are the main actors in the market economy, they have the capacity – and responsibility – to offer "sustainable" products and services accessible to all people. In addition, they are crucial for research and innovation processes driving the twin digital and green transition. Being both producers/providers as well as beneficiaries of public policies, they can make the difference on the road to sustainability, especially when they are prone to induce the transition given their features in terms of sector and management.

Firms are related to shared prosperity and well-being (i.e., wealth creation), ensuring decent working conditions (secure employment, fair wages, safe working conditions, social protection, social dialogue and labor rights and standards[31]), and, consequently, decent living conditions for the workforce. The interaction with civil society may trigger the aforementioned virtuous mechanisms concerning the well-being of individuals. Furthermore, this partnership may improve firms' profitability. Indeed, the interplay with the other helices / actors intervenes in the creation of new entrepreneurs and firms (König et al., 2021), with firms bringing market-oriented perspectives, capital, and entrepreneurial expertise to transform knowledge into commercially viable products and services (Leydesdorff, 2012).

Given their role in the production process and the market economy and, since their interdependence with other actors, firms are relevant to reach sustainable goals and undertaking sustainability transitions. In particular, large firms hold complementary assets (specific skills and knowledge, large-scale test trials, distribution channels, service networks, and complementary technologies) to implement innovations that might accelerate their breakthrough and uptake for the sake of the sustainability transition (Geels, 2011).

It is also relevant that firms have various kinds of ownership, either private or public, or they may take the form of joint public-private partnerships. This generates issues related to the financial sector and consequently to credit access, which is one of the main tools of new investment that drive transitions. Therefore, a rethinking of the financial system and the relationship between firms and banks (or other financial institutions or intermediaries) is fundamental for addressing and incentivizing firms' contribution to sustainability transition and sustainable development goals.

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[31] According to the EC and ILO's definitions in https://international-partnerships.ec.europa.eu/policies/sustainable-growth-and-jobs/employment-and-decent-work_en#:~:text=The%20International%20Labour%20Organization%20(ILO,%2C%20security%20and%20human%20dignity%E2%80%9D

Academia

The primary missions of academia (universities and research institutions) are to provide high-level education (high-quality human capital), to conduct research, and to foster knowledge diffusion. Indeed, the academia has the expertise, infrastructure (such as laboratories), and administrative know-how to support rigorous research and ancillary activities (Franklin, 2009).

Academic institutions are key actors in societal transformation, highlighting their contribution beyond traditional education and research functions (Leydesdorff, 2012). In particular, they emerge as potentially significant allies for all other actors as they are able to connect various domains of society and strands of engagement. Consequently, they are recognized as vital for the revitalization and metamorphosis of modern economies and societies (OECD, 2007).

Academia would be represented as a niche[32] (or a set of several niches in a country or worldwide), referring to a specialized segment or specific role within a larger system or environment with a specific area of expertise or focus. In particular, academic institutions can be conceived as incubators of new ideas and practices for sustainability and sustainability transitions (Purcell et al., 2019; Leal Filho et al., 2023). Firstly, education might shape the view of future managers, entrepreneurs, and politicians, giving them a sustainable perspective, e.g., concerning environmental awareness and social innovation (Leal Filho et al., 2019). Second, the contribution to research and innovations is complementary to one provided by the private sector by having different goals than profit and market dynamics. Third, its knowledge diffusion and public engagement mission may influence policy-making processes, providing new ideas and evidence.

For all these reasons, it is fundamental for academia to be adapt to new visions, being ready to accept new theories and criticize the old ones, fostering the reskilling of workers with proper education and training programs, and preparing a new generation of policymakers and entrepreneurs.

Civil society

As mentioned, the helix of the "public", more specifically being defined as the "media-based and culture-based public" and civil society (Carayannis and Campbell, 2009), adds to the academia-business-government relation as a fourth and independent sphere (Marcovich and Shinn, 2011). It incorporates a wide range of civil stakeholders (e.g., people, communities, and grassroot organizations) into the knowledge creation, innovation and sustainability transition amalgam, substantially widening the societal commitment.

This fourth subsystem integrates and combines two forms of "capital". On the one hand, it brings a "social capital" to sustainability transition and innovation processes through the culture-based public with its values, experience, traditions, and visions. On the other hand, it brings also a "capital of information" through the media-based public, potentially shaping and supporting the diffusion of sustainability-related knowledge at different levels (Carayannis and Campbell, 2009).

König et al. (2021) argues that the increasing involvement of this part of the "public", more broadly renamed and extended to "civil society" as a whole, has both analytical and policy consequences (Arnkil et al., 2010; Miller et al., 2018).

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[32] For the concept of niche see Geels (2011).

First, the civil society represents bottom-up values (including different value systems by various segments of the society) and actions, shaping the societal vision underlying any structural transformation of the economy and the society. As stated by König et al. (2021, p. 480), this forces all other actors to cross-fertilize *"with the demands and needs of civil society in order to maintain and gain legitimacy and justification within an informed society"*.

In this regard, this model is argued to facilitate democratic forms of process knowledge and innovation (König et al., 2021) to identify shared issues and joint solutions that are accepted by and available to larger segments of civil society rather than just government institutions (von Hippel, 2005). Therefore, as stressed by Oxfam and ARCO (2016), active citizens and grassroots organizations can shape their own society if they are able to exercise the right to be informed and the right to be heard primarily in decision-making processes relating to development objectives, strategies, resources and efforts. This implies passing on information about wishes, needs, problems, or satisfaction of citizens as output into politics or the political system (Carayannis et al., 2012). In this way, according to König et al. (2021) the design of public policies may rely on collective discussion and decision-making among stakeholders who should be placed on an equal footing for working to solve a common issue. In fact, the public and civil society can be seen as decision-making correctives that raise concerns about the ethical, normative, and ecological aspect of knowledge and innovation, something that may would have been overlooked in a Triple Helix governance regime. Nevertheless, it should be highlighted that principles and values from the civil society reflect power relations and (im)balances, which are socially and politically determined within each context (Oxfam and ARCO, 2016).

Second, the involvement of the civil society has the potential to shape "*more complex, dynamic knowledge and innovation processes based on coexistence, cooperation, coevolution, coopetition, and cross-fertilization*" (König et al., 2021, p. 479), referred to as "mode 3 of knowledge production" (Carayannis and Campbell, 2009). In other words, this mode embraces a more comprehensive understanding of knowledge and innovation, taking into account incremental, cross-referenced, interactive, hidden, social, and nontechnical knowledge. It also highlights the shifting roles of stakeholders, such as those from consumer to prosumer (Miller et al., 2018). In this way, civil society actors try to put societal needs ahead of technical affordances in innovation processes (Arnkil et al., 2010) and are capable of performing novel forms of innovation, e. g. environmental, bottom-up, or user-oriented innovations (König et al., 2021).

In line with this perspective, new innovative products, services, technologies and solutions (including social innovations) are developed with the involvement of users in their role as lead users, co-developers, and co-creators (Carayannis et al., 2017).

Such proactive engagement of citizens and civil society may be translated in public-private-people partnerships (MacGregor et al., 2010), which can effectively contribute to SHD innovations when a spirit of mutual trust, openness, accountability, transparency and commitment exists (Oxfam and ARCO, 2016). For instance, König et al. (2021) highlight that several studies on helix models illustrate how partnerships with civil society actors have the potential to benefit sustainable industrialization and result in positive employment effects, even though the effectiveness of such Helix models needs a more thorough elaboration. Similarly, it should be recognised that civil society organizations may (and often do) play a crucial role in providing services and jobs for the most vulnerable people and marginalized groups within welfare systems, placing them in a position to shape social sustainability transition and social innovation processes.

Last, the involvement of the civil society adds to these processes its role in terms of advocacy and awareness raising towards sustainability. As mentioned, the "public" brings in the social capital of

values, experience, traditions, and visions that can echo notions of public and corporate responsibility in social, spatial and environmental terms (Suwala and Albers, 2020). For instance, by incorporating values from the "public", a new green consciousness and the new human lifestyle may be spread and influence not only knowledge creation and innovation processes, but also production processes (Carayannis et al., 2012) where existing industries may be retrofitted and made more sustainable, with increased resource efficiency and greater adoption of clean and environmentally sound technologies (König et al., 2021).

Natural environment

The Quintuple Helix model, which expands on the Quadruple Helix model, gives innovation processes a fifth dimension by highlighting the role and impact of the natural environmental. This model emphasises the interaction, co-development, and co-evolution of society and nature (Carayannis et al., 2022). Because it serves as a societal engine for transformation, encouraging the creation of new knowledge and improved invention (such as eco-innovation and eco-entrepreneurship), the natural environment of the society is also a crucial actor of the socioecological transition (Baccarne et al., 2016). All in all, according to Carayannis et al. (2012) and König et al. (2021, p. 480), "*the natural environment is not only another inspirational source of knowledge and innovation but argued to be the most critical as it serves as the backdrop for the preservation, survival, and vitalization of humanity*".

Carayannis et al. (2012) define the natural environment as the totality of the various plants, animals, and other natural resources that serve as the "natural capital" for the other four helices. It might be claimed that the natural environment is the most important source of knowledge and invention since it provides a basis for the existence of humans (König et al., 2021). Indeed, we all live in strict interaction and dialogue with the natural environment surrounding us. It's worth noting that within the ecological economics context, the term "natural capital" often draws criticism due to its association with the notion of assigning a monetary value to the complex biophysical system. The "capital" approach could inadvertently overlook the integral ecology vision, namely the hierarchical interdependence between human activities and the natural world. Additionally, the term "capital" implies a homogenous entity, measured by a mono-dimensional unit like money, which can be accumulated over time. This concept, however, cannot be easily applied to the ecological systems as they are highly heterogenous and do not tend to an endless growth. However, when producing new knowledge and innovations, nature becomes a crucial component, and ecologically good ideas and methods are the products of the natural world. For example, new knowledge about a greener way of life is a potential input provided by the natural environment to the helix of civil society, especially if the general public is prone to receive and react to it; in democracies, when a more considerable portion of the population has the opportunity to engage in collective actions, these reception and reaction are more likely to happen (König et al., 2021). Similarly, this also has a potential of influencing the way how we perceive and organize entrepreneurship (Carayannis et al., 2012).

In this regard, the Quintuple Helix model proposes that the main drivers of knowledge-based societies should be seen as environmental and ecological sensitive (Carayannis et al., 2012).

An unresolved issue within the Quintuple Helix model is effectively linking the five helices and their associated knowledge and innovation systems. Specifically, establishing a connection between the environmental helix and the other four helices poses a challenge.

The natural environment can be considered both a fifth actor or the overarching sphere where the other four categories of actors (firms, university, government, civil society) interact (Carayannis et al., 2012; Grundel and Dahlström, 2016). König et al. (2021) opt for the latter interpretation, explaining that using the concept of ecology encompasses the interdisciplinary examination of relationships between living organisms (social ecology) or between living organisms and their surroundings (natural ecology). According to this view, the multitude of these relationships is encompassed within the framework of ecosystems, and the Quintuple Helix model refers both to the role of the natural environment in shaping constraints and opportunities (for knowledge creation, innovation, and, more broadly, for human flourishing) as well as to the socio-environmental impact of government, business, and academia.

Ultimately, the exchange of information and the development of society through the co-evolution of society and the environment could potentially result in a fresh balance between the two, characterized by reduced exploitation, destruction, pollution, and inefficiency (Grundel and Dahlström, 2016; König et al., 2021), and fostering sustainability transition.

Helix interactions with each other and with the natural environment

The Triple and Quadruple Helix models offer a state-of-the-art approach to understanding knowledge production and innovation processes in contemporary societies, highlighting the dynamic interdependencies between government, business, academia, and civil society. However, in the Anthropocene, human activities are altering natural earth system processes (atmospheric, geologic, hydrologic, biospheric) which in turn are increasingly impacting human life and well-being (Lewis and Maslin; Steffen et al., 2015; UNDP, 2020). The Quintuple Helix thus offers a useful extension to the previous models in line with the vision of SHD by incorporating the fundamental interactions of the natural environment with government, business, academia, and civil society, to inform how knowledge production and innovation can contribute to sustainability transitions (Carayannis et al., 2012; Carayannis et al., 2014).

