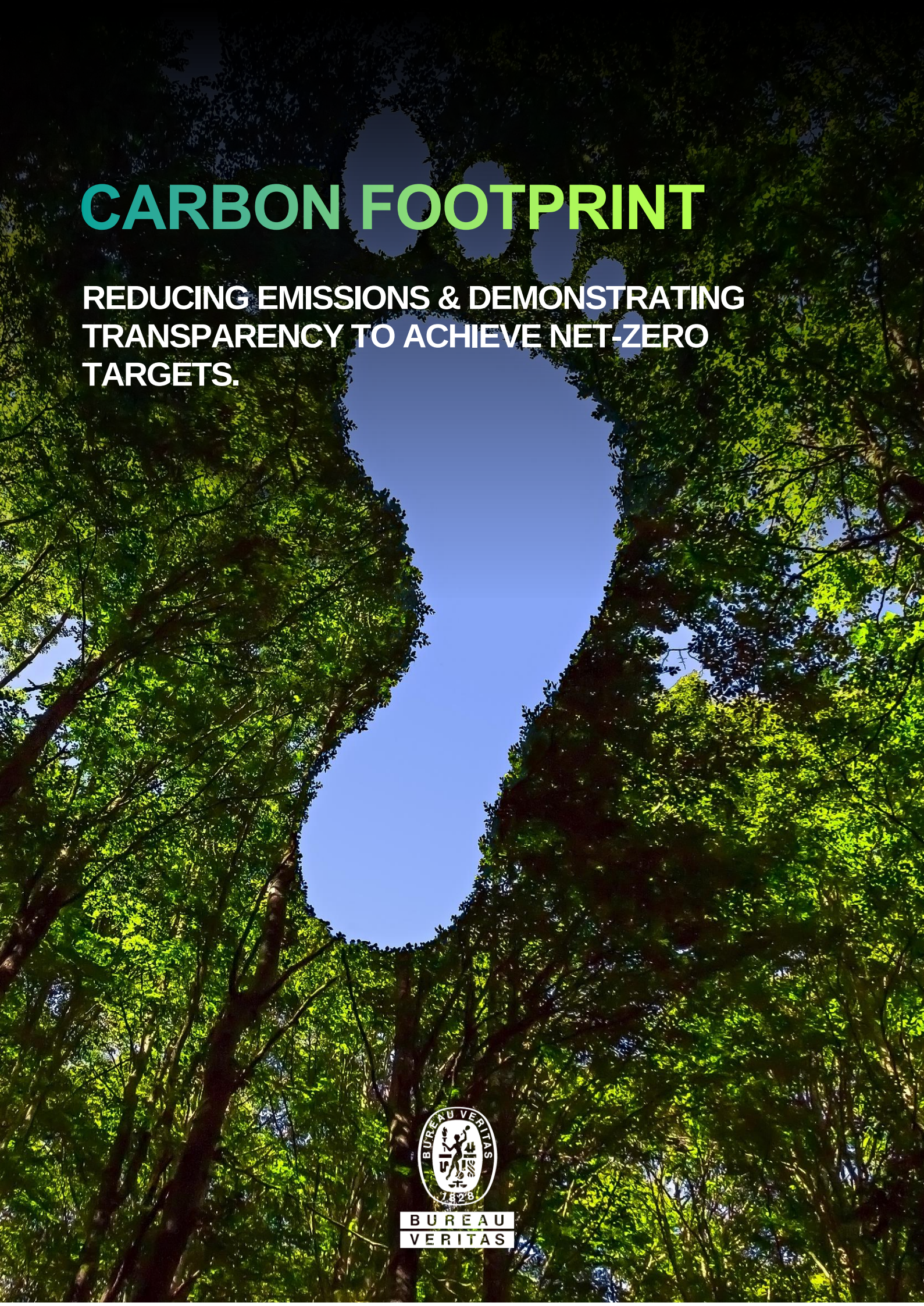
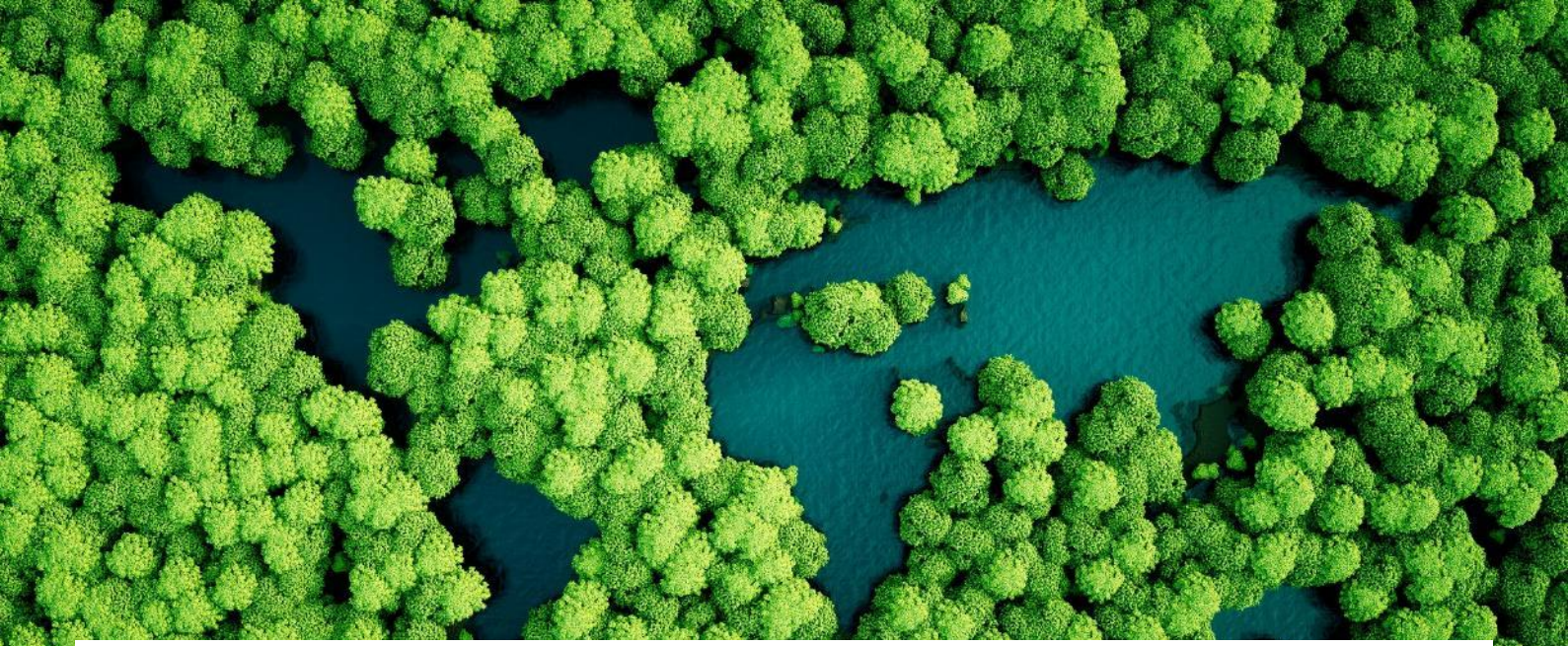


