Social-Ecological Resilience and the network SECORES A short overview

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1. What is the Network for Social-Ecological Resilience?

The Network for **S**ocial-**Eco**logical **Res**ilience SECORES has been created by 9 Belgian organizations during the elaboration of their Joint Strategic Framework which covers their five-year-programs co-financed by the Belgian government: BOS+, CEBioS, Join For Water, VIA Don Bosco, WWF Belgium and Uni4Coop (being the structural collaboration of 4 NGOs).

While the Joint Strategic Framework is more oriented towards its members, the objective of the network SECORES is to integrate the concept of social-ecological resilience in Belgian development cooperation, which includes not only the large range of Belgian actors, but also their partners in the field. More specifically, the network aims at (a) strengthening knowledge on social-ecological resilience; (b) improving the coherence of (Belgian) development policy; and (c) stimulating synergy on this topic.

Although the network has been created by 9 organizations, it offers a platform to a broad participation of organizations interested in and working on (aspects of) resilience. This document describes the fundamental concepts on social-ecological resilience and how we, as members of the network, work on its application. This text is based on the Join Strategic Framework 2022-2026 which includes all necessary references that have been omitted here to increase readability.

2. Social-ecological resilience: what is it about?

2.1. Resilient ecosystems

Resilience can be defined as *the level of disturbance that an ecosystem or society can undergo without crossing a threshold to a situation with different structure or outputs; resilience depends on factors such as ecological dynamics as well as the organizational and institutional capacity to understand, manage, and respond to these dynamics*. Another, shorter definition is *the capacity to deal with change and continue to develop*.

An **ecosystem** is *a dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit*. Ecosystems can be "natural and undisturbed", such as wilderness areas or natural parks, but they can also include agricultural areas, or urban ecosystems or built environments.

The 21st century has been termed 'the Anthropocene', the geological era where the influence of humans is so pervasive that all ecosystems on earth are altered by this influence on a scale akin to the great forces of nature. At the same time, social and economic development of humanity is bound by the physical and ecological limits of the biosphere, as described further down with the concept of planetary boundaries. During the past centuries, the human impact on ecosystems at local and global scales reduced their resilience, i.e. the capacity of a system to both withstand shocks and surprises and to rebound itself if damaged, and therefore its ability to support human development.

While ecosystems and humans are often considered separately, we consider them jointly within social-ecological systems. Ecosystems and social systems, whether local or global, are intrinsically linked with each other and shape each other continuously in complex ways. The term emphasizes that humans must be seen as part of, not apart from, nature – that the delineation between social and ecological systems is artificial and arbitrary. In a similar vein, the Covid-19 pandemic demonstrates exactly how fragile our global social-ecological system is.

Social-ecological resilience can therefore be defined as *the capacity to adapt or transform in the face of change in social-ecological systems, particularly unexpected change, in ways that continue to support human well-being*.

2.2. Planetary boundaries

In the planetary boundary framework, nine services or processes have been identified, all of which have specific boundaries that we should not surpass (Figure 1). In 2015, an international team of 18 scientists found that four of nine planetary boundaries have been crossed because of human activity (biosphere integrity, climate change, biochemical flows, and land-system change). Un update in 2022 showed that two others have also been crossed: freshwater use (green water component) and novel entities. Climate and biosphere integrity are core boundaries providing the planetary- level overarching system in which all the other planetary boundaries operate. On their own, they would likely be able to push the Earth system out of the current stable state (see next chapter on ecosystem collapse and alternative stable states).

The effects of climate change are already visible with extreme weather events impacting agricultural production and coastal settlements, amongst others. Scientists estimate that global warming above 1.5°C puts us at high risk of runaway global warming and ecosystem collapse.

Biosphere integrity, where the biosphere is defined as the totality of all ecosystems on Earth and their biota, regulates the earth's material and energy flows and its responses to abrupt or gradual change. Biodiversity is an important component of biosphere integrity since it provides resilience to ecosystems via its function as the reservoir of genetic diversity, the capacity to adapt to new situations, and the attribute of redundancy that enables other species/genotypes to take over the function, if a certain species or genotype is removed from the system.