In line with the visions of ecological economics, economic and social systems are conceptualized as being within and part of ecological systems, necessitating the need for an inter- and transdisciplinary approach among and between all five helices to understand how knowledge and innovations are produced, diffused, and applied in line with the principles of environmental sustainability (Markard et al., 2012; Schot and Steinmueller, 2018; König et al., 2021). Similarly, responsibilities and efforts to maintain peace and harmonious coexistence among humans, as well as between the ecosystem and human beings, is spread across all actors.

For these reasons, although there are difficulties in effectively linking the five helices and their associated knowledge and innovation systems, the importance of such interactions is nonetheless imperative and acknowledged. In particular, this model points out that there is not a single helix responsible for promoting partnerships; rather they all play an important role in establishing partnerships based on collective efforts and policy coherence across helices, without which the transition may fail.

In this pursuit, academia plays a fundamental role in researching and disseminating scientific findings related to the complex human-environmental interactions, and how innovations (technical, social, institutional…) can affect these relations in the future. There is increasing importance on the effective dissemination of new knowledge to relevant actors in government, business and civil society to effectively and efficiently drive the changes required for successful sustainability

transitions. The government, with its core mission to represent the interests of the public, has a responsibility to collaborate and learn from the other actors and further regulate, inform, and implement policies based on the vision that "*the circulation of knowledge and the evolution of society based on the coevolution of society and nature may be approaches that lead to a novel harmony between the two, with less exploitation, destruction, contamination, and wastefulness*" (König et al., 2021, p. 480). In this, the Quintuple Helix model emphasizes the importance of open innovations, harnessing knowledge from territorial and social capital and highlighting the important contributions of civil society in identifying the contextual features related to human-environmental dynamics (König et al., 2021; Camagni et al., 2009). Business, with its functional role in providing goods and services in an economy, is viewed to collaborate extensively and make use of environmentally sensitive knowledge either to adjust processes towards strong and weak sustainability practices, or further connect with academia, government, or civil society to create new innovative processes more in harmony with ecological processes, such as the principles of circularity and initiatives towards a bioeconomy (Grundel and Dahlström, 2016; Baccarne et al., 2016). Lastly, civil society, with its direct and interconnected linkages with nature and well-being, acts as the first line of change driving the other helices based on the bottom-up values and cultures of individuals, communities, and grassroots organizations which are increasingly becoming more environmentally conscious. The role of an informed media-based public is fundamental in identifying and spreading the experiences individuals are having related to the challenges of sustainability and environmental conditions while also enabling active participation and engagement in the processes of change (Carayannis and Campbell, 2009; Miller et al., 2016).

It is important to mark here that the Quintuple helix model of knowledge creation and innovation for SHD – in our interpretation – is valid and can be observed at different levels:

1. at international level (including supranational settings as in the EU), where rules and coordination mechanisms are set providing the backdrop to the "degrees of freedom" that each of actors of the Quintuple Helix enjoy in their national / local domain, thus affecting the interplay with other governance levels;
2. at national level, where actors in the different helices interact with each other to shape the design and implementation of sustainability-related strategies and policies;
3. at local level, where knowledge creation and innovation processes deriving from the helix model are closest to people potentially informing choices (e.g., concerning life-stiles, entrepreneurial creation and business management, production and consumption patterns) and decision-making processes.

Taking into account all these different – though complementary – roles at various levels, it should be highlighted the need to navigate between, and mediate among, conflicting interests, especially when structured mechanisms of dialogue that promote stakeholder participation in decision and policy-making processes are in place. Indeed, as stated by Carayannis et al. (2017, p. 148), modern societies (either national or local) are "*increasingly being viewed as eco-systemic agglomerations of organizational and institutional entities or stakeholders with socio-technical, socio-economic, and socio-political conflicting as well as converging (co-opetitive) goals, priorities, expectations, and behaviours that they pursue via entrepreneurial development, exploration, exploitation, and deployment actions, reactions and interactions*". This is the case, for instance, of just transition issues, where ecological instances should be carefully aligned with workers' rights. This requires a sort of "extraordinary concertation" for policy coherence among helices that can lead to institutional innovation, mediation of conflicts and the reinforcement of a common sense of identity and SHD vision. What trigger and enable such extraordinary concertation is discussed in the next chapter.

4. The triggering factors for sustainability transition towards SHD

So far, our SPES framework has gradually combined the 5 Ps of the 2030 Agenda with the 5 pillars of Sustainable Human Development as the guiding vision for the sustainability transition, to be driven by actions and interactions as conceived in the Quintuple Helix model.

However, it should be emphasised that sustainability transition and its required transformation processes in all socio-technical systems "*do not only include technical and technological changes, but also cultural changes, behavioural shifts and institutional reforms. They question values, change priorities, challenge beliefs, identities and stereotypes*." (Giovannini et al. 2020, p. 6). Therefore, achieving a successful transition calls for the joint collective engagement of all societal actors in discussions and actions.

For this reason, a last key question needs to be addressed: what nurture helix interactions uniting roles and efforts for the sustainability transition?

Two transformative elements are identified here:

1. inner transformation at individual and collective level towards "unity";
2. reflexivity and social learning towards transformative resilience.

Taken together, they governance mechanisms, Research & Innovation processes and capital investment that are key means of implementation to foster the sustainability transition towards SHD.

4.1 Transformative elements

Inner transformation towards unity

In order to trigger sustainability transition processes towards SHD and all its pillars, other criteria rather than profit-seeking and economic growth on which to base collective choices should be set. For instance, Caselli (2018) refers to the following criteria, among others: environmental safeguard (i.e., the earth is not just for us, we have an obligation towards future generations); humanity (i.e., respect for every person is the hallmark of living together); responsibility (i.e., in satisfying his/her own needs, everyone behaves taking into account the needs and requirements of others, rather than in a strictly individualistic logics); moderation (i.e., sobriety is the way to discover resources that are priceless); prudence (i.e., in the sense of the ability to prevent and control present and future risks); diversity (i.e., recognition of the other as a way to respond to the variety of situations); and citizenship (i.e., everyone is a full member of the community in which they live).

In other words, reference to normative values and ethics (Becker, 2023) is essential because "*our values determine how we act, what kind of world we create together*" (Lelkes, 2021, p. 168), shaping our moral intentions (Basu, 2022). Pursuing SHD is, in fact, a complex interplay of external circumstances and internal responses, as well as of individual and collective beliefs and actions. This is evident when we observe people and social groups going beyond the realms of their personal

lives, to question existing societal norms and rule, seek corrective actions and changes, and create alternative norms and institutions (Lelkes, 2021).

The literature on psychology and behavioural economics (Bar-Tal, 1976; Beilin and Eisenberg, 2013; Padilla Walker and Carlo, 2014; Kristeller et al. 2005; Batson et al. 2015) has also shown that altruism, empathy, and compassion tend to trigger the adoption of pro-social and pro-environmental behaviours at individual and collective level (Yunus et al., 2021). The same applies for sustainability transition research, where the urgent need for addressing inner dimensions and interior factors and their relation to sustainability to support individual, collective and systems change has been acknowledged (Slaughter, 2012; Berejnoi et al., 2020; Woiwode et al., 2021). In the words of Lelkes (2021, p. 168): "*The discovery of emotions, physical sensations and a more comprehensive awareness of oneself and that of others and of the outer world is also essential to understand motivations, choices and behaviours*".

In the same line of reasoning, Woiwode et al. (2021) emphasize that, according to a growing number of academics and practitioners, the technological and scientific approach to sustainability transition needs to be complemented with an internal focus on the psychological, cultural, artistic, and spiritual dimensions of human life (EEA, 2016; Geels and Schott, 2007; Hunecke, 2018; Köhler et al., 2019; Leal Filho and Consorte McCrea, 2019; Upham et al., 2019). In this context, inner dimensions such as consciousness, values, worldviews, beliefs, spirituality, and human-nature-connectedness are seen as indispensably important for sustainability transformation at both the individual[33] and societal levels (Ulluwishewa, 2014; Woiwode et al., 2021).

For these reasons, here we argue that individual, collective and policy choices should be driven by the concept of "unity", which is central in an integral ecology perspective and explains the value in all human lives: unity with the world, unity with each other, and unity within ourselves (Wenar, 2020).

Unity with the world refers to world-oriented desires for the common good, including ends such as literacy, education and global health, as well as planet and environmental protection. Unity with each other refers to the mankind considered in its anthropological fullness, not as individuals but as persons capable of – and fully living in – relationships (Caselli, 2018), "*constituted through their mutual relations, and do not exist[ing] prior to and outside of their relationships*" (Gasper and Keheler, 2021, p. 121). Unity within oneself refers to the intrapersonal dimension of value, including one's unity with one's past and future selves and having the same recursive logic as the interpersonal dimension (Wenar, 2020).

In similar terms, Woiwode et al. (2021) argues for a move from the self towards the Self, understood as the universal self (bigger than us), embracing and acknowledging interdependence of all beings and the universe, i.e., recognizing the unity of existence (Scharmer and Kaufer, 2015). This lets us understand that we are not alone and that we are responsible to others and to the planet, who depend, for better or for worse, on our actions. It also requires listening and interacting with other viewpoints as part of public discussion and reasoning (as already stressed by Sen, 1999) to accommodate different views of the world shaping individual and collective choices and actions.

For this reason, in line with Scharmer and Kaufer (2015), we argue that we should progress from ego-system to eco-system awareness, focusing our attention on "*inner changes, the changes which make our relationships with fellow human beings and with nature less self-centered and more loving*"

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[33] The spirituality / transcendence dimension is often included in lists of central capabilities (see, for instance, Max-Neef, 1991 and Alkire, 2002b).

(Ulluwishewa, 2016, p. 167). In this perspective, according to Wenar (2020), activities can be good[34] when they create unity with the world, and/or unity with other people, and/or unity within oneself, with some activities being especially valuable because they create more than one type of unity.[35]

In line with the concept of unity, scholars from various academic fields contend that alienation from others, ourselves, and the natural world is a major contributing factor to the current multiple crises (Bhaskar, 2002). As a result, one way to overcome this alienation, and subsequently the current crises, is to re-establish connections with our inner dimensions, such as self-awareness, pro-social values, or human-nature connectedness (Woiwode et al., 2021), to re-acquire our generative role both as individuals as well as communities. Examples of the potentials of these inner dimensions include, according to Hedlund-de Witt (2011, p. 1059): rehabilitation of nature (i.e., an overall greening of (individual) lifestyles); a sense of interconnectedness (i.e., responsibility and empowerment of the individual and groups); embedded individuality (i.e., vocation, self-work-ethic, service through self-actualization); sense of urgency and crisis (i.e., willingness for change, little attachment to status quo); focus on inner fulfilment (i.e., alleviate consumerism and support sustainability transition); individual consciousness development (i.e., higher levels of functioning, creativity and efficacy); cultural experimentation and renewal (i.e., forces of creativity, innovation and social change); subtle activism (i.e., support for change through meditation, prayer and positive intentions); active and participatory solidarity (i.e., personal and collective actions aimed at the removal of inequalities and social exclusion).

Therefore, only through transformational processes that also address inner dimensions at the individual and collective levels will a fundamental change towards sustainability succeed (Woiwode et al., 2021).

All in all, if we recognize the crucial role of own beliefs and actions, it derives that our society must acquire and maintain these inner dimensions at all levels and nurture also immaterial forms of capital across the whole society and in all helices (government, firms, academia, civil society). This underlines that the motivation of diverse actors toward a common cause – e.g., individual and collective action towards SHD – should exceed their individual interests and desires, acknowledging that collective action can be more efficient than individual action (a counterintuitive argument as compared to the traditional interpretation of efficiency) in dealing with sustainability issues. This should be triggered by the expansion from an egocentric value system to being part of a larger whole, interconnected with the well-being of many others and being part of nature, living in unity with it.

