

TWO

NATURE AS THE FOUNDATION FOR SUSTAINABLE DEVELOPMENT: LINKING NATURE'S NEEDS TO SUSTAINABLE DEVELOPMENT ACTION

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Linking nature to sustainable development action

Nature provides the foundations for human society and economies. This understanding underpins the sustainable development paradigm from its first formulation 50 years ago to its current formulation in the 2030 Agenda for Sustainable Development (Agenda 2030) and the Sustainable Development Goals (SDGs). However, there has been limited systemic and theoretical underpinning of the paradigm, likely a factor in the poor achievement of outcomes.¹ The global economic system is not only systematically but increasingly overdrawing on two accounts—what nature can provide, and what societal actors can endure in terms of inequalities—and is environmentally, socially, and financially unsound.²

¹ Clark and Harley (2020); Mensah (2019); Purvis, Mao, and Robinson (2019); Biermann et al. (2022); United Nations (2024).

² Obura et al. (2026).

The core proposition in this chapter is that the construct of “nature, economy, and society” is fundamentally a systems model of human life in nature, deeper than the framing of sustainable development, which represents one scenario, or configuration of outcomes.³ Historically, how we have converted what nature produces into goods and services through the economy, and our understanding of the intangible benefits from nature that support cultural identity, mental well-being, sense of place, and “gifts” of nature have been severely out of balance.⁴ The main question, now, is: Are we at or beyond the threshold of multiple planetary boundaries and tipping points of major Earth systems, and what is the needed transformative change?⁵ This question was posed by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in its 2019 Global Assessment on Biodiversity and Ecosystem Services and is taken up in this chapter to inform considerations of the post-2030 sustainability framework and the successors to the SDGs.⁶

The crises we face are not just technical challenges, or “market failures” that can be reversed through tweaks to the current system. Mainstream framing by economists has been that the problems, arising from externalities—carbon emissions, ocean acidification, impacts on biodiversity and water—can be progressively priced, and markets will self-correct.⁷ The deeper explanation, however, relates to a fundamental mismatch between what we value (therefore what markets price and do), and what is needed. If economies and markets valued balance, externalities would not arise as their impacts would not be accepted as “part of a package.” This shifts the debate toward recognizing the multiple values of nature (and social systems) alongside financial profit. What we currently face is more a values failure underpinning markets, not simple market failures amenable to technical solutions.

A systems approach helps show the full dynamics across natural, economic, and societal domains, and how they relate to finance. It reveals why the underlying trends in biodiversity and planetary boundaries have continued to worsen despite rapid advances in technical and scientific understanding of what needs to be done. More than three decades since the Earth Summit in 1992, and now a decade into Agenda 2030 and the SDGs, nature is still not fully internalized into the development agenda. This chapter argues that making nature the foundational element of social and economic development is the transformation that is needed, and that this goes beyond the classical focus on instrumental uses from nature to incorporating intrinsic and relational values, as well as the values inherent in social capital. While apparently theoretical, given its grounding in systems theory, this approach provides tangible heuristics in just about any context to help actors select more sustainable pathways.

The Sustainable Development Goals

The SDGs illustrate the gap addressed here for sustainable development more generally, i.e., between the internal logic and coherence of the concept, and external weak application. Presented as a static rectangle of 17 goals with associated targets and indicators, the goals and targets express the dominant political economy of the time, an operational framework to facilitate action and alignment.⁸ However, given the importance of negotiated text in intergovernmental agreements, ambition has been locked in the agreed words for the last decade, directing attention

3 Ibid.

4 Pascual et al. (2017).

5 Lenton et al. (2019); Rockström et al. (2009).

6 IPBES (2019).

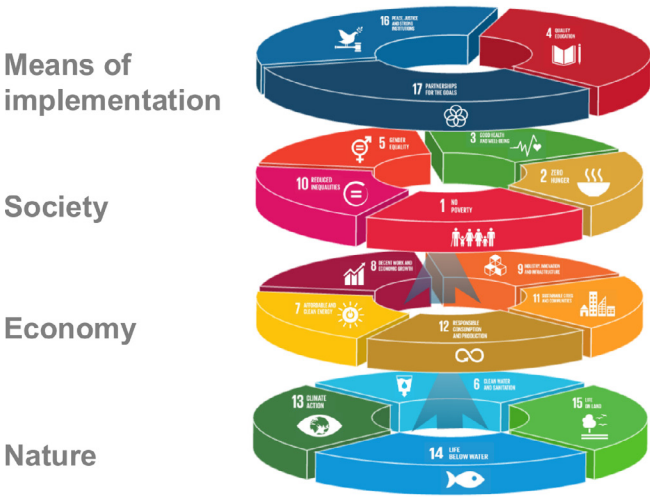
7 Maechler and Boisvert (2025); Kill (2014).

8 Kamau, Chasek, and O'Connor (2018).

away from interlinkages among the goals and change dynamics.⁹ As a result, in spite of explicit recognition of their indivisibility, implementation of the SDGs has been characterized by siloed action and alienation, resulting in poor delivery of outcomes.¹⁰

In fact, the goals embed highly integrated narratives of people’s lives and economies in nature. The goals can be arranged in a stack with nature as the foundation (figure 2.1), moving up through goals associated with economic, societal, and means of implementation domains.¹¹ Community-based small-scale fisheries provide a case-study narrative for localization of the SDGs.¹² This starts with life in the ocean (Goal 14) as the source, affected by adjacent land use, freshwater flows, and climate (Goals 15, 6, 13), which provisions aquatic food caught by small-scale businesses and fishers (Goal 8). Fishers use gear and vessel technologies that have differential impacts on fish and the ocean (Goals 7, 9, 12), and are embedded within communities and settlements (Goal 11). The fishing sector supports incomes (Goal 1), food security (Goal 2), and health (Goal 3) of households, with distributional and equity aspects that vary among locations and countries (Goals 5, 10). The whole is governed (Goal 16) and supported by varied partners such as banks and other financial institutions, and technical and other organizations (Goal 17). Technical and local or Indigenous knowledge (Goal 4) influence choices and decisions that determine how fishing actors operate. The intimacy and lived reality of these narratives become harder to express at larger scales. Combined with the alienating language of the negotiated text, this has resulted in poor delivery of SDG outcomes across scales.

