



BSI Standards Publication

Connection between the contributions of civil engineering works to sustainability and achievement of the Sustainable Development Goals

National foreword

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The UK participation in its preparation was entrusted to Technical Committee B/558, Sustainability of construction works.

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© The British Standards Institution 2025
Published by BSI Standards Limited 2025

ISBN 978 0 539 30339 1

ICS 13.020.20; 93.010

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2025.

Amendments/corrigenda issued since publication

Date	Text affected
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ICS 13.020.20; 93.010

English Version

Connection between the contributions of civil engineering works to sustainability and achievement of the Sustainable Development Goals (ISO/TR 7016:2025)

Lien entre les contributions des ouvrages de génie civil
au développement durable et la réalisation des
Objectifs de développement durable (ISO/TR
7016:2025)

Zusammenhang zwischen den Beiträgen von
Ingenieurbauten zur Nachhaltigkeit und dem Erreichen
der SDGs (ISO/TR 7016:2025)

This Technical Report was approved by CEN on 10 October 2025. It has been drawn up by the Technical Committee CEN/TC 350.

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European foreword

This document (CEN ISO/TR 7016:2025) has been prepared by Technical Committee ISO/TC 59/SC 17 "Sustainability in buildings and civil engineering works" in collaboration with Technical Committee CEN/TC 350 "Sustainability of construction works" the secretariat of which is held by AFNOR.

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Foreword

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This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, SC 17 *Sustainability in buildings and civil engineering works*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 350, *Sustainability of construction works*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Introduction

The methodology for sustainability assessment defined in EN 17472 and ISO 21928-2 provides results intended to be communicated to the interested parties in an understandable way.

The Sustainable Development Goals (SDGs) provide a common language to express sustainability, its challenges and results, and for this reason it would be good to express sustainability performance in terms of SDGs. However, they are not articulated in such a way to form a comprehensive, structured and rigorous set to evaluate the sustainability of a civil work. Therefore, to express the evaluations carried out according to EN 17472 and ISO 21928-2 in terms of SDGs can facilitate the understanding of the stakeholders and can demonstrate the progress and contributions made by the civil engineering works to meeting the SDGs.

Links between the indicators in EN 17472 and ISO 21928-2 and SDGs can be established. This can lead to improved performance on the indicator results and a greater likelihood of achieving the SDGs. The aim of this document is to identify linkages between the indicators used to assess the sustainability performance of civil engineering works and the SDGs adopted by the United Nations.

Connection between the contributions of civil engineering works to sustainability and achievement of the Sustainable Development Goals

1 Scope

This document shows the relationship between the indicators in EN 17472 and ISO 21928-2, used to assess the environmental, social, and economic performance of civil engineering works (CEW), and the Sustainable Development Goals (SDGs), which can serve as a tool to communicate the results of the assessment carried out with the methodology established in EN 17472 and ISO 21928-2.

This document does not provide any criteria or rules for performing any kind of assessment.

This document also provides information about how the SDGs are influenced by the performance of several CEW, based on the results of the assessment done according to either EN 17472 or ISO 21928-2, or both, and demonstrate their contributions to achieving the SDGs targets.

The links provided can also be applied to address efforts towards satisfying specific SDGs.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 21928-2, *Sustainability in buildings and civil engineering works — Sustainability indicators — Part 2: Framework for the development of indicators for civil engineering works*

EN 17472, *Sustainability of construction works — Sustainability assessment of civil engineering works — Calculation methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21928-2 and EN 17472 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Methodology

Five typologies of CEW are considered in the study:

- industrial process infrastructures;
- linear infrastructures;
- dams and other fluvial works;
- maritime works;

— public spaces.

The objective of sustainability assessment of the CEW is to measure and evaluate the environmental, economic and social performance of each project and their area of influence. This assessment is carried out with a list of indicators which, in some cases, define the adoption of measures. The list of indicators can be found in the Excel file available at: <https://standards.iso.org/iso/tr/7016/ed-1/en>.

Targets and indicators for each SDG are provided with a link to the relevant page on the United Nations (UN) website, the first time they are cited (i.e. [5.1](#)). All information on the SDGs can be found on this website: <https://sdgs.un.org/>.

