

Linking LCA and SDG 15

Goal 15. Life on land: protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

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15 Goal 15. Life on land

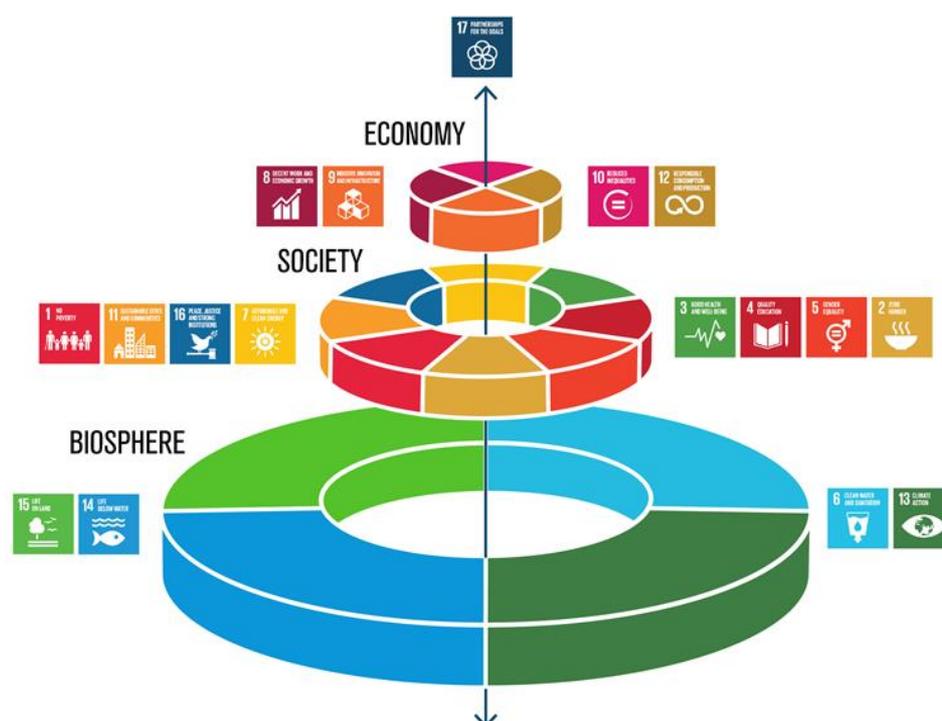
15.1 Introduction

The subtitle of SDG 15: Life on land, is “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.” This SDG focusses on nature and biodiversity.

According to Johan Rockström (Former director of the Stockholm Resilience Centre) and Pavan Sukhdev (President and Board Chair of the Worldwide Fund for Nature, WWF International), the SDGs related to the biosphere (on water, climate change, life below water and life on land) are crucial to reaching the other SDGs, as our economy cannot thrive without society, and both find their foundation in our natural resources.

Figure 1 below highlights the role of the biosphere related SDGs.

Figure 1: Re-structured of the view on the SDG's according to Röstrom and Sukhdev (2019)



Currently, humans have changed almost three-quarter of the earth's surface, which leaves little room for wildlife and nature. Human presence leads to deforestation, desertification, land degradation, and biodiversity loss.

Relevant literature on this topic is best summarized as: “Global biodiversity is falling at an alarming rate.” The Global Assessment Report on Biodiversity and Ecosystem Services from the

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) states that one million species face extinction (CBD, 2020).. The living planet report from WWF concludes that we are failing to protect the natural resources we rely on (CBD, 2020).The UICN Red List of Threatened Species (CBD, 2020).shows we live in an age of unprecedented loss of species, which undermines the achievement of important goals we have in society.

15.2 Targets and indicators of SDG 15

SDG 15 aims to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

There are several targets that are focused on ensuring the health, conservation, restoration and sustainable use of nature, ecosystems and their services. Target 15.1 specifically targets *terrestrial and inland freshwater ecosystems*, target 15.2 is focussing at *forests*, target 15.3 aims to halt land degradation and target 15.4 ask for special attention for *mountain ecosystems*. Target 15.8 also belongs in this category. There is no specific ecosystem mentioned in target 15.8, but the goal is to prevent the impact of invasive species in order to ensuring the health and conservation of ecosystems.

Target 15.5 is about reducing the degradation of natural habitats, combatting biodiversity loss, and reducing the number of species threatened with extinction.