FIGURE 2.1



NOTE: Stack of the Sustainable Development Goals, starting with nature goals as the foundation, with contributions from nature leveraged through economy goals in the second layer, supporting social goals in the third layer. Goals necessary for implementation are shown as a fourth layer.¹³

SOURCE: Author’s updated design, adapted from Obura (2020, fig. 3). Original figure © 2020 Elsevier.

9 Biermann, Kanie, and Kim (2017); Singh et al. (2018).
10 United Nations (2024).
11 Obura (2021).
12 Bitoun et al. (2024); Obura (2021).
13 Obura (2021).

A systems model of nature, economy, and society

A systems model starts with a description of the system.¹⁴ Like other species, all humans inhabit an ecological niche determined by our material needs from nature—in the form of food, water, shelter, a livable environment, and myriad others.¹⁵ Our niche is made more complex by sociality and the differentiation this allows among individuals, as well as our high degree of self-awareness and capacity to pass knowledge and practices to future generations.¹⁶ These have profound implications for how our ecological niche is materialized, and how our needs are met, from individual to group or societal dimensions. The IPBES developed the concept of nature's contributions to people (NCP) as an inclusive framing of all material and nonmaterial needs of people from nature, grouped into three overlapping classes related broadly to intrinsic, instrumental, and relational values of nature: needs met through regulating functions of natural systems that generate conditions on which people depend (such as clean air or water, diversity of species); direct material needs met through consumption, capture, or harvest from nature, obtained through direct use (such as food, water, shelter); and nonmaterial needs from nature that are important to people's sense of well-being, culture, and learning (such as habitats or species of cultural or spiritual significance).¹⁷ These relate, respectively, to intrinsic, instrumental, and relational values of nature. The exchanges of all these flows can be depicted in the space between people and nature (figure 2.2a).

For people living directly from nature, individuals, households, or small social groups may directly access the contributions from nature they depend on. But as social groups grow in size, specialization of roles occurs, necessitating sharing and trading of skills and goods extracted from nature. Mechanisms for such exchange have been found almost universally across cultures, and over time, currencies have developed to facilitate the measurement of relative value, exchange, and accumulation of value.¹⁸ Now, most people operationalize their ecological niche (i.e., how they obtain food, shelter, water, and other basic necessities) through financial exchanges in markets. Fundamentally, the global economic system represents humans' globalized socio-ecological niche of the 21st century. Importantly, this economy has focused on assigning value to, pricing, and trading some goods from nature (e.g., food, materials, energy). But it has done this while failing to price many essential benefits from nature (e.g., carbon sequestration, biodiversity, regulating services, cultural values), and externalizing many costs and impacts, and thus excluding these from market decisions.

This fundamental relationship between nature, economy, and society can be represented in a system model (figure 2.2b), enabling direct exploration of the properties of each domain, the interactions between them, and how the purpose of the system directs and determines these, building on the conceptual and values frameworks developed by the IPBES.¹⁹ The model comprises two inner interaction loops, with one as the base (nature-economy), the second above it (economy-society), and a third outer loop (nature-society). Nature forms the foundational layer, with

14 Holling (2001); Meadows and Wright (2008).

15 Polechová and Storch (2019).

16 McInturff et al. (2025).

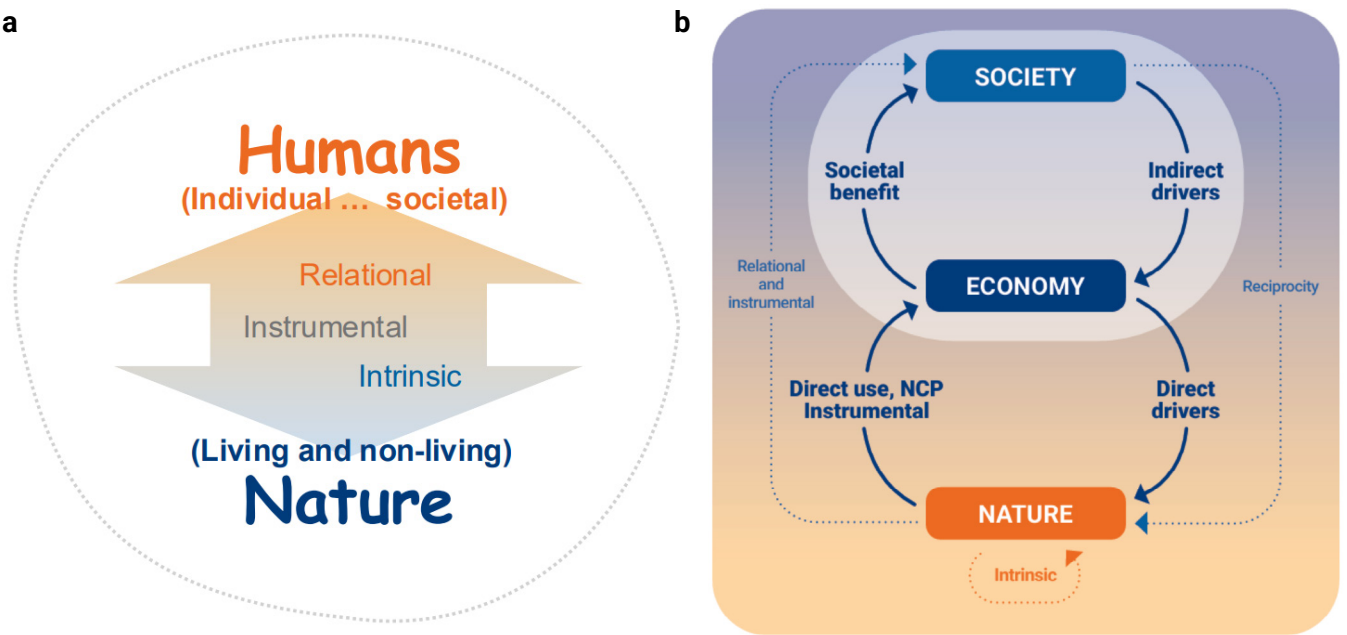
17 IPBES (2022); Pascual et al. (2017, 2023).

