



# Regenerative economics for planetary health: A scoping review

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Research Paper

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## ABSTRACT

**Introduction:** The relationship between humans and our planet is conditioned by an economic system that undermines rather than supports health. There has been an emerging focus on the relationship between economic structures and planetary health, but alternative economic approaches to support health for people and the planet require further development. Regenerative economics offers a compelling approach to transform humankind's relationships with each other and their environment. Regenerative economics fosters grounded, pragmatic solutions to wider human and ecological crises that moves beyond a sustainability discourse towards one of regeneration. While there are, notionally, large areas of overlap between regenerative economics and planetary health, to date these have not been systematically articulated. **Methods:** A scoping review was performed to examine the background, principles, and applications of regenerative economics, and their implications for planetary health. Five databases (SCOPUS, Ovid Medline, Web of Science, Geobase, IEEE Xplore) were searched for peer-reviewed literature using key terms relating to regenerative economics and planetary health. Findings were reported using thematic synthesis. **Results:** The review identified a total of 121 articles and included 30 papers in the final review, from economics, industrial design, business, tourism, education, urban design and architecture, energy, technology, and food and agriculture. The principles of regenerative economics focused on people, place, planet, position, peace, plurality, and progress. Putting these principles into action requires identifying and valuing different forms of capital, taking a dynamic systems approach, applying regenerative design, developing a true circular economy, good governance, and transdisciplinary education and advocacy. **Conclusions:** While the principles of regenerative economics and planetary health are well aligned, the tools and actions of each field differ substantially. Planetary health can learn from regenerative economics' grounding in natural design principles, systems-based approaches, actions at the right scale and cadence, respect for diversity, community and place, and mindset that moves beyond sustainability towards a regenerative future.

## KEYWORDS

Heterodox Economics, Planetary Health, Regenerative Economics, Wellbeing Economy

## INTRODUCTION

The prevailing global economic system undermines rather than supports planetary health (Gill & Benatar, 2020; Horton et al., 2014; Mair, 2020). The economy can be thought of as a system “the system that a society uses to take in resources and produce and

distribute goods and services” (Mair, 2020), which is, in turn, embedded in and shaped by wider social and ecological systems (Raworth, 2017). Economic systems mediate humanity's impact: on people and the planet. Globally, our economy, underpinned by



neoliberal capitalism, is not meeting basic human needs at a sustainable level of resource use, and not on track to do so (Brand-Correa et al., 2022; Fanning et al., 2021; O'Neill et al., 2018). This has substantial implications for health: how planetary resources are extracted, processed, and distributed at scale is one of the most fundamental determinants of health, patterning socioeconomic, geopolitical, and environmental factors (Brand-Correa et al., 2022; Braveman & Gottlieb, 2014; Naik et al., 2019).

Much has been done to articulate the impact of economic systems on health (Naik et al., 2019), or the impact of economic systems on the environment (Everitt et al., 2010; Perrings, 2005), but little has been done at the intersection of the two. By framing health as something that is interdependent with the well-being of the planet and our ecosystems (Planetary Health Alliance, n.d.), planetary health provides a lens to understand interconnected, systemic impact of economic systems on both health and the environment (Brand-Correa et al., 2022).

Through a planetary health lens, the complex relationships between our economic structures and planetary health, and actions that can address this, can begin to be articulated. Policy initiatives, such as The Rockefeller Foundation Economic Council on Planetary Health, have begun to demonstrate how the global financial system is structurally poorly equipped to address complex planetary health and global public goods issues (Chenet, 2019). The WHO Council on the Economics of Health for All (2022) reframes health and wellbeing as central to economic development, and centres planetary health in a whole-of-society approach. However, moving from a problem analysis (linking the economy and planetary health) to changing fundamentally harmful economic structures (articulating systemic alternatives) is challenging.

Ecological economists and others have for some decades been articulating systemic alternatives for planetary futures (Brand-Correa et al., 2022; Collado-Ruano & Segovia Sarmiento, 2022). In “Small is Beautiful: Economics as if People Mattered,” Schumacher (1973) argued for designing economies around the needs of communities and popularised environmentally- and socially-minded concepts such as ‘fair trade’ and ‘buy local.’ The steady state

economy first proposed by Daly (1977) was put forward as an alternative economic, moral, political, and biophysical system built on the axiom of ‘enough is best’. Degrowth subsequently advocated for “transforming societies to ensure environmental justice and a good life for all within planetary boundaries” (Degrowth, n.d.) through radical redistribution of resources and values-based economies. Deglobalization argues for localising environmental and social justice through decentralised and pluralistic economic governance sensitive to regional needs (Bello, 2008). Aspects of these approaches are mirrored by wellbeing economy dimensions of valuing dignity and happiness, natural restoration, connection and belonging, fairness, and locally-rooted participation (Wellbeing Economy Alliance, n.d.). A notable example of a wellbeing economy in action was New Zealand’s world-first Wellbeing Budget in 2019 (Te Tai Ōhanga New Zealand, 2019). A circular economy approach has become popularised as a systems solution across various sectors to tackle global ecological challenges and regenerate local ecosystems (Cheshire, 2019). More recent enquiries have asked what ‘living well within limits’ would look like in a world that contains both ecological constraints and social inequality (Steinberger, 2021), such as Doughnut economics, a framework for sustainable development that addresses ecological ceilings while providing just social foundations (Raworth, 2017). Many of these approaches implicitly consider human health, for example through engaging with concepts of ‘living well’ or designing economies for human needs, but, except for wellbeing economies, rarely address human health explicitly.

Akin to the economic alternatives outlined above, regenerative economics articulates an approach to redesigning economies in the face of critical social and ecological challenges. Beyond social and environmental harm reduction objectives, regenerative economics asks how we can repattern social, cultural, and environmental practices to enable the flourishing of all life on the planet. It brings together regenerative practices (i.e., those that encourage regeneration or renewal of biosocial systems) (Collado-Ruano & Segovia Sarmiento, 2022) with a holistic approach to the economy based on *living virtuously as a member of a community through wise resource management*, a concept attributed to



Aristotle (Sanford, 2020). The roots of regenerative economics can be traced to the regenerative agricultural movement, an approach to land stewardship that focuses on working in harmony with nature and helping create the conditions under which ecosystems can thrive (Collado-Ruano & Segovia Sarmiento, 2022). Both regenerative economics and regenerative agriculture are influenced by and aligned with Indigenous worldviews and environmental practices (NDN Collective, 2020; United Frontline Table, 2020). Regenerative economics offers a paradigm shift away from linear, incremental improvements towards transformative systemic solutions that incentivise regenerative activities around wider environmental, social and governance objectives (McPhearson et al., 2021).

Given its focus on repatterning social, economic, cultural, and environmental relationships to not only repair but *renew* human and ecological wellbeing, regenerative economics offers a compelling approach for the field of planetary health. While there are notionally areas of overlap between regenerative economics and planetary health, little has been done at the intersection of these fields. This may be due to the relative recency of both fields of practice, and their radical departure from health and economic 'orthodoxy.' This research emerged from a curiosity about the lessons that the planetary health movement could derive from regenerative economic practice to both prevent further harm and begin a path to planetary health regeneration. Thus, the aim of this article is to better understand the principles and processes of regenerative economics and how they can inform planetary health action (and vice versa).

To do this, we performed a scoping review of the background, principles, and applications of regenerative economics, and discussed their implications for planetary health research and action. A major contribution of this work is to systematically articulate the principles and processes of regenerative economics, highlighting what planetary health can learn from regenerative economics and vice versa. To build this case, the document is structured in three main sections. First, we present our approach to scoping and collating the literature and mapping the current landscape. Next, we present the key results according to principles, practices, and

implications for planetary health. Finally, we engage in a discussion about the current landscape and discuss ways forward for planetary health.

## METHODS

We performed a scoping review of the literature by adapting Arksey and O'Malley's (2005) methodological framework across the five stages of research question articulation, identification of relevant studies, study selection, charting the data and collating the results. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines to report our results (Tricco et al., 2018). The review protocol was registered on the Open Science Framework (DOI 10.17605/OSF.IO/PHJAF).

### Research Question

Our review focused on mapping the concepts and applications of regenerative economics, and subsequently reflecting on their relevance to planetary health. As such, the research question was framed: *what are the principles and processes of regenerative economics, and how can they inform planetary health research and action?*

### Identification of Relevant Resources

Searches were conducted in August 2022 in five databases covering social sciences, economics, and life sciences: SCOPUS, Ovid Medline, Web of Science, Geobase, and IEEE Xplore. Key terms related to regenerative economics were utilised in the search ("regen\* econom\*" OR "regenerative cap\*" OR "regenerative fin\*") and/or its (principles, practice, OR applications). Terms ("health" OR "planetary health") were then added, and the search was repeated to identify any resources that sat at the intersection of health and regenerative economics. Forward and backward screening of included articles references was also performed.

### Selection of Relevant Resources

Following de-duplication, titles and abstracts were independently screened according to the selection criteria. Full texts were then screened in a similar process. Articles were included if they outlined an



aspect of the background, principles, or applications of regenerative economics, or how they may be relevant to planetary health. The search was not restricted to any particular time frame or article type.

### ***Charting the Landscape and Collating the Results***

Information was extracted from each included resource according to the institutional location of lead authors, the focus areas of the paper, the core principles of regenerative economics, processes involved in regenerative economics, case studies and applications of regenerative economics, and interventions or ideas relevant to planetary health. We collated the results using a thematic synthesis approach (Thomas & Harden, 2008). First, the text from the articles was scanned and relevant sections describing the principles and applications of regenerative economics were extracted into a matrix. These codes were grouped into descriptive themes, and ultimately these were used to generate more high-level thematic groups.