CARBON FOOTPRINT

REDUCING EMISSIONS & DEMONSTRATING TRANSPARENCY TO ACHIEVE NET-ZERO TARGETS.

BUREAU VERITAS



ABOUT THIS WHITEPAPER

Companies, organizations and governments can have an impact on the economy, the environment and people through their activities and business relationships, thereby making a positive or negative contribution to sustainable development. The term "sustainable development" refers to development that meets the needs of the present generation without compromising[1] the ability of future generations to meet their own needs.[2] That the increase in greenhouse gas emissions from human activities is causing global warming is clearly scientifically proven.[3]

In addition, people around the world are expressing, in one way or another, their recognition of the urgency of tackling climate change and their willingness to mitigate its impacts and do their part to decarbonize the economy. The Paris Agreement[4] targets "net zero emissions" to limit global temperature rise to well below 2°C and continue efforts to reduce it to 1.5°C.

In addition, the European „Green Deal“[5] aims to make the EU the first "climate neutral" continent by 2050, with all 27 EU member states committing to reducing emissions by at least 55% by 2030 compared to 1990 levels.

At the national level, the amended Federal Climate Protection Act was also passed by the Bundestag on June 24, 2021.[6]

Given this urgency, more and more companies are setting ambitious goals, including "climate neutral" or "carbon neutrality" as well as "net zero" targets. These terms are overlapping concepts with subtle differences that can be applied globally or sub-globally.[7] At the same time, these goals show that companies have very different understandings of sustainability and approaches to achieving them.

[1] *World Commission on Environment and Development, Our Common Future, 1987.*

[2] *Consolidated Set of the GRI Standard 2022*

[3] *1. IPCC_AR6_WGI_Chapter03, page 93; 2. IPCC_AR6_SYR_LongerReport, page 6; 3. IPCC_AR6_WGI_Chapter03, page 35; 4. IPCC_AR6_WGI_Chapter01, page 38; 5. IPCC_AR6_WGI_Chapter01, page 104*

[4] *At the UN Climate Change Conference in Paris, France, in December 2015, 197 countries agreed on a new global climate change agreement. The agreement entered into force on 4 November 2016 after being ratified by 55 countries that emit at least 55 percent of global greenhouse gases. https://www.bmwk.de/Redaktion/DE/Artikel/Industrie/klimaschutz-abkommen-von-paris.*

[5] *https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_de*

[6] *The new law brings forward the goal of climate neutrality by five years to 2045. The path to this goal is set with binding targets for the 20s and 30s. The interim target for 2030 is increased from the current 55 to 65 percent reduction in greenhouse gas emissions compared to 1990 levels. For 2040, a new interim target of 88 percent reduction applies. https://www.bmuv.de/gesetz/bundes-klimaschutzgesetz*

[7] *IPCC_AR6_WGIII_Chapter01, IPCC_AR6_WGIII_Chapter03, IPCC_AR6_WGI_AnnexVII, IPCC_AR6_WGIII_Annex-I*

OVERVIEW

This white paper examines the key impacts of business, presents potential actions for decarbonization, and explains how holistic assessment, audits, reporting systems, and data and reporting reviews can help companies/organizations achieve their goals for decarbonizing the economy and addressing climate change.

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Introduction

Many organizations are aiming to decarbonize the economy by 2050 as part of the UN's “Race to Zero[8] campaign, the largest alliance of local governments, businesses, and investors. Others are aiming for net zero emissions in a more ambitious timeframe, such as 2030, or even net negative emissions targets.