The most important environmental impact categories related to these targets are land use, water use, climate change, eutrophication, acidification, and ecotoxicity. This is derived from the five main environmental causes for the loss of nature, biodiversity and ecosystems services (IPBES, 2019):

- Habitat change (land use change and physical modification of rivers or water withdrawal from rivers) or land/sea use change
- Overexploitation / resource extraction
- Invasive alien species
- Pollution
- Climate change

Habitat change is covered by the land use impact category. Overexploitation and resource extraction is partly covered by water use. Invasive alien species are not covered by LCA impact assessment methods, and pollution is covered by eutrophication, acidification, photochemical ozone formation, and ecotoxicity. Climate change is covered in life cycle assessment.

Of course, these environmental impacts caused by humans have a direct link with social and economic issues covered in the Handbook for Product Social Impact Assessment. The most important social indicators are access to tangible resources, community engagement, employment & skill development, meeting basic needs and land rights.

The relationship between biodiversity and social indicators related to peoples economic situation, like, employment and meeting basic needs, is complex and in many ways bi-directional. The Convention on Biological Diversity (CBD) states that biodiversity has an important role to play when it comes to social economic development:

“Biodiversity is crucial to the reduction of poverty, due to the basic goods and ecosystem services it provides. Globally, some 2.6 billion people worldwide draw their livelihoods either partially or fully from agriculture. More than 3 billion people depend on marine and coastal biodiversity, while over 1.6 billion rely on forests and non-timber forest products. Loss of biodiversity poses a significant threat to their livelihoods. Biodiversity must therefore be protected and sustainably used for achieving poverty reduction and sustainable development” (CBD, 2020).

Biodiversity is required to lift people out of poverty, but meeting basic needs and employment is also needed to prevent further loss of nature. Property right can play a crucial role here. If property rights are secured, people owning the land have an incentive to protect nature as they can benefit from the ecosystems services provided. Furthermore, places with a proper rule of law in which land rights are secured, can attract investments in nature conservation and sustainable resource use.

Table 1. The targets and indicators defined for SDG 15

Target	Indicator
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.1 Forest area as a proportion of total land area 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	15.2.1 Progress towards sustainable forest management
15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	15.3.1 Proportion of land that is degraded over total land area
15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	15.4.1 Coverage by protected areas of important sites for mountain biodiversity 15.4.2 Mountain Green Cover Index
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	15.5.1 Red List Index

15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed	15.6.1 Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits
15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products	15.7.1 Proportion of traded wildlife that was poached or illicitly trafficked
15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	15.8.1 Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species
15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting
15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems	15.a.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments
15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation	15.b.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments
15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local	15.c.1 Proportion of traded wildlife that was poached or illicitly trafficked

communities to pursue sustainable livelihood opportunities

15.3 Classifying the links between SDG 15 targets and LCA impact categories

15.3.1 Target 15.1, 15.2, 15.3, 15.4, 15.5, and 15.8: Ensure the health, conservation, restoration and sustainable use of nature, ecosystems and their services

Target 15.1: "By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements."

Target 15.2: "By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally."

Target 15.3: "By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world."

Target 15.4: "By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development."

Target 15.5: "Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species."

Target 15.8: "By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species."

These targets all have in common that they aim to ensure the health of nature, ecosystems and their services in general (target 15.1 on forests, wetlands, mountains and drylands). Some targets have a specific focus on a type of ecosystem, like forests (15.2), deserts (15.23), and mountains (15.4). Target 15.5 is focussed on preventing the extinction of species within these ecosystems and target 15.8 aims to prevent the occurrence of invasive species.

These targets were grouped together because the drivers of loss are the same for ecosystems in general and in LCA there are no specific impact categories for specific ecosystems. We assume that limiting the drivers for loss in biodiversity or ecosystem quality will also prevent further extinction of species and limiting land use change and other human induced activities will limit the impact of invasive species.

Environmental LCA:

The EF 3.0 method does not have a standardised way of dealing with biodiversity impact. Currently the technical secretariat developing the product category rules, shall determine whether biodiversity is relevant and include the topic by assessing the percentage of material in the product that have impact on biodiversity. Alternatively, certification schemes can be used as a proxy. Although there is no specific standard to include biodiversity in a PEF study, the PEF CR guidance document (EC: 2018) mentions at least 6 impact categories included in the EF method

that have an effect on biodiversity; climate change; eutrophication aquatic freshwater; eutrophication aquatic marine; acidification; water use; and land use. According to the ReCiPe2016 impact assessment method (Huijbrechts et al. 2016), photochemical ozone formation also has an impact on terrestrial ecosystem quality. Therefore these environmental impact categories are linked to goal 15, target 15.1 to 15.5 and 15.8.