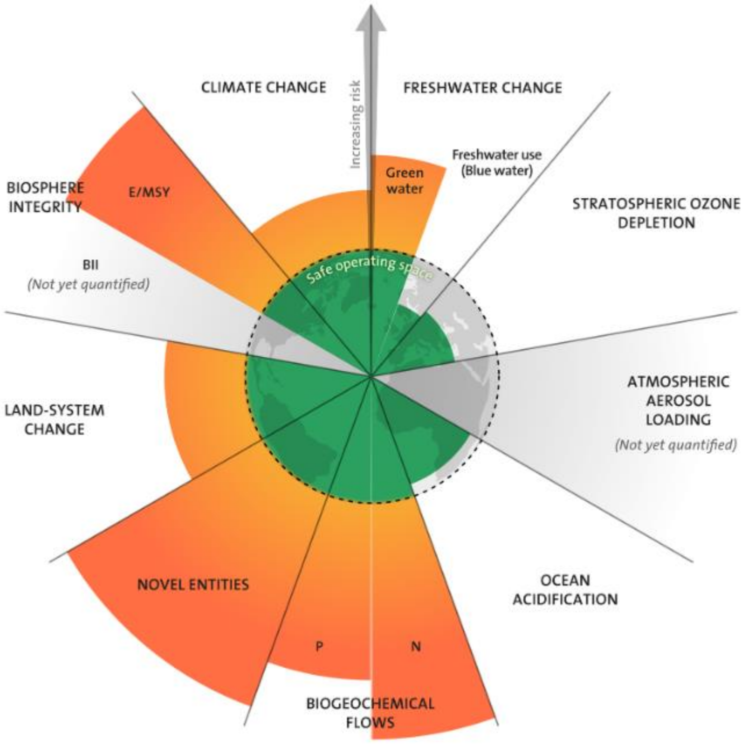


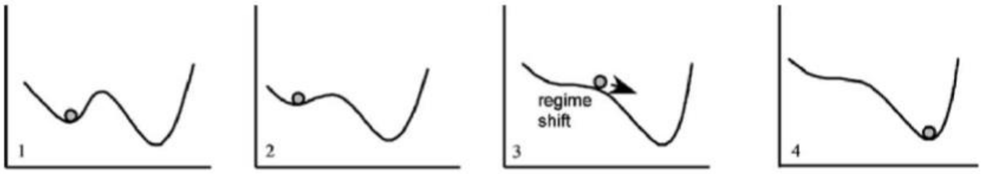
Figure 1 – Six of nine planetary boundaries have already been crossed because of human activity
Source: Stockholm Resilience Centre

2.3. Ecosystem collapse and alternative stable states

Ecosystems with reduced resilience are more prone to tip towards another stable state. When planetary boundaries are surpassed, the resilience of ecosystems is reduced to the point that shifts become very likely. An abrupt shift in an ecosystem's state, with negative consequences on biodiversity and ecosystem services (ES), is termed "ecosystem collapse". After such collapse, ecosystems can re-invent themselves and re-organize into an (alternative) stable state (see examples in Figure 2).

However, recovery towards the previous steady state potentially requires a huge effort and a restoration of environmental factors far beyond the previous state, due to non-linear behaviour of complex ecosystems. Reorganization of ecosystems into a new stable state or restoration of ecosystems towards a previous stable state can happen with the assistance of human actions.