18 Ruddick (2025); Middelkoop (2016).

19 Meadows and Wright (2008); Obura et al. (2026); Díaz et al. (2015); IPBES (2022); Pascual et al. (2017).

material contributions flowing directly into the economy through direct use and extraction from nature, generating benefits that are distributed among actors in society. Values held by members of society influence the indirect drivers that determine how the economy operates, and thus the direct drivers impacting nature. Societal values also include relationality and reciprocity of people with nature.²⁰ The illustration depicted here emphasizes interactions in the global economic framing (see below), but other arrangements could be drawn for other value systems.

FIGURES 2.2A AND 2.2B



NOTE: Figure 2.2a. Distinction of humans as a species within nature, with the space in between illustrating the transfer of nature’s contributions to people, across intrinsic (closer to nature), instrumental (between the two), and relational (closer to humans) values. Examples of potential distinctions within nature (living vs. nonliving) and humans (individual vs. societal) are also illustrated. Figure 2.2b. Expresses how “economy” operationalizes the exchange of goods and services with instrumental value between nature and humans, i.e., the ecological niche of humans in societal groups. Economy is nested within society, and society within nature, but economy is placed mechanistically between them. The key linkages depicting intrinsic, instrumental, and relational values are shown.²¹

SOURCES: Figure 2.2a: Author’s own design; Figure 2.2b: Adapted from Obura et al. (2026, fig. 3), licensed under CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>). Colors and typography modified.

20 Obura et al. (2026).
21 Obura et al. (2026).

MULTIPLE STATES—SUSTAINABILITY VS. THE ANTHROPOCENE

Multiple states or configurations of a model may be possible, with systems approaches enabling exploration of how shifts may occur between them.²² Two configurations of this model are most relevant here. First is the idealized configuration that is in balance across elements of the system and in all its interactions, such that the system is stable and sustains itself into the future. To maintain balance, negative feedbacks operate such that perturbations to any of the loops are counterbalanced by compensatory responses. For common usage, these are more directly described as stabilizing feedback loops, such that economy and nature are in balance with one another, and economy and society are in balance. The outer feedback loop of nature-society interactions would also be stabilizing. Overall, this model configuration must be guided by a system purpose, or the rules and norms of the society, that values and thus produces balance among elements and directs the stabilizing interactions. This configuration corresponds to the “sustainable development” paradigm.

The second configuration matches present-day conditions of market-based extractivism, in which the economy is dominant, with interactions that degrade the state of nature, and of society. Interactions in the two loops show positive (i.e., destabilizing) feedbacks. Over-extraction from nature and externalization of costs by economic actors produce the five direct drivers (land- and sea-use change, direct exploitation, pollution, climate change, invasive alien species) at levels that further drive nature’s decline. At the same time, the goal to grow wealth through private ownership reinforces destabilizing interactions in the nature-economy loop and magnifies unequal sharing of benefits among people and exposure to social impacts and inequalities. Destabilizing interactions in the outer nature-society loop result from inadequate care and stewardship of nature, reinforcing the mutual instability in the two inner loops. These self- and mutually reinforcing feedback loops result in the complex “polycrisis” and conditions currently experienced of the Anthropocene, which are only partially described by any singular focus.²³ For example, the “triple planetary crisis” focuses on decline in nature and two of the five direct drivers between the economy and nature domains (climate change and pollution, figure 2.2b).²⁴ It has been very impactful in bringing these complex challenges to a policy audience, but only partially describes the extent of challenges.

Note that neither of these configurations implicitly or explicitly requires currencies or financial exchanges to mediate interactions between the three domains (see the “Finance” section below).

LOOP 1: THE ENGINE ROOM—NATURE AND ECONOMY

The basal feedback loop addresses our use of instrumental values from nature, which have been commodified for trade and mediated through economic actors. The IPBES’ Nexus Assessment focused on this loop, addressing interactions between two nature subdomains (biodiversity and climate change) and three economic sectors (water, food, and health sectors).²⁵ Its goal was to identify how to minimize trade-offs that result in harm to any of the focal elements and thus to actors dependent on them, and enable synergies to amplify co-benefits and cooperation among actors—essentially to establish stabilizing feedback loops among the five elements. The IPBES Business and Biodiversity Assessment focused on the specific interests and capabilities of primary actors (businesses) within the economy domain.²⁶ It framed the linkages as “impacts and dependencies” between businesses and nature, or

22 Holling (2001); Meadows and Wright (2008).

23 Clark and Harley (2020); Estoque (2023); IPBES (2024a).

24 Andersen (2020).

25 IPBES (2024a).

26 Jones et al. (2026).

“risks and opportunities,” translating the IPBES terms “direct drivers” and “nature’s contributions” into terms more accessible to business actors.