The method used to find relations is to study how each indicator (and other items included within each indicator) can contribute to achieving each of the targets of the SDG, and, finally, determine whether the indicator has a direct or indirect influence on the SDG. The initial assessment considered dams and other fluvial works, but the links can be generally applied in the same way to the other typologies. For this reason, many of the examples provided in this document are related to dams and other fluvial works.

Relationships are established through the following steps. Firstly, it is identified whether the possible relationship is positive (contribution to the achievement of the objective) or negative. Then the intensity of the relationship is determined, so that the relationship can be either very close or more indirect. Finally, examples are provided to justify the type of relationship established or justified in a generic way with solid arguments.

If an indicator has a relation with more than one target of a SDG, the direct relations between the target and the indicator outweighs the indirect relations in the final assessment of the relation between the indicator and the SDG. Therefore, for instance, if an indicator has a direct and an indirect relation with two targets of the same SDG, that indicator has a direct relation with the SGD.

In addition, each set of aspects has an assessment of the relation that it has with the SGD, following the same criteria expressed previously.

5 Relations between assessment indicators and SDGs

5.1 Environmental indicators

5.1.1 SDG 1. End of poverty

5.1.1.1 General

The targets for SDG 1 are available on the United Nations website¹⁾. The relations between the indicators and the targets of SDG 1 are explained in [5.1.1.2](#).

5.1.1.2 Indicator water management and target 1.5

The following item is considered: water flooding.

Reducing the risk of water flooding will improve the resilience and reduce the exposure to climate-related extreme events and disasters.

1) Goal 1 “End poverty in all its forms everywhere”: <https://sdgs.un.org/goals/goal1#targets and indicators>.

5.1.2 SDG 2. Zero hunger

5.1.2.1 General

The targets for SDG 2 are available on the United Nations website²⁾. The relations between the indicators and the targets of SDG 2 are explained in [5.1.2.2](#) to [5.1.2.5](#).

5.1.2.2 Indicator water management and target 2.3

The following items are considered:

- consumptive use of fresh water;
- water scarcity.

CEW provide greater access to irrigation water, which makes it easier to achieve the goal.

When assessing consumptive use of fresh water, usually lower consumption means better performance. But (assuming that efficiency in water management is a different issue), a better result in the indicator means a worst result in the target.

Reducing the consumptive use of fresh water in CEW, and (in the case of dams) having more water availability, increases the availability of water for agriculture, which can increase the productivity and incomes of small-scale food producers.

5.1.2.3 Indicator emissions to the environment and target 2.4

The following item is considered: soil quality: potential soil quality index (dimensionless).

Changes in food production in order to ensure sustainability reduce excessive land uses for cultivation that cause loss of soil quality, ensuring its adequate level of quality.

Improving soil quality can influence the proportion of agricultural areas under productive and sustainable agriculture (SDG indicator 2.4.1).

5.1.2.4 Indicator ecosystem health and target 2.3

The following items are considered:

- change in ecosystem services;
- biodiversity change: protected areas affected;
- biodiversity change: non-protected areas with biodiversity quality changes.

The increase of agricultural productivity can cause indirect changes in ecosystem services and also cause negative effects on biodiversity and ecosystems, by increasing the areas used for agriculture and decreasing natural sites and protected areas.

Avoiding negative effects on ecosystem services and biodiversity can support agricultural productivity and income (SDG indicator 2.3.1). For example, avoiding the loss of habitat for pollinators helps maintain yields of pollinator dependent crops.

5.1.2.5 Indicator land use changes and target 2.3

The following item is considered: surface of land that changes its previous use because of the CEW (because the land is occupied by it or because of its influence).

2) Goal 2 “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”: https://sdgs.un.org/goals/goal2#targets_and_indicators.

The same argumentation as in ecosystem health, land use changes are necessary to secure the needed level of food productivity.

Surface land use changes and the influence of CEW can influence agricultural productivity and incomes by bringing new land into or removing from production and sustainable agricultural use.

NOTE Dams can facilitate the use of new land to be used for productive and sustainable agricultural use or increase the productivity and incomes of existing farmers.

5.1.3 SDG 3. Good health and well-being

The targets for SDG 3 are available on the United Nations website³⁾. This SDG does not present any type of relation between its targets and the environmental indicators defined in ISO 21928-2 and EN 17472.

5.1.4 SDG 4. Quality education

The targets for SDG 4 are available on the United Nations website⁴⁾. This SDG does not present any type of relation between its targets and the environmental indicators defined in ISO 21928-2 and EN 17472.