These impact categories link to biodiversity impact. In the EF method, the links are not quantified to an endpoint area of damage. In ReCiPe 2016, they are. The area of protection is the natural environment, the endpoint is damage to ecosystem quality and the result reflects the time integrated species loss expressed in species.yr.

The results reflects the health of an ecosystem determined by the change in the potentially disappeared fraction of species. This indicator can serve an indicator for the health of nature, ecosystems and biodiversity. The indicator can also serve as a proxy for the risk of losing ecosystem services when we assume that areas with healthy ecosystems offer more ecosystem services than degraded land and areas where a large part of biodiversity is lost.

Environmental LCA:

- **Climate change** is listed as one of the key drivers of biodiversity loss in the IPBES report (IPBES, 2019). There is a direct match with the LCA impact category 'climate change.' Like in most impact assessment methods, the EF 3.0 method uses radiative forcing as global warming potential (GWP100) from the baseline model of 100 years of the IPCC (based on IPCC 2013).

Climate change and biodiversity are interrelated. First, climate change has an impact on biodiversity, it is a dominant driver of current and future biodiversity loss because changing temperatures lead to changes in ecosystems. The species living in those ecosystems need to adapt, or migrate to other areas if they are available. If the species cannot adapt and habitat is not available, climate change will lead to a loss of species.

The loss of biodiversity also magnifies the negative effects from climate change, and lead to more land use change, invasive species and disturbance, for instance by more wildfires, extreme weather events like storms, and droughts.

- **Land use** is one of the main causes of the decline in health of nature, ecosystems and their services. Examples are agricultural production, urban settlement of mineral extraction. The environmental problem arise when natural areas are converted to areas with anthropogenic activities.

In LCA there are multiple ways to model land use impact. Some methods focus on the quality of the soil, others look at the physical changes to flora and fauna. The EF method includes the LANCA model, focussing on carbon content as an indicator of (mostly agricultural) soil quality, while ReCiPe2016 for instance calculates the biodiversity impact due to habitat change. Both ways of modelling land use impacts can lead to the endpoint of ecosystem quality. An overview of the cause-effect chain is provided in the following figure.