Any aspect of nature (whether a species, habitat, ecosystem, or biome), looked at from any applicable scale (local to global), has limits to how much use or damage it can sustain while continuing to support people and life more broadly. This is also the case for altered ecosystems such as in agricultural or pastoralist landscapes, or seascapes, where ecosystem and ecological functions are altered to varying degrees around production to support people.²⁷ The nature-economy loop may be in one of three states: stable, in which exchanges between the two domains are balanced; unstable, where one (or both) of the stocks is being depleted, the other potentially expanding, eventually reaching a point of collapse (or zero function) resulting in collapse of both; or it may be possible for both stocks to grow (particularly if they have both been depleted in the past), if linkage interactions are calibrated to enable this without tipping into an unstable state. Regeneration from a degraded state of one or both domains can enable improved condition and state of both, enabled fundamentally by nature’s ability to regenerate itself through the growth and replenishment of species populations and reestablishment or strengthening of ecological interactions. This emphasizes the primary role of natural functions in supporting the entire model, and the primary benefit of maintaining and/or regenerating nature as a primary solution.²⁸

The “engine room” feedback loop between economic actors and nature is addressed by concepts and principles around the circular economy and the bioeconomy. Circular economy concepts directly apply the logic of the feedback loop by focusing on reuse and repurposing of previously used material to minimize extraction of new material from nature, which also assists in minimizing waste and impacts on nature to as low as may be possible.²⁹ Varied economy frameworks emphasize the functioning of natural systems and variety of benefit streams that are possible, starting with varied interpretations of the term “bioeconomy” broadly focused on certain nature-based approaches to emerging challenges or opportunities, “green economy” focused initially on agriculture but more generally on land systems, “blue economy” on sustainable and inclusive use of ocean resources, “wildlife economy” on tourism and recreational hunting, and even “biodiversity economy”—though many usages may not have explicit requirements for sustainability.³⁰

LOOP 2: THE CONTROL ROOM—ECONOMY AND SOCIETY

The upper feedback loop expresses how exchange of services and goods distributes benefits across the range of actors in society. This is mediated by societal rules and norms, or the license and controls imposed by society on the behavior of economic actors and on economic activity. The IPBES Global Assessment on Biodiversity and Ecosystem Services highlighted the importance of indirect drivers in four broad classes (demographic and socio-cultural, economic and technological, institutions and governance, conflicts and epidemics), underpinned by deeper “values and behaviors” held by people in society.³¹ The IPBES Methodological Assessment of the Diverse Values and Valuation of Nature showed how worldviews aligned with extractive, market-based values direct the destabilizing feedback loops of the current global condition, while other worldviews enable greater balance between and among people and with nature.³² The IPBES Transformative Change Assessment identified three sets of values

27 Leadley et al. (2022); Mohamed et al. (2024).

28 IPBES (2024a).

29 D’Amato (2021); Ghisellini, Cialani, and Ulgiati (2016); Tan and Lamers (2021).

30 Roe and Snyman (2026); Tan and Lamers (2021).

31 IPBES (2019), xxix.

32 IPBES (2022).

or “underlying causes” that lock in the destabilizing feedbacks currently active between society and economic actors, namely (a) values promoting domination over people and over nature, (b) reinforcement of unequal power and wealth among people, and (c) prioritization of short-term material and financial gains.³³ These incentivize and reinforce destabilizing feedbacks across both upper and lower loops, and disincentivize actions that would stabilize them over longer time periods.

A system’s behavior is set by its purpose, which here is set by the dominant values held by society.³⁴ How values are expressed by different communities and societies across the planet varies enormously; the interest here is in identifying the “operational rules” that determine how the system behaves. The three “underlying causes” of the current condition were clustered from available evidence by the IPBES Transformative Change Assessment and offer operational instructions that set the “effective purpose” of the global human-nature system as it is now.³⁵ To shift the system to a new stable state, systems framing would propose the inverse of each of these to propose “underlying causes” of a sustainable system state: promoting care and reciprocity with nature (and other people), assuring equity in power and wealth among people, and prioritizing long-term prosperity and security.³⁶ Each of these would shift multiple linkage interactions in the model to be stabilizing (negative feedbacks) rather than destabilizing (positive feedbacks). More importantly, without such foundational shifts in values, this systems framing holds that superficial solutions cannot deliver systemic change and balance (i.e., a phase shift from one state to another). Patchwork efforts will be undermined and doomed to failure by continuation of the values driving the current system.

Transition or transformation?

The IPBES Transformative Change Assessment also identified a wide range of building blocks to transformation, identifying the need to achieve changes in “views, structures and practices” to effect a shift from transition (which may improve some conditions but overall system state remains within the same phase) to transformation (shift the state of the system).³⁷ Knowledge and practice on individual interaction links of the model, corresponding to practices and actions (nature-economy interactions) and structures or institutions (society-economy interactions), may in many cases be quite well known, such as in the evidence accumulated to identify more than 70 response options in the IPBES Nexus Assessment.³⁸ But additional to these is the need to shift deeper underlying drivers and causes, or views and values, that correspond to the purpose or vision driving the system, in this case in relation to the goals driving markets, and wealth accumulation. The point at which changes shift from being transitional to transformative is not clear, and may only emerge from aggregated and mutually reinforcing shifts across views, practices, and structures that result in a shift in whole-system behavior toward sustainability.³⁹ This aligns with emerging work on positive social tipping points, where key shifts may trigger major cascades that result in transformation in system behavior to sustainable outcomes.⁴⁰

33 IPBES (2024b).

34 IPBES (2022); Pascual et al. (2023).

35 IPBES (2024b).

36 Obura et al. (2026).

37 IPBES (2024b).

38 IPBES (2024a).

39 IPBES (2024b).

40 Milkoreit (2023).

But as noted in the prior section, systems theory posits that establishing a new system purpose is necessary for a system to persist in a different state. The question may therefore be about how much transitional change in views, practices, and structures may be needed to motivate sufficient societal will to both adopt and invest in a vision of sustainability that would enable the deeper and persistent changes needed to shift from the current Anthropocene configuration to the sustainable configuration. Agenda 2030 and the SDGs have led us to a point of seeing the potential for transformation but have not led us close enough for it to happen. This is the work that the final years of the SDGs and a post-2030 agenda will have to address.