5.1.5 SDG 5. Gender equality

The targets for SDG 5 are available on the United Nations website⁵⁾. This SDG does not present any type of relation between its targets and the environmental indicators defined in ISO 21928-2 and EN 17472.

5.1.6 SDG 6. Clean water and sanitation

5.1.6.1 General

The targets for SDG 6 are available on the United Nations website⁶⁾. The relations between the indicators and the targets of SDG 6 are explained in [5.1.6.2](#) to [5.1.6.11](#).

5.1.6.2 Indicator water management and targets 6.1 and 6.4

The following item is considered: consumptive use of fresh water.

For target 6.1, the construction of CEW, in the form of dams, contributes directly to the supply of fresh water to nearby populations with year-round storage, allowing for a continuous supply of water and making water more affordable for all by reducing its price.

For target 6.4, CEW are related to the efficient use of water. Dams provide access to this resource, and their management determines availability. Industrial infrastructures and their subsequent management have a great influence on the efficient use of the resource.

5.1.6.3 Indicator water management and targets 6.2 and 6.4

The following item is considered: non-consumptive use of fresh water.

For target 6.2, as in [5.1.6.2](#) for target 6.1, the accumulation of large bodies of water in dams allows a greater supply for both consumptive and non-consumptive purposes, increasing the level of hygiene of the population with their use, thanks to the continuous flow that these structures allow.

3) Goal 3 “Ensure healthy lives and promote well-being for all at all ages”: https://sdgs.un.org/goals/goal3#targets_and_indicators.

4) Goal 4 “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”: https://sdgs.un.org/goals/goal4#targets_and_indicators.

5) Goal 5 “Achieve gender equality and empower all women and girls”: https://sdgs.un.org/goals/goal5#targets_and_indicators.

6) Goal 6 “Ensure availability and sustainable management of water and sanitation for all”: https://sdgs.un.org/goals/goal6#targets_and_indicators.

For target 6.4, CEW can increase or decrease the efficient use of water. Dams provide access to this resource, and their management determines availability. Industrial facilities and their subsequent management have a great influence on the efficient use of the resource.

5.1.6.4 Indicator water management and targets 6.1, 6.2 and 6.4

The following item is considered: water scarcity.

For target 6.1, there is an indirect link. The proper management of water resources in the construction and use of infrastructures is directly related to its availability. In situations of scarcity or drought, dams are a resource to combat potential adverse effects. Water treatment and water transport infrastructures facilitate fair and universal access to water.

For target 6.2, there is an indirect link. The management of water resources during the construction and use of infrastructures is directly related to its availability. In scenarios of scarcity or drought, dams are a resource against adverse effects. Water treatment and water transport infrastructures facilitate fair and universal access to water.

For target 6.4, by accumulating large quantities of water masses throughout the year, dams, reservoirs and other fluvial works, e.g. rainwater tanks, ensure a continuous flow to the population, provided that controlled and planned water withdrawals are carried out. In this way, dams become indispensable elements for the achievement of this target, especially in countries with scarce water resources.

5.1.6.5 Indicator water management and target 6.2

The following item is considered: water flooding.

Floods pose health risks as well as safety risks. One of the main functions of dams is flood control. Other types of CEW also have an influence on the reduction or increase of risk, depending on their design and the considerations that have been taken into account.

5.1.6.6 Indicator water management and targets 6.1, 6.2, 6.3 and 6.6

The following item is considered: water quality.

For target 6.1, the accumulation of drinking water in the same controlled area allows a more efficient management of its physical and chemical characteristics. Dams provide availability. In this way, water from dams and reservoirs can be treated to improve its quality for consumption.

For target 6.2, as with the previous indicator, the quality improvement that can be made to water stored in dams also positively affects sanitary water, improving hygiene to a large extent. Proper reservoir management is crucial to ensure the quality of stored water.

For target 6.3, CEW such as treatment plants or dams are directly aimed at improving the availability and quality of water for human or agricultural use. On the other hand, certain industrial processes or phases of construction, maintenance or operation of infrastructures are directly linked to possible variations in water quality.

For target 6.6, CEW sometimes have an impact on aquatic ecosystems. Sometimes more indirectly, by crossing or diverting watercourses, sometimes by transforming them, as in the case of dams that convert a river regime into a lake regime. The indicator related to water quality directly provides information on the influence of infrastructure on aquatic ecosystems.