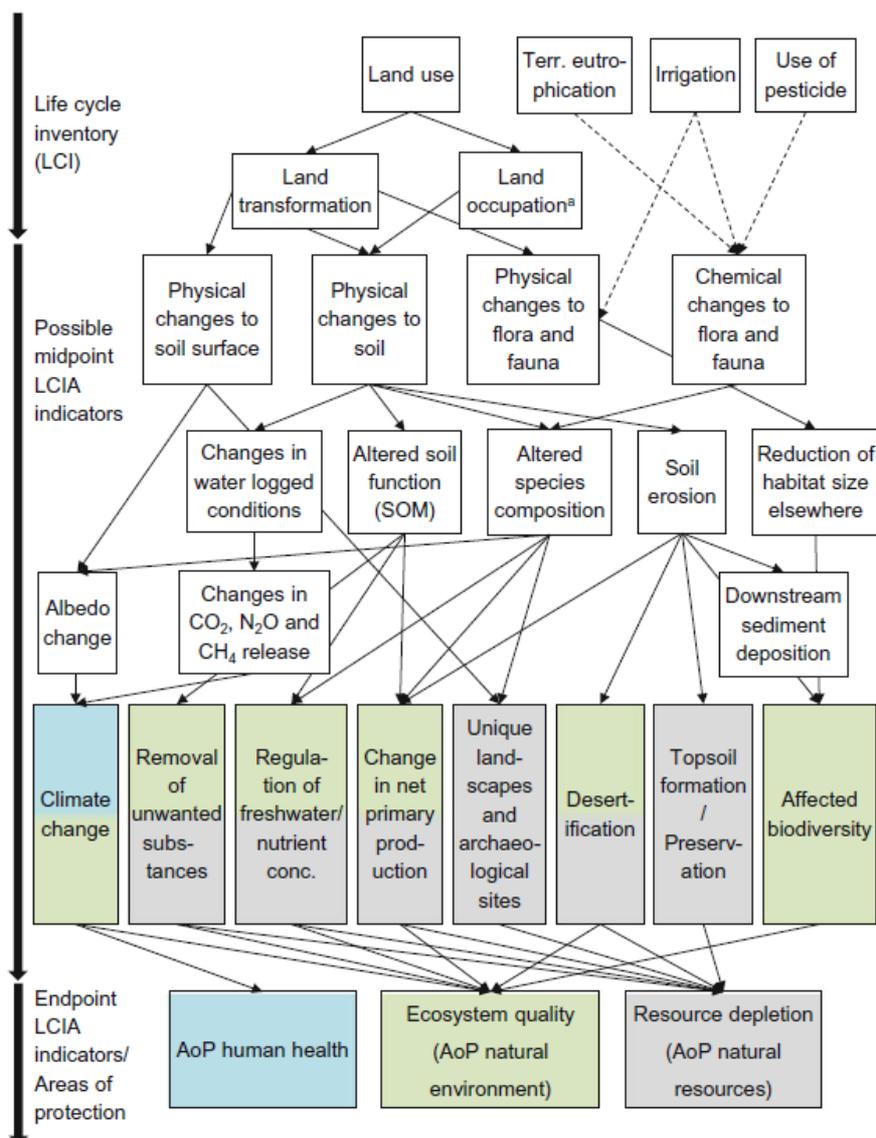


Figure 2: Impact pathways for land use by Rosenbaun et al. (2018) ^aLand occupation will not cause changes, but will continue to prolong the changes conditions. From: Ralph K. Rosenbaum, Michael Z. Hauschild, Anne-Marie Boulay, Peter Fantke, Alexis Laurent, Montserrat Núñez and Marisa Vieira (2018) Chapter 10 Life Cycle Impact Assessment. In Life Cycle Assessment Theory and Practice. Hauschild, Rosenbaum & Olsen (eds).

- **Water scarcity** has a link with both the human health and the ecosystems damage category. Sustainable use of water is needed to match both demand from humans, while preventing constraining the water availability for terrestrial ecosystems. Impact from water use can be quantified in several ways, the first water footprints simply measured the total water use. Later, impact assessment methods were developed using the water to withdrawal-to-availability as indicator. Is the water is released in the same watershed, the withdrawal will not lead to scarcity, so consumption-to-availability indicators were developed. In 2016, Boulay et al developed the Available Water Remaining (AWARE) indicator, based on availability minus demand. This is a better match with an impact

pathway to ecosystem damages since earlier indicators did not reflect shortages resulting from water use. The EF 3.0 method includes the AWARE method for water scarcity, so this model is suited to link with damages to ecosystems.

“Acidification of soil or aquatic ecosystems can be defined as an impact which leads to a fall in the system’s acid neutralising capacity (ANC), i.e. a reduction in the quantity of substances in the system which are able to neutralise hydrogen ions added to the system” (Rosenbaum et al. 2018).

- Acidification is caused mainly by emissions of NH₃, NO₂ and SO_x. The method by Seppälä et al. (2006) and Posch et al. (2008) uses Accumulated Exceedance (AE) characterizing the change in critical load exceedance of the sensitive area in terrestrial and main freshwater ecosystems, to which acidifying substances deposit. This links well with the targets 15.1, 15.2, 15.3, 15.4, 15.5, and 15.8. Ocean Acidification (mainly caused by CO₂ emissions) is not included in the method, this is not a problem since it has no direct link with terrestrial ecosystems (and SDG 15 life on land).
- **Eutrophication** is another main contributor to ecosystem damages. In LCA eutrophication is often split in aquatic and terrestrial eutrophication. Aquatic eutrophication can also be split in freshwater and marine eutrophication. The main contributors to eutrophication are (inorganic) fertilisers and manure, agriculture is a major source of nitrogen (most important for terrestrial and marine eutrophication) and phosphorus emissions (most important for freshwater aquatic eutrophication). The main problem for ecosystems is the excess nutrients which disturb the natural vegetation. For life on land we can make a link with both terrestrial eutrophication as well as aquatic freshwater eutrophication. No link is made with marine eutrophication since this is a better match with marine ecosystems and SDG 14: Life below water.
- **Photochemical ozone formation** can be described more commonly as summer smog. This impact category deals with the negative impacts from volatile organic compounds, CO and NO_x. Photochemical ozone formation is harmful both to humans and ecosystems. The damage to ecosystems is caused by the reactive compounds attacking the surfaces of plants or enter plant leaves and cause oxidative damage on their photosynthetic Organs.
- The final impact category that we can classify within the “pollution” driver of nature loss, damage to ecosystems and biodiversity loss is **freshwater ecotoxicity**. The emission of toxic substances such as heavy metals, pesticides and other substances is harmful to ecosystems.