Discussion

RESETTING VALUES

To date, the global system has been locked within two mutually reinforcing/destabilizing positive feedback loops driven by a value system that is explicit to market actors in terms of minimizing cost and maximizing return to shareholders. But the consequences may not be fully appreciated either by all actors in the markets, or by the public at large. While public and official ambitions are to “leave no one behind” and eliminate poverty, the rules governing economic and financial decisionmaking have become increasingly competitive and deregulated, incentivizing greater extraction from natural and social capitals.⁴¹ Contributing factors include the increasing geographic scales of value chains and thus separation of cause and effect, and concentration of power through information, the media, and advertising being increasingly controlled by larger corporations and individuals that benefit from this direction of capital conversion. These factors make the causal chains of choices increasingly invisible to, and undermine the agency of, less powerful actors and consumers in the markets, even as documentation and scientific explanation have expanded.

Other configurations of the system model may be possible, determined by other worldviews or sets of values, such as Indigenous and other cultural worldviews. These may focus on balance in the interactions between economic actors pursuing livelihoods and ways of living with or as nature, in relation to the nature they consume and the society they are embedded in.⁴² Dominant interactions within the system may also reside in the outer loop of relationality between people and nature. In many instances, these economies may function without currencies, maintaining stable and regenerative exchanges among nature, economy, and society.⁴³ In other value systems, securing the state of nature might be dominant, or securing societal values might be. The multilateral worldview within which the sustainable development framework has been negotiated embeds dominant assumptions of Global North cultures that set the “postwar” consensus of the 1950s, embedding inconsistencies and direct conflicts with Global South and Indigenous or community worldviews, whose voices have historically been suppressed, though they are now increasingly heard.⁴⁴ An emerging framing around the “global” or “tropical majority” is a sign of increasing balance and more inclusive values.⁴⁵

41 United Nations (2015).

42 IPBES (2022); Pascual et al. (2023).

43 Ruddick (2023; 2025).

44 Fukuda-Parr and Muchhala (2020).

45 Spalding et al. (2023).

Where a configuration of the model is localized and has minimal linkages or impacts beyond its space and to other social groups, almost any model configuration might be possible. But as human population and size of economies increase, almost all large cultures historically have reached limits and then followed varied pathways of collapse, including through ecological overshoot.⁴⁶ With the world now connected from local to global levels and at planetary limits, the two configurations addressed here are of critical importance—the current configuration driving toward whole-system collapse, and the alternative that seeks to bring all interactions into balance, that allows rebuilding and regeneration of degraded system components, and sustains the whole into the future.

HOW ‘STRONG SUSTAINABILITY’?

Recent syntheses and reviews of the sustainable development paradigm and the SDGs have found limited systemic and theoretical underpinning, instead finding collections of concepts and frameworks, investigation of policy and negotiation processes, and exploration of synergies and trade-offs among goals and targets.⁴⁷ The top-level political texts, being negotiated and agreed across all countries, omit details of theory and principles to facilitate consensus, thus provide little mechanistic guidance on how to operationalize them.⁴⁸ As a result, the aptly named formulations of “weak sustainability,” but also of supposed “strong sustainability,” have not been strong enough to counter the acceleration of drivers and impacts and “underlying causes” of the current situation.⁴⁹

Internal contradictions and trade-offs have undermined operationalization of sustainable development, a prime example being prioritization of economic growth (e.g., in target 8.1) that makes fulfillment of other goals or targets very challenging (e.g., target 6.3 on minimizing pollution, or target 15.5 on preventing extinction of species).⁵⁰ Resolving the complexity of interactions requires deeper and mechanistic framing of causes and consequences. This occurred with the concurrent development of the IPBES Conceptual Framework (focused on mechanisms and interactions) with negotiation of the SDGs (focused on political consensus). Both were developed over several years to 2015, but independence of the processes, different contexts (knowledge synthesis vs. multilateral policy, respectively), and specialized terminology have inhibited integration and alignment.⁵¹ Aligning them may enable “super-strong” operationalization of sustainable development through enabling systemic and aligned responses to intensifying challenges of the Anthropocene.⁵²

ANTHROPOCENE LIMITS—THE FLOOR, THE CEILING, AND LOCALIZATION

That humanity is pushing key properties of our planet beyond livable limits motivated the first explorations of sustainable development, and was further developed in the planetary boundaries framework and the “safe” thresholds of key biophysical elements.⁵³ Concerns about what these mean for a dignified life and escape from poverty have

46 Brozović (2023).

47 Clark and Harley (2020); Mensah (2019); Purvis, Mao, and Robinson (2019); Rockström and Sukhdev (2017); Vos (2007); Biermann, Kanie, and Kim (2017); Kamau, Chasek, and O’Connor (2018); Nilsson, Griggs, and Visbeck (2016); Singh et al. (2018).

