Linking LCA and SDG 14

Goal 14. Life below water: conserve and sustainably use the oceans, seas and marine resources

PRé

Fact-based sustainability

Life Cycle Initiative

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Table of contents

14 Goal 14. Life below water

14.1 Introduction

The subtitle of SDG 14: Life below Water is "conserve and sustainably use the oceans, seas and marine resources for sustainable development."

Oceans are covering more than 70% of the Earth's surface. More than half of the world's oxygen, is produced in oceans. They regulates climate, and provide valuable habitat to a variety of marine and coastal species. Oceans also support the global economy and local livelihoods, and provide a means for transportation and trade (IUCN, 2020).

The health of oceans ecosystems is under threat. Because the ocean is the planet's largest carbon sink (approximately 23% of the annual CO_2 emissions are absorbed by oceans), oceans are becoming more acidic. This has a negative effect on coral reefs, and species living in the oceans (UN, 2020).

Another threat to the world's life below water is overexploitation of fishing stock. According to the FAO, the percentage of fish stocks that are within biologically sustainable levels have decreased from 90 percent in 1974 to 65.8 percent in 2017 (FAO, 2020).

14.2 Targets and indicators of SDG 14

Seven main targets are formulated to achieve the conservation and sustainable use of the oceans, seas and marine resources.

- Target 14.1 is focusing on pollution, specifically on eutrophication. Plastic pollution is the second topic of this target.
- Target 14.2 aims to sustainably manage and protect marine and coastal ecosystems.
- Target 14.3 is focusing on pollution, specifically acidification.
- Target 14.4 emphasizes the urge to end overfishing and the depletion of fish stocks.
- In target 14.5 the expansion of protected coastal and marine areas is set to 10%.
- Subsidies for activities that lead to overfishing have to stop in order to meet target 14.6.
- Finally target 14.7 aims to promote sustainable use of marine resources, including through sustainable management of fisheries, aquaculture, and tourism.

For this SDG the targets are individually linked, no groups of targets with the same linkages are identified.

In environmental LCIA models, the cause–effect chains of seven major drivers of marine biodiversity loss are identified; climate change; ocean acidification; eutrophication; seabed damage; overexploitation of biotic resources; invasive species; and marine plastic debris (Woods et al. 2016).

Of these seven drivers listed by Woods et al., the EF 3.0 method contains climate change, acidification and marine eutrophication. For the remaining drivers; seabed damage;

overexploitation of biotic resources; invasive species; and marine plastic debris, the impact assessment models are still under development.

Additionally, some impact assessment methods, like ReCiPe, include marine in the mid-point impact categories. This impact category is a natural fit with target SDG 14.2 (sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts), next to the seven drivers identified by Woods et al.

Table 1. The targets and indicators defined for SDG 14

Target	Indicator
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	14.1.1 (a) Index of coastal eutrophication; and (b) plastic debris density
14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans	14.2.1 Number of countries using ecosystem-based approaches to managing marine areas
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations
14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	14.4.1 Proportion of fish stocks within biologically sustainable levels
14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	14.5.1 Coverage of protected areas in relation to marine areas
14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential	14.6.1 Degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing

treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation

14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism	14.7.1 Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries
14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries	14.a.1 Proportion of total research budget allocated to research in the field of marine technology
14.b Provide access for small-scale artisanal fishers to marine resources and markets	14.b.1 Degree of application of a legal/regulatory/ policy/institutional framework which recognizes and protects access rights for small-scale fisheries
14.c Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of "The future we want"	14.c.1 Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nations Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources

14.3 Classifying the links between SDG targets and LCA impact categories

14.3.1   Target 14.1: Reduce marine pollution

Target 14.1: "By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution"

Although this target aims to prevent and reduce marine pollution of all kinds, the indicator for this target mentions only two types: eutrophication and plastic debris.