There is broad consensus that the global ecosystem should remain within the current stable state to guarantee long-term human survival. Ecological degradation inducing ecosystem collapse at a global scale would bring us to unknown terrain with all related risks (e.g., climate, diseases, food insecurity). This means humanity needs healthy ecosystems to benefit from all the services they provide.



clear-water lakes	phosphorous accumulation in agricultural soil and lake mud	flooding, warming, overexploitation of predators	turbid-water lakes
coral-dominated reefs	overfishing, coastal eutrophication	disease, bleaching hurricane	algae-dominated reefs
grassland	fire prevention	good rains, continuous heavy grazing	shrub-bushland
grassland	hunting of herbivores	disease	woodland
kelp forests	functional elimination of apex predators	thermal event, storm, disease,	sea urchin dominance
pine forest	microclimate and soil changes, loss of pine regeneration	decreased fire frequency, increased fire intensity	oak forest
seagrass beds	removal of grazers, lack of hurricanes, salinity moderation, spatial homogenization	thermal event	phytoplankton blooms
tropical lake with submerged vegetation	nutrient accumulation during dry spells	nutrient release with water table rise	floating-plant dominance

Figure 2 – Some examples of alternative states (Adapted from Folke et al. 2004)

Explanation of Figure 2

- Graph 1 and 4: two scenarios for a variety of ecosystems of a possible equilibrium state (small circle) and pathways of energy or difficulty to shift to an alternative state. In graph 1, the ecosystems are still in a healthy state, but may shift to the right (new state) by means of a large external event (small hyperbole between the two dips, representing the 'tipping point'). In graph 4, the alternative unhealthy state is difficult to be shifted back (steep lines or deep dip).
- Graph 2 provides some possible causes of decreased resilience (hyperbole between the two dips becomes flatter) for each of the ecosystems listed under graph 1. These causes will make it easier for the equilibrium state to pass the tipping point and fall in a new alternative undesired state. Note also that the alternative state is situated at a deeper level (Y-axis) than the original state, making it more difficult (demanding more energy) to return to the normal (or be restored).
- Graph 3 provides some triggers for these shifts to unhealthy or undesired states.

2.4. Ecosystem services

The Millennium Ecosystem Assessment, MEA defines ecosystem services as the benefits people derive from ecosystems. These services are broadly classified in three or four categories: supporting, regulating (supporting and regulating services are occasionally combined to just "regulating"), provisioning (material, as described in Figure 3), and cultural (non-material in Figure 3). Since this original conceptualisation of ecosystem services, the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) has reinforced the message of their importance to human well-being. In their framework, they preserve the four original service types as identified by the MEA and take it a step further to discuss "*Nature's Contribution to People*". This progression places indigenous and local knowledge as well as cultural services at the centre of the links between people and nature. Figure 3 shows the relationship between ecosystem services and human well-being, as presented in the conceptual framework from the IPBES. This relationship can differ depending on gender, age, socio-economic position etc.

There is compelling evidence that human well-being is intrinsically linked to resilient ecosystems (functional ecosystems). Biodiversity loss impacts human well-being and development actions leading to biodiversity rich ecosystems result in an overall net gain and stabilisation of ecosystem processes, which ultimately benefit humans via sustainable ecosystem service availability and quality. Also, the "One Health" approach conceptually takes a holistic and cross-sectorial view of disease, vector, humans, animals, and their environment. This explicit link between ecosystems and human health and the pathways linked to disease transmission is very pertinent, in view of the pandemic crisis of Covid-19.