5.1.6.7 Indicator waste management and targets 6.3 and 6.6

The following item is considered: hazardous waste disposed.

For target 6.3, there is an indirect link. The management of hazardous waste and possible accidental discharges during the construction and use of the infrastructure will, as a result, affect the quality of the water bodies.

For target 6.6, there is an indirect link. The management of hazardous waste and possible accidental discharges during the construction and use of the infrastructure will, as a result, affect the quality of the bodies of water and, consequently, the ecosystems present in them.

5.1.6.8 Indicator waste management and target 6.6

The following item is considered: non-hazardous waste disposed.

There is an indirect link. Waste management, possible accidental spills during the construction and use of the infrastructure or uncontrolled handling, unauthorized landfills or landfills without the necessary protections, affect, as a result, the quality of the bodies of water and, consequently, the ecosystems present in them.

5.1.6.9 Indicator waste management and target 6.3

The following item is considered: radioactive waste disposed.

There is an indirect link. The management of radioactive waste and possible accidental discharges during the construction and use of the infrastructure will, as a result, affect the quality of the water bodies.

5.1.6.10 Indicator emissions to the environment and targets 6.1, 6.3 and 6.6

The following items are considered:

- emissions to water;
- acidification of soil and water.

For target 6.1, the possible contamination that can occur accidentally or that, limited and controlled, is an inherent part of the infrastructure management processes, has a direct effect on the population's safe access to drinking water. The existence of certain infrastructures, such as dams, with their effect of diluting certain polluting episodes, is also related to this goal.

For target 6.3, infrastructure management is directly related to this goal. Those CEW infrastructures whose task is essentially water treatment contribute directly to its achievement. Those that retain, dilute or divert possible discharges also contribute positive value. Those that discharge accidentally or in a controlled manner can have a negative influence.

For target 6.6, infrastructure management is directly related to this goal. Those CEW infrastructures whose task is essentially water treatment contribute directly to its achievement. Those that retain, dilute or divert possible discharges also contribute positive value. Those that discharge accidentally or in a controlled manner can have a negative influence. The effect of these will be felt directly in water-related ecosystems.

5.1.6.11 Indicator ecosystem health and target 6.6

The following items are considered:

- protected areas affected;
- non-protected areas with biodiversity quality changes.

Certain CEW necessitate the utilization of large areas of land. This often affects protected areas. But in both protected and unprotected areas, restoration or protection measures determine the extent to which these areas are affected. Sometimes, remediation projects or projects developed in previously degraded areas can contribute to the improvement and therefore to the achievement of this goal. On other occasions, the effect can be negative, even with the adoption of remedial measures.

5.1.7 SDG 7. Affordable and clean energy

5.1.7.1 General

The targets for SDG 7 are available on the United Nations website⁷⁾. The relations between the indicators and the targets of SDG 7 are explained in [5.1.7.2](#) to [5.1.7.4](#).

5.1.7.2 Indicator energy management and targets 7.1, 7.2, 7.3, 7.a and 7.b

The following item is considered: energy sources.

For target 7.1, increasing the use of renewable energy sources (and decreasing the use of non-renewable energy sources) can indirectly increase the proportion of the population that rely on clean fuels and technology (SDG indicator 7.2.1).

Dams can provide a source of electricity that can directly increase the proportion of the population with access to electricity (SDG indicator 7.1.1) and the proportion that rely on clean fuels and technology (SDG indicator 7.2.1).

For target 7.2, energy management indicators measure the use and uptake of renewable energy sources compared to non-renewable energy sources. Increasing the use of renewable energy sources (and decreasing the use of non-renewable energy sources) directly contributes to increasing the renewable energy share in the total final energy consumption (SDG indicator 7.2.1).

Hydroelectric dams can be a direct source of renewable energy that increases the proportion of population with primary reliance on clean fuels and technology (SDG indicator 7.1.2). Dams can be a source of renewable energy that directly increases the share of renewable energy in the global energy mix (SDG indicator 7.2.1).

For target 7.3, reducing the total use of primary and secondary energy resources can directly decrease energy intensity in terms of primary energy and GDP (SDG indicator 7.3.1). For example, decreasing the total use of primary energy in construction works that still provide the same function and benefits can improve energy intensity measured against GDP.