Environmental LCA:

Since plastic debris pollution is not part of the EF method, only marine eutrophication is linked to this target. The MARILCA project is developing an impact assessment method to integrate potential environmental impacts of marine litter in LCA, but their work is still ongoing, so currently the link for this target is limited to **Eutrophication, marine.** This link is a direct match with the indicator.

According to the ocean action hub (a UNDP initiated, open, interactive platform providing information and promoting action globally to support SDG14), *"nutrient pollution loads to the oceans have tripled since pre-industrial times leading to exponential growth in eutrophication and the occurrence of hypoxic (low oxygen) areas, now numbering over 500"*[1]

Social LCA:

The marine pollution target is formulated in a very generic way, since the goal is to goal to reduce marine pollution of all kinds. Therefore a link with a more generic PSM impact category on **"responsible communication"** was made.
Responsible communication in the PSM handbook is focussing on the sustainability performance of a product. Companies making claims on the environmental performance of their product should back their sustainability claims with scientific evidence, 3rd party research, following national or international requirements. This should allow consumers to make informed decisions, lead to more sustainable products on the market, and to more sustainable use of products by consumers. We can expect that more sustainable (use of) products can reduce the impact of marine pollution.

14.3.2   Target 14.2: Protect marine and coastal ecosystems

Target 14.2: "By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans."

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[1] SDG 14 targets, context and indicators. https://www.oceanactionhub.org/sdg-14-targets-context-and-indicators

Environmental LCA:

Target 14.1 is focussed specifically on marine eutrophication. Target 14.3 is focussed specifically on acidification. Since this target has a wider focus on marine ecosystems in general, links to all environmental impact categories in the EF method related to marine ecosystems are made. These are: **climate change; ocean acidification; eutrophication and marine ecotoxicity.**

14.3.3   Target 14.3: Ocean acidification

Target 14.3: "Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels."

Environmental LCA:

This target specifically focusses on acidification, therefore only one linkage is made. SDG target 14.3 is linked with the **acidification** impact category.

14.3.4   Target 14.4: End overfishing

Target 14.4: "By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics."

Environmental LCA:

Although overfishing is a one of the main environmental problems in marine ecosystems, very little research has been done on overfishing and life cycle impact assessment. Helias and Bach[2] are researching the biodiversity impact of fisheries. They have developed an approach to assess the ecosystem impact caused by the withdrawal fish by fisheries. This approach is based on the disappeared fraction of the stock. Characterization factors for almost 5000 fish stocks are calculated. Since this work is still forthcoming, it is not (yet) possible to make a link between LCIA and overfishing.

Social LCA:

The following SDG topics are linked to SDG 14.4:

- This SDG target aims to prevent overfishing. This links with the PSM handbook topic '**Access to tangible resources'.** It is defined as mitigating adverse effects on local communities, improving their access and respect foe indigenous people, women's land rights, and tangible forms of cultural heritage. Although this definition does not specifically mention marine resources, the rationale described in the handbook includes preventing conflict over natural material resources such as water, forests, and homelands.

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[2] Hélias, Arnaud & Bach, Vanessa (2020) Biodiversity impact of fisheries. SETAC Europe 30th annual meeting. https://www.researchgate.net/publication/341794046_Biodiversity_impact_of_fisheries

- **Land rights** are defined in the PSM handbook as; rights to land that are clearly defined, long term, enforceable, appropriately transferable, socially and legally legitimate. This is a prerequisite to fair sharing of genetic resources. The rationale includes small scale entrepreneur farmers, but also fishing communities who need access to lakes and rivers.

14.3.5   Target 14.5: Conserve at least 10 per cent of coastal and marine areas

Target 14.5: "By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information."

Since this is purely a target for policymakers, it has no link with environmental or social indicators.

14.3.6   Target 14.6: Prohibit certain forms of fisheries subsidies

Target 14.6: "By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation."

Since this is purely a target for policymakers, it has no link with environmental or social indicators.

14.3.7   Target 14.7: Increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources.

Target 14.7: "By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism."

Since this is purely a target for policymakers, it has no link with environmental or social indicators.