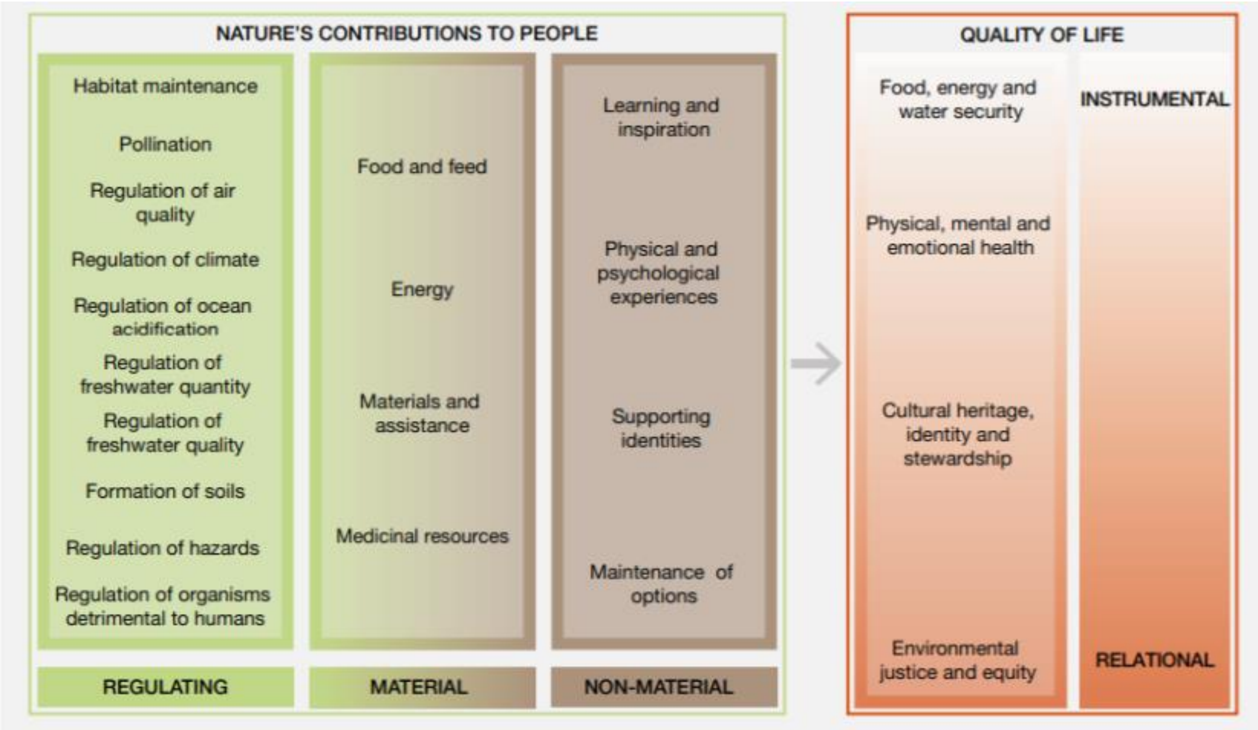


Figure 3 - IPBES framework describing Nature's Contribution to People and the link to Human Well Being with reference to regulating, material and non-material ecosystem services

2.5. Drivers of biodiversity and ecosystem change

Understanding the factors that cause changes in ecosystems and ecosystem services is essential to design interventions that capture positive impacts and minimize negative ones. The IPBES provides very useful frameworks and detailed reports to understand the drivers of biodiversity and ecosystem change. They distinguish **direct** drivers, which have direct physical (e.g., mechanical, chemical, noise, light) impacts on nature and/or people from **indirect** drivers, which operate diffusely by altering and influencing direct drivers. See Figure 4 for a schematic overview of direct and indirect drivers. The five main direct drivers in descending order of importance are 1) land use change, 2) direct exploitation, 3) climate change, 4) pollution, and 5) invasive species. Indirect drivers include institutions, economic, demographic, technological, governmental, regional conflicts, and wars, sociocultural and socio-psychological, and health related drivers.

In Figure 4 the colour bands represent the relative global impact of direct drivers, from top to bottom, on terrestrial, freshwater, and marine nature, as estimated from a global systematic review of studies published since 2005. Land- and sea-use change and direct exploitation account for more than 50 per cent of the global impact on land, in fresh water and in the sea, but each driver is dominant in certain contexts. The circles illustrate the magnitude of the negative human impacts on a diverse selection of aspects of nature over a range of different time scales based on a global synthesis of indicators.

Effective and long-lasting improvement of ecosystems and their services requires actions both on the domain of the direct drivers and the indirect drivers, the underlying causes that are more systemic and have complex links with the direct drivers. The future demographic and consumption patterns are very important indirect drivers.