Reliable energy management is essential for economic development, diversification, and the well-being of inhabitants. The provision of dependable energy sources and thorough demand side energy management are indirectly impacted by industrial process infrastructures, dam (power generating or pumped hydro) facilities, linear infrastructure, and by maritime works.

For target 7.a, construction works that adopt or increase the use of renewable primary energy resources can directly or indirectly support clean energy research, development, and production in developing countries (SDG indicator 7.a.1). For example, construction works can incorporate solar PV to meet some or all of the energy demand of the asset in operation.

Hydroelectric dams can be a direct source of clean (renewable) energy.

For target 7.b, increasing the use of renewable energy sources can expand the infrastructure and technology needed to supply modern and sustainable energy services in developing countries (SDG goal 7.b). For example, construction works can incorporate solar PV to meet some or all of the energy demand of the asset in operation.

Hydroelectric dams can be a direct source of clean (renewable) energy.

5.1.7.3 Indicator waste management and target 7.1 and 7.2

The following item is considered: exported energy.

For target 7.1, exported energy, whether as an infrastructure asset's sole function or as an additional benefit, can directly or indirectly increase the proportion of population with access to electricity (SDG indicator 7.1.1).

7) Goal 7 "Ensure access to affordable, reliable, sustainable and modern energy for all": https://sdgs.un.org/goals/goal7#targets_and_indicators.

Hydroelectric dams can export electricity that can increase the proportion of population with access to electricity (SDG indicator 7.1.1) and the proportion of the population with primary reliance on clean fuels and technology (SDG indicator 7.1.2).

For target 7.2, exported renewable energy, whether as an infrastructure asset's sole function or as an additional benefit, can directly increase the share of renewable energy in the global energy mix (SDG indicator 7.2.1).

Hydroelectric dams can export renewable energy that increases the share of renewable energy in the global energy mix (SDG indicator 7.2.1).

5.1.7.4 Indicator emissions to the environment and targets 7.1, 7.2 and 7.a

The following item is considered: emissions to air.

For target 7.1, reducing the global warming potential (GWP) of emissions to air can promote the adoption of clean fuels and technologies and increase the proportion of the population with primary reliance on clean fuels and technologies (SDG indicator 7.1.2).

For target 7.2, reducing the global warming potential (GWP) of emissions to air can promote the use of renewable energy and increase the renewable energy share in the global energy mix (SDG indicator 7.2.1). For example, certain construction works reduce the total GWP of emissions to air by replacing the use of diesel generators with solar PV and battery storage.

For target 7.a, reducing the global warming potential (GWP) of emissions to air can promote the adoption of clean fuels and technologies and support clean energy research, development, and production (SDG indicator 7.a.1). For example, certain construction works use pumps or engines that meet higher efficiency and emission standards or deploy renewable energy sources as part of the construction works.

5.1.8 SDG 8. Decent work and economic growth

5.1.8.1 General

The targets for SDG 8 are available on the United Nations website⁸⁾. The relations between the indicators and the targets of SDG 8 are explained in [5.1.8.2](#) to [5.1.8.6](#).

5.1.8.2 Indicator water management and target 8.9

The following item is considered: quantity.

Provision of adequate water supply is essential for the development of an ongoing tourist industry whether it is based upon nature and water excursions or promising an eco-friendly sojourn.

5.1.8.3 Indicator energy management and target 8.4

The following items are considered:

- use of renewable energy;
- renewable secondary energy-sources;
- ratio between useful energy output over total energy input.

Renewable energy generated from CEW projects directly impacts the availability and use of renewable energy and therefore indirectly impacts the quantities of energy required from secondary sources. The ratio between useful energy output over total energy input is directly applicable to CEWs such as processes, dams and other fluvial works, and linear infrastructures.

8) Goal 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all": https://sdgs.un.org/goals/goal8#targets_and_indicators.

5.1.8.4 Indicator material management and target 8.4

The following items are considered:

- virgin material;
- recycled material;
- recyclable material;
- non-recyclable material;
- reused material.

The amount of virgin material used in a CEW directly impacts this target. Indirect benefits are yielded by identifying and tracking material types, qualities and quantities that are non-recyclable, recyclable or recycled, as well as reusable.