48 Kamau, Chasek, and O’Connor (2018); United Nations (1992; 2012; 2015); United Nations Secretary-General (2021).

49 Godin et al. (2022); Wu (2013); Steffen et al. (2015); IPBES (2024b).

50 IPBES (2024a); Kamau, Chasek, and O’Connor (2018); United Nations (n.d.).

51 Obura (2026, forthcoming).

52 Obura et al. (2026).

53 Brundtland et al. (1987); Meadows and the Club of Rome (1972); Richardson et al. (2023); Rockström et al. (2009).

stimulated formulation of conceptions of “just” complements to the safe boundaries.⁵⁴ These were brought together powerfully in the ring of “doughnut economics” visualizing an inner floor of minimum social needs with the ceiling of planetary or biophysical outer limits, and applied in several urban and national contexts, where jurisdiction, a tax foundation, and geographically and socially defined boundaries enable action.⁵⁵ Adding further dimensions of quantification, justice, and time, the Earth Commission has extended the ring into a “safe and just corridor” into the future.⁵⁶ Both formulations allow for translation of the space between the floor and ceiling into a global budget (e.g., of carbon dioxide, water, components of biodiversity), which can be allocated to relevant actors, and which may be set at different scales from local (e.g., cities’ doughnut economic plans) to global.⁵⁷

Rendering these concepts accessible to actors is a significant challenge. This systems model provides a mechanistic model of how actors operate in the space between the floor and ceiling. Simplistically, the nature and society domains may be thought of as analogs to the planetary ceiling and social floor, though conceptually inverted with nature as the foundation (figure 2.2b). Further theoretical and practical work can deliver more nuanced and disaggregated elaborations for specific contexts, while the common language of sustainable development and the SDGs enables linking actors and contexts, for all to adopt their fair share of the global budget relevant to their actions.⁵⁸ For practical purposes, operationalizing this systems model can be achieved for different geographic (city, region, country) or thematic (sector, company) contexts, through a portfolio of relevant indicators across the three layers and the linkages between them: the bottom layer with respect to nature outcomes, the upper layer with respect to social outcomes, and sandwiched between them indicators of economic activity. For the small-scale fisheries example (see “The Sustainable Development Goals” section), local indicators of ecosystem health, fishery actors and income and other social benefits, alongside measures of the linkages—fish catch, benefits provided to consumers, governance and financial support to fishers and the fishers’ boats and gear use—may be used to provide a holistic picture of the sustainability (or not) of the fishery.

Importantly, while local-to-global quantification and linkages are desirable to know each actor’s just share and contribution to the global budget, even without this, actors can determine if their actions are stabilizing or destabilizing and worsening or improving the condition of or interactions between each domain. This frees monitoring from the “perfect being the enemy of the good” so that progress can be pursued in all contexts, rather than waiting for perfect information before taking action. This speaks to the powerful metaphor of “bending the curves of biodiversity decline”; while trajectories, or feedback loops, are trending toward decline, actors don’t need detailed quantification of the final goal: They can first “bend the curves” under their control, prioritizing drivers and underlying causes because otherwise system dynamics will continue as before, so trajectories and feedback loops bend toward the desired outcomes.⁵⁹ Once measures are trending in the right directions, actors can spend greater effort on identifying a final target, and reaching it in the most productive and effective ways. In the above fishery example, perfect data on each of the domains or interactions are not needed for first decisions to improve sustainability, where early action can achieve early wins for sustainability and progressive improvements in the fishery, and building capacities essential to enable future change.

54 Gupta et al. (2021).

55 Fanning and Raworth (2025); Raworth (2017); Khmara and Kronenberg (2023); Recordon et al. (2025).

56 Gupta et al. (2022; 2024).

57 Bai et al. (2022; 2024); Gupta et al. (2024).

58 Gupta et al. (2024); Kallis et al. (2025).

59 Mace et al. (2018).

NATURE-BASED SOLUTIONS

The concept of nature-based solutions (NbS) originated in the climate change space, where the scale and complexity of emerging challenges forced a realization that purely technical and anthropogenic solutions pale in significance compared to the potential scale and scope of solutions from nature. A corollary of the IPBES’ concept of contributions from nature is that any of the contribution classes (of which there are 18; see table 2.1) could be the substrate of a “nature-based solution.” Thus, focus has broadened from carbon sequestration (NCP 4), to insect pollination (NCP 2) as a primary service for agriculture, then to how natural systems support disaster resilience (multiple NCP: 6, 7, 9). Examples of novel approaches to nature-based solutions include restoring natural river courses and flows and reclaiming wetlands, as solutions against flooding and extreme climate events in the United Kingdom; eliminating invasive species to restore native vegetation critical to watershed management in drought-stressed Cape Town, South Africa; or regenerating mangroves across tropical coastlines in Southeast Asia and East and West Africa to address sea-level rise, storm protection, carbon capture, and regeneration of fisheries.⁶⁰

TABLE 2.1

Nature’s contributions to people (NCP) as defined by the IPBES

Earlier NCP in the table tend to be more intrinsic, middle ones instrumental, and later ones relational, though these categories overlap, and measuring and valuing any NCP will tend to instrumentalize it.

1. Habitat formation and maintenance	10. Pest, disease and stress regulation
2. Pollination, seed dispersal and connectivity	11. Production of biomass-based fuels
3. Regulation of air quality and atmospheric gases	12. Food and feed, from wild, managed or domesticated species
4. Regulation of atmospheric gases that affect climate	13. Production of materials derived from wild or domesticated species
5. Regulation of ocean acidification	14. Medicinal, biochemical and genetic resources
6. Regulation of freshwater quantity, location and flows	15. Opportunities for learning, artistic, scientific and technological inspiration
7. Regulation of freshwater and coastal water quality	16. Opportunities for physical and experiential interactions with nature
8. Formation, protection and decontamination of soils and sediments	17. Symbolic meaning, involving spiritual, religious, identity connections, social cohesion and cultural continuity
9. Regulation of hazards and extreme events	18. Preservation, by organisms and ecosystems, of options for the future

SOURCE: Adapted from IPBES (2019).