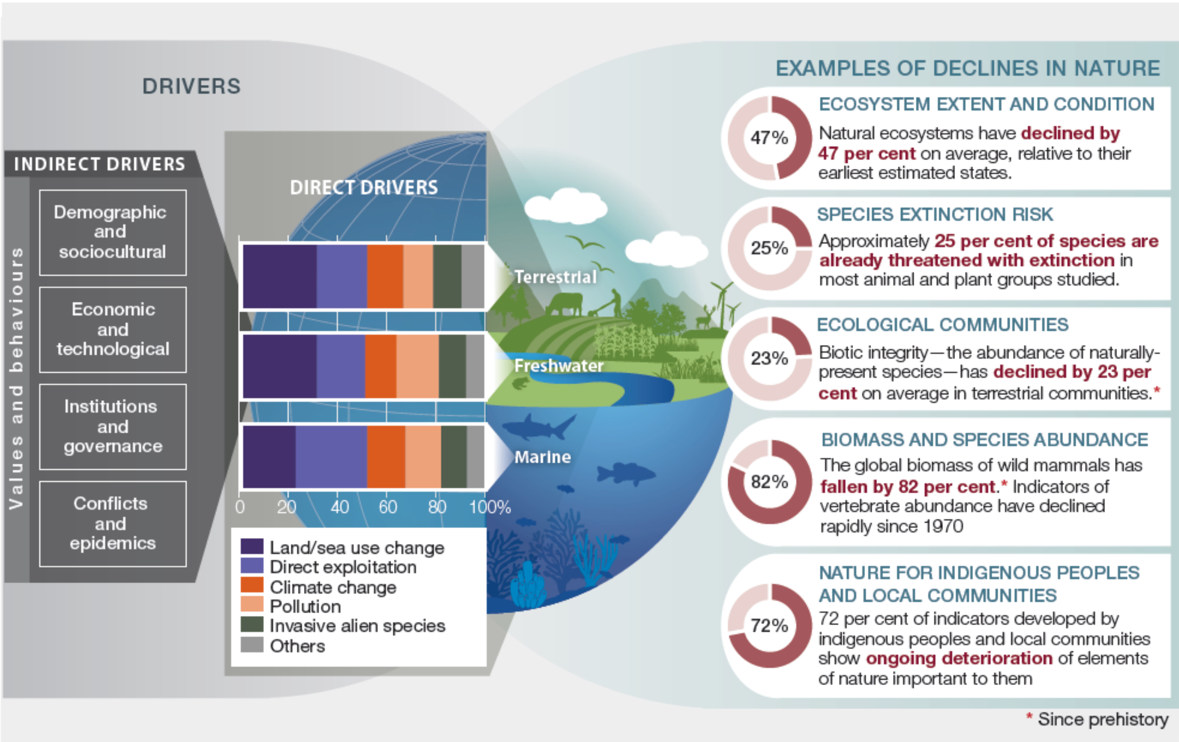


Figure 4 - Examples of global declines in nature, emphasizing declines in biodiversity, that have been and are being caused by direct and indirect drivers of change (source: Diaz, S. et al. (2019)

2.6. Connection between global and local scales in the short and long term

In an increasingly interconnected world, global and local scales are interlinked in complex ways. Global phenomena have local repercussions, and events at local level can contribute to global phenomena. It is important to understand that, while scientific knowledge dominates the considerations of global and long-term processes (such as climate change), local, traditional, and practitioner's knowledge often dominates the considerations of site-specific resource management issues, where detailed scientific studies may not exist. It is therefore necessary to bridge the gaps between the global and local scales.

The temporal scale is also important to consider. Sometimes, the feedback or consequence of one action is not felt in the immediate term, or contrarily, there may be negative impacts in a shorter term that may still provide positive outcomes in the future. As an example, it is vital that people can harvest natural resources. However, in a context where the access and use are unchecked and the system is depleted, the short-term consequence of limiting or managing the resource harvest will provide resilience in the long-term, as the ecosystem is able to "bounce-back" to continue furnishing services in higher quality and quantity. The temporal scale therefore becomes critical – seeking social-ecological resilience is not just for the current generation, but for humanity to benefit in years to come.