5.1.8.5 Indicator waste management and target 8.4

The following items are considered:

- non-hazardous waste disposed;
- components for re-use;
- materials for recycling.

There is an indirect contribution to this target from most CEWs, by monitoring and via the long-term reduction or minimization of the quantities of non-hazardous waste being disposed. Further indirect benefit is yielded by tracking and maximizing the number of components that are reused and materials being recycled.

5.1.8.6 Indicator land use changes and target 8.3

The following item is considered: surface of land that changes its previous use because of the CEW (because the land is occupied by it or because of its influence).

Land use is a primary input for the development of the key policies of this target. If the land use is changed as a result of a CEW, those policies, and therefore the ability to satisfy the target, are indirectly impacted.

5.1.9 SDG 9. Industry, innovation and infrastructure**5.1.9.1 General**

The targets for SDG 9 are available on the United Nations website⁹⁾. The relations between the indicators and the targets of SDG 9 are explained in [5.1.9.2](#) to [5.1.9.6](#).

5.1.9.2 Indicator water management and target 9.1

The following items are considered:

- quantity;
- quality.

A water supply of sufficient quantity and quality is essential for long-term provision of economic development, diversification, and the well-being of inhabitants. This indicator can be indirectly influenced by industrial process infrastructures, dams and other fluvial works and by maritime works.

9) Goal 9 “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”: https://sdgs.un.org/goals/goal9#targets_and_indicators.

5.1.9.3 Indicator energy management and target 9.4

The following item is considered: ratio between useful energy output over total energy input.

Process, linear infrastructure and dam (power generating or pumped hydro) facilities have a direct link with energy efficiency.

5.1.9.4 Indicator material management and targets 9.1 and 9.b

If CEWs implement comprehensive material management techniques as part of their standard implementation procedures, there are indirect impacts upon targets 9.1 and 9.b by aiding with evolution of infrastructures for material management, recycling and reuse.

5.1.9.5 Indicator waste management and target 9.4

The following items are considered:

- components for re-use;
- materials for recycling;
- materials for energy recovery (not being waste incineration).

There is an indirect contribution to this target by tracking and maximizing the number of components that are reused, materials being recycled, and materials recovered for energy.

5.1.9.6 Indicator landscape changes and target 9.1

The following item is considered: permanent land occupation: land surface occupied by the asset.

Careful design considerations for CEW can minimize landscape changes.

5.1.10 SDG 10. Reduce inequalities

The targets for SDG 10 are available on the United Nations website¹⁰⁾. This SDG does not present any type of significant relation between its targets and the environmental indicators defined in ISO 21928-2 and EN 17472.

5.1.11 SDG 11. Sustainable cities and communities**5.1.11.1 General**

The targets for SDG 11 are available on the United Nations website¹¹⁾. The relations between the indicators and the targets of SDG 11 are explained in [5.1.11.2](#) to [5.1.11.16](#).

5.1.11.2 Indicator water management and target 11.5

The following items are considered:

- water scarcity;
- water flooding.

Both droughts and floods are disaster-causing phenomena that can be mitigated by the implementation of certain CEW. In particular, dams contribute substantially to reducing their probability and, in any case, their effects. On the other hand, accidents or inadequate management can lead to greater damage.

10) Goal 10 “Reduce inequality within and among countries”: https://sdgs.un.org/goals/goal10#targets_and_indicators.

11) Goal 11 “Make cities and human settlements inclusive, safe, resilient and sustainable”: https://sdgs.un.org/goals/goal11#targets_and_indicators.

5.1.11.3 Indicator material management and target 11.c

The following items are considered:

- virgin material;
- recycled material;
- recyclable material;
- non-recyclable material;
- reused material.

The management of construction materials used for operation and maintenance on a construction site contributes directly to the development of the economy. Construction is a material-intensive activity and, precisely for this reason, it is usually more profitable to use local materials. These practices can lead to economic benefits, reduced environmental impacts, and a lower carbon footprint, thus contributing to the achievement of this target.

5.1.11.4 Indicator waste management and target 11.5

The following items are considered:

- hazardous waste disposed;
- radioactive waste disposed.

Both hazardous and radioactive waste can affect health and cause death. Their proper or inadequate management has direct consequences on people's health.