## **RESULTS**

### ***Academic Landscape***

A total of 121 articles were identified, including six cross-referenced articles. Following de-duplication, 87 references were screened by title and abstract. A total of 41 articles were selected for full text screening, where an additional 11 articles were excluded due to not meeting the inclusion criteria and/or not being available. A total of 30 papers were included in the final review ([Figure 1](#)).

Identified studies were published between 1999 and 2022, with the majority (n=26) published since 2016. Lead authors were based at a mixture of global institutions across most continents, although were largely from more affluent countries, and included a variety of methodological approaches and focus areas. Summary characteristics of included articles are provided in [Table 1](#). The focus areas of the articles are outlined in [Figure 2](#).

### ***Roots of Regenerative Economics***

Regenerative economics was defined in a variety of ways, which emphasise different yet complementary

perspectives. The first group of definitions focused on the linguistic roots of regeneration, for example (Barauna et al., 2021) who highlight the Latin term *regenerare*, referring to reproduction and revival. The second group of definitions derived inspiration from the natural world. Fullerton (2015) describes a regenerative economy as “one which uses universal patterns and principles as a model for economic activity” and Müller (2020) as being “based on the principles and strategies that life develops in nature.” Similarly, Wahl (2016) outlines how a regenerative culture is based on “...understanding our deep interbeing as fundamentally interconnected expressions of life itself.” The third group of definitions infused a more holistic perspective on how economic systems can enable flourishing, summarised succinctly by Lovins (2016): “it is an economy in service to life.” Brown and colleagues (2018) define a regenerative economy as “enabling social and ecological systems to maintain a healthy state and to evolve,” whereas (Blau et al., 2018) state that it is an “economic system that works to regenerate capital assets providing goods and services that contribute to our well-being.” Related to these was a desire to align human economic activities with ecosystem health. For example, Morsetto (2020) focuses on “creating better conditions to support the life-enhancing qualities of ecosystems” and Ateljevic (2020, citing Hunter) states that “to align the human economy with this purpose [service to life], we must learn to live as nature lives, organise as nature organises, and learn as nature learns guided by a reality-based, life-centred, intellectually-sound economics.” Fourth, some authors defined regeneration as a component focus of circular economics. In circular economics, concepts of restoration and regeneration of both natural and technical systems feature side by side, although the concept of regeneration was at times poorly defined (Morsetto, 2020).

Despite the variety of definitions, there was general agreement that the paradigm of regenerative economics goes beyond sustainability alone. Sustainability was seen as an important but ultimately un-transformative objective; by focusing on harm reduction or restoration, sustainability approaches were not seen to lead to the systemic shifts required to both uphold life and allow it to flourish. In this vein, articles described the spectrum of regenerative



economics and how it extends beyond sustainability, as outlined by Fullerton (2015). This spectrum demonstrates how regenerative economic design pushes us to move beyond a sustainability mindset towards holistic and regenerative systems. On one side of the spectrum are economic approaches (conventional, 'green') that lead to degeneration, based on mechanistic and reductionist thinking, leading to more energy, waste and materials being used. On the other side are economic approaches (sustainable, restorative, regenerative) that lead to exponentially greater regeneration and less energy and material use, through holistic thinking and natural system design (Fullerton, 2015). This model was adapted from Reed's (2007) original Trajectory of Environmentally Responsible Design.

The origins of regenerative economics trace back to agricultural practices of the mid-20th century, although arguably has deeper roots in various Indigenous philosophies. As early as 1942, Rodale used the term regeneration to refer to an organic agricultural practice that restores soil damaged by intensive agriculture (Collado-Ruano & Segovia Sarmiento, 2022). This was widely promoted from the 1970s as a means of organic renewal of complex living systems (see Dahlberg, 1991 cited in Morseletto, 2020). From these agricultural principles, the concept of 'regenerative economic development' emerged (Mang & Reed, 2012 cited in Morseletto, 2020). This initial conceptual model was subsequently adapted by entrepreneurs such as Hawken (1993) and Anderson (2004), who articulated how business activities could promote regenerative and restorative environmental practices. Similarly, the concept was also adapted and adopted by a subset of the design and architecture community. For example, Lyle (1994) initiated regenerative development and design practices that fuse ecology, architecture, design, permaculture, and regenerative agriculture (Morseletto, 2020), which in turn influenced wide scale land regenerative practices to improve the health of ecosystems (e.g., Kellert, 2004; Reed, 2007). Few articles recognised how regenerative economics aligned with certain Indigenous philosophies and land management practices based on harmony with nature (Collado-Ruano & Segovia Sarmiento, 2022).

### *Principles of Regenerative Economics*

Regenerative economics is built upon principles that orient towards building an economy in service of life. These have also been referred to as 'tendencies,' which capture how a system moves to being regenerative (Rodale Institute, n.d.). The review identified 37 key principles that were organised into seven overarching themes that relate to place (community-building, localisation, renewal and resilience), planet (ecological mindedness, revaluing natural capital, environmental protection & regeneration), position (right relationship and right scale), people (social justice, designing an economy the works for everyone, and valuing human knowledge and creativity), peace (harmony and balance, interconnectedness), plurality (diversity, complexity, traditional knowledge), and progress (paradigm shift, transformation of culture, moral vision). The principles of regenerative economics are summarised in [Figure 3](#).

The first group of principles focused on **place**. Regenerative economics is a practice that has been built, literally, from the ground up. Conceiving regions as socio-ecological spaces and channelling resources towards building localised economies were central to a regenerative approach (Frank & Marsden 2016; Perkins & Jessup 2021). Community-building of healthy human networks is core to this, offering empowered participation and social solidarity (Goerner 2019; Collado-Ruano & Segovia Sarmiento 2022). Honouring community and place enhance both individual and collective wellbeing, across humans and non-human life, and nourishes human, social, intellectual, and physical capital (Fullerton 2015). It also boosts resilience through a greater ability to adapt, evolve, and respond to stressors (Fullerton 2015; Alves et al. 2022).

The second group of principles focused on the **planet**. There was a deep sense of ecological mindedness across all articles, represented by biophilic design approaches (Blau et al. 2018; Fullerton 2015), emphasis on environmental protection and restoration (Arman & Mark-Herbert 2021), a holistic worldview, and general awareness of and respect for planetary support systems. Awareness of and respect for the environment and planetary support systems was a common thread throughout all papers. Designing with and for nature was a principle that emerged from most articles,



referring to how the study of the natural world could help inform the design of social systems through biomimicry, biophilic design, and nature-based solutions (Fullerton 2015; Fath et al. 2019; Goerner 2019; Kadar & Kadar 2020). Designing for the whole so that it is in balance with nature and draws on universal principles and patterns was also important (Fullerton 2015; Goerner 2019; Lovins & Fullerton 2014).

The third group of principles focused on **position**, being in 'right relationship' and acting at the right scale. The concept of 'Right Relationship' was first coined by Brown & Garver (2009) as a vision for a whole-earth economy that serves people and our 'common wealth.' Right relationship refers to careful actions that recognise connectedness, complementarity, the interdependence of all life forms, and synergies across different relational systems (Fath et al. 2019; Morseletto 2020; Sheldon 2021). The literature also espoused a multi-scalar perspective to ensure the right scale of design, as well as striving to ensure connection across and between scales of operation. The concept of scale applied to both place (localisation) and time (long-range solutions).

The fourth group of principles focused on **people**. At the core of regenerative practice was a cultural shift to align human activities with ecological flourishing (Hunter Lovins 2016; Lovins & Fullerton 2014). Social justice was at the core of this, with concepts such as individual and collective liberation, equity, justice, and decolonization central to regenerative futures (Collado-Ruano and Segovia Sarmiento 2022; Howson 2021; Perkins and Jessup 2021). Openness to knowledge reflected a desire for deeper thinking and an epistemological shift. The convergence of disciplines and collaborative learning was summarised by the principle of transdisciplinarity (Lyle 1996; Sonetti et al. 2019). In the realisation of socioeconomic vitality and an economy that works for everyone, economic systems are inverted for sustainability and social justice and economic performance is reoriented towards wellbeing and shared prosperity through the long-term creation of a steady-state economy (Perkins and Jessup 2021). This requires stewardship & governance, making wiser choices, operating within planetary boundaries, and being responsible to each other and the environment

(Frank and Marsden 2016; Howson 2021; Alves et al. 2022).

The fifth group of principles focused on **peace**. Living in harmony and balance with all parts of the larger whole was a guiding principle for a regenerative relationship between nature and people (Fath et al. 2019; Fullerton 2015; Goerner 2019). This required a holistic perspective that prioritises the wellbeing of the whole and tends to the weakest component to strengthen the whole system. Connectedness and care relate to concepts of reciprocity and mutualism and how they have the potential to repair community, restore lost connections, and re-join the web of life (Alves et al. 2022; Goerner 2019; Sheldon 2021). Designing with and for nature was a principle that emerged, in contrast to control over or controlling for complex variables (Haselsteiner et al. 2021; Vineis and Mangone 2022).

The sixth group of principles focused on **plurality**. In society, as in nature, diversity was identified to enhance systemic wellbeing. Pluralism is also related to the appreciation of different bioregional zones and cultures, as well as valuing the diversity of different perspectives (Alves et al. 2022; Ateljevic 2020). This included respect for traditional and Indigenous knowledge systems. Complexity was a prerequisite for regenerative practice, through a focus on systems behaviours such as non-linearity, circular flows of resources, feedback loops, and leverage points (Alves et al. 2022; Duguma et al. 2020; Fath et al. 2019; Lovins & Fullerton 2014; Sonetti et al. 2019). These processes reflected an awareness of universal patterns and flows of resources and highlighted the co-evolutionary and dynamic processes of ecosystems (Duguma et al. 2020; Fath et al. 2019).