Reflexivity and social learning towards transformative resilience

Sustainability transitions are driven fundamentally by a normative directionality. The notion of unity, defined above, contributes significantly to understanding what truly makes sustainability transition not simply desirable, but also feasible thanks to an inner transformation in people, groups and communities. However, another key feature of sustainability transitions is its dynamic complexities, characterized as long-term, multi-actor processes (Köhler et al., 2019). Thus, it is not enough to understand simply the desired direction, but more importantly to be able to understand that this

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[34] Wenar (2020, p. 221) highlights that "*Linguists tell us that the root of the word 'good' is an Indo-European word that means, 'to unite.' We lead our most valuable lives, our most fully human lives, when our lives are with others and for others. […] Goodness is unity – unity with the world, with each other, and within ourselves.*" This resonates with Gandhi's inspiring ideal of "heart unity". Similarly, harmonious society is also a notion derived from Confucianism.
[35] Lelkes (2021) introduces the concept of "*Sustainable hedonism*" and stresses that we may expand our ability to act in virtuous ways, which promotes our own well-being as well as the well-being of others at the same time.

direction is not fixed in stone, that wars, pandemics, climate change effects and other unforeseen events may shock our systems. This requires the ability of the system to continuously and endogenously reflect on what has happened, process new information and evidence, and re-imagine the desired future and what is needed to get there, along with increasing systemic capacities to prevent and anticipate shocks. In a nutshell, it requires transformative resilience, ensuring that *"the system finds it new sustainable development path and avoid collapses"* (Giovannini et al. 2020, p. 6). In this sense, an occurred shock is transformed by the society into an opportunity to find new solutions and pursue a structural change of the economy, reaching a new and improved equilibrium for the community.

Reflectivity is thus argued to be a fundamental complementarity to inner transformations and unity in nurturing sustainability transition and enabling transformative resilience. From a systemic point of view, *"reflexivity is a 'layer' … which is embodied in certain capabilities owned by individual actors in the system, by the organizations (collective actors) in the system, and hence by the system as a whole"* (Lindner, et al., 2016, p.18). Reflexivity emphasizes the importance of learning, understanding, participating, and interacting within and among the actors in a system which *"fosters the possibility to reorient ideas, values, aims, others, roles, visions and their relation with the current situation"* (Sol et al., 2018, p. 1389). Four key capacities required for systems to be reflexive can be identified, namely; i) self-reflection capacities which enable critical thinking and reflection about values and orientation; ii) bridging and integration capacities which enable the collective coordination of diverse actors and knowledge; iii) anticipation capacities, fundamental for dealing with uncertainties; and iv) experimentation capacities which allow for parallel approaches and learning processes (Lindner, et al., 2016).

Crucial to reflexivity is social learning, defined by Reed et al. (2010, p.6) as *"a change in understanding that goes beyond the individual to become situated in wider social units or communities of practice through social interactions between actors in social networks."* This dynamic process occurs continuously and endogenously throughout society, manifesting itself in changing attitudes, behaviours, norms, trust, and respect (Sol et al., 2018).

In this regard, the concept of "Empowered Learning Systems" (ELS) stresses the important interactions and linkages between individual and collective capabilities, human agency and learning processes, and highlights how it is necessary to not only give people the opportunity to learn but also to provide them with a voice and influence in the learning and decision-making process in order to achieve sustainable human development (Clark et al., 2019b, p. 395-396). The constituent elements of ELS include supportive institutions, relationships of solidarity and trust, critical pedagogy, and emancipatory outcomes which all require institutional frameworks that are able to listen to, and engaged with, people to works towards a better future.

These features align largely with the normativity of unity, playing a fundamental role in reshaping emerging knowledge, innovation processes and Quintuple Helix interactions, driving sustainability transition and guiding policymakers towards SHD.

4.2 Means of implementation

Figure 14 shows the role of these elements for Sustainable Human Development. In short, actors of change in the five helices are triggered to act and joint efforts in all pillars of SHD by a stronger sense of unity in their inner dimensions and by higher reflexive capacities, which together in turn shape and direct governance, R&I and investment processes towards SHD. In turn, the pursuit and achievement of SHD pillars may nurture the continuous regeneration of the transformative elements to activate a virtuous and self-reinforcing circle.

On the contrary, in absence of such elements, actors may be less prone to pursue together SHD pillars, as most common in past and current capitalist economies and societies as made evident by patterns of unstainable growth.

Figure 14. The role of transformative and procedural elements for SHD
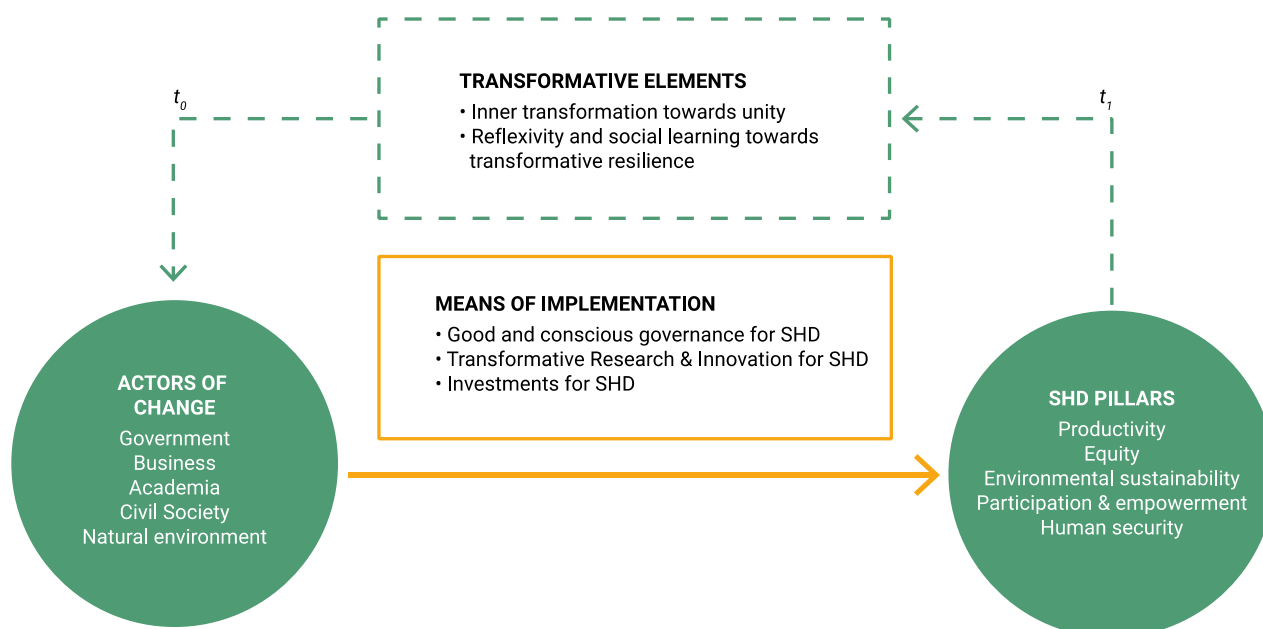
Source: Authors' elaboration

The different means of implementation as shaped by the transformative elements are described below.

Good and conscious governance for SHD

Good governance is a vital procedural concept often associated with the quality of government (Rothstein and Teorell, 2008), and it also plays a role in new public missions to drive societal challenges for sustainable development (Biggeri and Ferrannini, 2020). According to Council of Europe[36] the main characteristics refer to the following twelve principles: 1) Participation,

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[36] See https://www.coe.int/en/web/good-governance/12-principles.

Representation, Fair Conduct of Elections; 2) Responsiveness; 3) Efficiency and Effectiveness; 4) Openness and Transparency; 5) Rule of Law; 6) Ethical Conduct; 7) Competence and Capacity; 8) Innovation and Openness to Change; 9) Sustainability and Long-Term Orientation; 10) Sound Financial Management; 11) Human Rights, Cultural Diversity and Social Cohesion; and 12) Accountability.

When driven by the above-discussed transformative elements (i.e., inner transformation and reflexivity), it may be extended to "conscious governance", conceived as *the capacity to imagine a new feasible path of (local) development and [...] the ability to organise a consensus between the various (local) actors* (Dei Ottati, 2005, p. 266). It emphasized the significance of collective action through multi-stakeholder involvement and engagement, while prioritizing transparency and mutual responsibility (Biggeri and Ferrannini, 2014).

Together, good and conscious governance refers to the principles and practices that underpin effective, inclusive and ethical management of institutions and resources in a society. It underlines the role of actors in all helices and takes the well-being of people and of the planet (i.e., the quintuple helix) as litmus paper.

First, good and conscious governance by government institutions facilitates the coordination of several actors and helices providing them with strong leadership and coordination towards common sustainable development goals, especially at local level (Becattini, 2014; OXFAM and ARCO, 2016).

Second, good and conscious governance by firms extends the concept of the "good entrepreneur" of Schumpeter to the concept of sustainable entrepreneur and entrepreneurship (Biggeri et al., 2022). This can be defined as an entrepreneur that take in to account the social and environmental impact of business activities, despite constraints and obstacles given by high competition in modern capitalist economies. Indeed, the material eager for profit can often push human beings' behaviours far away from the common good and SHD, with behaviours aiming only at maximizing profits and economic value, whose features may strongly undermine SHD.[37] Conversely, social entrepreneurship (Yunus et al., 2021) and sustainable entrepreneurship play a central role in sustainability transition process (Terán-Yépez et al. 2020).[38] However, in the reality sustainable entrepreneurs face higher complexity and ambiguity with respect to standard entrepreneurs aiming at creating economic value only (Cohen et al., 2008), since a sustainable entrepreneur need to combine social/environmental value and economic profitability in some way.

Third, good and conscious governance by the academia refers to its mission on human capital creation through tertiary education, which obviously may have an impact on shaping the skills, attitudes and mind-sets of future policy-makers, civil servants and entrepreneurs. It similar concerns the second and third missions of the academia in terms of knowledge creation and diffusion for the common good.

Fourth, good and conscious governance by the civil society enhance not only public awareness on societal challenges, but especially shared accountability, not only by government institutions, but also by all stakeholders in their own communities, including by the civil society itself. Indeed, citizens

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[37] Profit-seeking strategies and attitudes may deteriorate the environment and deploy natural resources, thus being future-less profits; may exploit the labour force, and reduce the quality of work, thus being job-less profits; may enhance disparities among social and income groups, thus being ruthless profits; may create the loss of identity in people, communities and places, thus being root-less profits; may take into account people and stakeholders' voice, thus being voice-less profits; may be linked to violence and sustain conflicts and war, thus being peace-less profits; may produce negative effects on health (during the production processes or via consumption), thus being health-less profits.

[38] The notions of social and solidarity economy (Yunus, 2021) and civil economy (Becchetti et al., 2015) introduce key elements of transformation for entrepreneurship and market structures.

and grassroot organizations can require transparency, accountability and dialogue spaces to underpin policy design in their contexts, thus pushing government, business and academia to use their resources to respond to citizens' demands for sustainability-related services and products.

All in all, these arguments allow us to stress again that there is not a single helix responsible for promoting good and conscious governance; rather they all play an important role in addressing conflicting interests and establishing partnerships based on collective efforts and policy coherence across helices, without which the transition may fail.

Transformative Research & Innovation for SHD

Inner transformation and reflexivity have a strong interdependence also with Research and Innovation (R&I) because, at first, they may lead R&I processes to embrace a more transformative and responsible perspective towards SHD (Biggeri and Ferrannini, 2020). Indeed, not all the research, knowledge, technology and innovation are good and positive to nurture a transformative change towards SHD. Public and private R&I efforts in their past and current format may have led and contributed to exacerbate environmental externalities and social inequalities associated with productivity enhancement economic growth (Schot and Steinmueller, 2018; Biggeri and Ferrannini, 2020). For these reasons, the purpose underlying R&I policy can no longer be the non-directional promotion of innovation for growth and competitiveness (Lundin and Schwaag Serger, 2018). Rather, as stated by Gjoksi (2011), R&I policy should not remain neutral and should pursue a normative direction towards an integrated and balanced perspective on economic, environmental and social sustainability.

Indeed, R&I processes can at the core of the generative process of system transformation, playing a fundamental role to question the status quo and to pave the way for (and accelerate) this transformative change towards sustainability. In other words, R&I is crucial for the sustainability transition (Schot and Steinmueller, 2018), if they are directed towards SHD rather than being oriented to low-quality economic growth and private profits.

Therefore, as highlighted by Biggeri and Ferrannini (2020, p. 19-20) transformative nature and directionality are thus inextricable features of this new framing for R&I policies, which has been strongly enhanced in recent times:

1. Transformative, in the sense of transforming in an integrated manner the economy, social relationships and the relationship between people and their natural environment (Schot et al., 2018, p. 4);
2. Directionality, in sense of tackling the societal challenges and sustainability transitions for all the sociotechnical systems affecting present and future human capabilities, e.g. concerning, among others energy, water, air, waste, climate, biodiversity, mobility, food, nutrition, healthcare, disability, ageing, social relations, communication, housing, building, justice and rule of law, production systems, consumption patterns, poverty, social exclusion, corruption, human rights, migration, violence, and so on.