Companies aiming for full decarbonization must start by eliminating or reducing greenhouse gas emissions throughout their value chain. This means they must account for direct GHG (greenhouse gas) emissions from owned or controlled sources, including on-site fuel combustion, such as in fleet vehicles, and indirect GHG emissions, such as from the generation of electricity or steam purchased and used by the organization (also known as "Scope 1" and "Scope 2 emissions").

Importantly, they must also include all other indirect greenhouse gas emissions that occur in their value chain (known as Scope 3 emissions), such as GHG emissions from the production of raw materials from suppliers (upstream emissions), GHG emissions resulting from the transportation of raw materials and products, and the use and end-of-life phases of the products and services they offer.

A comprehensive assessment of the entire value chain contributes to a company's credibility when it comes to communicating "net zero" goals. In addition, it is important for companies to have their data, assessments, methodologies, and management systems conducted and externally audited according to national or international standards to ensure that they comply with national and international guidelines and legislations. This serves as a basis to demonstrate the effectiveness and accuracy of the strategies to stakeholders and wider parties.

8 *https://unfccc.int/climate-action/race-to-zero-campaign*

Net-Zero

At the global level, "carbon neutrality" and "net zero" are equivalent. At the sub-global level, "net zero" typically refers to emissions and their mitigation within the direct control or territorial responsibility of the reporting entity (Scope 1 and Scope 2 emissions of the carbon footprint), while "carbon neutrality" typically includes emissions and their mitigation within and outside the direct control or territorial responsibility of the reporting entity (including Scope 3 emissions of the carbon footprint). "Climate neutrality," on the other hand, considers all human impacts that affect the climate.

In a corporate context, the working definition of Net-Zero[9] is generally understood as a state in which the activities of a company and its value chain have no impact on the climate through greenhouse gas emissions. One way to achieve this desired state is to set and pursue a science-based, 1.5°C target (e.g., Science Based Target, SBTi)[10], which outlines a pathway to reduce and eliminate emissions throughout the value chain.

WHY IS NET-ZERO NECESSARY?

Climate science is clear that the extent of global warming is proportional to the total amount of carbon dioxide and other greenhouse gas emissions released into the atmosphere by human activities.

To stabilize climate change and limit global warming to 1.5°C, which is part of the Paris Agreement target, greenhouse gas emissions must therefore fall to zero. The longer it takes to achieve this, the more the climate will change. The 2018 report of the Intergovernmental Panel on Climate Change (IPCC) concludes that global emissions need to fall to zero around mid-century (2050) to have a reasonable chance of meeting the 1.5°C target.[11]

In addition, the carbon footprint will become an important criterion in procurement in the foreseeable future, so the demand for responsibility in the value chain will continue to increase.

[9] *Working definition provided by the Science-Based Targets initiative*
[10] *https://sciencebasedtargets.org/resources/files/Net-Zero-Standard.pdf*
[11] *https://eciu.net/analysis/briefings/net-zero/net-zero-why*

HOW CAN WE ACHIEVE THE NET ZERO GOAL?

The first step for any organization making a Net Zero commitment is to gain an understanding of its own emissions (greenhouse gases, GHG). These greenhouse gas emissions are typically aggregated and converted (in terms of their ability to affect atmospheric warming) into metric tons of carbon dioxide equivalent (tCO_2eq. for short, in short “Carbon Footprint”) or kilograms of carbon dioxide equivalent (kg CO_2eq. for short, in short “Carbon Footprint”) to express the impact of total greenhouse gases in a single number, making it easier to compare. Greenhouse gases that are most abundant in the atmosphere include: Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the so-called F-gases: Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF_6), and Nitrogen Trifluoride (NF_3). Under the Kyoto Protocol[12] Companies are required to consider at least the above greenhouse gas emissions in order to calculate and communicate their Carbon Footprint.

However, there are other emissions that enter the atmosphere and contribute to the greenhouse effect indirectly, through their involvement in various atmospheric reactions. These include water vapor (H_2O), nitrogen oxides (NO), carbon monoxide (CO), volatile organic compounds (VOCs), and sulfur dioxide (SO_2). It is important to note that while these gases may have indirect effects on climate change, their primary environmental and health concerns are related to air quality and human well-being.

The share of greenhouse gas emissions varies by sector. A total of 58.4 GT was emitted by July 03, 2023. These estimates are based on a novel statistical model developed by researchers at the Vienna University of Economics and Business and the World Data Lab (WDL) to produce realistic projections of GHG emissions under different assumptions. Figure 1 shows the distribution of global greenhouse gas emissions by sector.

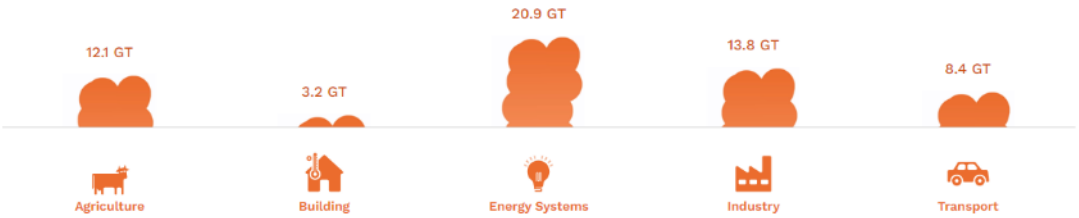


figure 1. Source: https://worldemissions.io/

Therefore, before a company can begin reducing its emissions, it must first determine exactly how much of each emission it produces and the sources of those emissions. Once this critical foundation is established, the second step is to set science-based targets to develop a path to avoid, reduce and eliminate the identified emissions.