5.1.11.5 Indicator waste management and target 11.6

The following items are considered:

- hazardous waste disposed;
- non-hazardous waste disposed;
- radioactive waste disposed;
- components for re-use;
- materials for recycling;
- materials for energy recovery (not being waste incineration).

The waste generated directly affects the environmental impact. Both through the generation of the waste itself and through the loss of the resource (circular economy). These indicators are directly related to the environmental impact of cities.

5.1.11.6 Indicator emissions to air and target 11.2

The following items are considered:

- depletion potential of the stratospheric ozone layer (ODP);
- total global warming potential (GWP_{SUM}), defined as the sum of the fossil GWP, the biogenic GWP and the land use and land use change GWP, and expressed as kg CO₂ eq;
- fossil GWP (GWP_{fossil});
- biogenic GWP ($GWP_{biogenic}$);

- land use and land use change GWP (GWP_{luluc});
- formation potential of tropospheric ozone (POCP).

Linear works and in particular roads have a polluting effect that affects the sustainability of infrastructure as such.

5.1.11.7 Indicator emissions to air and target 11.b

The following items are considered:

- depletion potential of the stratospheric ozone layer (ODP);
- total global warming potential (GWP_{SUM}), defined as the sum of the fossil GWP, the biogenic GWP and the land use and land use change GWP, and expressed as kg CO₂ eq;
- fossil GWP (GWP_{fossil});
- biogenic GWP ($GWP_{biogenic}$);
- land use and land use change GWP (GWP_{luluc}).

In conjunction with infrastructure, and in the context of integrated climate change planning, disaster plans contribute to the adoption and implementation of appropriate policies.

5.1.11.8 Indicator emissions to water and targets 11.1, 11.2, 11.6 and 11.7

The following items are considered:

- eutrophication aquatic freshwater;
- eutrophication aquatic marine;
- eco-toxicity (freshwater).

For target 11.1, the infrastructures associated with water management facilitate access to adequate basic services. When they provide, both during construction and later in their life, adequate sanitation, water pollution is avoided, improving water quality. On the other hand, pollution episodes at any stage of the life cycle can have a negative impact on the guarantee of a quality water supply.

For target 11.2, infrastructure, and in particular roads, can generate pollution, making access to sustainable transport systems more difficult for all.

For target 11.6, pollution caused by the construction, operation and decommissioning of CEW increases the adverse per capita environmental impact of cities.

For target 11.7, pollution caused by infrastructure inhibits universal access to safe, inclusive and accessible green and public spaces; but on the other hand, infrastructure that improves the quality of the environment, such as wastewater treatment plants, waste treatment plants that allow proper management of waste that did not originate in the CEW, dams and their potential positive environmental impact, or recreational green spaces, makes it easier to do so.

5.1.11.9 Indicator emissions to soil and targets 11.1 and 11.7

The following item is considered: soil quality: potential soil quality index.

For target 11.1, soil contamination impedes the provision of adequate and safe housing and basic services.

For target 11.7, safe green and public spaces are incompatible with the presence of contaminated soil.

5.1.11.10 Indicator acidification of soil and water and target 11.b

The following item is considered: acidification: accumulated exceedance, acidification potential AP.

Water and soil acidification is an indicator of global warming potential and is directly related to climate change mitigation.

5.1.11.11 Indicator disturbance because of noise, vibrations and light impacts on ecological species, and targets 11.1 and 11.7

For target 11.1, the construction activity of infrastructures and, later, during the use phase of some of them, such as industrial areas, railways or roads, generates annoying noise and vibrations that undermine the healthiness of residential use.

For target 11.7, the safe use of public green spaces is not always compatible with the construction activity of infrastructures or, during the use phase of some of them, such as industrial areas, ports, railways or roads, because of the noise and vibrations that are produced and which reduce their healthiness.

5.1.11.12 Indicator permanent land occupation and target 11.3

The permanent occupation of land by infrastructure reduces both the possibilities for development and urbanization in the surrounding area and the availability of land for inclusive and sustainable development, as well as the capacity for planning and management.

5.1.11.13 Indicator biodiversity change and targets 11.7 and 11.a

The following items are considered:

- protected areas affected;
- non-protected areas with biodiversity quality changes.

For target 11.7, universal access to the environment has the potential to adversely affect environmental quality and its protection, and also accelerate biodiversity change.

For target 11.a, planning includes protected and non-protected areas, considering the changes that infrastructure brings to the territory, and thus supports possible positive linkages between urban, peri-urban and rural areas and reinforces sustainable planning.