In this way, it appears clear that science and technology are not merely technical but also a social and political scope. This underlines the need for shared responsibility and effective governance in nurturing the future by collectively stewarding science and innovation in the present (Stilgoe et al., 2013; Rip, 2014). This requires a strategic approach where stakeholders mutually respond to one another, proactively anticipating research and innovation outcomes aimed at facing the challenges of our time (Von Schomberg, 2013). At the same time, new governance mechanisms can emerge

thanks to R&I investments and efforts, further supporting the journey towards sustainability (Bell et al., 2019).

Investments for SHD

Our previous arguments open to a fundamental question on "investment for what?". Once a SHD vision is embraced, its pillars give a new direction for societal investments. Investments aimed at achieving sustainability transition based on SHD need to be framed based on extended and revised notions of the concept(s) of capital(s), despite its ambiguity and controversiality, in line with the idea that a system can only be considered sustainable if it doesn't exhaust natural resources or harm ecosystem services beyond a defined "safe operating space" (Costanza et al., 2016). In other words, having in mind that the planet cannot be exploited, but also that well-being is not just a matter of consumption (Costanza et al., 2017).

Clearly, sustainability transition entails creating a new socio-economic model that is not only sustainable from the environmental point of view, but also appealing in every aspect of human life, encompassing the role of natural, social, human, and built assets.

This means that different forms of capital (assets), accumulated and inherited from the past, through a proper understanding and management of their complexity and interplay may contribute to the well-being of both the present and future (Costanza et al., 2017).

Here, we go beyond the notion of social overhead capital by Hirschman (1967), and we expand the traditional forms of capital described in the sustainable livelihoods framework and used also by Costanza et al. (2017), adapting them to our framework in line with the transformative elements presented in the previous section.

Natural Capital: It refers to the economy's endowment of natural resources involved in the production and consumption process, but it does not conceive nature as capital. Natural Capital[39] is essential to provide various ecosystem goods and services that are essential to fulfilling basic human needs, and thus its management and preservation is crucial for sustainable development (Barbier, 2019). According to the World Bank (2021), it can be split into other two sub-categories: 1) Non-renewable natural capital, including fossil fuels (i.e. oil, gas, and hard and soft coal) and minerals; and 2) renewable natural capital, such as agricultural land (cropland and pastureland), forests (timber and ecosystem services), protected areas, mangroves, and marine fisheries. Here, the concepts of "sustainable scale" (Costanza et. al, 2017) and "safe operating space" (Rockström et al., 2019) are essential to address the uses and/or investments of this form of capital.

Human Capital: It represents the value of skills, experiences, and efforts by the working population over their lifetime disaggregated by gender and employment status (employed and self-employed) (World Bank, 2021). It includes not only investments in education and training, but also in the health and nutrition of individual from early childhood onwards (Frediani, 2010). Moreover, in order to increase people's autonomy and, at the same time, to open their minds to various perspectives and points of view, the promotion of critical, creative, and caring citizens is fundamental (Biggeri and Santi, 2012). At the same time, by acting as agents, people can also create an environment where they can be educated, speak freely, engage in collective actions, etc.

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[39] Here, we acknowledge that the stock-flow (non-renewable energy and material resources) and the fund-service (labour, capital and Ricardian land) are not substitutable, so we cannot properly label the natural stock-flow as a capital (see, Mayumi, K., et al. 1998).

Built / physical Capital:[40] It considers tangible assets, such as machinery, buildings, equipment, stock of plants, infrastructure, residential and non-residential urban land, but also intangible wealth, such as intellectual property, whose design and investment must be directed towards SHD pillars.

Economic / financial capital: For the economic aspect, Costanza et al. (2016), refers to the Net Economic Contribution, which suggests a measure similar to the Genuine Progress Indicator (GPI) to assess the efficient allocation for building a living economy as the net, between consumption and production, economic contribution to well-being. For the financial capital, the World Bank (2021) identifies the Net foreign assets, which concerns the sum of a country's external assets and liabilities (i.e., foreign direct investment and reserve assets). Moreover, re-interpreting economic and financial investments refers also to ESG (i.e., Environmental, Social, and Governance) as new criteria increasingly guiding actions by companies (Chen et al., 2022) and banking institutions (Ielasi et al., 2023) across the world.

Social / cultural capital: Costanza et al. (2017) define Social / Cultural Capital as the interpersonal connections, social networks, cultural heritage, traditional knowledge, and trust, and the institutional arrangements, rules, norms, and values that facilitate human interactions and cooperation between people. It fosters social cohesion, makes communities stronger and more efficient, and it also affects good governance (and government) (Putnam, 1994). Moreover, it plays a significant role in meeting essential human needs, including fostering participation, affection, and a sense of belonging. In our interpretation, this form of capital nurtures also the inner dimensions of transformation, making the case for a new moral foundation and practices to policy-making and business management. Indeed, investing in such immaterial form of "spiritual capital", as defined by Vasconcelos (2021), "*may free people from the egocentric and selfish chains that rest inside them and guide their purposes toward a more genuine and superior goals*" (Vasconcelos, 2021, p.133) by fostering some human qualities that are generative of SHD, such as humility, compassion, forgiveness, empathy, positive emotions, connections/relationships and sense of cooperation (Vasconcelos, 2021).

Investing in – while also preserving – all these forms of capital is fundamental for the sustainability transition. The public and private sectors should work to create a conducive environment that encourages well-rounded investments across all assets, directing them in an integrated way towards the 5 pillars of SHD. This involves not only manufactured and finite resources, but also human capital and the replenishable assets of nature. Assets representing the shared and communal good, such as education, public health, and the inherent wealth of the environment, particularly necessitate public investment or proactive governmental intervention (World Bank, 2021), enabling and coordinating also the interactions and joint efforts of actors within and across all helices.

Moreover, government interventions are vital for establishing property and usage rights to prevent depletion or unsustainable transformation into other forms of capital (World Bank, 2021). Furthermore, governments bear the responsibility of adjusting market inefficiencies for the common good. This would ensure that private investments in wealth generation align with the broader public interest, thus bridging the gap between private returns and the overall well-being of society.

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[40] Produced or man-made capital in Frediani (2010).

5. Policy principles to foster the sustainability transition process

As widely discussed in the previous pages, sustainability transition entails "*long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption*" (Markard et al. ,2012, p. 956). More broadly in our SPES framework, policy coherence to pursue the 5 pillars of SHD – productivity, equity, environmental sustainability, participation & empowerment, human security – in an integrated way and in line with the 5 Ps of the 2030 Agenda is required.

Besides understanding who drive these processes (i.e., the Quintuple Helix model for SHD), what triggers them (i.e., the combination of inner transformation towards unity and reflexivity towards transformative resilience) and what are the main means of implementation (i.e., good and conscious governance for SHD, transformative R&I for SHD, investments for SHD), we need to discuss how to navigate them, especially in terms of policy design and policy coherence.

This is particularly important as sustainability transition can be considered a "super-wicked" problem (Jakimowicz, 2022) that is a highly complex and challenging issue characterized by urgency, limited policy options and viable solutions, absence of a centralized authority, involvement of multiple stakeholders with conflicting interests, and little room for trial and error (Levin et al., 2012).

Our starting point here is that SHD gives the direction to public policies, making a clear distinction between objectives (i.e., the SHD pillars), areas of action (i.e., the 5 Ps) and means (i.e., public policies and collective action).

In this regard, the combination and coordination of resources, actions and capacities coming from different governance levels, policy fields and economic/social actors can be a crucial enabling factor for the sustainability transition in its environmental, social and economic dimensions, especially when it results in policy coherence. In this regard, the concept of multi-level governance (Piattoni, 2010) is used to describe the form of public policy formulation and implementation resulting from the existence of networks and policy actors in multiple levels and spheres (Marks et al., 1996) that replace the vertically hierarchical nation-state model (Noferini, 2010). Thus, multi-level governance (MLG) is an accelerator of the sustainability transition because it is essentially based on a series of institutional mechanisms and policy interventions involving a multiplicity of politically independent but nevertheless interconnected (public, private and social) social actors at different levels (Schmitter, 2004). It appears as a dynamic and open-ended process with both top-down and bottom-up interactions (Biggeri and Ferrannini, 2014; Meuleman, 2021).

Three key policy principles can be identified, as emerging from the policy coherence and integration paradigms (UN, 2018) and the MLG debate (UN-Habitat, 2022).

The first principle concerns the vertical integration between institutions at various levels through structured mechanisms and agreements for the alignment and coordination of sustainability transition strategies and policies at all levels of government (Smoke and Nixon, 2016). This therefore requires promoting synergies and cooperation between policies, interventions, and investments at global, supranational (e.g., European), national and local (i.e., regional, metropolitan and municipal) levels in order to effectively integrate transition measures. Concretely, this could and should result

in: i) the integration of global and European provisions into national plans and policies for the achievement of the Sustainable Development Goals and into national action plans for the environment, energy and climate change; ii) the definition of a national regulatory framework enabling sustainable business development and decent work for all, social inclusion and poverty eradication in the transition towards sustainable economies; iii) the strengthening of the institutional and technical capacities of sub-national authorities at regional and local levels to lead the transition and address the necessary changes in their economies; and iv) the creation, development and formalisation of mechanisms and structures for dialogue between all levels to discuss the best means to achieve social, economic and environmental objectives within transition processes.

The second principle concerns the horizontal integration within and between government institutions (and their departments) at the same level, through structured mechanisms that enable interconnections between sectors and policy domains. In other words, it is necessary to adopt a whole-of-government perspective (OECD, 2006) focused on the recognition of synergies and trade-offs between different policy domains and instruments in the name of a stronger policy coherence for the sustainability transition. This could and should first and foremost come through the integration of sustainability transition provisions into the agendas of relevant ministries (or departments/departments at the local level), rather than assigning them to a single ministry, and the promotion of close collaboration between relevant national ministries, including ministries of economic planning and finance, in order to define strategies, policies and programmes that can adapt to changes in the fiscal and policy landscape.

The third principle concerns the interaction and coordination with and between non-state actors through structured mechanisms that allow for full participation and social dialogue between societal stakeholders in the decision-making process for the sustainability transition at all levels. This principle therefore refers to a whole-of-society perspective (Cázarez-Gragega, 2018; OECD, 2020b), in which social partners have the opportunity and are enabled to actively participate at all stages, from policy design to implementation and evaluation, and at all levels, from the national to company levels. Such active participation may be clearly inspired (and better enabled) by those inner factors shaping individual and collective values, attitudes, behaviours and thus choices and steering them towards SHD. Moreover, it brings again attention to the importance of active citizenship by forming critical, responsible and capable agents, where everyone is a full member of the community in which she/he lives. Such participation and social dialogue appears to be instrumental not only in building political consensus on pathways to transition - necessary for its stable pursuit over time regardless of party changes at the governmental level - but also in stimulating active engagement in collaborative efforts and agreements between governments, employers' and workers' organisations, third sector organisations and universities/research centres to effectively enable policies for the sustainability transition. For example, this takes the form of stronger cooperation at the national level, where social partners cooperate with authorities in developing, implementing and monitoring policies in accordance with national practices; at the sectoral level, where social partners can play a key role through all forms of social dialogue, including collective bargaining, in securing decent work and in forecasting skills needs and employment challenges and designing appropriate and continuous training, among others; at the local level, where local authorities, employers, trade unions and research and training institutions need to cooperate to effectively integrate measures for a just transition to sustainable local economic development; at the company level, where social partners can work together to limit negative environmental impacts and support the development of workers' skills.

Taken together, these three principles – vertical integration between government institutions at various levels, horizontal integration within and between institutions at the same level, and

interaction and coordination with and between non-state actors – appear today fundamental to structuring a robust, coherent and comprehensive policy framework. Bringing together and concretising the perspectives of multilevel governance, whole-of-government and whole-of-society would allow for the alignment and convergence of the interests, resources, actions and capacities of all actors and social partners at different levels in designing and implementing effective measures for the sustainability transition. Nevertheless, it is clear that such a dynamic and open-ended process is shaped by issues of coordination, power asymmetries, conflicts of interests, and conflict management. Governments at all levels are surely assigned the role of navigating and mediating between conflicting visions and interests and generating awareness and trust within co-design and co-creation processes. For this reason, the lack and/or weakness of structured mechanisms referring to one or more of these principles strongly risks limiting the ability of all actors, from governments to companies and workers, to anticipate and manage the changes inherent in the sustainability transition process.