[12] *https://unfccc.int/resource/docs/convkp/kpeng.pdf*

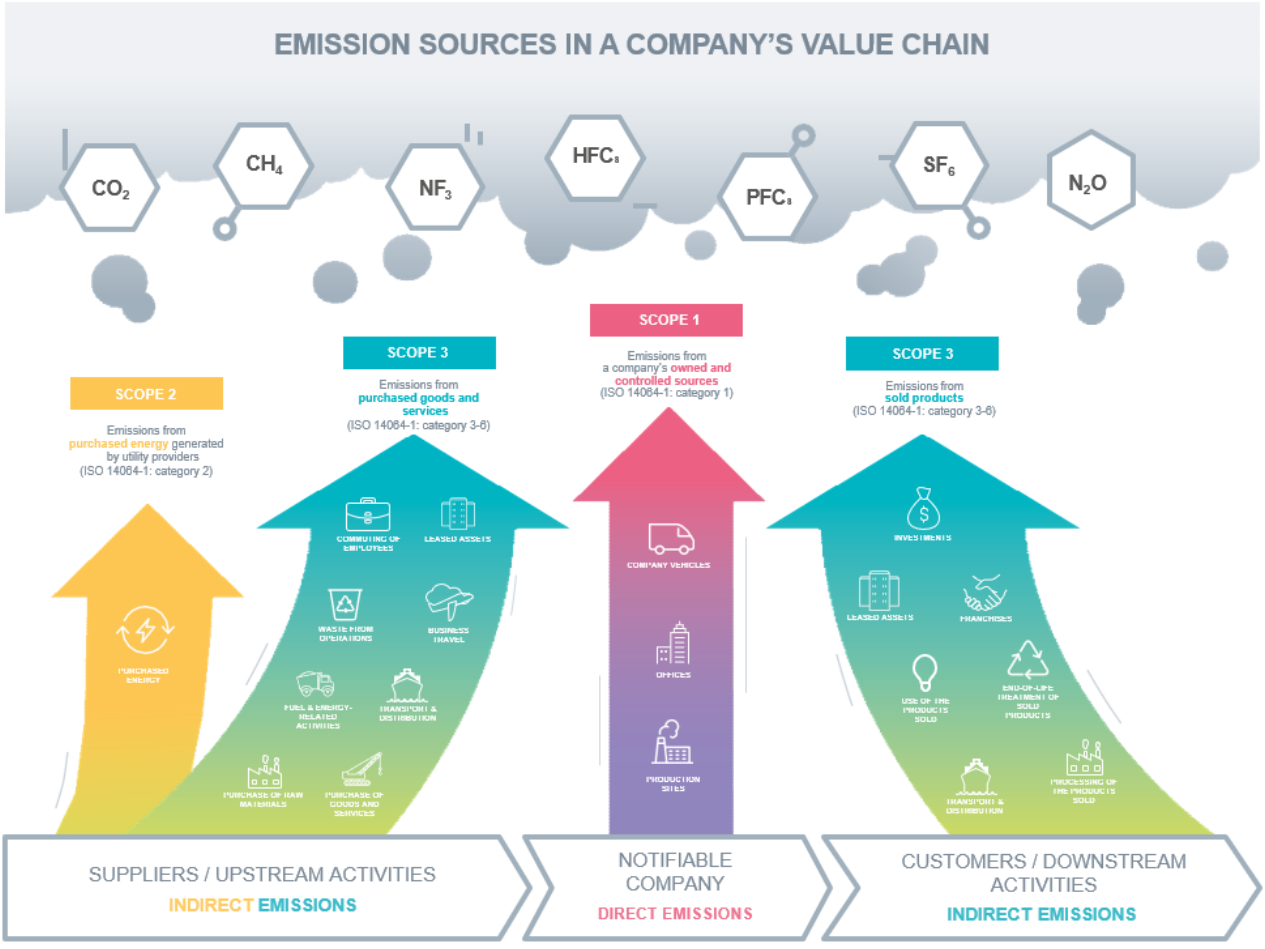
The three scopes:
Direct and indirect greenhouse gas emissions

In accordance with the GHG Protocol "A Corporate Accounting and Reporting Standard" of the WBCSD/WRI[13], a company's greenhouse gas emissions are divided into three areas:

1/3 Scope 1 emissions (also known as direct emissions, category 1 in ISO 14064-1) are the greenhouse gas emissions that the organization itself produces directly. Depending on the sector and activity of the company, these can account for a relatively small portion of total emissions.

2/3 Indirect greenhouse gas emissions are often responsible for a much larger share of a company's total emissions. If a company also purchases or generates energy in the form of electricity, heat, or steam to cover the production of its products, these are classified as Scope 2 emissions (also known as indirect emissions category 2 according to ISO 14064-1.

3/3 Scope 3 emissions are all greenhouse gas emissions that are emitted both upstream and downstream: upstream, meaning in the production of raw materials, and transport of purchased products and services, and downstream, meaning in use phase and the End-of-Life of the goods produced by the company. Scope 3 emissions address the indirect emission categories 3-6 of ISO 14064-1.