Social LCA:

- The topic of **meeting basic needs** relates to: “The extent to which the basics needs of small-scale entrepreneurs are met and the extent to which a contribution is made towards improving the status quo.” According to the CBD, biodiversity is crucial to the reduction of poverty, due to the basic goods and ecosystem services it provides. Making

sure that the basic needs of small-scale entrepreneurs are met, can also reduce the stress on nature because people living in high conservation value areas can generate sufficient income without impacting their environment. In the Handbook for Product Social Impact Assessment the reference scale of the “meeting basic needs” category includes access to awareness raising programs, best practices, safe water sources and a monitoring system to make sure conditions are not deteriorating.

- The rationale to include **access to tangible resources** as a social topic in the Handbook for Product Social Impact Assessment, is the mutual interest of communities and organizations to enhance the quality and quantity of local resources and infrastructure. This includes sustainable use of natural resources, pollution prevention and waste recycling. More importantly, companies can provide local communities with access to fertilizer and information to use it effectively. Providing access to these resources can prevent slash and burn farming.
- **Community engagement** is included as a social topic because it includes policies that affect the local environment and community projects such as Earth Day activities.
- **Employment and skill development** is linked to target 15.1 to 15.5 and 15.8 because according to the Handbook for Product Social Impact Assessment, employment creates ripple effects of sustainable development across the community.
- **Land rights** are a crucial for the sustainable use of resources, nature and ecosystem services. It provided owners of the land with an incentive to conserve the ecosystems they rely on. Furthermore, the lack of formal land tenure restrains smallholder farmers and small-scale entrepreneurs the ability to raise finance and invest in more sustainable use of land. Investment in optimizing the productivity of the land, will reduce the need for more arable land. Furthermore, it avoids the illegal conversion of forest to arable land with slash and burn farming.

15.3.2 Target 15.6 Promote fair sharing of genetic resources

Target 15.6: “Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.”

This target is not focusing on environmental impact, land degradation or biodiversity loss, but more on a fair distribution of the benefits from nature. Therefore, no environmental impact categories are linked to this target.

Social LCA:

The following social topics are linked to target 15.6

- The target aim to promote fair and equitable sharing and access to genetic resources. No definition is provided on what a fair and equitable distribution is, but the link with the

PSIA handbook is clear. **Access to tangible resources** is defined as mitigating adverse effects on local communities, improving their access and respect for indigenous people, women's land rights, and tangible forms of cultural heritage.

- **Land rights** are defined in the PSIA handbook as; rights to land that are clearly defined, long term, enforceable, appropriately transferable, socially and legally legitimate. We see this as a prerequisite to fair sharing of genetic resources. Since the absence of such a system, no one can appeal to a court to enforce a fair and just distribution of resources.

15.3.3 Target 15.7 End poaching and trafficking of protected species and stop trade in illegal wildlife products

Target 15.7: Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products

There is no direct link with environmental LCA impact categories or social topics for this target.

15.3.4 Target 15.9 Integrate ecosystem and biodiversity values into development plans

Target 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

This is purely a target for policymakers so there is no link with environmental or product social indicators.

15.3.5 Overview of links

In Figure 3 the overview of the links between LCA impact categories and SDG 15 is shown.