2.7. Global processes and institutions to address ecosystem change

The importance of maintaining and restoring healthy ecosystems is widely recognized and is reflected in the existence of many platforms, institutions and agreements on a global and regional level that aim to put conservation of our global ecosystem at the highest priority level. A societal and economic transition is necessary to stay within the planetary boundaries. This is clear from the general inability to meet the political goals (though countries such as Denmark and Costa Rica prove otherwise) to keep warming well below 2°C (Paris agreement) or maintain biodiversity (Aichi Biodiversity Targets).

Figure 5 – SDG representation from the Stockholm Resilience Centre, placing four SDGs as the basis for societal and economic development/well-being

The sustainable development goals clearly recognize climate action (SDG13), healthy ecosystems and their services (SDG6; clean water; SDG14, life below water; SDG 15, Life on land) as important elements for well-being and development. In their representation of the SDG's, the Stockholm Resilience Centre visually represents how these SDG's form the basis of sustainable development (Figure 5). This representation of the SDG’s reflects the planetary-boundaries view, which is outlined higher up. **A healthy biosphere is a precondition for sustainable social and economic development**.

Several international conventions are at the basis of our interventions. Especially the Rio conventions on climate change (IPCC) and biological diversity (CBD) are essential in this respect. The IPCC generated the 2015 Paris agreement, which asks all parties to work on a zero-carbon economy and reducing carbon emissions to reach a maximum increase of 1.5 °C. The CBD articulates around its 2010-2020 strategy with the 20 Aichi targets. These targets will be updated in 2021 at the COP-15 for the next strategy. The IPBES is the equivalent intergovernmental platform like IPCC, but for biodiversity and ecosystem services. It provides scientific assessments and advice to the CBD.

3. How to work on social-ecological resilience?

3.1. Conceptual framework

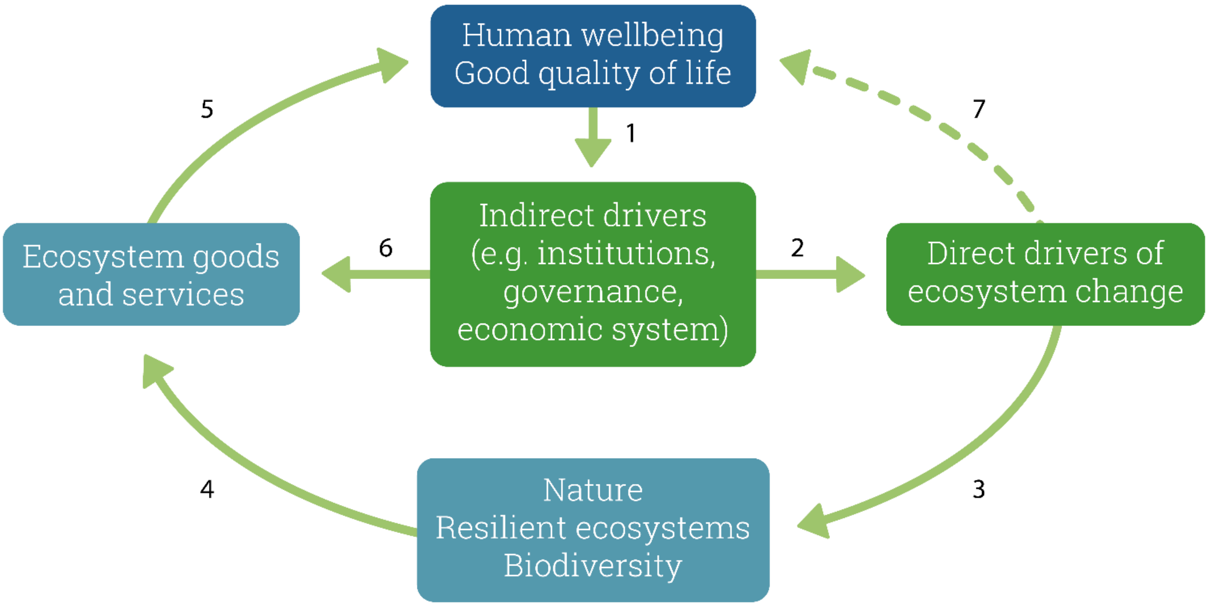


Figure 6 - Conceptual framework summarising interactions between the natural world and human societies

The conceptual framework in Figure 6 is based on the conceptual framework of the IPBES and summarizes the above analysis. It is a simplified representation of the highly complex interaction between the natural world and the human societies within the social-ecological system. This conceptual framework also forms the basis of the Theory of Change (TOC).