[13] *https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf*

Measuring and reducing the CO_2 - Footprint ("Carbon Footprint")

The key to eliminating greenhouse gas emissions is to ensure that emissions in all three scopes are identified and measured, and then reduced or eliminated. Companies that succeed in understanding, reducing and transparently reporting emissions, both direct and indirect, in all three scopes have a significant competitive advantage through cost savings, a better understanding of their supply chain and can benefit from the associated reputational advantages of taking action on emissions.

SCOPE 1 AND SCOPE 2 EMISSIONS - DEALING WITH THE EMISSIONS YOU CAN REDUCE YOURSELF

In order to avoid and reduce direct greenhouse gas emissions and reduce operating costs, organizations / companies can reduce the energy consumption of their facilities and their equipment, as well as the emissions from their production processes, only if their sources and quantities are known.

Therefore, the following aspects are important:

- Measurement and quantification of Scope 1 and 2 emissions
  - Use of suitable measurement technology (e.g., integrated greenhouse gas monitoring system or emission monitoring)
  - Measurement of electricity or gas at the extraction point
  - Documentation of the amount of electricity, heating oil or gas used, and the exhaust gases emitted
  - Documentation of the purchase quantities of raw materials, consumables, and supplies
- Using appropriate tools to identify raw material consumption and determine measures to reduce resulting emissions and waste
- Determination of energy consumption through a detailed energy audit and definition of measures to reduce energy consumption
  - Energy efficiency improvements through standardized operating systems and production processes (energy recovery, closed-loop steam condensate systems, conversion to automatic LED lighting, and conversion to energy-efficient heating, ventilation, and air conditioning systems and an energy management system can be useful)
  - Optimization of approaches (e.g., technology and digitalization as enablers)
  - Introduction of renewable energies / low-carbon technologies

SCOPE 3: THE BIG CHALLENGE IN REDUCING EMISSIONS

The other major part of total corporate greenhouse gas emissions comes from Scope 3 sources. Collecting data on these sources and then reducing them is one of the biggest difficulties in calculating the carbon footprint. This is because Scope 3 emissions can usually only be roughly estimated using secondary data.

Nevertheless, many companies are now demonstrating best practices in reducing Scope 3 emissions – and are making headlines.

Here's how to successfully better your Scope 3 emissions assessment:

- Identification of relevant categories in scope 3 emissions
- Use of tools such as Life Cycle Assessment, LCA to calculate emissions more accurately. In this context, the impact of the supply chain is also included.
- Eliminate – Identify potential hotspots that require further analysis to take immediate action:
  - Influence corporate decisions / use to avoid GHG emissions over the entire life cycle.
  - Potential exists when organizations change, expand, streamline, or relocate their business
- Transition to a new business model, alternative operation, or new product/service
- Reduce identified hotspots through collaboration with stakeholders
- Substitution of own emissions by purchasing inputs and services with lower embodied/embedded emissions.
- Compensation for "**unavoidable**" residual emissions

The sources of upstream emissions are highly industry-dependent and working with suppliers is important to quantify and manage them.

WHAT IS THE CO_2-FOOTPRINT OR CARBON FOOTPRINT?

Carbon Footprint is an important first step on the road to climate protection. It provides an initial assessment of the potential environmental impact, from which solutions can be developed. Emission hotspots in the entire value chain are identified in order to avoid negative impacts and to recognize unintended consequences. Two different types are differentiated here:

Corporate Carbon Footprints cover a company’s greenhouse gas emissions on an annual, while product Carbon Footprints accounts the emissions associated with a particular product or service. Data is collected from a variety of different sources, including corporate data management systems (operational emissions data, raw materials, energy and fuel consumption, emissions from travel and logistics) and external databases.

The Carbon Footprint enables a company to assess its progress in reducing emissions and then adjust its strategy as necessary.

The accuracy and reliability of a company's or product's Carbon Footprint can be significantly improved if the Carbon Footprint data is verified by a trusted and independent third party, such as Bureau Veritas. This not only ensures that companies are basing their sustainability strategies on reliable and accurate data – thus optimizing all their actions – but also allows them to demonstrate that the environmental claims they are making are accurate and transparent.

Reducing the CO_2-Footprint

Many Net-Zero emissions plans include an important component: the Carbon offset program (also known as compensation, neutralization, or offset program). However, before participating in such a program, it is necessary to quantify, reduce and eliminate emissions (Scope 1, 2 and 3).

Once companies have exhausted all the options available to them to reduce their emissions, organizations can apply to so-called Carbon offsetting programs to neutralize[14] or compensate[15] for emissions that cannot be avoided.

It is advisable to work with an independent third party to accurately quantify all your emissions and identify areas where changes are needed.

In a world where fossil fuels are still the main energy source, the voluntary offsetting or neutralization of non-avoidable greenhouse gas emissions is a key factor in achieving emission reduction targets. Despite criticism of carbon offsets as "selling indulgences," this is – in a global context with limited carbon taxes – an important first step in raising awareness of emissions reductions.

If a company decides to make use of carbon offsetting programs, it needs to be sure that the offsetting or neutralization is permitted. It is for this reason that companies should only invest in projects that have been certified and verified by an independent third party. Projects must be real, measurable and verifiable.

It is recommended to support renewable energy projects that help reduce or even eliminate deforestation and fossil fuel use, as well as projects with positive economic and social impacts. Such co-benefits can contribute to poverty alleviation through the creation of employment and education opportunities, and thus to the improvement of people's livelihoods. To this end, several standards are used to ensure the credibility of emission reduction projects. One of these standards is known as the Verified Carbon Standard (VCS). Projects certified to VCS provide tradable greenhouse gas credits to companies seeking to offset emissions. The Gold Standard is another standard that certifies that a project's carbon credits are genuine and verifiable.