6. Final remarks on measurement and research implications

In these pages, we have strongly argued that the Sustainable Human Development paradigm offers a clear integrated vision to sustainability transition processes, capable of reconciling potential contradictions between economic, social and environmental spheres and allowing to better identify its pillars, driving actors and triggering factors.

Indeed, the vision underlying the SPES project and framework integrates the sustainable development and human development paradigms and their relative theoretical and policy approaches, pointing out that the lives of human beings and the sustainability of our societies should be the ultimate concern for any government intervention at all levels. This makes our original contribution both theoretically-grounded and policy-oriented. Similarly, it makes our SPES framework dynamic and centred on collective action shaped by a clear attention for the common good and underpinned by a normative position on capitalism and structural change, as well as on objectives and factors shaping transition processes.

For these reasons, the SPES framework has relevant implications for academic research on sustainability transition, urging the whole global community of scholars to keep the vibrant debate on sustainability at the forefront as well as to support societal actors in the systemic change towards SHD.

In particular, measurement implications deriving from our arguments are prominent, calling for the definition and definitive uptake of an appropriate measurement and analytical framework on sustainable human development and transition performances. Indeed, the fundamental push to go "beyond GDP" on development measurement given by several global initiatives (among others, the 2009 Commission on the Measurement of Economic Performance and Social Progress led by Stiglitz, Sen, Fitoussi and all the subsequent work by the OECD; the indicator framework of the 2030 Agenda since 2015; the work of the UNDP Human Development Report office since 1990; the new initiative to develop a UN system-wide contribution on Beyond GDP) paved the way for the design and adoption of new development indicators across the world. [41] However, this critical approach has not yet achieved a prominent, fully mainstream and, above all, embedded role in policy and public debate. GDP is still used as a valid indicator of economic growth and is the main objective of economic policies. This is also because a large, heterogeneous and somehow confusing / inconsistent group of alternative indicators leads policy makers to rely on GDP as the most convenient measure of development, despite its drawbacks and ambiguities. Nevertheless, it is fundamental and urgent to go beyond GDP to capture the real SHD progress, directing all efforts to "valuing what counts" the well-being of people and of the planet, while acknowledging that the System of National Account was not built in one day.

Therefore, today it is still necessary and urgent to deal with open questions within the current academic and policy debate: what (sustainable) development performance would we need to measure, in terms of outcomes and processes? How can we measure them? Are current measurement frameworks appropriate and robust? How can we improve them?

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[41] See the SPES report "Report on mapping indicators and composite indices relevant to measure transition performances" and its supplementary material available here.

The study of these crucial measurement issues mainly results into both a) assessing the capacity of the existing indicator sets and composite indices to effectively track sustainability transition, exploring their suitability to measure different dimensions and phenomena within transition performances; and b) exploring how non-conventional data sources and methods can provide new evidence on transition performances, paying attention also to their governance and ethics implications.

Taken together, advancements in these directions, among others, may contribute to tackling the predominant challenge about how to integrate the dimensions of social, environmental, and economic sustainability into a new policy and measurement framework, in order to consolidate the paradigm of SHD for its mainstreaming and uptake at all levels.

Along with these fundamental measurement issues, implications in terms of research and policy engagement are very clear and relevant, especially for the activities foreseen within our SPES project and similar research projects. First, embracing our novel framework requests dealing with the long-lasting "Beyond GDP" debate on measurement of (sustainable) development and finding appropriate, feasible and reliable solutions to truly inform decision-making processes. Second, all the pillars of SHD deserve merit and attention in the analysis of transition performances, dealing with both outcomes and conditions (at supranational, national, and local level) in the pursuit of productivity, equity, environmental sustainability, participation & empowerment, and human security. Third, reconciling sustainability objectives as in the SPES framework calls for an in-depth understanding of the multiple synergies and trade-offs within transition processes, assessing the complex modes of interaction between the social, economic, and environmental dimensions of the transition. Fourth, the identification and analysis of evidence-based scenarios on the sustainability transition would contribute to make the SPES framework operational in order to derive policy and governance implications for decision-makers dealing with concomitant societal priorities and challenges. Fifth, the SPES framework itself should be an object of discussion, revision, and further refinement, based on evidence obtain throughout the SPES project implementation and on the engagement with a wider multidisciplinary audience (also going beyond the academic sphere), along with taking into account novel ideas and external circumstances. Last but not the least, the SPES framework is conceived to inform the policy discussions at different levels, thus requiring making it clear and appealing for its effective uptake and discussing how its main insights can be implemented in real world policies and actions.

All in all, the ambition of the SPES framework and the subsequent activities of the project is contributing to shape a new sustainability model for the future of our societies inspired by a Sustainable Human Development vision. Only in this way the pursuit of shared prosperity and human flourishing would be able to reconcile productivity enhancement with inclusiveness and environmental protection, while strengthening democracy and ensuring human security for all.

We are aware that the road to go is complex and that the real-world is still far from the vision and arguments proposed in this paper. However, we firmly believe that, with the active engagement and contribution of several actors and colleagues, all together we can steer these fundamental changes to our economic and social systems towards Sustainable Human Development.

References

Abbas, J. & Sağsan, M. (2019). Impact of knowledge management practices on green innovation and corporate sustainable development: A structural analysis. *Journal of Cleaner Production*, 229, 611-620.

Acemoglu, D. (2021). Remaking the post-COVID world. *Finance and Development*. IMF.

Ahmed, F., Ahmed, N.E., Pissarides, C. & Stiglitz, J. (2020). Why inequality could spread COVID-19. *The Lancet Public Health*, 5(5), e240.

Aiginger, K. (2007). Industrial Policy: A Dying Breed or A Re-emerging Phoenix. *Journal of Industry, Competition and Trade*, 7, 297-323.

Airoldi, E.M. & Bischof, J.M. (2016). Improving and Evaluating Topic Models and Other Models of Text. *Journal of the American Statistical Association*, 111(516), 1381–1403.

Alkire, S. (2002a). *Valuing freedoms: Sen's capability approach and poverty reduction*. Oxford University Press, Oxford.

Alkire, S. (2002b). Dimensions of Human Development. *World Development*, 30(2), 181-205.

Alkire, S. & Deneulin, S. (2009). The human development and capability approach, in S. Deneulin and L. Shahani (Eds.), *An introduction to the Human Development and Capability Approach: Freedom and agency*. Earthscan, London and Sterling, VA.

Anand, P., Ferrer, B., Gao, Q., Nogales, R. & Unterhalter, E. (2020). COVID-19 as a capability crisis: using the capability framework to understand policy challenges. *Journal of human development and capabilities*, 21(3), pp.293-299.

Arnkil R., Järvensivu, A., Koski, P. & Piirainen, T. (2010). Exploring Quadruple Helix: outlining user-oriented innovation models. *Työraportteja working papers 85/ 2010*, University of Tampere, Institute for Social Research, Work Research Centre.

Autor, D., Basu, K., Qureshi, Z. & Rodrik, D. (2022). *An inclusive future? Technology, new dynamics, and policy challenges*. Brookings Institution, Washington, DC. Available at https://policycommons.net/artifacts/4136518/an-inclusive-future-technology-new-dynamics-and-policy-challenges/4944541/

Baccarne, B., Logghe, S., Schuurman, D. & De Marez, L. (2016). Governing quintuple helix innovation: urban living labs and socio-ecological entrepreneurship. *Technology Innovation Management Review*, 6(3), 22-30.

Ballet, J., Biggeri, M. & Comim, F. (2011). Children's agency and the capability approach: A conceptual framework, in M. Biggeri, J. Ballet and F. Comim (Eds.), *Children and the Capability Approach*, Palgrave Macmillan, New York.

Barbier, E. B. (2019). The concept of natural capital. *Oxford Review of Economic Policy*, 35(1), 14-36.

Bar-Tal, D. (1976). Prosocial Behavior: Theory and Research; Hemisphere Publishing Corp, New York.

Basu, K. (2022). Conventions, morals and strategy: Greta's dilemma and the incarceration game. *Synthese* 200, 58.

Batson, C. D., Lishner, D. A., Stocks, E. L. (2015). The Empathy–Altruism Hypothesis. In Schroeder, D.A., & Graziano, W. G. (ed.s). *The Oxford Handbook of Prosocial Behavior*. Oxford University Press, Oxford.

Baumgärtner, S., & Sievers-Glotzbach, S. (2012). The relationship between intra-and intergenerational ecological justice. *Environmental Values*, 21(3), 331-355.

Bebbington, J. (2001). Sustainable development: a review of the international development, business and accounting literature. *Accounting Forum*, 25(2), 128-157.

Becattini, G. (2014). Prologue. In M. Biggeri and A. Ferrannini. *Sustainable Human Development: A new territorial and people-centred perspective*. Palgrave Macmillan, Basingstoke and New York.

Becchetti, L. , Bruni, L. & Zamagni, S. (2015). Human values, civil economy, and subjective wellbeing. In Helliwell, J., Layard, R. & Sachs, J. (Eds.). *World Happiness Report 2015*. Sustainable Development Solutions, New York.

Becker, C. U. (2023). Ethical underpinnings for the economy of the Anthropocene: Sustainability ethics as key to a sustainable economy. *Ecological Economics*, 211, 107868.

Beilin, H. & Eisenberg, N. (2013). *The Development of Prosocial Behavior*. Academic Press, New York.

Bell, J., Buisman, N., Child, P., D'Acunto, A. & Malo, J.-D. (2019). *The Future of European R&I policy: Sustainability and the Sustainable Development Goals*. European Commission Directorate-General for Research and Innovation.

Bellandi, M., Donati, L. & Cataneo, A. (2021). Social innovation governance and the role of universities: Cases of quadruple helix partnerships in Italy. *Technological Forecasting and Social Change*, 164, 120518.

Berejnoi E., Messer, D. & Cloutier, S. (2020). Cultivating Spiritual Well-Being for Sustainability: A Pilot Study. *Sustainability*, 12, 10342.

Bhaskar, R. (2002) The philosophy of metareality: creativity, love and freedom. Routledge, London.

Biggeri, M. (2023), Briefing note for the Task Force IV Changing the world of work: New employment opportunities in G20 countries, *G20 − L20 - Background Note*, 22-24 June 2023, Patna, India.

Biggeri, M., Clark, D.A., Ferrannini, A. & Mauro, V. (2019). Tracking the SDGs in an "integrated" manner: A proposal for a new index to capture synergies and trade-offs between and within goals. *World Development*, 122, 628-647.

Biggeri M., Colucci D., Doni N. & Valori V. (2022). Sustainable Entrepreneurship: Good Deeds, Business, Social and Environmental Responsibility in a Market Experiment. *Sustainability*, 14, 3577.

Biggeri, M., & Ferrannini, A. (2014). *Sustainable Human Development: A New Territorial and People-centred Perspective*. Palgrave Macmillan, New York and Basingstoke.

Biggeri, M. & Ferrannini, A. (2020). Framing R&I for transformative change towards sustainable development in the European Union. *R&I PAPER SERIES WORKING PAPER 2020/07*, EU Commission - Directorate-General for Research and Innovation.

Biggeri, M. & Mauro, V. (2018). Towards a more 'Sustainable' Human Development Index: Integrating the environment and freedom. *Ecological Indicators*, 91: 220-231.

Biggeri, M. & Santi, M. (2012), The missing dimensions of children's well-being and well-becoming in education systems: Capabilities and philosophy for children. *Journal of Human Development and Capabilities*, 13(3), 373−395.

Bischof J. & Airoldi, E. (2012). Summarizing Topical Content with Word Frequency and Exclusivity, In J Langford, J Pineau (eds.), *Proceedings of the 29th International Conference on Machine Learning*, ICML '12, 201−208. Omnipress, New York.

Boda, C. S. & Faran, T. (2018). Paradigm found? Immanent critique to tackle interdisciplinarity and normativity in science for sustainable development. *Sustainability*, 10(10), 3805.

Borio, C. (2020). The Covid-19 economic crisis: Dangerously unique. *Business Economics*, 55(4), 181-190.