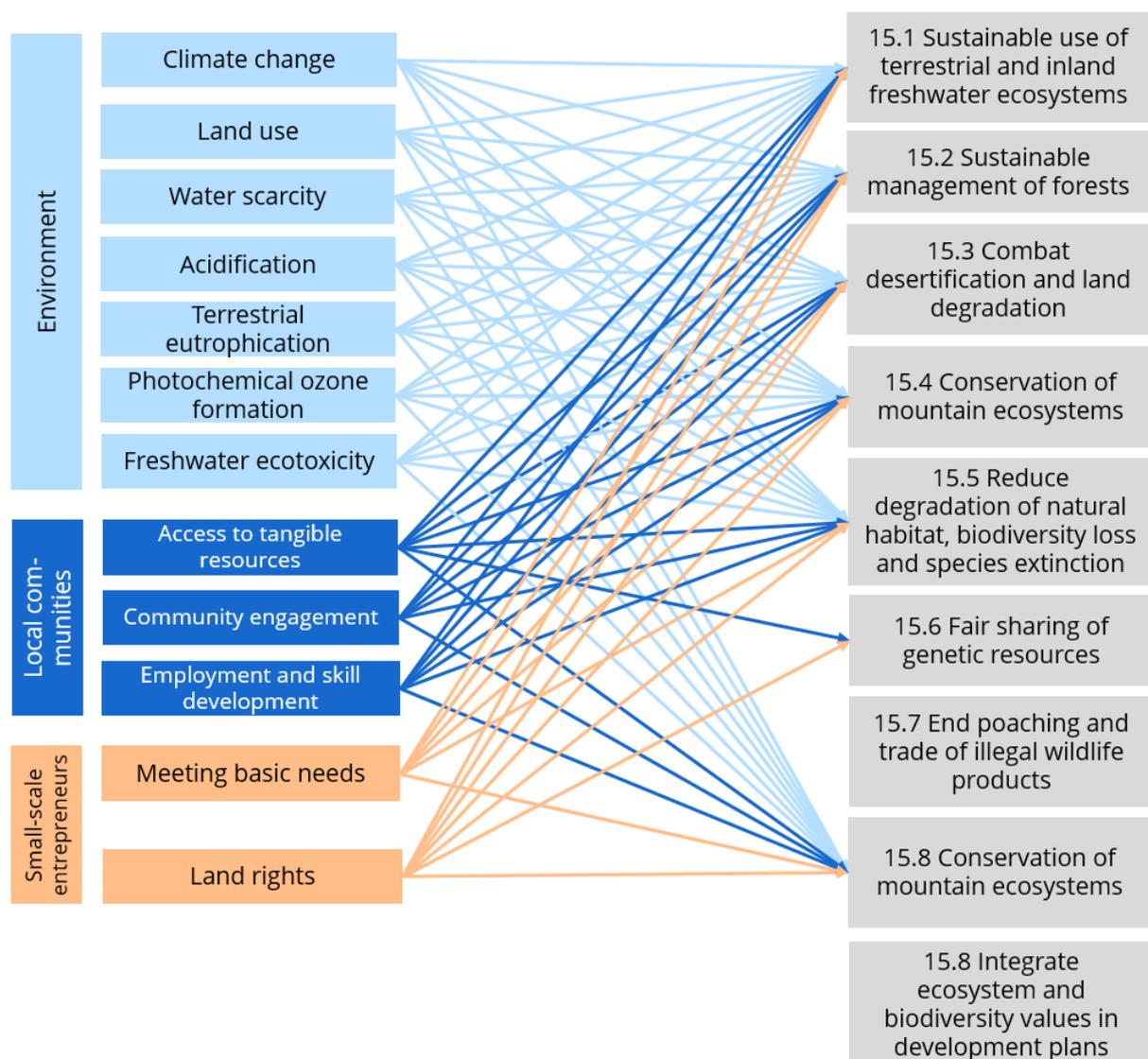


Figure 3 Overview of links between LCA impact categories and SDG targets for SDG 15

15.4 Characterizing the relation between LCA and SDG 15

In this paragraph, the nature of the relation between the impact categories and the targets of SDG 15 are defined. This step determines the score needed to qualify as a contribution to a target, per target and impact category. The first section describes how environmental impact category indicator results can be linked; the second section does the same for social metrics.

15.4.1 Environmental LCA

Table 15.2 environmental topic linking to SDG 15

LCA impact category	Rationale	Requirements to be counted as a contribution to SDG 15	
Climate	SDG target 15.1 to 15.5 and 15.8: Ensure the health, conservation, restoration and sustainable use of nature, ecosystems and their services, are under threat of climate change	+2	The environmental impact is a lot lower than the reference product (>10%)
		-2	The environmental impact is a lot higher than the reference product (> 10%)
Land use	SDG target 15.1 to 15.5 and 15.8, all relate to this topic directly	+2	The environmental impact is a lot lower than the reference product (>10%)
	Land use is one of the main causes of the decline in health of nature, ecosystems and their services	-2	The environmental impact is a lot higher than the reference product (> 10%)
Water scarcity	SDG target 15.1 to 15.5 and 15.8, all relate to this topic directly	+2	The environmental impact is a lot lower than the reference product (>10%)
	Increased water stress a negative contributor to this SDG overall, while reducing it can be a contributor.	-2	The environmental impact is a lot higher than the reference product (> 10%)
Acidification	SDG target 15.1 to 15.5 and 15.8, all relate to this topic directly	+2	The environmental impact is a lot lower than the reference product (>10%)
	Acidification can damage leafs directly or vegetation indirectly through acidification of the soil	-2	The environmental impact is a lot higher than the reference product (> 10%)
Eutrophication	SDG target 15.1 to 15.5 and 15.8, all relate to this topic directly	+2	The environmental impact is a lot lower than the reference product (>10%)
	Excess of nutrients can significantly disrupt normal functioning of ecosystems	-2	The environmental impact is a lot higher than the reference product (> 10%)