[14] *Compensation/Offsetting – removal of emissions outside of a company's value chain*
[15] *Neutralization - elimination of emissions within or outside the value chain*

However, when participating in these programs, companies should avoid getting caught in what is known as the rebound effect[16], meaning that although companies offset their emissions, they ultimately continue to produce emissions or even produce more emissions. For example, by manufacturing a product in an environmentally better way, costs may be reduced, but these cost savings may lead to increased demand for the product, in turn leading to higher emissions. Non-financial influences such as changing norms or attitudes, as well as insufficient knowledge about the optimal use of efficient technologies, can also cause behavioral changes that lead to increased demand and thus rebound effects. This increased demand can relate to the efficient product itself or to other products and sectors.

Benefits of validation as well as verification in carbon offsetting and neutralization:

BENEFITS

- **Measurement and control** of own emissions
- **Transparent evaluation** and reporting on the effects of own projects
- **Proof** of the legitimacy of own emission credits

[16] *The rebound effect corresponds to the additional demand for resources induced by increased resource efficiency. If the efficiency increases by 10%, a 10% reduction in resource demand would be expected if demand remained unchanged. If, however, it can be observed that the resource demand decreases by only 5% as a result of the efficiency change, there is a rebound effect of 50%. https://www.umweltbundesamt.de/sites/default/files/medien/376/publikationen/texte_31_2015_rebound-effekte_ihre_bedeutung_fuer_die_umweltpolitik.pdf*

Life Cycle Assessment (LCA)

A life cycle assessment offers companies the opportunity to provide different levels of detail depending on the company's orientation. It can include data from the production of raw materials to the delivery of the purchased product and thus reflect the entire supply chain ("cradle-to-gate").

If a company focuses on a reduced approach that only considers direct suppliers, primary "gate-to-gate" LCA data can be collected and supplemented with data from LCA databases or industry associations. By using LCA in the right way, companies can obtain the necessary supplier-specific emissions data (Scope 3) without having to reveal all the supplier's process know-how.

However, it is important here that standards are used to lend credibility to these studies. Furthermore, it is important that these studies are verified by a third party if the results are to be communicated externally.

Energy Management Systems

The world emits around 58.4 billion metric tons of greenhouse gases every year[17]. It is estimated that almost three quarters of these emissions come from energy use due to the energy supply systems, transport and industry [18]. Improving energy management is therefore key to reducing emissions and mitigating climate change. For companies that want to make a significant contribution to combating climate change, conducting targeted energy audits or implementing a company-wide Energy Management System (EnMS) is often the best place to start.

The first step for companies implementing an EnMS is to become aware of which areas of their business consume the most energy – their significant energy use units (SEUs). This process is critical to highlighting areas of focus and areas for improvement specifically related to Scope 2 emissions. Identifying SEUs begins with an energy report that shows energy use based on measurements and data. This information is used to determine current energy performance and identify opportunities for improvement, such as installing smart meters that record and report energy use in near real-time.

An EnMS, as required by ISO 50001, can also enable an organization to reduce Scope 2 emissions. It enables an organization's management to develop an energy policy that defines the systems and processes needed to improve energy performance. This could include influencing employee behavior, more detailed measurement of processes, and an inventory of opportunities to improve energy efficiency.

FURTHER FACTS

- More than 80% of the energy generated worldwide still comes from fossil fuels[19]. The transition to low-carbon energy sources is crucial to reduce emissions.
- Global energy consumption is increasing every year and was projected to reach over 176,431 TWh in 2021. In the last 50 years, there have been only a few years in which energy consumption has not increased.[20]

[17] *https://ourworldindata.org/ghg-emissions-by-sector*
[18] *https://www.wri.org/data/world-greenhouse-gas-emissions-2019*
[19] *https://ourworldindata.org/energy-mix*
[20] *https://ourworldindata.org/energy-production-consumption*

Data and report verification

To ensure that their emissions reduction strategies are well chosen, organizations must base their decisions on accurate and meaningful data and results. Likewise, organizations should be able to demonstrate that the data and results are truthful and communicated transparently. Only then can companies benefit from the reputational advantage that sustainability efforts provide.

In both cases, robust data collection and reporting systems that have been independently verified or certified by an expert third party are critical. It is also important that all resulting data and results are verified if a company's carbon offset program (compensation or neutralization) is to be considered fully credible.

HOW CAN BUREAU VERITAS SUPPORT YOU IN THIS?

Bureau Veritas supports responsible companies by providing holistic assessment, audits and verifications of emissions inventories, recording / footprints, and reports on progress towards their goals. We also validate and verify offset and emission reduction initiatives and demonstrate the legitimacy of carbon credits.

In addition, our experts can verify the fulfillment of the "net zero" target through verification and certification according to various standards and systems.

After all, it's one thing for a company to announce a "carbon neutrality" target or a "climate neutral" goal; it's quite another to actually achieve it. And at a time when consumers and other stakeholders are becoming increasingly demanding and skeptical, companies must provide evidence that they have excellent sustainable credentials if they have taken the extra step of verifying.

Integrated assessment, verification / certification by Bureau Veritas

Our role in your decarbonization journey

Achieving ambitious Net Zero goals requires implementing best business practices across the value chain. With many large companies setting carbon-neutral and Net Zero targets, the responsibility now lies with many smaller suppliers to understand and reduce their emissions.