The seventh group of principles focused on **progress**. They capture the fundamental paradigm shift that must occur for a regenerative economy to take root (Ateljevic 2020; Guinot 2020). This requires transformative thinking, the identification of root causes, and a radical redesign and re-conceptualization of the economic system (Lovins 2016; Lovins & Fullerton 2014). This type of shift was not seen to occur through intellectual reasoning alone, but instead through a shift in culture, morals, and values towards living in harmony and balance and



touching on the 'sacredness of life' (Fullerton 2015). It also takes creativity and cultural leaders who can enable a reimagining of the future, a vision based on both hope and evidence (Ateljevic 2020; Goerner 2019; Perkins and Jessup 2021).

### *Processes of Regenerative Economics*

While the guiding *principles* of regenerative economics help orient the field, these provide little practical guidance about how to put them into action. The review identified a set of processes that help explain how regenerative economics can be applied at scale. These were organised into six overarching groups: identifying and valuing alternate forms of capital, good governance, a truly circular economy, taking a dynamic approach to systems, applying regenerative design, and education and advocacy.

A regenerative economy is built on a fundamental realignment of societal values, where economic systems are inverted to promote sustainability and social justice (Perkins and Jessup, 2021). This requires **identifying and valuing alternate forms of capital**: the explicit identification of a holistic array of human and environmental resources, and the construction of new incentive systems to value them. Sheldon (2022) and Lovins & Lovins (2016) articulate a variety of different forms of capital beyond financial capital, including social, natural, trust, compassion, innovation, cultural, experimental, and intellectual capital. Forms of natural capital include biodiversity, health, biosphere resources, living systems, and ecosystem services such as the provisioning of food or climate regulation (Hunter Lovins, 2016; Vineis & Mangone, 2022); see also (European Environmental Agency, 2014). While avoiding the commodification of the environment (Howson, 2021), it is also necessary to think about new ways of measuring different forms of capital so that they can be appropriately valued (Haselsteiner et al., 2021; Sheldon, 2022). This should be guided by community inputs, and signal a move away from a purely transactional, monetised economy (Sheldon, 2022). Examples of non-capitalist forms of ownership, non-monetary exchange and beneficial community-based development that values diverse forms of local capital include agroecology and food sovereignty initiatives, and community-led, regenerative tourism (Sheller, 2021).

**Effective and inclusive governance** underpins regenerative economies (Alves et al., 2022). Governance innovation may occur at various layers of the socio-ecological system. At the local level, this could include engaging communities to re-build economies dedicated to wellbeing (Perkins & Jessup, 2021, see also [translocalhealth.com](http://translocalhealth.com)), and strengthening community-based organisations and people's assemblies to ensure citizen voice (Alves et al., 2022; Goerner, 2019; Sheller, 2021). Nationally, policy reforms can help build structural resilience through decentralisation of power (Lovins & Fullerton 2014) and financial reforms to regain sovereignty over domestic financial systems and incentivise these systems to act in the interest of the common good (Fullerton & Lovins, 2009). At the international level, progressive regionalism approaches (Frank & Marsden, 2016) to forge international alliances without imposing a particular set of values (Howson, 2021) aligns with a decolonising agenda (Collado-Ruano & Segovia Sarmiento, 2022). Policy reforms at all levels should be supported by reflexive and multi-level governance and monitoring frameworks (Frank & Marsden, 2016).

**A truly circular economy** represents a shift from a linear and degenerative system towards one that is regenerative with circular flows of resources that are effective and efficient, reduce or eliminate waste, and are ultimately self-renewing (Guinot, 2020; Kadar & Kadar, 2020; Perkins & Jessup, 2021). Circular principles may be applied across technical/industrial or biological processes. Technical and manufacturing strategies focus on the extension of the life of a particular product through its reuse, repair, renewal, refurbishment, remanufacture, maintenance, and upgrading, or the transformation of old parts into new products (Morsetto, 2020). Industrial processes in a circular economy may include the use of renewables over fossil fuels, the avoidance of harmful chemicals, and regenerative waste management processes (Lyle, 1996), or the installation of a completely different foci to industrial processes altogether. For example, Viruega Sevilla et al.(2022) suggest building-in integrated pollution prevention and control, industrial ecological practices, and system dynamics and life cycle thinking to industrial processes using techniques such as process stimulation, Best Available Techniques (BAT)



analysis and dynamic material and energy flow analysis. Biological processes focused on natural capital restoration may focus on healthy waste production, reversing environmental damage, and cradle-to-cradle environmental regeneration.

A regenerative economic model represents the ability to **think and plan across dynamic systems**, at the right scale and cadence of action. Localisation approaches focus on nurturing an economy that honours community and place and encourages the revitalisation of a network of localised resources. Micro-enterprises, re-localisation policy, slow money, slow-food, and purpose-driven, for-benefit enterprises are relevant examples (Fullerton, 2015). Long-term thinking means that regenerative practices focus on sustainable solutions that will last, have an awareness of intergenerational impacts, and encourage a slowness and deliberateness of actions. Embracing complexity is key to enable thinking and planning across dynamic systems. Examples of technology identified that embody systems thinking include cybernetics, applying AI for design, and blockchain platforms. Howson (2021) describes how blockchain platforms can enable decentralised approaches to building regenerative economies through renewable energy grids, food production networks, environmental monitoring, supply chain management, charitable giving, humanitarian action, ecological regeneration, democratic governance, and local currencies.

**Regenerative urban and regional design processes** support the renewal and resilience of communities and ecosystems. Regenerative-restorative neighbourhoods and cities employ a place-based design that respects the geopolitical location and its dynamics, cultures, and needs (Haselsteiner et al., 2021). The design process includes strategies to use local resources efficiently, such as utilising local and regional supplies where possible, reusing resources, and restoring degraded ecosystems, as well as employing agro-ecological principles into urban and peri-urban food growing and distribution (Frank & Marsden, 2016). Other urban design strategies include restorative energy systems, zero waste design, preservation of natural water cycles, providing opportunities for reconnection with nature through green spaces and natural corridors, and fostering bottom-up,

connected regional cultures through identifying and supporting nodes of development to meet the circular economy needs (Frank & Marsden, 2016; Haselsteiner et al., 2021).

Transitioning to a regenerative economy requires a transformation of current thought patterns, which is in turn underpinned by a widespread cultural shift. This shift can be facilitated by **education and advocacy strategies** that facilitate deep reflection, connection to the whole, and collaborative learning. Emerging from this process is a new cultural narrative that centres the health and wellbeing of the whole and connects people with the principles of regeneration outlined above. An example of regenerative education in action is the UNESCO-recognised TiNi Education Program in Ecuador, which “teaches students the importance of understanding the interdependence of natural and social phenomena in co-evolutionary terms ... links schools and communities and allows the development of regenerative cultures” (Collado-Ruano & Segovia Sarmiento, 2022). While a unifying, noble purpose that inspires people to serve a cause greater than themselves is important, a facilitative environment that enables these ideas into actions is also required (Fullerton, 2015).

## DISCUSSION

Regenerative economics encourages the realignment of human values and activities to support the flourishing of all life through nurturing a healthy, sustaining relationship between humans and their environment. A major contribution of this article was the systematic articulation of the principles and processes of regenerative economics, so that the planetary health movement can learn from regenerative economics and vice versa. The principles underpinning regenerative economics can be thought of in terms of people (social justice, designing an economy that works for everyone, and valuing human knowledge and creativity), place (community-building, localisation, renewal and resilience), planet (ecological mindedness, revaluing natural capital, environmental protection & regeneration), position (right relationship and right scale), peace (harmony and balance, interconnectedness), plurality (diversity, complexity, traditional knowledge), and progress (paradigm shift, transformation of culture, moral



vision). These principles can be put into practice through six transformative processes: identifying and valuing natural and human capital, taking a dynamic approach to systems, applying regenerative design, developing a true circular economy, good governance, and transdisciplinary education and advocacy.

While the vision of regenerative economics spans a range of disciplines and lays out an ambitious vision for the future, the field itself is relatively new and the literature base remains under-developed. Critiques of regenerative economics in identified papers included the replication of capitalist and colonial logic such as 'greenwashing' (Collado-Ruano and Segovia Sarmiento 2022; Howson 2021; Sheldon 2021), lack of widespread adoption (Ateljevic 2020), the tendency of projects to emphasise the environment over the social / cultural aspects of regeneration (Fath et al. 2019; Morseletto 2020), and the difficulty of convincing those who benefit the most from the current system to think differently (Fullerton & Lovins, 2009). In addition, some articles lacked conceptual distinction between regenerative and circular economics or used terms interchangeably (Arman and Mark-Herbert 2021; Guinot 2020; Kadar and Kadar 2020; Sulis et al. 2021; Vineis and Mangone 2022). Although there was a consensus that regenerative economics reaches beyond the objective of sustainability alone, some articles tied their analysis to the UN Sustainable Development Agenda (Haselsteiner et al. 2021; Sonetti et al. 2019), which has been criticised as failing to deliver on its transformative promise with an ongoing focus on a Western, capitalist, and anthropocentric model of development (Collado-Ruano & Segovia Sarmiento 2022; Hickel, 2019).

### ***The Economics of Regeneration***

The regenerative economics approach calls for a radical transformation of economic thought. As such, it had very limited (or no) grounding in neoclassical economic theory and practice. As a field, regenerative economics provides a coherent alternative to orthodox thinking, which was positioned as a driver of globalised market fragilities, socioeconomic inequalities, environmental extractivism, human and environmental externalities, and the concentration of wealth and power in the hands of a few (Lovins &

Fullerton 2014). Through regenerative economics, a linear and reductive approach to economic thinking is replaced by non-linear, complex, and dynamic systems perspectives (Sanford, 2020). The focus on efficient allocation of scarce resources is instead dealt with through the concept of 'wise management' and stewardship of resources (ibid), as well as living within planetary boundaries (Steinberger, 2021). The pursuit of "unbridled exponential economic growth" at all costs (Perkins, 2021) as a globalised economic objective of neoliberal capitalism was explicitly rejected.