Photochemical ozone formation	SDG target 15.1 to 15.5 and 15.8, all relate to this topic directly	+2	The environmental impact is a lot lower than the reference product (>10%)
	Photochemical ozone formation is harmful both ecosystems. The damage is caused by the reactive compounds attacking the surfaces of plants or enter plant leaves and cause oxidative damage on their photosynthetic organs	-2	The environmental impact is a lot higher than the reference product (> 10%)
Freshwater ecotoxicity	SDG target 15.1 to 15.5 and 15.8, all relate to this topic directly	+2	The environmental impact is a lot lower than the reference product (>10%)
	The emission of toxic substances such as heavy metals, pesticides and other substances is harmful to ecosystems	-2	The environmental impact is a lot higher than the reference product (> 10%)

15.4.2 Social LCA

Table 15.3: Social topic linking to SDG 15

Stakeholder	Social topics	Rationale	Requirements to be counted as a contribution to SDG 6
Local communities	Access to tangible resources	When local communities have access to (natural) resources, there is a mutual interest of communities and organizations to enhance the quality and quantity of local resources. Therefore there is a link with SDG target 15.1 to 15.5 and 15.8. This topic is also	+2 The company or facility has a PDCA programme in place to address the local community's access to tangible resources (beyond the requirements set in the local laws). Commitments, performance, improvements and effectiveness of programmes are disclosed publicly.

	crucial for target 15.6, fair sharing of genetic resources.	-2	Incidents of actual damage, adverse impacts or risks to the community's access to tangible resources have been discovered, but a corrective action plan with a timeline for completion has not been developed.
Community Engagement	Community engagement is included as a social topic for SDG target 15.1 to 15.5 and 15.8, because it includes policies that affect the local environment and community project such as Earth Day activities.	+2	The company or facility has continuous dialogues with representatives of the local community and pays special attention to the voice of vulnerable groups, such as indigenous peoples and women. The company has implemented rules that require it to base decisions on consent of the local community if such decisions have serious implications for the community.
	There is no direct evidence that lack of community engagement leads to damage to nature therefore, only contributions are counted.	+1	The company or facility is engaging in a dialogue with the community representatives and incorporates their views into management decisions. There is evidence that the company or facility has taken these inputs seriously and, where appropriate, softened the consequences of the decision.
Employment and skill development	Employment and skill development is linked to target 15.1 to 15.5 and 15.8 because employment creates ripple effects of sustainable development across the community.	+2	The policies and commitments are published, and a grievance mechanism is in place to handle complaints about how staff is selected and how the commitments are handled.
	Since the ripple effect is an indirect benefit, the lack of a ripple effect is not counted as a negative contribution	+1	The company or facility has committed to a long term program to grow local employment or at least keep the workforce stable. The company actively contributes to skill development in connection to its future need for staffing and the staffing of its subcontractors and smallholders.
Small-scale entrepreneurs	Meeting basic needs The topic of meeting basic needs relates to the extent to which the basics needs of small-scale entrepreneurs are met and the extent to which a	+2	Small-scale entrepreneurs' access to safe water sources, improved sanitation facilities and food security is regularly monitored to control whether the current conditions are not deteriorating.

	<p>contribution is made towards improving the status quo.</p> <p>Meeting the needs of small scale entrepreneurs can reduce the stress on nature because people living in high conservation value areas can generate sufficient income without impacting their environment.</p>	<p>+1</p> <p>-2</p>	<p>Actions targeting small-scale entrepreneurs' basic needs are undertaken (awareness raising programmes, best practices). Evidence indicates that > 80% small-scale entrepreneurs find the provided interventions useful.</p> <p>A majority of the small-scale entrepreneurs does not have access to safe drinking water and improved sanitation facilities. Most of the small-scale entrepreneurs feel that they do not have a sufficient food supply throughout the year. Opportunities for improvement have not been identified.</p> <p>OR</p> <p>Local conditions and risks are not assessed.</p>
Land Rights	<p>Proper administration and a functioning judicial system is a requirement for the sustainable use of nature and its resources. Therefore there is a link with SDG target 15.1 to 15.5 and 15.8. This topic is also crucial for target 15.6, fair sharing of genetic resources.</p>	<p>+2</p> <p>-2</p>	<p>Evidence can be given that no land grabbing takes place in the region. Most of the small-scale entrepreneurs feel that their land rights are secure</p> <p>Security of land is not monitored or unknown</p>

15.5 Scoring matrix for SDG 15

Based on the tables above, the following summary can be made as a checklist for determining if the LCA results can support a contribution to SDG 15 and its targets.