Bureau Veritas supports both large and small organizations by providing holistic assessment and verification of reports on progress toward their goals. We provide holistic assessment, review, verification, and in some cases certification of components of holistic Net Zero strategies.

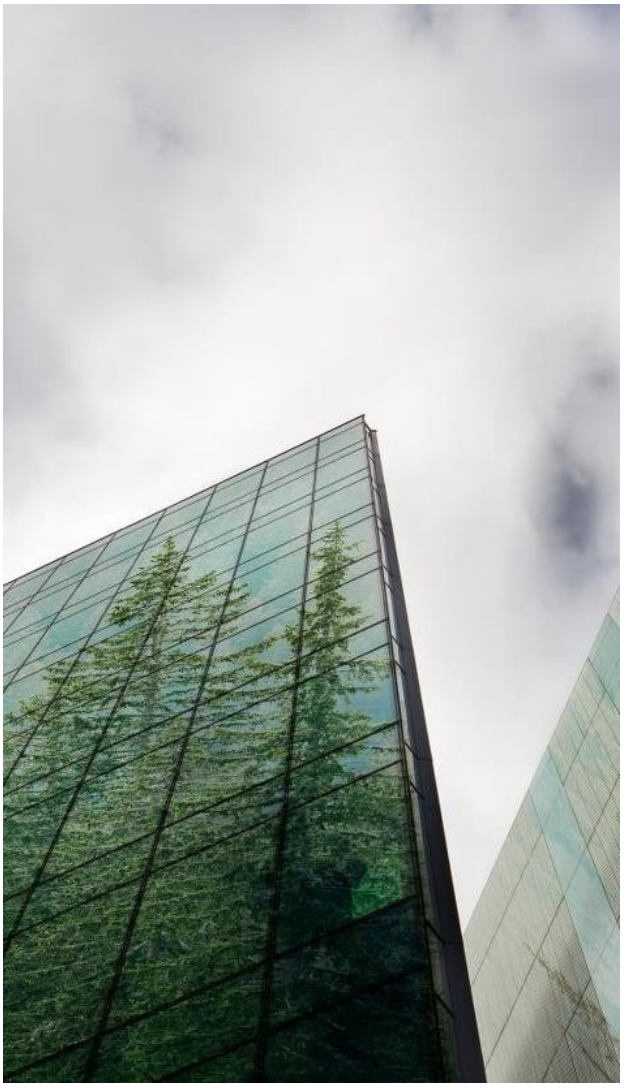
REDUCTION OF THE CO_2 FOOTPRINT (CARBON FOOTPRINT)

For organizations seeking accurate assessment and reporting of their emissions and identifying areas for improvement, Bureau Veritas reviews companies' data, assessment methodologies and reports against a range of voluntary standards and regulatory requirements.

We review according to ISO 14064-1, ISO14067, ISO 14040/14044, ISO 14025, PEF (Product Environmental Footprint from the European Commission), the international EPD system, and the European Union Emissions Trading Scheme (EU ETS), among others, taking into account potential conflicts of interest. In doing so, we proceed as follows:

- Holistic assessment of your emissions or carbon Footprint
- Verification of the Carbon Footprint

We can also assist you with the certification of your energy management system according to ISO 50001.



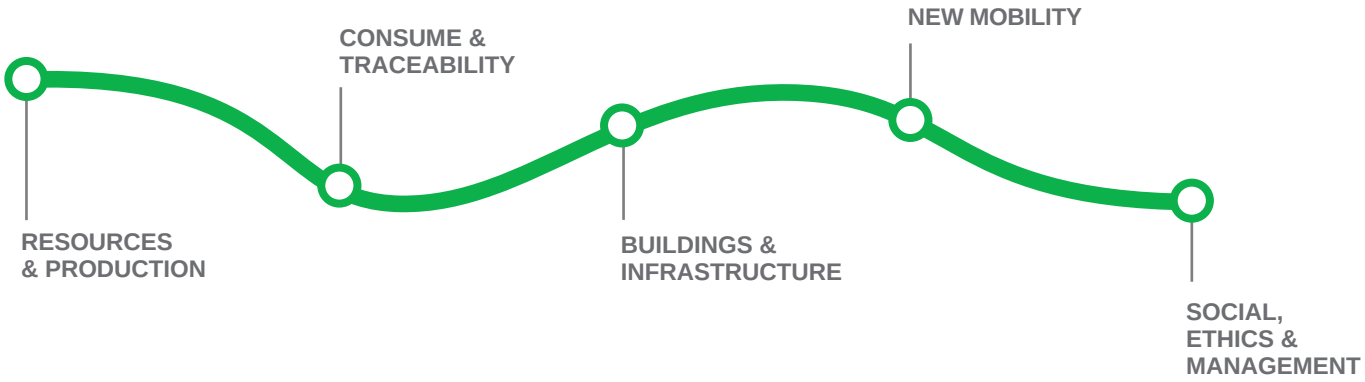
CREATION OF TRANSPARENCY

To demonstrate full transparency, companies can engage Bureau Veritas to provide certification of their maturity level with the Carbon Progress© certification system or certified carbon neutrality declarations in accordance with PAS 2060 (or the anticipated ISO 14068). These standards require companies to set carbon targets, monitor carbon emissions, identify inefficient areas, make improvements, measure emissions reductions, and, in the case of a carbon neutrality declaration, purchase the right amount of carbon credits to offset any residual emissions.