Fundamentally, realising a regenerative economy for people and the planet comes down to reorientation of values and a re-valuation of different forms of common wealth, underpinned by different economic models. This means a radical reorientation of economic structures away from neoliberal capitalist models and weaving together several processes, including the recognition that finance is a means, not an end. While finance may be a means to a healthy economy, it is not the sole 'purpose' of economic activity nor a process to amass, exploit or hoard financial wealth from others (Lovins & Fullerton 2014). The hegemony of financial capital over other forms of value is pathognomonic of neoliberal capitalism, an international economic configuration characterised by transnational structures, the internationalisation of production, and the removal of barriers to the global flows of commodities and capital (Ortiz Wadgymar, 1994; Patanaik, 2017). From the perspective of ecological, feminist, and Marxist economics, neoliberal capitalism represents the hegemony of 'the market' over state, household and commons provisioning systems, or a particular structuring of the economy that "prioritises the accumulation of exchange value above other types of value" (Mair, 2020). Regenerative economics attempts to reclaim the value of a diverse array of capital - such as human, natural, and cultural capital - so that economies may be aligned with nurturing and promoting the health of these assets.

There is a conceptual overlap and synergies between regenerative economics and other schools of heterodox economics. Primarily, regenerative economics is most aligned with ecological economics, a discipline that examines economic systems as embedded in and shaped by wider social and



ecological systems (Brand-Correa et al., 2022). Commonly used ecological economics terms such as steady-state economy, planetary boundaries, and a focus on biophysical system dynamics were commonly used in the regenerative economics literature. However, Fath et al. (2019) warn against a focus on the ecological aspects of an economy at the expense of its social aspects and outline the limitations of “metaphoric extrapolations from biology and ecology” alone. Regenerative economics literature does not explicitly reference ecofeminism but shares many similarities, both being political and philosophical movements that bridge environmental and social justice, built from translocal grassroots action. Ecofeminism connects the exploitation of nature and people (largely focused on women’s experiences of oppression) through patriarchal, capitalist, and colonial systems (Federici 2004, 2018; Gaard & Gruen 1993; Shiva 2016). Regenerative economics also shares commonalities with other forms of economic practices that prioritise social and economic justice, such as Marxist economics (Benería, 1995; Brand-Correa et al, 2020; Glyn, 1990).

Indigenous knowledge underpins much regenerative practice but was not outlined in great depth in the identified literature. The wider activist movement articulate these links in more detail, with groups such as The NDN Collective promoting Indigenous regenerative economies that value traditional knowledge and practices. While recognising the plurality of Indigenous cosmologies, there are many commonalities between Indigenous knowledges around regenerative practices. For example, *Vivir Bien* or *Buen Vivir*, based on the Andean concepts of *suma qamaña* and *sumaq kawsay*, emphasizes living in harmony with each other and nature, and prioritises principles of holism and the *Pacha*, coexisting in multipolarity, dynamic equilibrium, complementarity, and diversity (Solon, 2018). Similarly, Indigenous Australian land management practices (known as caring for country) originate in the holistic relationships of Aboriginal and Torres Strait Islander peoples with the environment, which serves as foundation for Indigenous culture, kinships, spirituality, and Law (Hill et al, 2013). Indigenous ancestral knowledge was seen as a guide to regenerative economies in North America, with interconnectedness, right relationship, reciprocity, mirroring natural principles, honouring place, and

social justice underpinning an Indigenous-informed approach to regenerative economic practice (NDN Network, 2020).

### *Relevance TO and Avenues FOR Planetary Health*

Regenerative economics offers useful points of convergence and parallels to the field of planetary health. Both disciplines have emerged from relatively conservative, institutionalised fields - economics, and health - that haven’t necessarily considered their negative externalities nor accounted for ecology in their practice. Both regenerative economics and planetary health represent an attempt to transform their fields towards more regenerative practice on the basis that ecosystem flourishing is necessary for human health and functioning economic systems. In this way, the principles of regenerative economics map onto those of planetary health. Planetary health is a “solutions-oriented, transdisciplinary field and social movement focused on analysing and addressing the impacts of human disruptions to Earth’s natural systems on human health and all life on Earth” (Brown, 2002). Planetary health has embedded systems thinking (Iyer et al., 2021; Pongsiri et al., 2017; United Health Futures, 2021), social justice (Gill & Benatar, 2020), and respect for nature (Baumgartner, 2021) into its practice, which align closely with the principles of regenerative economics identified by this review.

While there are potentially many interesting ways to read-across disciplines, one illuminating example is to reflect on how the concept of ‘health’ is operationalised by each field of practice. On the one hand, planetary health centres the health of people, outlining the impact of humans on biospheric systems and its subsequent impact on health and disease (Planetary Health Alliance, n.d.). This attempts to move beyond the purely individualistic, mechanistic, and biomedical approach to health that has been the dominant paradigm, in recognition of the interconnectedness of human and planetary wellbeing as a relational state. On the other hand, regenerative economics tends to focus more on systemic health, or health of the whole. By focusing on the health of the system, as well as aligning the system towards human flourishing, different leverage points can be identified that enable systems-based solutions to emerge. Considering both constructs of



health unlock new possibilities in planetary health research and action.

As an emerging movement that draws from other fields, planetary health may benefit from building on the strengths of regenerative economics and applying relevant best practice. For example, planetary health identifies the need for a systems approach (Iyer et al. 2021; Pongsiri et al. 2017); regenerative economics provides practical strategies and tools that embrace complexity and apply systems thinking through urban design (Blau et al. 2018; Frank & Marsden 2016), agriculture (Sheldon 2021), computational analyses (Kadar and Kadar 2020), and other forms of technology such as blockchain (Kadar and Kadar 2020; Howson 2021). Regenerative economics also demonstrates how small-scale, place-based initiatives can effectively respond to large-scale global crises, through tailoring responses to the right scale of activity and linking up these actions in a global network. Planetary health advocacy tends to be concentrated in the global arena, with limited networks of support for small-scale localised initiatives (Translocal Health, n.d.). Planetary health may be able to learn from regenerative economic practice that emphasises understanding the right scale and cadence of response depending on the need at hand (Frank & Marsden 2016; Keesstra et al. 2018). Finally, regenerative economics calls for approaches that move beyond sustainability toward regeneration; this requires a cultural shift in patterns of activities that go above and beyond problem analysis and harm reduction. Planetary health may benefit from reflection about how its activities not only avert human and environmental disasters, but also how it can help regenerate systemic human and ecological wellbeing.

### *Towards Transformative Action*

Although the values of regenerative economics and planetary health are closely aligned, the practices differ substantially. Planetary health has tended to use the tools of public and global health - such as epidemiological analyses and political advocacy - to advance the field. On the other hand, the applications of regenerative economics tended to draw on design and land-management practices and tools, outlined above. There is an opportunity for both fields to learn from and adapt different cross-disciplinary tools. For

example, regenerative economics calls for different ways to measure natural and human capital; epidemiological and environmental modelling from planetary health may provide a replicable and valid way to measure and value these alternative forms of capital, with a focus on health, social and environmental assets.

Regenerative economics bridges fundamental principles with practical action. The discipline is shaped by profound principles, which help guide several processes and practical actions. The attention given to principles and process contrasts with the outcome-orientation of neoclassical economics that tends to prioritise outcomes of profit maximisation, efficiency, and growth (Brand-Correa et al., 2022; Goerner, 2019; Schmelzer, 1993). The principles and processes outlined in Figure 3 represent a unifying framework while also allowing for a diversity of practice and outcomes that are community driven and tailored to local needs. Beyond theory, regenerative economics is an art and science in action, with a grounded and practical focus reflecting its permaculture roots. Practical examples of regenerative economics spanned regenerative tourism, industrial sectors (manufacturing, waste), energy, agri-food systems, education, technology, land stewardship, governance, architecture, business, and urban design. Some examples relevant to planetary health are highlighted in [Figure 4](#).

### **CONCLUSION**

The fields of planetary health and regenerative economics are working towards similar objectives from different disciplinary perspectives. There are many ways that each field can learn from the other. Collective efforts at all levels of the system and across all sectors are required to avert the worst outcomes of climate crises and other anthropogenic environmental changes (IPCC, 2022). While working together towards a common objective is essential, these must be done without duplicating efforts. Both planetary health and regenerative economics call for transdisciplinary approaches, however little has been done to date at the intersections of these fields to join up the dots. There is much potential for both fields of practice to embed practically and intellectually in each other's worlds through collaboration, shared



funding initiatives, education, and community-building.

Regenerative economics offers a compelling blueprint for values-based, practical, multi-scalar action in planetary health. Planetary health can draw on regenerative economics' grounding in natural design principles, systems-based approaches, actions at the right scale and cadence, respect for diversity, community and place, working towards the health of the whole, and putting into practice initiatives that move beyond sustainability towards a regenerative future. These strategies can help both fields to not only prevent further planetary harm, but also begin a path to planetary regeneration built upon a widespread cultural shift.