We follow the vision of the IPBES that the ethical and ecologically sustainable utilisation of nature are key components for human well-being. The way in which a society adopts this vision will be directly reflected in institutions, governance systems, economic systems, and other indirect drivers (**link 1**). This could be the existence of rights to land and water use, pollution control, regulations on use of ecosystems (hunting, extraction).

Indirect drivers affect the direct drivers of ecosystem change, for example, population size and lifestyle choices will influence the amount of land that is allocated to food crops, energy crops or cattle (**link 2**). Direct drivers affect the ecosystem and thus their ability to deliver ecosystem goods and services which contribute to human well-being (**link 3, 4 and 5**).

Indirect drivers also modulate the link between nature and human well-being by regulating the access to and the use of ecosystem goods and services (**link 6**). Direct drivers also can impact human well-being directly, for example, pollutants or heat strokes not only impact ecosystems but can also impact human health (**link 7**).

3.2. Theory of change

Our **first assumption** is that the main guarantee for human well-being is to act within the planetary boundaries – i.e., our rate of extraction/consumption/discharge should be in line with the rate at which the planet can replenish, regulate, and absorb.

The **second assumption** is that, to remain within the planetary boundaries, resilience of social-ecological systems is needed. As described above, the natural/ecosystem integrity (biosphere properties) is a precondition for social and economic development, and human well-being.

The TOC builds on the **summarizing conceptual framework** above. Human behaviour has generated direct drivers (arrow 2) that impact ecosystems (arrow 3), and ecosystems' ability to endow services in the necessary quality and quantity (arrows 4 and 6). This decrease in turn impacts humans (arrows 5 and 7), generally in a negative way. This relationship is described as a feedback loop. One negative action by humans negatively impacts the ecosystems, and boomerangs on humans.

However, as **third assumption**, the same feedback loop with negative repercussions can be reversed to reap benefits (i.e., in a positive direction). Human behaviours that are modified to limit/stop the drivers of ecosystem change (arrow 2), and simultaneously implement actions that directly conserve or enhance ecosystem functionality (arrows 3, 4 and 6) can tip the scales and foster a positive link between the social and ecological systems. This means that we must change (a) rights, policies, and governance; (b) awareness, knowledge, and skills; (c) the way ecosystems are influenced; and (d) the way ecosystem services are accessible and managed.

More **resilient social-ecological systems** are those that can keep functioning properly and weather the upcoming storm, because they are able to cope with changes. Resilient social-ecological systems will show increased capacity to deliver ecosystem services and manage and use them in a sustainable way which, in their turn, will increase the integrity and stability of the system in the face of unfavourable changes.

The **ultimate change** is improved well-being of local communities in their surrounding ecosystems which, we believe, is brought about by improving social-ecological resilience.

In the sphere of influence, the desired changes translated to **4 strategic goals** are

1. Improved rights, policies, and governance of ecosystems and natural resources
2. Improved awareness, knowledge, skills about sustainable ecosystems
3. Strengthened sustainable access to, management and use of ecosystem services
4. Ecosystems are conserved or restored for optimal functioning

The strategic goals are **mutually supportive** and are intended to be implemented **in parallel**. Three goals are specifically linked to the desired changes sought from actor-groups and key stakeholders. The fourth goal is associated with the bio-physical aspects of ecosystems themselves.