14.3.8   Overview of links

In Figure 1 the overview of the links between LCA impact categories and SDG 14 is shown.
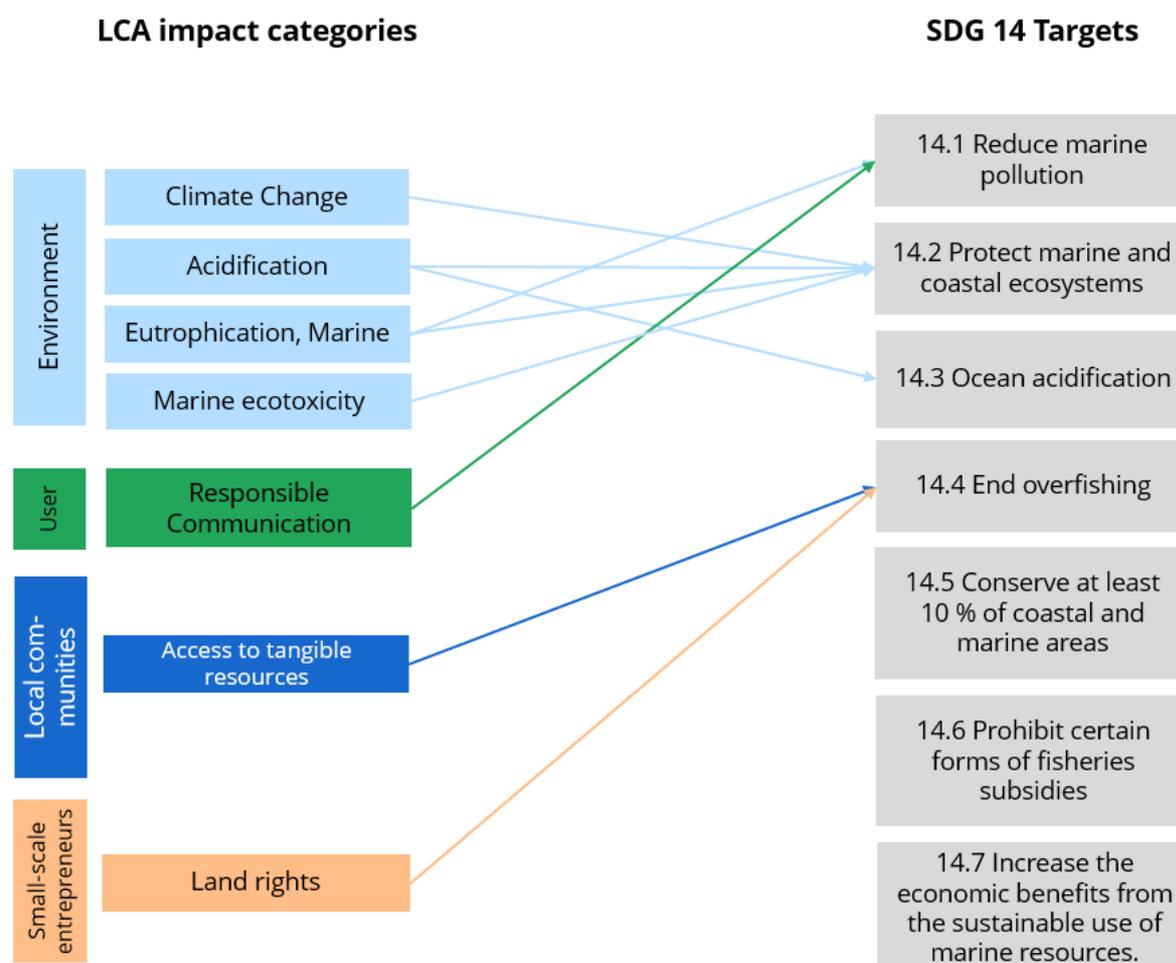

Figure 1 Overview of links between LCA impact categories and SDG targets for SDG 14

14.4 Characterizing the relation between LCA and SDG 14

In this paragraph, the nature of the relation between the impact categories and the targets of SDG 14 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.