Brunori, P., Ferreira, F. H. & Peragine, V. (2013). Inequality of opportunity, income inequality, and economic mobility: Some international comparisons. *IZA Discussion Papers*, No. 7155, Institute for the Study of Labor (IZA), Bonn.

Bundervoet, T., Dávalos, M.E. & Garcia, N. (2022). The short-term impacts of COVID-19 on households in developing countries: An overview based on a harmonized dataset of high-frequency surveys. *World development*, 105844.

Cai, Y. & Amaral, M. (2022). Triple Helix model of innovation: from boundaries to frontiers. *Triple Helix*, 9(2), 107-117.

Cai, Y. & Etzkowitz, H. (2020). Theorizing the Triple Helix model: Past, present, and future. *Triple Helix*, 7(2-3), 189-226.

Camagni, R., Capello, R. & Nijkamp, P. (2009). Territorial capital and regional development. *Handbook of regional growth and development theories*, 1, 118-132.

Carayannis, E. G. & Campbell, D. F. (2009). 'Mode 3'and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. *International journal of technology management*, 46(3-4), 201-234.

Carayannis, E. G. & Campbell, D. F. J. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate To Each Other? A Proposed Framework for a Trans-Disciplinary Analysis of Sustainable Development and Social Ecology. *International Journal of Social Ecology and Sustainable Development*, 1(1), 41–69.

Carayannis, E. G., Campbell, D. F. & Grigoroudis, E. (2022). Helix trilogy: The triple, quadruple, and quintuple innovation helices from a theory, policy, and practice set of perspectives. *Journal of the Knowledge Economy*, 13(3), 2272-2301.

Carayannis, E. G., Grigoroudis, E., Campbell, D. F. J., Meissner D. & Stamati, D. (2017). The ecosystem as helix: an exploratory theory-building study of regional co-opetitive entrepreneurial ecosystems as Quadruple/Quintuple Helix Innovation Models. *R&D Management*, 48(1), 148-162.

Carayannis, E. G., Grigoroudis, E., Stamati, D, & Valvi, T. (2019). Social business model innovation: A quadruple/quintuple helix-based social innovation ecosystem. IEEE Transactions on *Engineering Management*, 68(1), 235-248.

Carayannis, E.G., Barth, T.D. & Campbell, D.F. (2012), The quintuple helix innovation model: global warming as a challenge and driver for innovation, *Journal of Innovation and Entrepreneurship*, 1(1), 1-12.

Carayannis, E.G., Depeige, A. & Sindakis, S. (2014), Dynamics of ultra-organizational co-opetition and circuits of knowledge: a knowledge-based view of value ecology. *Journal of Knowledge Management*, 18(5), 1020-1035.

Cárdenas Rodríguez, M., I. Haščič & M. Souchier (2018). *Environmentally Adjusted Multifactor Productivity: Methodology and Empirical results for OECD and G20 countries*. OECD Green Growth Papers, No. 2018/02, OECD Publishing, Paris.

Caselli, L. (2018). L'economia non può fare a meno dell'etica. *Electronic Journal of Management*, 2, 1-11.

Cázarez-Gragega, K. (2018). The Whole of Society Approach: Levels of engagement and meaningful participation of different stakeholders in the review process of the 2030 Agenda, *Discussion paper*, Partners for review, GIZ - German Agency for International Cooperation, Bonn.

Chambers, R. (1997). *Whose Reality Counts? Putting the First Last*. Intermediate Technology, London.

Chen, H.-M., Kuo, T.-S. & Chen, J.-L. (2022). Impacts on the ESG and financial performances of companies in the manufacturing industry based on the climate change related risks. *Journal of Cleaner Production*. 380 (1).

Clark, D. A., Biggeri, M. & Frediani, A. A. (2019). *The capability approach, empowerment and participation: Concepts, methods and applications*. Palgrave Macmillam, London.

Clark, D. A., Biggeri, M., & Frediani, A. A. (2019b). Participation, Empowerment and Capabilities: Key Lessons and Future Challenges. In Clark, D. A., Biggeri, M. & Frediani, A. A. (Eds.). *The capability approach, empowerment and participation: Concepts, methods and applications*. Palgrave Macmillam, London.

Cobbinah, P. B., Erdiaw-Kwasie, M. O. & Amoateng, P. (2015). Rethinking sustainable development within the framework of poverty and urbanisation in developing countries. *Environmental Development*, 13, 18-32.

Cohen, B., Smith, B.B. & Mitchell, R. (2008). Toward a sustainable conceptualization of dependent variables in entrepreneurship research. *Business Strategy and the Environments*. 17, 107–119.

Colglazier, W. (2015). Sustainable development agenda: 2030. *Science*, 349(6252), 1048-1050.

Costanza, R. (2000). The dynamics of the ecological footprint concept. *Ecological economics,* 32(3), 341-345.

Costanza, R. & Daly, H. E. (1987). Toward an ecological economics. *Ecological modelling*, 38, 1-7.

Costanza, R., Alperovitz, G., Daly, H., Farley, J., Franco, C., Jackson, T., Kubiszewski, I. & Victor, P. (2017). Building a sustainable and desirable economy-in-society-in-nature. *Green Economy Reader: Lectures in Ecological Economics and Sustainability*, 367-454.

Costanza, R., Daly, L., Fioramonti, L., Giovannini, E., Kubiszewski, I., Mortensen, L. F. & Wilkinson, R. (2016). Modelling and measuring sustainable wellbeing in connection with the UN Sustainable Development Goals. *Ecological economics*, 130, 350-355.

Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K.E., Ragnarsdóttir, K.V., Roberts, D., De Vogli, R. & Wilkinson, R. (2014). Time to leave GDP behind. Nature, 505, 283–285.

Cumberland, J. H., Daly, H., Goodland, R., Norgaard, R. B., Kubiszewski, I. & Franco, C. (2015). *Introduction to Ecological Economics (2nd ed.)*. CRC Press.

Daly, H. E. (1996). *Beyond Growth: The Economics of Sustainable Development*. Beacon Press, Boston.

Daly, H. E. (2007). *Ecological economics and sustainable development*. Edward Elgar Publishing Ltd, Cheltenham.

Daly, H.E. & Cobb, J.B. (1994). *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future*. 2nd Edition, Beacon Press, Boston.

Daly, H. E. (1991). *Steady-State Economics*. 2nd edition, Island Press, Washington, DC.

de Santiago, B. S. R., Carretero, M. D. R. M., Gómez-Jarabo, I. & Vera, C. S. (2022). An intersectional focus on inequality and inequity in the framework of the 2030 Agenda. *International Journal of Latest Research in Humanities and Social Science*, 5(11), 73-82.

Dei Ottati, G. (2005). Global competition and entrepreneurial behaviour in industrial districts: Trust relations in an Italian industrial district. In H.H. Hoehmann & F. Welter (Eds.). *Trust and Entrepreneurship: A West-East Perspective,* Edward Elgar Publishing Ltd, Cheltenham.

Gasper, D. & Keleher, L. (2021). Investigating L.-J. Lebret as a pioneer of human development thinking and global development ethics. *Journal of Global Ethics*, 17(2), 115-126

Doyal, L. & Gough, I. (1991). *A Theory of Human Need*. Macmillan Education, London.

Drèze, J. & Sen, A.K. (2002). *India, development and participation*. New Delhi University Press, New Delhi.

EC (2022a). *A New Era for Europe. How the European Union Can Make the Most of its Pandemic Recovery, Pursue Sustainable Growth, and Promote Global Stability*. European Commission.

EC (2022b). *Towards a green, digital and resilient economy: our European Growth Model*. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. COM (2022) 83 final, Brussels.

EC (2023). *Developing Alternative Visions for Assessing Progress to Sustainable Development 'Beyond GDP'*. RTD Publications. Publications Office of the European Union.

EEA (2016). *Sustainability transitions: now for the long term*. European Environment Agency and European Environment Information and Observation Network, Copenhagen.

El-Chichakli, B., von Braun, J., Lang, C., Barben, D. & Philp, J. (2016). Policy: Five cornerstones of a global bioeconomy. *Nature*, 535(7611), 221-223.

Etzkowitz, H. & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Research policy*, 29(2), 109-123.

European Parliamentary Research Service (2023). *Beyond growth. Pathways towards sustainable prosperity in the EU*. Members' Research Service of the European Parliamentary Research Service in collaboration with the Joint Research Centre of the European Commission, Brussels.

Ferrannini, A., Barbieri, E., Biggeri, M. & Di Tommaso, M.R. (2021). Industrial policy for sustainable human development in the post-Covid19 era. *World development*, 137, 105215.

Franklin, N. E. (2009). The need is now: University engagement in regional economic development. *Journal of Higher Education Outreach and Engagement*, 13(4), 51-73.

Frediani, A. A. (2015). "Participatory Capabilities" in Development Practice. *DPU Working Paper 178*. Development Planning Unit, The Bartlett, University College London.

Frediani, A.A., Clark, D.A. & Biggeri, M. (2019). Human Development and the Capability Approach: The Role of Empowerment and Participation. In Clark, D.A., Biggeri, M. & Frediani, A.A. (Eds.). *The Capability Approach, Empowerment and Participation. Concepts, Methods and Applications*. Palgrave Macmillan, London.

Frediani, A. A. (2020). Sen's Capability Approach as a Framework to the Practice of Development. *Development in Practice*, 20(2), 173–87.

Freire, P. (1997). Foreword. In S. E. Smith, D. G. Willms & N. A. Johnson (Eds.), *Nurtured by Knowledge: Learning to Do Participatory Action Research*. The Apex Press, New York.

Fukuda-Parr, S. (2007). Rethinking the policy objectives of development aid: From economic growth to conflict prevention. UNU-WIDER Research Paper, no 2007/32.

Furceri, D., Loungani, P., Ostry, J.D. & Pizzuto, P. (2020). Will Covid-19 affect inequality? Evidence from past pandemics. *Covid Economics*, 12(1), 138-157.

Galvão, A., Mascarenhas, C., Gouveia Rodrigues, R., Marques, C.S. & Leal, C.T. (2017). A quadruple helix model of entrepreneurship, innovation and stages of economic development. *Review of International Business and Strategy*, 27(2), 261-282.

Galvao, A., Mascarenhas, C., Marques, C., Ferreira, J. & Ratten, V. (2019). Triple helix and its evolution: a systematic literature review. *Journal of Science and Technology Policy Management*, 10(3), 812-833.

Geels, F. W., Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36, 399-417.

Geels, F.W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Research Policy*, 31, 1257–1274.

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33, 897–920.

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental innovation and societal transitions*, 1(1), 24-40.

Georgescu-Roegen, N. (1984). Feasible recipes versus viable technologies. *Atlantic Economic Journal*, 12, 21-31.

Giovannini, E., Benczur, P., Campolongo, F., Cariboni, J. & Manca, A. (2020). *Time for transformative resilience: the COVID-19 emergency*, EUR 30179 EN, Publications Office of the European Union, Luxembourg.

Gjoksi, N. (2011). Innovation and sustainable development: Linkages and perspectives for policies in Europe. *European Sustainable Development Network Quarterly Report*, June 2011.

Gómez, O. & Gasper, D. (2021). The Position of Crises in Human Development Processes and Thinking: Using the Human Security Approach in an Era of Transitions. *Background Paper for the 2022 UNDP Special Report on Human Security*.

Grundel, I. & Dahlström, M. (2016). A quadruple and quintuple helix approach to regional innovation systems in the transformation to a forestry-based bioeconomy. *Journal of the Knowledge Economy*, 7, 963-983.

Guarini, G. (2023). A Classical-Post Keynesian critique on neoclassical environmentally-adjusted multifactor productivity. *Brazilian Journal of Political Economy*, 43(1), 67-77.

Guterres, A. (2020). We are all in this Together: Human Rights and COVID-19 Response and Recovery. Message by the United Nations Secretary-General, 23 April 2020.

Haq, M. (1995). *Reflections on human development*. Oxford University Press, Oxford.

Hart, C., Biggeri, M. & Babic, B. (Eds.). (2014). *Agency and Participation in Childhood and Youth: International Applications of the Capability Approach in Schools and Beyond*. Bloomsbury, London.

Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S. & Smits, R. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting and Social Change*, 74, 413–432.

Hepburn, C., O'Callaghan, B., Stern, N., Stiglitz, J. & Zenghelis, D. (2020). Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? *Oxford Review of Economic Policy*, 36(1), S359-S381.