5.1.11.14 Indicator biodiversity change and target 11.4

The following item is considered: protected areas affected.

The presence of infrastructure can negatively affect both the natural heritage itself and efforts to protect and safeguard cultural and natural heritage.

5.1.11.15 Indicator ecological connectivity (landscape connectivity) and target 11.4

The following item is considered: degree to which CEW facilitates or impedes the movement through the landscape for flora and fauna.

The transversal permeability of linear infrastructures for natural flora and fauna, or the level of barrier that various infrastructures, such as dams or industrial installations, can pose, has a direct and significant impact on the defence of cultural and natural heritage and its good health.

5.1.11.16 Indicator land use changes and target 11.a

The following items are considered:

- land use changes inside the project boundaries for the CEW development, considering the previous use of the land (non-previous developed, and previously developed land);

- surface of land that changes its previous use because of the CEW (because the land is occupied by it or because of its influence).

Infrastructure has to be part of regional level planning and, to the extent that it has been considered and depending on how it has been done, it has an impact on national and regional development planning.

5.1.12 SDG 12. Responsible consumption and production

5.1.12.1 General

The targets for SDG 12 are available on the United Nations website¹²⁾. The relations between the indicators and the targets of SDG 12 are explained in [5.1.12.2](#) to [5.1.12.13](#).

5.1.12.2 Indicator water management and target 12.2

The following items are considered:

- consumptive use of fresh water;
- non-consumptive use of fresh water;
- water scarcity.

Infrastructures in general have an important relationship with water use, both in terms of the water required for their maintenance and operation and the effects they have on runoff water bodies. Linear barriers redirect flows and concentrate them in crossing works. But in a particular and especially relevant way, the role of dams in the sustainable management and efficient use of water as a resource is very important.

5.1.12.3 Indicator water management and target 12.4

The following item is considered: quality.

The possible contamination of water during the construction processes of infrastructures, as well as during operation, can have a decisive influence on the correct environmental management of waste throughout its life cycle, and reduce its release into water in order to minimize adverse impacts on human health and the environment.

5.1.12.4 Indicator energy sources and target 12.2

The following items are considered:

- use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ, net calorific value);
- use of non-renewable primary energy resources used as raw materials (MJ, net calorific value);
- total non-renewable primary energy resources (primary energy and primary energy resources used as raw materials);
- non-renewable secondary energy sources.

Infrastructures can contribute to energy generation and use. Clean energies, such as wind or hydroelectric power, are based on the construction and operation of CEW which, in this way, contribute to the proper management of resources and energy as such. On the other hand, the operation of certain types of infrastructures, mainly industrial installations, consumes significant quantities of fossil fuels and other types of energy.

12) Goal 12 “Ensure sustainable consumption and production patterns”: https://sdgs.un.org/goals/goal12#targets_and_indicators.

5.1.12.5 Indicator energy sources and target 12.a

The following items are considered:

- use of renewable primary energy excluding renewable primary energy resources used as raw materials (MJ, net calorific value);
- use of renewable primary energy resources used as raw materials (MJ, net calorific value);
- total renewable primary energy resources (primary energy and primary energy resources used as raw materials);
- use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ, net calorific value);
- use of non-renewable primary energy resources used as raw materials (MJ, net calorific value);
- total non-renewable primary energy resources (primary energy and primary energy resources used as raw materials);
- renewable secondary energy sources;
- non-renewable secondary energy sources.

The construction of infrastructure and its subsequent operation can drive industry towards changes that lead to greater efficiency in the use of resources, in particular energy resources.

5.1.12.6 Indicator demand side management and target 12.2

Windmills, dams, industrial plants, etc. are needed to harness energy.

5.1.12.7 Indicator material management and target 12.2

The following items are considered:

- virgin material;
- recycled material;
- recyclable material;
- non-recyclable material;
- reused material.

Materials management has a direct bearing on this goal. The use of materials from recovery or recycling to the extent that it is a consequence of proper materials management also has a direct bearing on this goal.

5.1.12.8 Indicator material management and target 12.5

The following items are considered:

- virgin material;
- recycled material;
- recyclable material;
- reused material.

The performance of both waste and materials management during all stages of the infrastructure life cycle has a direct influence on the achievement of this target.