14.4.1   Environmental LCA

Table 2 environmental topic linking to SDG 14

LCA impact category	Rationale	Requirements to be counted as a contribution to SDG 14	
Eutrophication, Marine	Target 14.1 is directly linked to this topic since the SDG indicator includes "coastal eutrophication"	**+2**	The environmental impact is a lot lower than the reference product (>10%)
	This impact category is also linked to the more generic target 14.2: Protect marine and coastal ecosystems	**-2**	The environmental impact is a lot higher than the reference product (> 10%)
Climate Change	SDG target 14.2 is linked to climate change because it causes average sea surface temperature raise, it increases the frequency and intensity of anomalies, a rise in average global sea level, sea-ice retreat, a loss of dissolved oxygen, and changes in upper-ocean salinity. All these changes lead to damage to ecosystems due to the loss of species that only survive under specific conditions.	**+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%)
Acidification	Target 14.3. is directly linked to this topic since the SDG indicator includes "average marine acidity (pH)"	**+2**	The environmental impact is a lot lower than the reference product (>10%)
	This impact category is also linked to the more generic target 14.2: Protect marine and coastal ecosystems	**-2**	The environmental impact is a lot higher than the reference product (> 10%)
Marine ecotoxicity	This impact category is linked to the more generic target 14.2: Protect marine and coastal ecosystems	**+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%)

14.4.2   Social LCA

Table 3: Social topic linking to SDG 14

Stakeholder	Social topics	Rationale	Requirements to be counted as a contribution to SDG 14	
Users	Responsible communication	Target 14.1 Companies that enable consumers to make environmentally friendly decisions and informed help to reduce marine pollution	+2	Claims made in marketing and product documentation that the product or its use support a more sustainable lifestyle are all backed up with scientific evidence, 3rd-party market research or research following international or national requirements. This evidence is publicly available and easy to access for all users and potential users. The company or facility has a mechanism in place to engage in dialogues with users/consumers.
			-2	The product is not labelled according to the regulation in the country of sale. There are many incidents that show that the communication is not responsible
Local communities	Access to tangible resources	Target 14.4 Companies that directly or indirectly positively influence access to fishing resources to the most vulnerable groups in the local communities can claim a contribution. Companies responsible for restricting local communities to fish sources directly (by engaging in overfishing) or indirectly (by causing damage to ecosystems) have a detrimental impact	+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.
			-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.
Local communities	Land rights	Proper administration and a functioning judicial system is a requirement for the sustainable use of nature and its resources. This includes access of fishing communities	+2	Evidence can be given that no land grabbing takes place in the region. Most small scale entrepreneurs feel their land rights are secured.

	-2	Security of land rights is unknown
to rivers and lakes. Therefore a link is made with target 14.4. Small scale entrepreneurs should be interpreted as fishing communities and land rights are fishing rights in this case.		

14.5 Scoring matrix for SDG 14

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 14.

Table 4: Scoring matrix for determining whether the LCA results can indeed support SDG 14

SDG 14	Blocking		Contributing
Target 14.1			
Eutrophication, Marine	-2		+2
2.3 Responsible communication	-2		+2
Target 14.2			
Eutrophication, Marine	-2		+2
Climate Change	-2		+2
Acidification	-2		+2
Marine ecotoxicity	-2		+2
Target 14.3			
Acidification	-2		+2
Target 14.4			
3.2 Access to tangible resources	-2		+2
4.6 Land rights	-2		+2

14.6 Literature

FAO 2020. The State of World Fisheries and Aquaculture 2020. http://www.fao.org/state-of-fisheries-aquaculture

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Woods, John & Veltman, Karin & Huijbregts, Mark & Verones, Francesca & Hertwich, Edgar. (2016). Towards a meaningful assessment of marine ecological impacts in life cycle assessment (LCA). Environment International. 89-90. 48-61. 10.1016/j.envint.2015.12.033