Hirschman, A. O. (1967). *Development Projects Observed*, Brookings Institution Press.

Hoekstra, R. (2019). *Replacing GDP by 2030: towards a common language for the well-being and sustainability community*. Cambridge University Press, Cambridge.

Hunecke M (2018) Psychology of sustainability: psychological resources for sustainable lifestyles. In Parodi, O. & Tamm, K. (Eds). *Personal Sustainability. Exploring the Far Side of Sustainable Development*. Routledge, 33–50.

Ielasi F., Bellucci M., Biggeri M., & Ferrone L. (2023). Measuring banks' sustainability performances: The BESGI score. *Environmental Impact Assessment Review*, 102, ISSN 0195-9255

ILO (2008). *Green Jobs: Towards decent work in a sustainable, low-carbon world*. United Nations Environment Programme.

ILO (2018). Just transition towards environmentally sustainable economies and societies for all. *ILO ACTRAV Policy Brief*. International Labour Organization.

IPCC (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

Jakimowicz, A. (2022). The energy transition as a super wicked problem: The energy sector in the era of prosumer capitalism. *Energies*, 15(23), 9109.

Kemp, R. (1994). Technology and the transition to environmental sustainability. *Futures*, 26, 1023–1046.

Kemp, R., Schot, J. & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis and Strategic Management*, 10, 175–198.

Kherwa, P. & Bansal, P. (2019). *Topic modeling: a comprehensive review*. EAI Endorsed transactions on scalable information systems, 7(24).

Kivimaa, P. & Kern, F. (2016). Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. *Research Policy*, 45(1), 205–217.

Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., ... & Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions*, 31, 1-32.

König, J., Suwala, L., & Delargy, C. (2021). Helix models of innovation and sustainable development goals. In W. Leal Filho et al. (Eds.), *Industry, Innovation and Infrastructure, Encyclopedia of the UN Sustainable Development Goals*, 473-487.

Kristeller, J. L. & Johnson, T. (2005). Cultivating Loving Kindness: A Two-Stage Model of the Effects of Meditation on Empathy, *Compassion, and Altruism*. Zygon, 40, 391–408.

Kroll, C., Warchold, A. & Pradhan, P. (2019). Sustainable Development Goals (SDGs): Are we successful in turning trade-offs into synergies? *Palgrave Communications*, 5(1).

Leal Filho, W. & Consorte McCrea, A. (Eds.). (2019). *Sustainability and the Humanities*. Springer Nature.

Leal Filho, W., Ozuyar, P. G., Dinis, M. A. P., Azul, A. M., Alvarez, M. G., da Silva Neiva, S., ... & Vasconcelos, C. R. (2023). Living labs in the context of the UN sustainable development goals: state of the art. *Sustainability Science*, 18(3), 1163-1179.

Leal Filho, W., Vargas, V. R., Salvia, A. L., Brandli, L. L., Pallant, E., Klavins, M., ... & Vaccari, M. (2019). The role of higher education institutions in sustainability initiatives at the local level. *Journal of Cleaner Production*, 233, 1004-1015.

Lelkes, O. (2021). *Sustainable Hedonism: A Thriving Life That Does Not Cost The Earth*. Bristol University Press.

Levin, S. (2012). Epilogue: the challenge of sustainability: lessons from an evolutionary perspective. In *Sustainability Science: The Emerging Paradigm and the Urban Environment*, 431-437.

Lewis, S. L. & Maslin, M. A. (2015). Defining the Anthropocene. *Nature*, 519 (7542), 171-180.

Leydesdorff, L. & Etzkowitz, H., (1996), Emergence of a Triple Helix of university-industry-government relations. *Science and Public Policy*, 23(5), 279–286.

Leydesdorff, L. (2012). The triple helix, quadruple helix, ... and an N-tuple of helices: Explanatory models for analyzing the knowledge-based economy? *Journal of the Knowledge Economy*, 3(1), 25-35.

Lin, D., Hanscom, L., Murthy, A., Galli, A., Evans, M., Neill, E., ... & Wackernagel, M. (2018). Ecological footprint accounting for countries: updates and results of the National Footprint Accounts, 2012–2018. Resources, 7 (3), 58.

Lindner, R., Daimer, S., Beckert, B., Heyen, N., Koehler, J., Teufel, B., ... & Wydra, S. (2016). Addressing directionality: Orientation failure and the systems of innovation heuristic. Towards Reflexive Governance (No. 52). *Fraunhofer ISI Discussion Papers-Innovation Systems and Policy Analysis*.

Loorbach, D., Frantzeskaki, N, & Avelino, F. (2017). Sustainability transitions research: transforming science and practice for societal change. *Annual Review of Environment and Resources*, 42, 599-626.

Loorbach, D. & Rotmans, J. (2006). Managing Transitions for Sustainable Development. In Olsthoorn, X. & Wieczorek, A. (Eds). Understanding Industrial Transformation. *Environment & Policy*, 44, 187-206.

Lundin, N. & Schwaag Serger, S. (2018). Agenda 2030 and A Transformative Innovation Policy – Conceptualizing and experimenting with transformative changes towards sustainability. *Transformative Innovation Policy Consortium*, WP 2018-01.

Lynas, M., Houlton, B. Z. & Perry, S. (2021). Greater than 99% consensus on human-caused climate change in the peer-reviewed scientific literature. *Environmental Research Letters*, 16(11).

MacGregor, S. P., Marques-Gou, P. & Simon-Villar, A. (2010). Gauging readiness for the Quadruple Helix: a study of 16 European organizations. *Journal of the Knowledge Economy*, 1(3), 173–190.

Marcovich, A. & Shinn, T. (2011). From the Triple Helix to a Quadruple Helix? The case of dip-pen nanolithography. *Minerva*, 49, 175–190.

Markard, J. (2011). Transformation of infrastructures: sector characteristics and implications for fundamental change. *Journal of Infrastructure Systems* (ASCE) 17, 107–117.

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: an emerging field of research and its prospects. *Research Policy*, 41(6), 955–967.

Marks, G., Nielsen, F., Ray, L. & Salk, J. E. (1996). Competencies, cracks, and conflicts: Regional mobilization in the European Union. *Comparative Political Studies*, 29(2), 164-92.

Max-Neef, M. A. (1991). *Human scale development: Conception, Application and Further Reflections*. Apex Press, New York.

Mayumi, K., Giampietro, M. & Gowdy, J. M. (1998). Georgescu-Roegen/Daly versus Solow/Stiglitz revisited. *Ecological Economics*, 27(2), 115-117.

Mazzucato, M. (2016). From market fixing to market-creating: a new framework for innovation policy. *Industry and Innovation*, 23(2), 140-156.

Mazzucato, M., & Kattel, R. (2020). COVID-19 and public-sector capacity. *Oxford Review of Economic Policy*, 36(Supplement_1), S256-S269.

Mehrotra, S. (2008). Democracy, decentralization and access to basic services: An elaboration on Sen's capability approach. In F. Comim, M. Quizilbash, and S. Alkire (Eds.). *The Capability Approach: Concepts, Measures and Applications*. Cambridge University Press.

Meuleman, L. (2021). Public Administration and Governance for the SDGs: Navigating between Change and Stability. *Sustainability*, 13, 5914.

Miller, K., McAdam, R., Moffett, S., Alexander, A. & Puthusserry, P. (2016). Knowledge transfer in university quadruple helix ecosystems: an absorptive capacity perspective. *R&D Management*, 46(2), 383-399.

Mimno, D., Wallach, H. M., Talley, E., Leenders, M. & McCallum, A. (2011). Optimizing Semantic Coherence in Topic Models. *In Proceedings of the Conference on Empirical Methods in Natural Language Processing*, Association for Computational Linguistics, EMNLP 11, 262–272.

Muench, S., Stoermer, E., Jensen, K., Asikainen, T., Salvi, M. & Scapolo, F. (2022). *Towards a green and digital future*. EUR 31075 EN. Publications Office of the European Union.

Nalau, J. & Verrall, B. (2021). Mapping the evolution and current trends in climate change adaptation science. *Climate Risk Management*, 32, 100-290.

Natarajan, N., Newsham, A., Rigg, J. & Suhardiman, D. (2021). A sustainable livelihoods framework for the 21st century. *World Development*, 155.

Neve, J.-E. & Sachs, J. (2020). The SDGs and human well-being: a global analysis of synergies, trade-offs, and regional differences. *Scientific Reports*, 10.

Neumayer, E. (2012). *Human development and sustainability*. Journal of Human Development and Capabilities, 13 (4), 561–579.

Newman, D., Lau, J. H., Grieser, K. & Baldwin, T. (2010). *Automatic Evaluation of Topic Coherence. In Human Language Technologies: The 2010 Annual Conference of the North American Chapter of the Association for Computational Linguistics,* Association for Computational Linguistics, 100–108.

Noferini, A. (2010). Development, decentralised cooperation and multilevel governance: Considerations for the current climate. *Observatorio de Cooperacion Descentralizada UE – AL*, Governance and Institutional Strengthening.

O'Neill, D. W., Fanning, A. L., Lamb, W. F. & Steinberger, J. K. (2018). A good life for all within planetary boundaries. *Nature Sustainability*, 1, 88–95.

OECD (2006). *Whole of Government Approaches to Fragile States*. Dac Guidelines and Reference Series - A Dac Reference Document. Organisation for Economic Co-operation and Development, OECD Publishing, Paris.

OECD (2007). The Engagement of Higher Educational Institutions in Regional Development: An Overview of the Opportunities and Challenges. In Globally Competitive, Locally Engaged Higher Education and Regions - *OECD/IMHE International Conference* - 19-21 September 2007 Valencia, Spain.

OECD (2020a). *COVID-19: Protecting people and societies, Tackling coronavirus (Covid-19) – Contributing to a global effort*. Organisation for Economic Co-operation and Development, OECD Publishing, Paris.

OECD (2020b). *OECD Public Integrity Handbook, Organisation for Economic Co-operation and Development*, Organisation for Economic Co-operation and Development, OECD Publishing, Paris.

Ogata, S., & Sen, A. (2003). *Human Security Now: Commission on Human Security, Final Report*. Commission on Human Security, New York.

Olabi, A. G. & Abdelkareem, M. A. (2022). Renewable energy and climate change. *Renewable and Sustainable Energy Reviews*, 158.

Ottersen, O. P. & Engebretsen, E. (2020). COVID-19 puts the sustainable development goals center stage. *Nature Medicine*, 26(11), 1672-1673.

OXFAM and ARCO (2016). *Where change happens. Local governance to tackle multidimensional poverty and inequality.* Position Paper, Oxfam International.

Padilla-Walker, L. M. & Carlo, G. (2014). The Study of Prosocial Behavior. *Prosocial Development*, 3, 3-16.

Patermann, C. & Aguilar, A. (2018). The origins of the bioeconomy in the European Union. *New Biotechnology,* 40, 20-24.

Piattoni, S. (2010). *The theory of multi-level governance: Conceptual, empirical, and normative challenges.* Oxford University Press, Oxford.

Pope Francis. (2015). *Laudato Si': On Care for Our Common Home* [Encyclical].

Purcell, W. M., Henriksen, H. & Spengler, J. D. (2019). Universities as the engine of transformational sustainability toward delivering the sustainable development goals: "Living labs" for sustainability. *International Journal of Sustainability in Higher Education*, 20(8), 1343-1357.

Putnam, R. D., Leonardi, R. & Nanetti, R. Y. (1994). *Making Democracy Work: Civic Traditions in Modern Italy.* Princeton University Press, Princeton.

Ranjbari, M., Esfandabadi, Z. S., Zanetti, M. C., Scagnelli, S. D., Siebers, P. O., Aghbashlo, M., Peng, W., Quatraro, F. & Tabatabaei, M. (2021). Three pillars of sustainability in the wake of COVID-19: A systematic review and future research agenda for sustainable development. *Journal of Cleaner Production,* 297.

Rao, N. D. & Min, J. (2018). Decent Living Standards: Material Prerequisites for Human Wellbeing. *Social Indicators Research*, 138, 225−244.

Raworth, K. (2017). A Doughnut for the Anthropocene: humanity's compass in the 21st century. *The Lancet Planetary Health*, 1(2), e48-e49.

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., ... & Stringer, L. C. (2010). What is social learning? *Ecology and Society*, 15(4).