## REFERENCES

- Alves, F. M., Santos, R., & Penha-Lopes, G. (2022). Revisiting the Missing Link: An Ecological Theory of Money for a Regenerative Economy. *Sustainability: Science Practice and Policy*, 14(7), 4309.
- Amalina, F., Razak, A. S. A., Krishnan, S., Zularisam, A. W., & Nasrullah, M. (2022). A comprehensive assessment of the method for producing biochar, its characterization, stability, and potential applications in regenerative economic sustainability – A review. *Cleaner Materials*, 3, 100045.
- Athena Protocol. (2022, April 9). *Regenerative Finance: Innovation for a sustainable future*. Coinmonks. <https://medium.com/coinmonks/regenerative-finance-innovation-for-a-sustainable-future-315580e11f90>
- Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32.
- Arman, S., & Mark-Herbert, C. (2021). Re-Commerce to Ensure Circular Economy from Consumer Perspective. *Sustainability: Science Practice and Policy*, 13(18), 10242.
- Ateljevic, I. (2020). Transforming the (tourism) world for good and (re)generating the potential “new normal.” *Tourism Geographies: An International Journal of Tourism Place, Space and the Environment*, 22(3), 467–475.
- Barauna D, Stafford FDN, Farina MZ, Aleixo ACO. (2021). Covid-19 and the emergency of new economies for the design of a new world. *Strategic Design Research Journal*. 14(1). <https://pdfs.semanticscholar.org/976d/078d35218a91804c96976ffb38bb26da7217.pdf>
- Baumgartner, J. (2021). Planetary Health: Protecting Nature to Protect Ourselves. Samuel Myers and Howard Frumkin (eds). *International Journal of Epidemiology*, 50(2), 697–698.
- Bello, W. (2008). *Deglobalization: Ideas for a New World Economy*. Zed Books Ltd.
- Benería, L. (1995). Toward a greater integration of gender in economics. *World Development*, 23(11), 1839–1850. [https://doi.org/10.1016/0305-750X\(95\)00095-T](https://doi.org/10.1016/0305-750X(95)00095-T).
- Berrett-Koehler Publishers, Brown, P., Garver, G., & Garver, G. (2009, February 9). *From berrett Koehler publishers: Right relationship*. Berrett-Koehler Publishers. <https://www.bkconnection.com/books/title/right-relationship?>
- Blau, M. L., Luz, F., & Panagopoulos, T. (2018). Urban River Recovery Inspired by Nature-Based Solutions and Biophilic Design in Albufeira, Portugal. *Land*, 7(4), 141.
- Brand-Correa, L., Brook, A., Büchs, M., Meier, P., Naik, Y., & O'Neill, D. W. (2022). Economics for people and planet-moving beyond the neoclassical paradigm. *The Lancet. Planetary Health*, 6(4), e371–e379.
- Braveman P, Gottlieb L. (2014). The Social Determinants of Health: It's Time to Consider the Causes of the Causes. *Public Health Reports*, 129(1\_suppl2):19-31. doi:10.1177/003335491412915206
- Brown, A. (2002). Planetary Health. *Interdisciplinary Environmental Review*, 4(2), 159.
- Chenet, H. (2019). *Planetary Health and the Global Financial System*. The Rockefeller Foundation Economic Council on Planetary Health, UK.
- Cheshire, D. (2019). What is a circular economy? In *Building Revolutions* (pp. 3–12). RIBA Publishing.
- Collado-Ruano, J., & Segovia Sarmiento, J. (2022). Ecological economics foundations to improve environmental education practices: Designing regenerative cultures. *World Futures*, 1–28.
- Daly. (1977). Steady state economy. *San Francisco*. <https://books.google.com/books?hl=en&lr=&id>



- =AfFsUGoab4C&oi=fnd&pg=PA47&dq=Daly+1977&ots=nhpGk3EJs&sig=Cc6AkmEEHqP-MPEkImmW5exXhEA
- Degrowth. (n.d.). Degrowth. Retrieved September 14, 2022, from <https://degrowth.info/degrowth>
- Duguma, L., Kamwilu, E., Minang, P. A., Nzyoka, J., & Muthee, K. (2020). Ecosystem-Based Approaches to Bioenergy and the Need for Regenerative Supply Options for Africa. *Sustainability: Science Practice and Policy*, 12(20), 8588.
- Everett T, Ishwaran M, Ansaloni GP, Rubin A. (2010). Economic Growth and the Environment. Defra Evidence and Analysis Series, Paper 2. Available at: [https://mpr.aub.uni-muenchen.de/23585/1/MPRA\\_paper\\_23585.pdf](https://mpr.aub.uni-muenchen.de/23585/1/MPRA_paper_23585.pdf)
- Fanning, A. L., O'Neill, D. W., Hickel, J., & Roux, N. (2021). The social shortfall and ecological overshoot of nations. *Nature Sustainability*, 5(1), 26–36.
- Fath, B. D., Fiscus, D. A., Goerner, S. J., Berea, A., & Ulanowicz, R. E. (2019). Measuring regenerative economics: 10 principles and measures undergirding systemic economic health. *Global Transitions*, 1, 15–27.
- Federici, S. (2018). *Re-enchanting the world: Feminism and the politics of the commons*. Oakland: PM Press.
- Frank, A., & Marsden, T. (2016). Regional Spatial Planning, Government and Governance as Recipe for Sustainable Development? In *Metropolitan Ruralities* (Vol. 23, pp. 241–271). Emerald Group Publishing Limited.
- Fullerton, J. (2015). *Regenerative Capitalism*, Capital Institute.
- Fullerton, J. B. (2015). *Regenerative Capitalism: How Universal Principles and Patterns Will Shape Our New Economy*. Capital Institute.
- Fullerton J, Lovins H. (2009). *Transforming Finance and The Regenerative Economy*. Community Wealth. Available at: <https://communitywealth.org/sites/clone.communitywealth.org/files/downloads/paper-fullerton-lovins.pdf>
- Gaard, G., & Gruen, L. (1993). Ecofeminism: Towards global justice and planetary health. *Society & Nature*, 2, 1–35.
- Gill, S. R., & Benatar, S. R. (2020). Reflections on the political economy of planetary health. *Review of International Political Economy*, 27(1), 167–190.
- Goerner, S. J. (2019). The collapse of oligarchic capitalism and the rise of regenerative learning: How the science of energy systems clarifies what's happening today and what comes next. *World Futures*, 75(3), 135–162.
- Glyn, A. (1990). Marxist Economics. In: Eatwell, J., Milgate, M., Newman, P. (eds) *Marxian Economics*. The New Palgrave. Palgrave Macmillan, London. [https://doi.org/10.1007/978-1-349-20572-1\\_41](https://doi.org/10.1007/978-1-349-20572-1_41)
- Guinot, J. (2020). Changing the economic paradigm: Towards a sustainable business model. *International Journal of Sustainable Development and Planning*, 15(5), 603–610.
- Haselsteiner, E., Rizvanolli, B. V., Villoria Sáez, P., & Kontovourkis, O. (2021). Drivers and Barriers Leading to a Successful Paradigm Shift toward Regenerative Neighborhoods. *Sustainability: Science Practice and Policy*, 13(9), 5179.
- Hawken, P. (2004). *Natural Capitalism: Creating the Next Industrial Revolution*. Langara College.
- Hickel, J. (2019). The contradiction of the sustainable development goals: Growth versus ecology on a finite planet. *Sustainable Development*, 27(5), 873–884.
- Hill R, Pert PL, Davies J, Robinson CR, Walsh F, Falco-Mammone F. (2013). *Indigenous Land Management in Australia: Extent, Scope, Diversity, Barriers and Success Factors*. CSIRO, Australia.
- Horton, R., Beaglehole, R., Bonita, R., Raeburn, J., McKee, M., & Wall, S. (2014). From public to planetary health: a manifesto. *The Lancet*, 383(9920), 847.
- Howson, P. (2021). Distributed degrowth technology: Challenges for blockchain beyond the green economy. *Ecological Economics: The Journal of the International Society for Ecological Economics*, 184, 107020.
- Intergovernmental Panel on Climate Change (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösckke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge,