60 Gordon-Walker et al. (2007); Climate Adaptation Platform (2026); Tiggeloven et al. (2026); Song et al. (2023).

To resolve these challenges, the multiple-values-of-nature framing of the IPBES, and this systems framing of sustainability, focus attention on balance in the two feedback loops such that: (a) enhancing production of a focal NCP does not degrade nature or provisioning of other NCP, and (b) access to benefits from the solution is equitable among people, and not just serving dominant actors or those paying for it. Importantly, many NbS (such as in disaster resilience) provide benefits to society without mediation through markets and finance via the outer loop of nontraded instrumental benefits from nature to society (figure 2.2b) (though market mechanisms may be instrumental in enabling them through financing operations and development). And as demonstrated in the examples cited above, the richer the range of value streams provided by any system, the greater the return on investment in nature-based solutions—measured in aggregate “real” and monetary values.

The multiple options for, and benefits from, nature-based solutions in any natural system reinforce consideration of nature as critical infrastructure.⁶¹ With many benefits not being directly quantifiable monetarily, or tradable through financial markets, quantifying full benefit flows is essential. Global standards are already advanced for natural capital valuation of certain value streams, though many value flows (particularly intrinsic and relational values) are not addressed by these methods, and it may be inappropriate to do so.⁶² Establishing relevant indicators for them, in “natural” units relevant to each, is a critical first step. This can be followed by conversion to financial values where appropriate, based on existing knowledge, with due consideration for assumptions, uncertainties, and error embedded in any such methods, and provisions to update conversion factors and caveats as new knowledge emerges. Computational power to aggregate multiple types of data and indicators is no longer an obstacle, obviating the earlier need to convert all values into the same units, usually currency (notably, early systems modeling focused on energy as a common unit or currency, also with varied success).⁶³ Valuing the flows of the full breadth of values, nature’s contributions, and nature-based solutions from any ecosystem or production system should now be possible, to show the full breadth of benefit flows to all relevant beneficiary groups (local or distant), and thereby show the full value of investing in productive and healthy natural capital.

FINANCE

Money, or currencies, address three main functions: as measures of relative value, as means of exchange, and as stores of value. Over time, the function of storage of value has grown in importance, with finance emerging as the dominant repository or measure of wealth for individuals, companies, and countries. The value assigned to a currency represents a shared estimation of its value among people, even where a standard, such as gold, is used.⁶⁴ And as currencies have become entirely virtual, with “real” and digital currencies represented principally in computer storage, economic markets’ measures of value have become disconnected from real material value—resulting in multiple financial bubbles in recent decades.

This system model expresses the idea that nature, and the goods and services it produces that humans depend on and value, is the ultimate source of wealth. Extraction of these benefits and their sharing/circulation in society, with value added through the agency of people (work), converts natural capital into economic capital, which supports social capital. Nature regenerates itself in seasonal and annual cycles, increasing the flows from and total stock of capital across the system—in natural, economic, and societal forms, and that accumulates as financial capital. The exchange function of money facilitates these flows, and with technological change and the amplification made

61 ISEP (2026).

62 United Nations (2021).

63 Costanza et al. (1997); Odum and Odum (2000).

64 Desan (2013); Middelkoop (2016).

possible by energy, automation, and organization, markets have emerged that maximize conversion of wealth from nature through economic and social capital, through and to financial capital. The dominant market-based value system has elevated finance as a primary store of value, which we can consider as a virtual “fourth capital” that dominates the “real” capitals. These values are described in the form of “underlying causes” of biodiversity decline and the current state of the Anthropocene systems model—degrading natural capital, undermining and eviscerating social capital, and cannibalizing economic capital (e.g., in mergers and acquisitions in the most aggressive corporate takeovers).⁶⁵ This concept opens a range of corollaries:

- a. Being a “nonreal” capital, finance does not do any “work” of its own—only when it is invested in (i.e., facilitates work on) another capital. Like any technology or tool, its influence can be positive or negative, depending on the purpose or values that guide its use, i.e., that determine the indirect and direct drivers associated with its application.
- b. The conversion of natural and social capitals into financial capital has played out over centuries and millennia, accumulating in financial capital. Roots of this process started with the Romans through taxation, using money as a mechanism of imperial control and wealth accumulation, and in more recent centuries with imperialism and colonialism, the emergence of capitalism, and globalized trade, all coded in law.⁶⁶ These systems are characterized by the transfer of (natural and social) capital from some parts of the globe and their people, to others, which can be traced by trends in natural, economic, social, and financial capital accumulation over space and time.⁶⁷
- c. The current polycrisis (biodiversity decline, climate change, pollution, and others) represents the failure of markets to maintain the integrity of nature and justice and equality in society. These are rational consequences of the extractivist values that drove those markets.⁶⁸ They thus do not represent “market failures” as the markets delivered precisely what they valued, but “values failures” as the rules guiding the markets are not appropriate for sustainable outcomes.⁶⁹ Reversing trends, consequently, requires values change, not just simple tweaks to current market systems (see the “Transition or transformation?” section).
- d. Repairing nature—biodiversity, climate, and other systems—requires expanding financial flows that are perceived as costs from \$220 billion nature-positive flows in 2023 to reach an estimated biodiversity financing need of \$722 billion to \$967 billion in 2030, and transforming close to \$7.3 trillion of nature-negative flows in the global economy to nature-positive flows.⁷⁰ The current value system sees these as costs, and even the most ambitious global targets (by 2030, raise direct flows for biodiversity to \$200 billion and convert \$500 billion of negative subsidies to positive, and by 2035, raise climate finance to \$300 billion per year) come nowhere close to these amounts.⁷¹ The ratio of nature-negative to nature-positive finance in the global economic system is 30:1.⁷² Reframing values to recognize the primary value of natural (and social) capital would reframe the required financial flows as rebalancing, or return, of over-extracted capital, now held in damaging financial capital, back into foundational and productive natural (and social) capital. That is, as investment or reinvestment.