Rehman, S. U., Kraus, S., Shah, S. A., Khanin, D. & Mahto, R. V. (2021). Analyzing the relationship between green innovation and environmental performance in large manufacturing firms. *Technological Forecasting and Social Change*, 163.

Reinert, E. S. (2012). Neo-classical economics: A trail of economic destruction since the 1970s. *Real World Economics Review*, 60, 2-17.

Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy*, 10, 1-15.

Roberts, M. E., Stewart, B. M. & Tingley, D. (2019). stm: An R Package for Structural Topic Models. *Journal of Statistical Software*, 91(2), 1−40.

Rockström, J., Gupta, J., Qin, D., Lade, S. J., Abrams, J. F., Andersen, L. S., ... & Zhang, X. (2023). Safe and just earth system boundaries. *Nature*, 1-10.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E. F., ... & Costanza, R. (2009). A safe operating space for humanity. *Nature*, 461, 472−475.

Rogers, D. S., Duraiappah, A. K., Antons, D. C., Munoz, P., Bai, X., Fragkias, M. & Gutscher, H. (2012). A vision for human well-being: transition to social sustainability. *Current Opinion in Environmental Sustainability*, 4(1), 61-73.

Rothstein, B. & Teorell, J. (2008). What Is Quality of Government? A Theory of Impartial Government Institutions. *Governance*, 21, 165-190.

Sachs, J. (2015). *The Age of Sustainable Development*. New York: Columbia University Press.

Sachs, J., Kroll, C., Lafortune, G., Fuller, G. & Woelm, F. (2021). *Sustainable Development Report 2021*. Cambridge University Press.

Samman, E., & Roche, J. M. (2014). Group inequality and intersectionality. *Maitreyee E-Bulletin*, Human Development & Capability Association.

Scharmer, C. O. & Kaufer, K. (2015). Awareness-based action research: catching social reality creation in flight. In *The SAGE Handbook of Action Research*, 199−210.

Schmitter, P. C. (2004). The quality of democracy: the ambiguous virtues of accountability. *Journal of Democracy*, 15(4), 47-60.

Schot, J. & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy*, 47(9), 1554-1567.

Schot, J., Boni, B., Ramirez, M, & Steward, F. (2018). Addressing SDGs through Transformative Innovation Policy. *Transformative Innovation Policy Consortium*, Research Briefing 2018-01.

Schwab, K. (Ed.) (2019). *The Global Competitiveness Report 2019*. World Economic Forum, Geneva.

Schwab, K. & Vanham, P. (2021*). Stakeholder Capitalism: A Global Economy that Works for Progress, People and Planet*. John Wiley & Sons Inc.

Sen, A. K. (1980). Equality of What? In *Tanner Lectures on Human Values*, 1, 195-220. Cambridge: Cambridge University Press.

Sen, A. K. (1985). *Commodities and Capabilities*. North-Holland.

Sen, A. K. (1990). Development as Capability Expansion. In K. Griffin & J. Knight (Eds*), Human Development and the International Development Strategy for the 1990s,* Macmillan, London.

Sen, A. K. (1999). *Development as Freedom*. Alfred Knopf.

Sen, A. K. (2009). *The Idea of Justice*. Cambridge, MA: The Belknap Press of Harvard University Press.

Sen, A. K. (2020). A better society can emerge from the lockdowns. Financial Times, 15(4), 2020.

Silge, J. & Robinson, D. (2017). *Text Mining with R*. O'Reilly Media, Inc.

Slaughter, R. A. (2012). Welcome to the Anthropocene. *Futures*, 44, 119–126.

Smith, A., Stirling, A. & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy*, 34, 1491–1510.

Smoke, P. & Nixon, H. (2016). *Sharing Responsibilities and Resources among Levels of Governments: Localizing the Sustainable Development Goals*. UN Department of Economics and Social Affairs, New York.

Snower, D. J. (2018). Beyond capital and wealth. *Economics,* 12(1), 20180021.

Sol, J., Van der Wal, M. M., Beers, P. J. & Wals, A. E. (2018). Reframing the future: the role of reflexivity in governance networks in sustainability transitions. *Environmental Education Research*, 24(9), 1383-1405.

Spence, M. (2011). *The Next Convergence: The Future of Economic Growth in a Multispeed World. Farrar*, Straus and Giroux.

Stefani, G., Biggeri, M. & Ferrone, L. (2022). Sustainable Transitions Narratives: An Analysis of the Literature through Topic Modelling. *Sustainability*, 14(4), 2085.

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O. & Ludwig, C. (2015). The trajectory of the Anthropocene: the great acceleration. *The Anthropocene Review*, 2(1), 81-98.

Stewart, F. (1989). Basic Needs Strategies, Human Rights, and the Right to Development. *Human Rights Quarterly*, 11(3), 347–374.

Stiglitz, J., Sen, A, & Fitoussi, J. P. (2009). The measurement of economic performance and social progress revisited: Reflections and Overview. *Sciences Po publications 2009-33*, Sciences Po.

Stiglitz, J.E., Shiller, R.J., Gopinath, G., Reinhart, C.M., Posen, A., Prasad, E., Tooze, A., Tyson, L.D. & Mahbubani, K. (2020). How the economy will look after the coronavirus pandemic. *Foreign Policy*, 15.

Stilgoe, J., Owen, R. & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, 42, 1568-1580.

Streeten, P. (1984). Basic needs: Some unsettled questions. *Word Development*, 12 (9), 973-978.

Suwala, L. & Albers, H.H. (2020). Corporate spatial responsibility and sustainable development goals. In Leal Filho, W., Azul, A., Brandli, L., Lange Salvia, A. & Wall, T. (Eds). *Decent work and economic growth. Encyclopedia of the UN sustainable development goals*. Springer, Cham.

Swim, J. K., Aviste, R., Lengieza, M. L. & Fasano, C. J. (2022). OK Boomer: A decade of generational differences in feelings about climate change. *Global Environmental Change*, 73, 102479.

Terán-Yépez, E., Marín-Carrillo, G.M., del Pilar Casado-Belmonte, M. & de las Mercedes Capobianco-Uriarte, M. (2020). Sustainable entrepreneurship: Review of its evolution and new trends. *Journal of Cleaner Production*, 252.

Terstriep, J., & Rehfeld, D. (2020). Bridging local embeddedness and global dynamics – the economics of social innovation. *European Planning Studies*, 28(5), 853-863.

Thorbecke, E. (2006). The Evolution of the Development Doctrine - 1950-2005. *Research Paper UN-WIDER,* No. 2006/155

Ulluwishewa, R. (2014) *Spirituality and Sustainable Development*. Palgrave Mcmillan, Basingstoke.

Ulluwishewa, R. (2016). Spirituality, Sustainability and Happiness: A Quantum-Neuroscientific Perspective. In Dhiman, S. & Marques, J. (Eds). *Spirituality and Sustainability*. Springer, Cham.

UN (2015). *Transforming our world: the 2030 Agenda for Sustainable Development.* A/RES/70/1.

UN (2018). *Working Together: Integration, institutions and the Sustainable Development Goals - World Public Sector Report 2018*. Division for Public Administration and Development Management, Department of Economic and Social Affairs, New York.

UN (2023). *Valuing What Counts – United Nations System-wide Contribution on Progress Beyond Gross Domestic Product (GDP)*. HLCP Core Group on Beyond GDP. UN-CEB Chief Executives Board for Coordination.

UNDP (1990). *Human Development Report 1990*. United Nations Development Program, Oxford University Press, New York.

UNDP (1994). *Human Development Report 1994: New Dimensions of Human Security*. United Nations Development Programme, New York.

UNDP (1996). *Human Development Report – Economic growth and human development*. United Nations Development Program, Oxford University Press, New York.

UNDP (2004). *Human Development Report 2004: Cultural Liberty in Today's Diverse World*. Hoechstetter Printing Co, New York.

UNDP (2016). *Human Development Report 2016: Human Development for Everyone*. United Nations Development Program, New York.

UNDP (2019). *Human Development Report 2019: Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century.* United Nations Development Program, New York.

UNDP (2020). *Human Development Report 2020: The next frontier: Human development and the Anthropocene.* United Nations Development Programme, New York.

UNDP (2022a). *New Threats to Human Security in the Anthropocene: Demanding Greater Solidarity*. United Nations Development Programme, New York

UNDP (2022b). *Human Development Report 2021/2022. Uncertain Times, Unsettled Lives: Shaping Our Future in a World in Transformation*. United Nations Development Programme, New York.

UNFCCC (2015). *Paris Agreement to the United Nations Framework Convention on Climate Change*, Dec. 12, 2015, T.I.A.S. No. 16-1104.

UN-Habitat (2022), *Accelerating progress towards the localization of the SDGs and post-pandemic recovery through enhanced multilevel governance*, United Nations Human Settlements Programme, Nairobi.

UNTFHS (2016). *Human Security Handbook: An Integrated Approach for the Realization of the Sustainable Development Goals and the Priority Areas of the International Community and the United Nations System*. United Nations Trust Fund for Human Security.

Upham, P., Bögel, P. & Johansen, K. (2019). *Energy transitions and social psychology: a sociotechnical perspective.* Routledge, London

Vasconcelos, A.F. (2021). Individual spiritual capital: meaning, a conceptual framework and implications. *Journal of Work-Applied Management*, 13(1), 117-141.

Venkatapuram, S. (2020). Human capabilities and pandemics. *Journal of Human Development and Capabilities*, 21(3), 280-286.

Visvizi, A., Lytras, M. D. & Daniela, L. (2018). Education, innovation and the prospect of sustainable growth and development. In *The future of innovation and technology in education: Policies and practices for teaching and learning excellence*, 297-305.

Vojnovic, I. (1995). Intergenerational and intragenerational equity requirements for sustainability. *Environmental Conservation*, 22(3), 223-228.

von Hippel, E (2005) Democratizing innovation: the evolving phenomenon of user innovation. *Journal für Betriebswirtschaft* 55(1), 63–78.

Von Schomberg, R. (2013). A vision of responsible research and innovation. *Responsible innovation: Managing the responsible emergence of science and innovation in society*, 51-74.

Wackernagel, M. & Rees, W. E. (1997). Perceptual and structural barriers to investing in natural capital: Economics from an ecological footprint perspective. *Ecological economics*, 20(1), 3-24.

Wang, Q., Hubacek, K., Feng, K., Guo, L., Zhang, K., Xue, J. & Liang, Q. M. (2019). Distributional impact of carbon pricing in Chinese provinces. *Energy Economics*, 81, 327-340.

Wang, S., Abbas, J., Safdar Sial, M., Álvarez-Otero, S. & Cioca, L.-I. (2022). Achieving green innovation and sustainable development goals through green knowledge management: Moderating role of organizational green culture. *Journal of Innovation & Knowledge*, 7(4).

WCED (1987). *Our common future*. Report of the World Commission on Environment and Development, New York.

Weber, K.M. (2003). Transforming large socio-technical systems towards sustainability. On the role of users and future visions for the uptake of city logistics and combined heat and power generation. *Innovation* 16, 155–176.

WEF (2020). *Emerging priorities and principles for managing the global economic impact of COVID-19 – Chief economists outlook*. World Economic Forum, Geneva.

Wenar, L. (2020) The Development of Unity. *Journal of Human Development and Capabilities*, 21(3), 211-222.

White, L. & Noble, B. F. (2013). Strategic environmental assessment for sustainability: A review of a decade of academic research. *Environmental Impact Assessment Review*, 42, 60-66.

Woiwode, C., Schäpke, N., Bina, O., Veciana S., Kunze, I., Parodi, O., Schweizer-Ries, P. & Wamsler C. (2021). Inner transformation to sustainability as a deep leverage point: fostering new avenues for change through dialogue and reflection. *Sustainability Science* ,16, 841–858.

World Bank (2021). *The Changing Wealth of Nations 2021: Managing Assets for the Future*. World Bank, Washington, DC.

Yunus, M., Biggeri, M. & Testi, E. (2021). Social Economy and Social Business Supporting Policies for Sustainable Human Development in a Post-COVID-19 *World. Sustainability*, 13.

Zenghelis, D., Agarwala, M., Coyle, D., Felici, M., Lu, S. & J. Wdowin (2020). *Valuing Wealth, Building Prosperity*. Wealth Economy Project first-year report to LetterOne. Bennett Institute for Public Policy, University of Cambridge