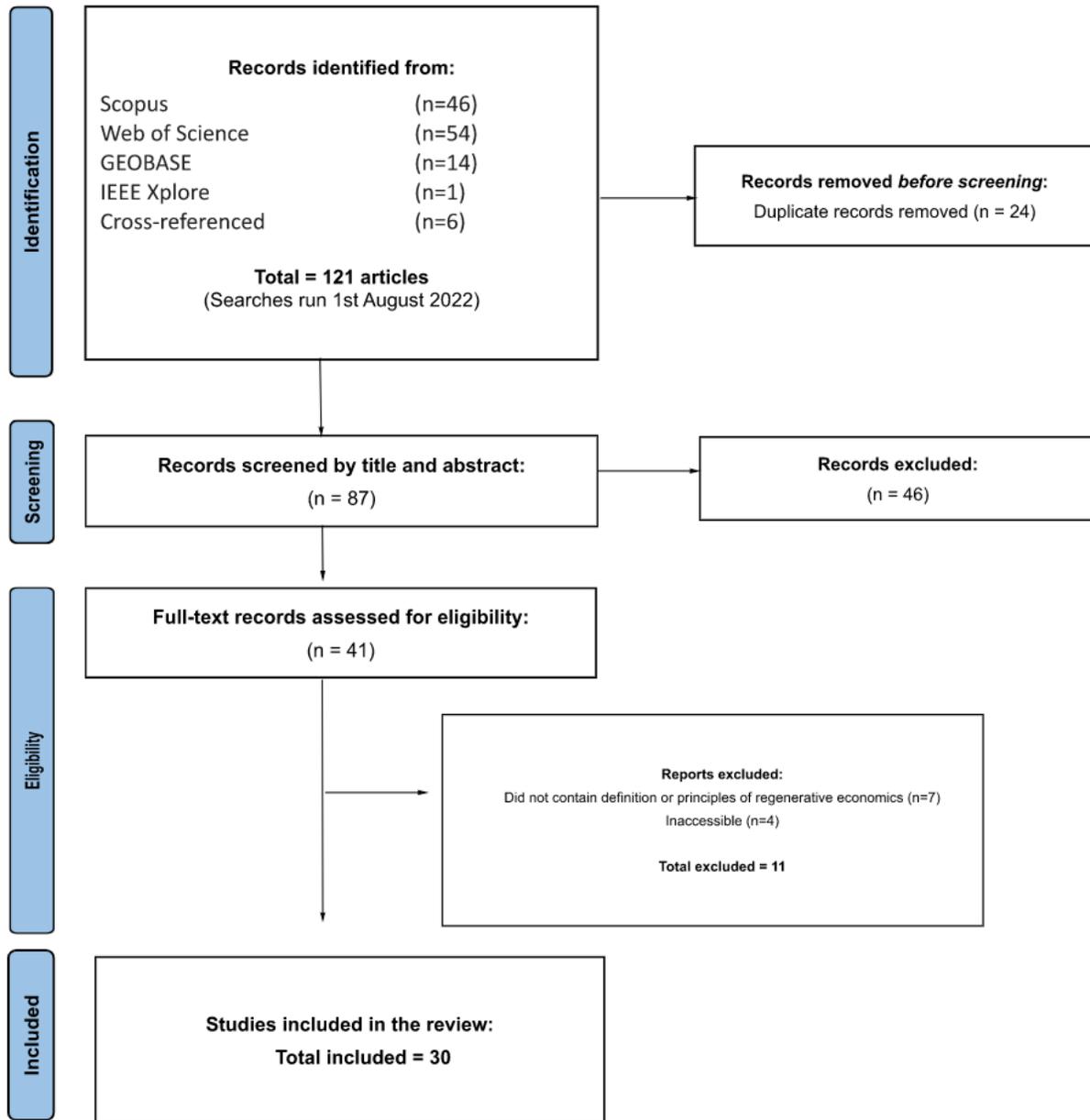
- UK and New York, NY, USA
- Iyer, H. S., DeVille, N. V., Stoddard, O., Cole, J., Myers, S. S., Li, H., Elliott, E. G., Jimenez, M. P., James, P., & Golden, C. D. (2021). Sustaining planetary health through systems thinking: Public health's critical role. *SSM - Population Health*, 15, 100844.
- Kadar, T., & Kadar, M. (2020). Sustainability Is Not Enough: Towards AI Supported Regenerative Design. *2020 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, 1–6.
- Keesstra, S., Mol, G., De Leeuw, J., Okx, J., Molenaar, C., De Cleen, M., & Visser, S. (2018). Soil-Related Sustainable Development Goals: Four Concepts to Make Land Degradation Neutrality and Restoration Work. *Land*, 7(4), 133.
- Lovins, H. (2016). Needed: A Better Story. *Humanistic Management Journal*, 1(1), 75–90.
- Lovins H, Fullerton J (2014). *Transforming finance and the regenerative economy*. GreenMoney Journal; GreenMoney. <https://greenmoney.com/transforming-finance/>
- Lyle, J. T. (1996). *Regenerative Design for Sustainable Development*. John Wiley & Sons.
- Mair, S. (2020). Neoliberal economics, planetary health, and the COVID-19 pandemic: a Marxist ecofeminist analysis. *The Lancet. Planetary Health*, 4(12), e588–e596.
- McPhearson, T., M. Raymond, C., Gulsrud, N. et al. (2021). Radical changes are needed for transformations to a good Anthropocene. *npj Urban Sustain* 1, 5. <https://doi.org/10.1038/s42949-021-00017-x>
- Morseletto, P. (2020). Restorative and regenerative: Exploring the concepts in the circular economy. *Journal of Industrial Ecology*, 24(4), 763–773.
- Naik, Y., Baker, P., Ismail, S.A. et al. (2019). Going upstream – an umbrella review of the macroeconomic determinants of health and health inequalities. *BMC Public Health*, 19(1678) <https://doi.org/10.1186/s12889-019-7895-6>
- Natural capital and ecosystem services*. (2014, February 6). European Environment Agency. <https://www.eea.europa.eu/soer/2015/europe/natural-capital-and-ecosystem-services>
- NDN Collective. (2020). *Indigenous Regenerative Economic Principles*. NDN Collective, USA.
- 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(2), 88–95.
- Ortiz Wadgymar, A. (1994). Neoliberal Capitalism in the New World Economy. *International Journal of Politics, Culture, and Society*, 8(2), 295-312.
- Patnaik, P. (2017). Neo-Liberal Capitalism and its Crisis. *International Development Economic Associates*. Available at: <https://www.networkideas.org/news-analysis/2017/10/neo-liberal-capitalism/>
- Perkins, S., & Jessup, A. (2021). Cybernetics, design and regenerative economics. *Technoetic Arts*, 19(1-2), 123–137.
- Perrings, C. (2005). "Economy and Environment," Cambridge Books, Cambridge University Press, number 9780521020763, May.
- Planetary Health*. (n.d.). Planetary Health Alliance. Retrieved September 13, 2022, from <https://www.planetaryhealthalliance.org/planetary-health>
- Pongsiri, M. J., Gatzweiler, F. W., Bassi, A. M., Haines, A., & Demassieux, F. (2017). The need for a systems approach to planetary health. *The Lancet. Planetary Health*, 1(7), e257–e259.
- Publications*. (2017, June 12). Rockefeller Foundation Economic Council on Planetary Health. <https://www.planetaryhealth.ox.ac.uk/publications/>
- Raworth, K. (2017). *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*. Chelsea Green Publishing.
- Reed, B. (2007). Shifting from “sustainability” to regeneration. *Building Research and Information*, 35(6), 674–680.
- Rodale Institute (n.d.). Seven Tendencies towards Regeneration. Available at: <https://rodaleinstitute.org/wp-content/uploads/7-TENDENCIES-REGENERATION.pdf>,
- Sanford, C. (2020). The Regenerative Economic Shaper Perspective Paper— Part 1. The Regenerative Economy Collaborative, Medium. Available at: <https://medium.com/the-regenerative-economy-collaborative/the-regenerative-economic-shaper-perspective-paper-part-1-8cd56d77f4b0>
- Schmelzer, M. (2015). The growth paradigm: History, hegemony, and the contested making of economic growthmanship. *Routledge Handbook*



- of the History of Sustainability. <https://doi.org/10.4324/9781315543017-12/growth-paradigm-matthias-schmelzer>
- Schumacher. (1973). *Small is beautiful: economics as if people mattered*. London: Blond & Briggs. <http://www.lonergan.org/wp-content/uploads/2021/02/Schumacher-Chapter-9.pdf>
- Sheldon, P. J. (2021). The coming-of-age of tourism: embracing new economic models. *Journal of Tourism Futures*, 8(2), 200–207.
- Sheldon, P. J. (2022). The coming-of-age of tourism: embracing new economic models. In *Journal of Tourism Futures* (Vol. 8, Issue 2, pp. 200–207). <https://doi.org/10.1108/jtf-03-2021-0057>
- Sheller, M. (2021). Reconstructing tourism in the Caribbean: connecting pandemic recovery, climate resilience and sustainable tourism through mobility justice. *Journal of Sustainable Tourism*, 29(9), 1436–1449.
- Shiva, V. (2016). *Staying alive: Women, ecology and development*, 3rd edn. Berkeley: North Atlantic.
- Solón, P. (2018). *Vivir Bien: Old Cosmovisions and New Paradigms*. Great Transition Initiative. Available at: <http://greattransition.org/publication/vivir-bien>.
- Sonetti, G., Brown, M., & Naboni, E. (2019). About the triggering of UN sustainable development goals and regenerative sustainability in higher education. *Sustainability: Science Practice and Policy*, 11(1), 254.
- Stahel, Walter R. and Reday-Mulvey, Geneviève (1981) *Jobs for Tomorrow, the potential for substituting manpower for energy*; Vantage Press, New York, N.Y.. ISBN 533-04799-4.
- Steinberger, J. (2021). *Living Well Within Planetary Limits: Is it possible? And what will it take?* Forum for Macroeconomics and Macroeconomic Policies. Available at: [https://www.boeckler.de/pdf/v\\_2021\\_10\\_30\\_s teinberger.pdf](https://www.boeckler.de/pdf/v_2021_10_30_s teinberger.pdf)
- Sulis, F., Agostinho, F., Almeida, C. M. V. B., & Giannetti, B. F. (2021). Recognizing the wealth of non-marketable food in distribution centres: The environmental benefits of donation. *Journal of Cleaner Production*, 318, 128482.
- Te Tai Ōhanga New Zealand. (2019). *The Wellbeing Budget 2019*. New Zealand Treasury. Available at: <https://www.treasury.govt.nz/publications/wel lbeing-budget/wellbeing-budget-2019-html>
- Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8, 45.
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., ... Straus, S. E. (2018). PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Annals of Internal Medicine*, 169(7), 467–473.
- United Frontline Table. (2020). *A People's Orientation to a Regenerative Economy: Protect, Repair, Invest and Transform*. United Frontline Table, USA.
- United Health Futures. *Systems thinking & planetary health*. (2021, November 1). United Health Futures. <https://uhf.ch/project/systems-thinking-planetary-health/>
- Vineis, P., & Mangone, L. (2022). The need for new metrics in the Anthropocene era. *Frontiers in Public Health*, 10, 935743.
- Viruega Sevilla, D., Francisco López, A., & Bello Bugallo, P. M. (2022). The Role of a Hazardous Waste Intermediate Management Plant in the Circularity of Products. *Sustainability: Science Practice and Policy*, 14(3), 1241.
- Wellbeing Economy Alliance (n.d). *Wellbeing Economy Policy Design Guide*. Wellbeing Economy Alliance. Available at: [https://weall.org/wp-content/uploads/Wellbeing-Economy-Policy-Design-Guide\\_Mar12\\_FINAL.pdf](https://weall.org/wp-content/uploads/Wellbeing-Economy-Policy-Design-Guide_Mar12_FINAL.pdf)
- WHO Council on the Economics of Health for All. (2022). *Valuing Health for All. Rethinking and Building a Whole-of-Society Approach*. Council Brief No.3. March 2022. World Health Organisation.
- Yesodharan, V., Weiyu, F., Almuala, Z. A., Heckenauer Barrón, E. G., Faraji Abdolmaleki, S., Fernández Rodríguez, J. J., & Bello Bugallo, P. M. (2022). Natural Security Games in the Regenerative Economy: A Review. *Gaming, Simulation and Innovations: Challenges and Opportunities*, 280–287.