65 IPBES (2022; 2024b).

66 Middelkoop (2016); Nölke (2026); Scott (2006); Pistor (2019).

67 Hickel et al. (2022a; 2022b).

68 IPBES (2022; 2024b).

69 Dasgupta (2021); Stern (2006); Obura et al. (2026).

70 UNEP (2026), xiii; Deutz et al. (2020), 8.

71 CBD (2022), 12; UNFCCC (2024).

72 UNEP (2026), xiii.

BETTER DELIVERY ON THE SDGS

The three-element nature, economy, and society systems model is a minimum model describing the system.⁷³ But to meet the need for pragmatic alignment across countries and stakeholders, the SDGs are an operational disaggregation of it. However, as noted earlier, fixation on negotiated text diverted attention from the whole and interlinkages among the parts, to atomized delivery of individual elements, and hence the poor delivery of outcomes.⁷⁴ Further prioritization within goals, of targets and indicators with insufficient consideration of the whole, further amplified contradictions that harm delivery of the framework.

With assessment of goal delivery due in 2030, this analysis calls for actors and countries to recognize the systemic nature of the goals framework, and its relevance to individual context when localized and context-specific narratives are the focus.⁷⁵ To enable this, applying “blurred vision” to the formal framing of the SDGs liberates actors to develop and strengthen their own sustainability narratives as well as more nuanced reporting on the SDGs.⁷⁶ This may unlock enhanced alignment and collective action that is needed to advance progress on the goals, both locally and aggregated to larger scales. Multiple initiatives already foster localized interpretation of the SDGs to motivate independent action, such as the United Nations Global Compact focused on business adoption of the SDGs, or the 17 Rooms initiative and its focus on institutions such as universities developing individualized SDG strategies.⁷⁷

Post-2030 policy

In late 2027, the United Nations will formally initiate discussions on a post-2030 framework to replace Agenda 2030 and the SDGs. In support of this process, it is important to recognize that the degree of multilateral consensus and goodwill for a shared outcome is far below that in the run-up to 2015. Acknowledging this, a range of scenarios and pathways may be envisioned from the current framework (SDGs and Agenda 2030) to their successor, acknowledging the very real possibility of significant retreat to less ambition than the current goals.⁷⁸ Nevertheless, on the side of continued positive ambition, a baseline may be considered as the same set of goals and principles simply being rolled over past 2030, learning from lessons to date, potentially consolidating, adjusting, or adding goals and/or targets, and streamlining indicators and measurements. A second general option is a stronger science foundation, such as on planetary limits and social foundations that may help to identify new thresholds and guardrails for new goals and targets, though this is challenged by geopolitical sensitivity over the science. A third general option is to incorporate advances in understanding of justice and equity, including through policy declarations from the United Nations, such as the Pact for the Future and Our Common Agenda.⁷⁹ A fourth option may be to prioritize more narrowly on more achievable and tractable areas, at the risk of losing sight of the forest for the trees—that without fully comprehensive and joined-up action, true sustainability is unlikely to be achievable.

⁷³ Obura et al. (2026).

⁷⁴ Nilsson et al. (2018); Singh et al. (2018); United Nations (2024).

⁷⁵ Obura (2021); Renaud et al. (2022).

⁷⁶ Obura (2026, forthcoming).

⁷⁷ See more on the United Nations Global Compact at <https://unglobalcompact.org/>; see more on the 17 Rooms initiative at <https://www.brookings.edu/projects/17-rooms/>.

⁷⁸ Kasumba (2026); IDOS (2026).

⁷⁹ See more on the Pact for the Future at <https://www.un.org/pact-for-the-future/en>; see more on Our Common Agenda at <https://www.un.org/en/common-agenda>.

An approach that strengthens mechanisms of implementation while enabling diverse national approaches could include the systems approach presented here, offering countries and actors the opportunity to commit to a systemic outcome (of balance, or balanced “growth”) with freedom to pursue an approach they may find more aligned with national priorities and culture. Critically, however, all must acknowledge their interdependency and mutual interest, to commit to forging alignment under a global vision, sufficient ambition to achieve global balance, and to avoid competitive harm. This systems framing offers some key solutions:

- If the same or minimally updated goal framework is retained, countries and actors can focus on improved implementation led by systems approaches. Most critically, let’s not throw the baby out with the bathwater.
- If an altered goal structure is preferred, of critical importance are their interlinkages and integration. This may be addressed through complementary and systemic targets and supporting indicators, and a focus on integrated—and not isolated—achievement.
- Essential is to ensure extension of the framing (system) across scales from global to local and back, enabling contextual differentiation, where goals and interactions may be expressed more tangibly for varied contexts, but actively delivered. This is enabled by flexibility and guidance on context- and scale-appropriate indicators, which may be used for reporting and alignment among actors at their scales, with upward aggregation.
- Explicit connections to existing agreements and institutions, to link commitments across specific themes. For example, the Global Biodiversity Framework and other multilateral environmental agreements linked to nature goals, the Paris Agreement linked to climate change as well as in relation to economics and trade, food, health, equality, and rights, and others. Forging more explicit linkages and recognition across sectoral instruments.⁸⁰
- In between the poles of no agreement and global consensus, leadership by mini-lateral groups, regions, or coalitions of the willing may enable the strongest engagement and delivery in specific geographies and contexts. This approach may focus on enabling collective action and future integration and upscaling, rather than acceptance of lowest-common-denominator agreements and minimal ambition.

Beneath the rhetoric of disagreement and nationalism in multilateral arenas, and in the loudest voices in mainstream and social media, a strong undercurrent of common cause is voiced, as well as of common and trusted findings among sciences and knowledge systems.⁸¹ Rebuilding the simple idea of sustainability, through a mechanistic understanding of the dependencies of economy and society on nature on a finite planet, may yet hold sway to deliver strong guidance for future pathways to sustainability.

⁸⁰ CBD (2022); UNFCCC (2015).

⁸¹ Turcu (2025); LRF (2026).

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