CERTIFICATION FOR CO_2 OFFSETTING AND REDUCTION (COMPENSATION / NEUTRALIZATION)

Bureau Veritas validates and verifies offset and emission reduction initiatives, proves the legitimacy of carbon credits, and helps companies achieve carbon neutral or net zero operations. Schemes include Verified Carbon Standard (VCS), ISO 14064-2, the Clean Development Mechanism (CDM), and the Gold Standard.

Our Green Line services and solutions



Resources & Production

- **Renewable and alternative energies**
  Onshore and offshore wind farms, solar plants from project to asset management, biofuel and hydrogen certifications.
- **Sustainable use of natural resources**
  Agricultural harvest monitoring and precision farming, responsible fishing, forest certification and marine pollution prevention.
- **CO_2 Footprint of industry**
  - Collection and monitoring of emissions
  - Assessment of environmental impacts according to different methods, standards and schemes
  - Methods for products, services, organizations and projects

Consumption & Traceability

- **Sustainable supply chains, food certification**
  Product component auditing, organic certification, supply chain resilience auditing, circular economy auditing, and supply chain ESG auditing

Buildings & Infrastructure

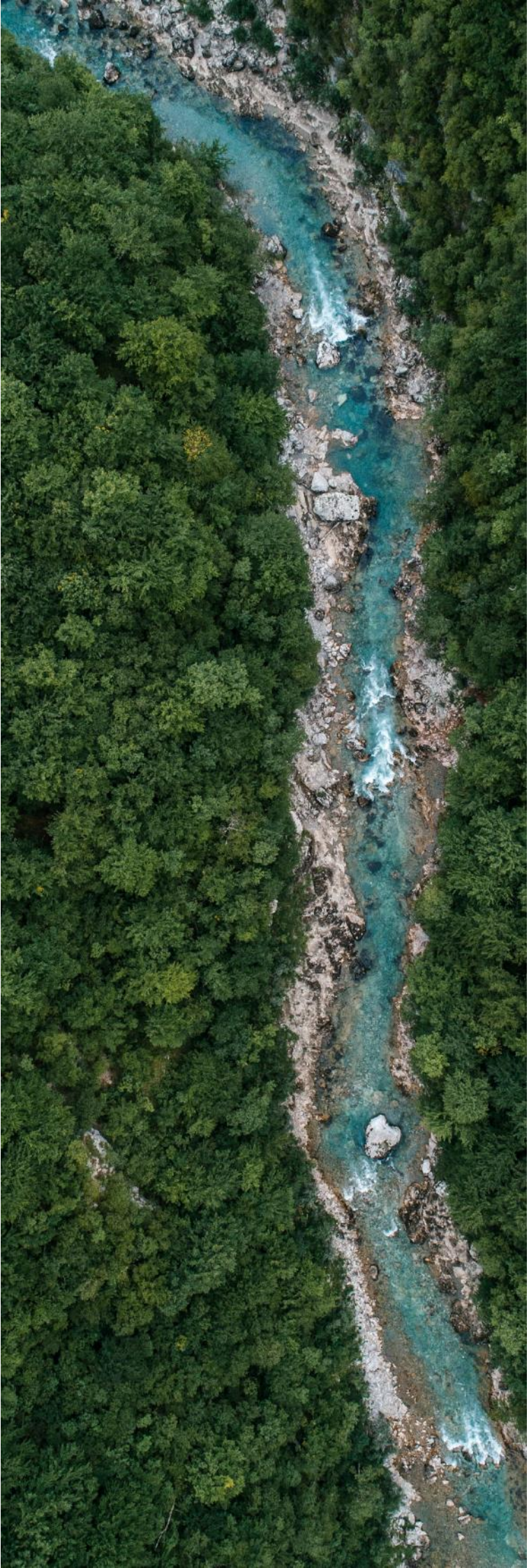
- **Construction & Renovation**
  Green building certification, project management for infrastructure improvement in developing countries, and life-cycle management of infrastructure assets in developed countries.

New Mobility

- **E-mobility, alternative drive systems**
  Batteries, charging stations, connection tests, inspection of LNG ships (new construction, conversion)

Social, Ethics & Administration

- **Social practices**
  Social audits, health, safety, hygiene and integration protocols
- **CSR strategy**
  Monitoring of measures, improvement of management systems, review of reporting
- **Ethics & Business Practices**
  Audit of human rights violations, supplier assessment, anti-corruption certification, data protection and cybersecurity certifications



Founded in 1828, Bureau Veritas is a world leader in Testing, Inspection and Certification (TIC).

Bureau Veritas offers high quality services to help you meet the growing challenges of quality, safety, environmental protection and social responsibility.

As a trusted partner, Bureau Veritas provides innovative solutions that go beyond confirming compliance with regulations and standards by reducing risk, improving performance and helping to promote sustainable development.

Do you have further questions on the topic of carbon footprint? Then please feel free to contact us:

Bureau Veritas Industry Services GmbH
Veritaskai 1, 21079 Hamburg, Germany

Tel: +49 40 23625-0
Fax: +49 40 23625-422
E-Mail: info-de@bureauveritas.com

www.bureauveritas.de
www.bureauveritas.at
www.bureauveritas.ch/en

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Please note that regulations can still change constantly. Therefore, please always keep up to date.

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