Table 15.4: Scoring matrix for determining whether the LCA results can indeed support SDG 15

SDG 15	Blocking	Contributing
Target 15.1		
Climate Change	-2	+2
Water scarcity	-2	+2
Land use	-2	+2

Acidification	-2		+2
Eutrophication	-2		+2
Photochemical ozone depletion	-2		+2
Freshwater Ecotoxicity	-2		+2
Access to tangible resources	-2		+2
Community Engagement			+1 +2
Employment and skill development			+1 +2
Meeting Basis Needs	-2		+1 +2
Land Rights	-2		+2
Target 15.2			
Climate Change	-2		+2
Water scarcity	-2		+2
Land use	-2		+2
Acidification	-2		+2
Eutrophication	-2		+2
Photochemical ozone depletion	-2		+2
Freshwater Ecotoxicity	-2		+2
Access to tangible resources	-2		+2
Community Engagement			+1 +2
Employment and skill development			+1 +2
Meeting Basis Needs	-2		+1 +2
Land Rights	-2		+2
Target 15.3			
Climate Change	-2		+2

Water scarcity	-2		+2
Land use	-2		+2
Acidification	-2		+2
Eutrophication	-2		+2
Photochemical ozone depletion	-2		+2
Freshwater Ecotoxicity	-2		+2
Access to tangible resources	-2		+2
Community Engagement			+1 +2
Employment and skill development			+1 +2
Meeting Basis Needs	-2		+1 +2
Land Rights	-2		+2

Target 15.4

Climate Change	-2		+2
Water scarcity	-2		+2
Land use	-2		+2
Acidification	-2		+2
Eutrophication	-2		+2
Photochemical ozone depletion	-2		+2
Freshwater Ecotoxicity	-2		+2
Access to tangible resources	-2		+2
Community Engagement			+1 +2
Employment and skill development			+1 +2
Meeting Basis Needs	-2		+1 +2
Land Rights	-2		+2

Target 15.5

Climate Change	-2		+2
Water scarcity	-2		+2
Land use	-2		+2
Acidification	-2		+2
Eutrophication	-2		+2
Photochemical ozone depletion	-2		+2
Freshwater Ecotoxicity	-2		+2
Access to tangible resources	-2		+2
Community Engagement			+1 +2
Employment and skill development			+1 +2
Meeting Basis Needs	-2		+1 +2
Land Rights	-2		+2

Target 15.6

Access to tangible resources	-2		+2
Land Rights	-2		+2

Target 15.8

Climate Change	-2		+2
Water scarcity	-2		+2
Land use	-2		+2
Acidification	-2		+2
Eutrophication	-2		+2
Photochemical ozone depletion	-2		+2
Freshwater Ecotoxicity	-2		+2

Access to tangible resources	-2		+2
Community Engagement		+1	+2
Employment and skill development		+1	+2
Meeting Basis Needs	-2	+1	+2
Land Rights	-2		+2

15.6 Literature

EC (European Commission) 2018. PEFCR Guidance document, Guidance for the development of Product Environmental Footprint Category Rules (PEFCRs), version 6.3.

https://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_guidance_v6.3.pdf

Huijbregts et al. 2016. ReCiPe 2016. A harmonized life cycle impact assessment method at midpoint and endpoint level Report I: Characterization. RIVM Report 2016-0104.

<https://www.rivm.nl/bibliotheek/rapporten/2016-0104.pdf>

IPBES (2019) Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany.

<https://ipbes.net/global-assessment>

IUCN (2020) Red List of Threatened Species™. <https://www.iucnredlist.org/>

Rockstrom & Suhdev (2019) Keynote Speech: Prof. Johan Rockström & CEO Pavan Sukhdev. EAT Stockholm Food Forum, June 2016. www.eatforum.org.

R.K. Rosenbaum et al. (2018) Chapter 10: Life Cycle Impact Assessment in Hauschild et al. 2018. Life Cycle Assessment – Theory and Practice.

WWF (2018) Living Planet Report - 2018: Aiming Higher. Grooten, M. and Almond, R.E.A. (Eds). WWF, Gland, Switzerland.

https://www.panda.org/knowledge_hub/all_publications/living_planet_report_2018/