Figure 1. PRISMA Flow Diagram of Search





**Table 1. Summary Characteristics of Included Articles**

Title	Authors	Year	Country	Type	Method	Focus
Revisiting the Missing Link: An Ecological Theory of Money for a Regenerative Economy	Alves et al.	2022	Portugal	Peer reviewed article	Transdisciplinary literature review	Rethinking money for regenerative futures: new economic and monetary paradigms that address the root causes of unsustainability
A comprehensive assessment of the method for producing biochar, its characterization, stability, and potential applications in regenerative economic sustainability – A review	Amalina et al.	2022	Malaysia	Peer reviewed article.	Literature review	Biochar production and how it contributes to regenerative economies
Re-commerce to ensure circular economy from consumer perspective	Arman & Mark-Herbert	2021	Sweden	Peer reviewed article	Literature review and focus group study of Bangladeshi consumers	Recommerce on Facebook in Bangladesh
Transforming the (tourism) world for good and (re)generating the potential 'new normal'	Ateljevic	2022	Croatia	Academic commentary	Commentary	The vision of connecting regenerative agriculture and transformative tourism is offered to reset the global tourism system for good.
Covid-19 and the emergency of new economies for the design of a new world	Barauna et al	2021	Brazil	Peer reviewed article	Strategy analysis and comparative framework of four economies	Summary of new economics principles and practice emerging from COVID-19 crisis
Urban river recovery inspired by nature-based solutions and biophilic design in Albufeira, Portugal	Blau et al.	2018	Germany	Peer reviewed article	Case study with study site analysed by the science of strolling	Urban river recovery inspired by regenerative economics
Ecological Economics Foundations to Improve Environmental Education Practices: Designing Regenerative Cultures*	Collado-Ruano & Segovia Sarmiento	2022	Ecuador	Peer reviewed article and review	Qualitative review of 51 papers	The Sustainable Development Goals (SDGs) are questioned for their conventional economic vision, and regenerative cultures are proposed to promote world futures focused on human well-being and environmental justice.



Ecosystem-based approaches to bioenergy and the need for regenerative supply options for Africa	Duguma et al.	2020	Kenya	Peer reviewed article	Quantitative study drawing on secondary data sources	Estimating the ecosystem's role in supplying energy, mostly in sub-Saharan Africa
Measuring regenerative economics: 10 principles and measures undergirding systemic economic health	Fath et al.	2019	USA	Peer reviewed article	Conceptual paper	Applying Energy Network Science to aid the process of understanding and implementing the rules of regenerative economics
Regional spatial planning, government and governance as recipe for sustainable development?	Frank & Marsden	2016	UK	Book Chapter	Book chapter. Case study of Stuttgart (Germany)	City and urban planning: framing regions as socio-ecological rather than mere socioeconomic spaces, thereby placing greater emphasis on ecosystems and ecological land management and a circular, regenerative economy
Regenerative Capitalism	Fullerton, 2015	2015	USA	White paper	Summary/ conceptual paper	Making a case for regenerative capitalism
The collapse of oligarchic capitalism and the rise of regenerative learning: how the science of energy systems clarifies what's happening today and what comes next	Goerner	2019	Scotland	Peer reviewed article	Conceptual paper	Applies the science of energy systems to economic reformation and political challenges
Changing the economic paradigm: Towards a sustainable business model	Guinot	2020	Spain	Peer reviewed article	Case studies	Sustainable Business Models: adopting the principles of circular and regenerative economy and taking environmental responsibility are a hallmark of the companies which are contributing to a more sustainable development
Drivers and Barriers Leading to a Successful Paradigm Shift toward Regenerative Neighborhoods	Haselsteiner, et al.	2021	Austria	Peer reviewed article	Literature review and quantitative data analysis	Regenerative sustainability principles in the built environment, including drivers and barriers faced during the implementation of regenerative principles in the built environment; and identifying gaps in the paradigm shift towards regenerative districts and macro-level projects



Natural Capitalism: Creating the Next Industrial Revolution	Hawken	1999	USA	Book	n/a	Based on the principle that businesses can be good for the environment, "Natural Capitalism" shows how leading-edge companies are practicing "a new type of industrialism" that is both more efficient and more profitable, while simultaneously protecting the planet and creating jobs.
Distributed degrowth technology: Challenges for blockchain beyond the green economy	Howson	2021	UK	Commentary	Commentary	This commentary considers the challenges and trade-offs in using blockchain as the facilitating digital infrastructure for degrowth projects. Blockchain needs to overcome challenges, in: 1) building democratic and (re)distributive economies, 2) regenerating the environment without commodifying it, and 3) facilitating international alliances without imposing a particular set of values.
Needed: A Better Story	Lovins	2016	USA	Peer reviewed article	Conceptual piece	Corporate and leadership solutions that can craft a new story of an economy that works for 100% of humanity
Transforming Finance and The Regenerative Economy	Lovins & Fullerton	2014	USA	Web article	Web article. Conceptual piece	Finance in general and specifically the flow of real investment capital is one of the critical leverage points to shift to a Regenerative Economy that serves humanity and stewards the integrity of earth's ecosystems.
Sustainability Is Not Enough: Towards AI Supported Regenerative Design	Kadar & Kadar, 2020	2020	UK	Conference Paper	Conference paper. Case studies and conceptual piece	This paper presents some examples of biomimicry in circular design and proposes techniques that integrate data science and artificial intelligence (AI) as tools to accelerate the transition towards the regenerative approach.
Soil-related sustainable development goals: Four concepts to make land degradation neutrality and restoration work	Keesstra et al.	2018	The Netherlands	Peer reviewed article	Conceptual piece	Land Degradation Neutrality and Restoration Work. To avoid further land degradation and promote land restoration, multifunctional use of land is needed within the boundaries of the soil-water system. The attainment of a balance between the economy, society, and the biosphere calls for a holistic approach.



Regenerative Design for Sustainable Development	Lyle	1996	USA	Book	Book	Production cycles based on a one-way flow of materials and energy have pushed us to the brink of environmental collapse: this book provides civil engineers, architects, land development planners, and others with practical, realistic approaches and proven regenerative practices for water use, land use, energy use, and building design.
Restorative and regenerative: Exploring the concepts in the circular economy	Morseletto	2020	The Netherlands	Peer reviewed article	Literature review	Definition of restoration and regeneration in circular economics: unlike regeneration, restoration can be considered a core principle because it has widespread application and can be a point of reference for circular applications.
Cybernetics, design and regenerative economics	Perkins & Jessup,	2021	USA	Peer reviewed article	Conceptual piece	Cybernetics and regenerative economics. Humanity will likely make outstanding technological progress, explore space or merge with artificial intelligence - but appreciating nature's technology provided to humanity through eons evolution, and avoiding short-term self-destruction, should be priorities.
The coming-of-age of tourism: embracing new economic models	Sheldon	2021	USA	Peer reviewed article	Conceptual piece, with a review of six progressive economic models.	Re-examine the economic models and assumptions that have given rise to current day tourism, for the greater good / to help solve systemic crises.
Reconstructing tourism in the Caribbean: connecting pandemic recovery, climate resilience and sustainable tourism through mobility justice	Sheller, 2021	2021	USA	Peer reviewed article	Conceptual piece	This article seeks to identify ways beyond tourism in which Caribbean small island states and non-independent territories might rebuild more sustainable ecologies and economies
About the Triggering of UN Sustainable Development Goals and Regenerative Sustainability in Higher Education	Sonetti et al.	2019	Italy	Peer reviewed article	Conceptual piece	Outlines the context in which universities can collaborate and contribute to triggering sustainability values, attitudes, and behavior within future regenerative societies.
Recognizing the wealth of non-marketable food in distribution centres: The environmental benefits of donation	Sulis et al.	2021	Brazil	Peer reviewed article	Conceptual piece	Circular economy and food donation applies the life cycle assessment method to evaluate the environmental impacts of plausible food donation scenarios in the 'CEAGESP' food distribution center



						in São Paulo city, Brazil
The need for new metrics in the Anthropocene era	Vineis & Mangone	2022	UK	Peer reviewed article	Conceptual piece	The Environmental, Social and Governance (ESG) ratings for bonds suffers from a lack of transparency and standardization. New metrics focusing on at least four dimensions: circularity, climate change, biodiversity, and health (including well-being), can support a more inclusive approach, to highlight the potential co-benefits of different strategies, especially those that promote regeneration and a truly circular economy.
The Role of a Hazardous Waste Intermediate Management Plant in the Circularity of Products	Viruega Sevilla et al.	2022	Spain	Peer reviewed article	Case study, qualitative analysis, and impact assessment	Redesign plan for an industrial system that includes mechanical workshops and a hazardous waste intermediate management plant, covering all management activities (both off-site and on-site), such as collection, transport, and treatment
Natural Security Games in the Regenerative Economy: A Review	Yesodharan et al.	2022	Spain	Conference Paper	Conference paper. Literature review	Simulation games play a vital role in building a sustainable world. This study investigates the games for topics like natural security, energy security, carbon capture and storage, renewable energy, and waste. The paper points out the importance of natural security and the need to develop more games in natural security and its related fields to build a regenerative economy.