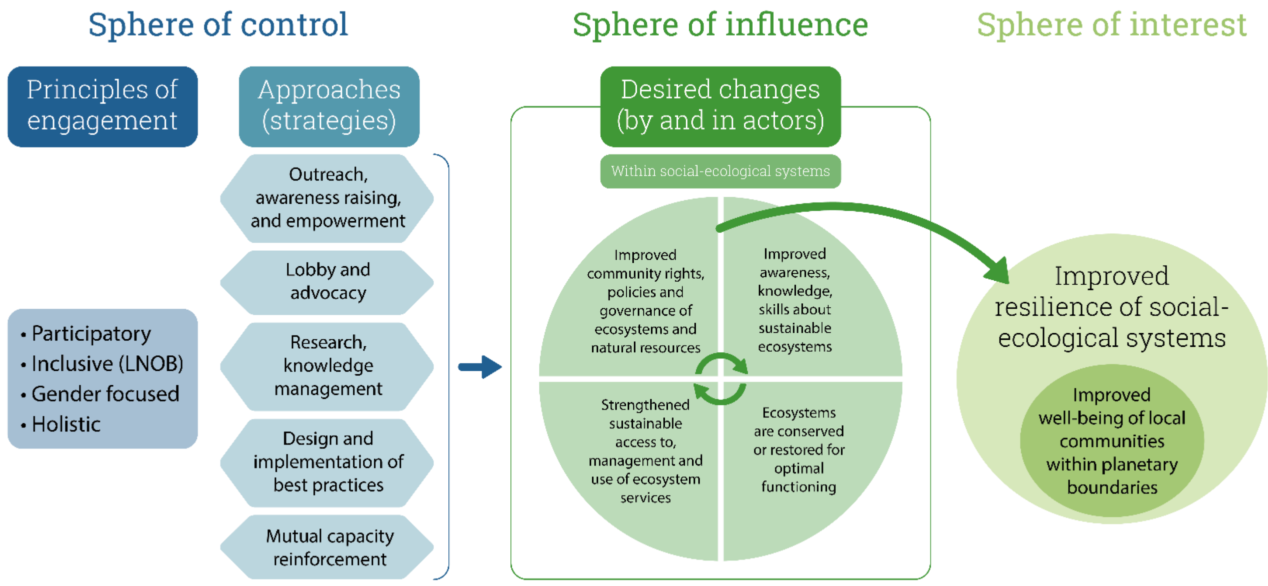


Figure 7 – Theory of Change for Social-Ecological Resilience

Changes do not happen automatically. They are linked to people. Diverse actors contribute in a positive or negative way to social-ecological systems. To achieve resilient social-ecological systems, we need changes by and in these actors. Sometimes we will work together with them; sometimes we will be at cross-purposes, with an objective to influence them. We identified **10 types of actors**:

- (1) indigenous people and local communities; (2) individual consumers; (3) civil society
- (4) primary, secondary, technical, and vocational schools; (5) research, universities, higher education
- (6) cooperation & development actors
- (7) local authorities; (8) national authorities; (9) multilateral/ International organisations
- (10) private sector

While we describe, in a broad way, 10 types of actors, we recognise that there can be overlap among actor groups. An individual consumer could also be targeted as a community member in some interventions, and indigenous people or local communities can also be organised into civil society organisations or cooperatives, etc. This fluid nature of actor types, overlapping with each other, lends a layer of complexity in the interactions. A Multi-Stakeholder Partnership will aim to positively reinforce favourably aligned relationships among actor types and find solutions or arrive at compromises among actor groups with competing objectives regarding social-ecological resilience.

Programmes will be based on **5 approaches**: (a) outreach, awareness raising and empowerment; (b) lobbying and advocacy; (c) research, knowledge management; (d) designing and implementing best practices; and (e) mutual capacity reinforcement.

Finally, **4 principles of engagement** are underlying to all programs: (a) participation; (b) inclusiveness (leave no one behind); (c) gender focus; and (d) holistic vision.

Further reading

- Stockholm Resilience Centre: https://www.stockholmresilience.org/
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES): https://ipbes.net/