Figure 2. Focus Areas of Included Articles

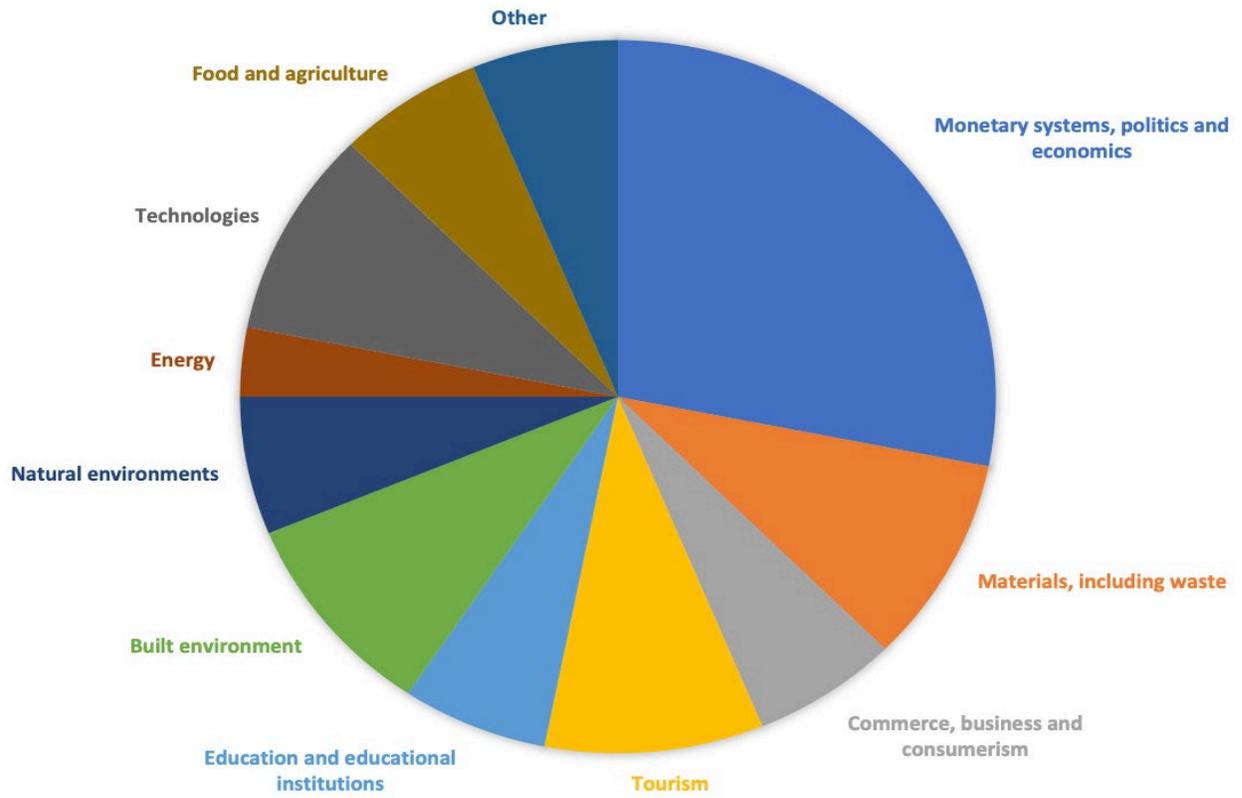
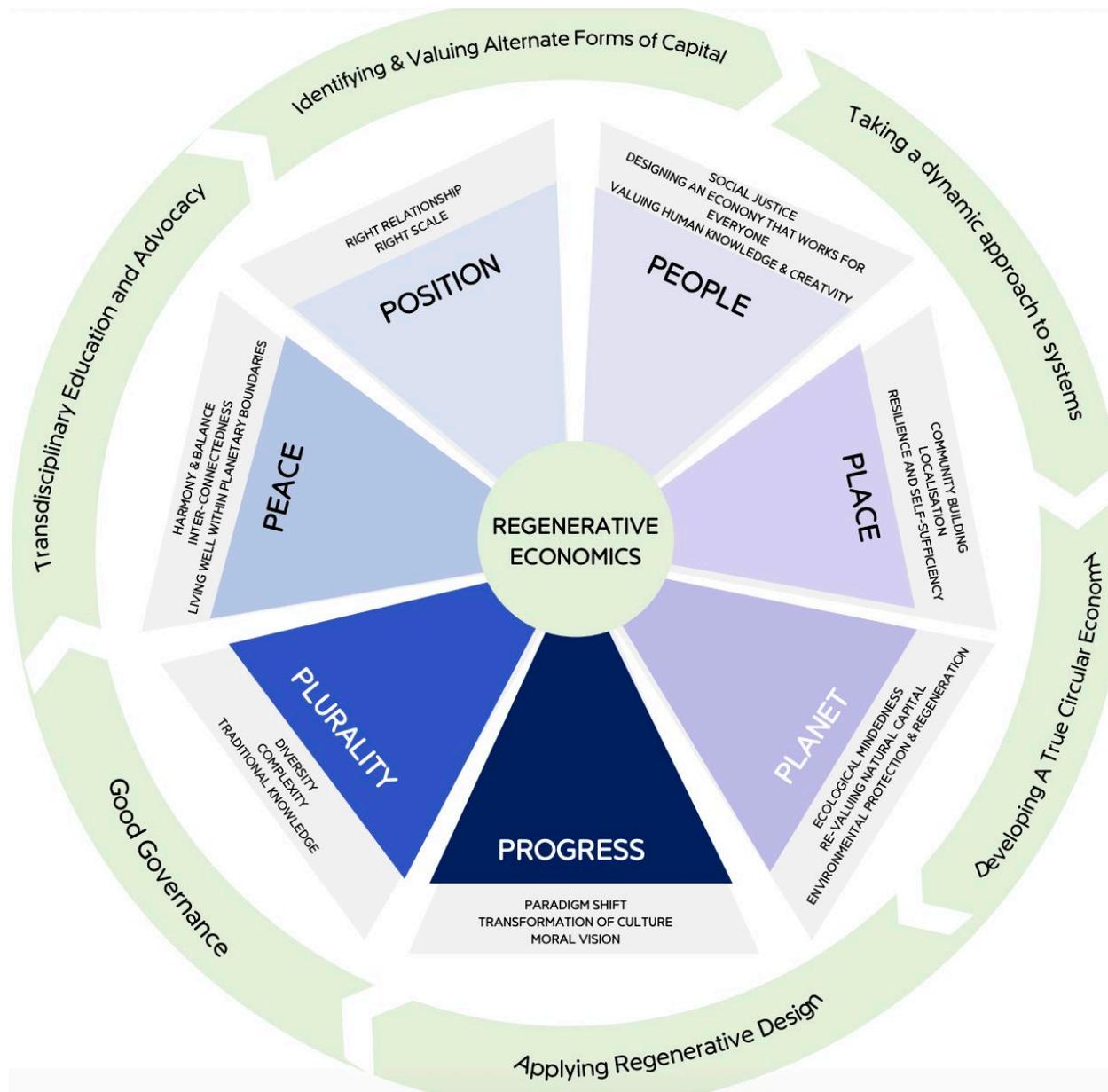




Figure 3. Principles and Practices of Regenerative Economics



Source: Authors



Figure 4. Case Example

**Box 1. Example Use-Cases of Regenerative Economics for Planetary Health**

*Better relationship to self*

- Inspired by biophilic ideas, transformative learning theories, and participatory evaluation, INDICARE is an evaluation framework that seeks an eco-centric and integrative approach toward our inner being, the earth and its communities (Sonetti et al., 2019).
- EAT-Lancet guidelines, a nutritional guide termed a “diet for the Anthropocene” (Vineis & Mangone, 2022)
- Microbiome research outlining the relationship between human biome, health, food systems (including soil) and the biosphere (Ateljevic, 2020)

*Better relationship to others*

- Vizinho do Bem ('Good Neighbor') app: a collaborative network to support elderly, quarantined and others who need help during the pandemic (Barauna et al., 2021).
- Transition Town Network (over 1200 transition initiatives globally, working to increase self-sufficiency to reduce the potential effects of peak oil and economic instability) and the Global Ecovillage Network (15,000 ecovillages around the world: communities consciously designed through locally owned participatory processes across social, culture, ecology, and economy sustainability to regenerate social and natural environments.) (Ateljevic, 2020)
- New forms of localised democratic governance facilitated by blockchain technology such as Democracy.Earth, a censorship-resistant, open-source platform for decision-making, and FairCoin, supporting a network of localised community economies (Balaguer Rasillo, 2020 in (Howson, 2021)).

*Better relationship with nature and the environment*

- The Permaculture movement (3 million practitioners globally) (Ateljevic, 2020)
- A river restoration project that naturally tells the history of the city, creates a sense of place, and unifies blue–green infrastructure in a symbolic way by offering areas for recreation (Blau et al., 2018).



- Regenerative cities, embracing the dual aims of (i) developing an environmentally enhancing relationship between cities and the natural systems whose resources they depend upon and (ii) fostering urban communities where people benefit from this process (Frank & Marsden, 2016).
- The Hawaiian Islands are strategizing a more mature, post-pandemic tourism based on native Hawaiian values such as malama (caring) and kuleana (responsibility) (Sheldon, 2021)
- Disaster reconstruction in the Caribbean centering food sovereignty, agroecology, and regenerative economies, as promoted by community-based organizations and people’s assemblies (Sheller, 2021).
- Companies adopting regenerative or circular design models. Zero-waste manufacturing, selling services instead of products (e.g., providing computer printing services instead of printers) or refurbishing and reselling own-brand products. For example, clothing brand Patagonia (Guinot, 2020).
- New metrics to capture the health and regenerative impact of Environmental, Social and Governance (ESG) bonds across at least four dimensions: circularity, climate. change, biodiversity, and health (including well-being). (Vineis & Mangone, 2022)