REALISING RESPONSIBLE IMPACT

2020 SUSTAINABILITY REPORT

TNO innovation for life

CONTENTS

PREFACE

TNO connects people and knowledge to create innovations that sustainably boost companies' competitiveness and increase wellbeing across society. We are the largest not-for-profit institution for applied research in the Netherlands. Our employees use their expertise to improve society through innovations and partnerships hence our motto: 'innovation for life'. TNO is proud to be part of the growing international community of companies and other organisations that are working on the basis of sustainable business practices. We hereby declare our continued support for the United Nations (UN) Global Compact and its principles, as well as our commitment to the UN Sustainable Development Goals. In the coming years, we will further embed the 10 principles of the UN Global Compact in our organisation in a process of continual improvement. As a meaningful step, we have established 'social responsibility' as one of the cornerstones of our new 2022-2025 TNO Strategy.

Paul de Krom, CEO

INTRODUCTION

TNO's motto is 'Innovation for life': we connect people and knowledge to create innovations that sustainably boost companies' competitiveness and increase wellbeing across society. As an independent public organisation, we want to do this in a responsible and sustainable way. In 2020, TNO fine-tuned its Corporate Social Responsibility (CSR) policy to make this ambition a reality in its operations. This new TNO Sustainability Report is one of the results: it complements TNO's 2020 Annual Report, and is the first Communication on Progress submitted to the UN Global Compact, which TNO joined in 2020. We report extensively and comprehensively on the 10 focal points of TNO's CSR policy. Where is TNO now as regards CSR, and what are we working towards?

Important developments are taking place in society at large as regards energy and sustainability: there is an impending climate crisis, the business world is taking action on sustainability, there is a growing public awareness of our ecological footprint, and there are international agreements to permanently reduce the emission of greenhouse gases (for other external developments, see page 19 of TNO's 2020 Annual Report). TNO advises the private and public sectors on the transition to a sustainable society, including as regards sustainable energy, circularity, healthy living, and mobility. TNO is also taking a stand in its own operations by setting itself the ambition of being fully climate-neutral by 2040. To this end, a long-term programme to make our buildings more sustainable was launched in 2020.

Significant developments are also taking place in supply-chain responsibility and working conditions, not least because of the coronavirus pandemic. Increasingly, organisations – including TNO – are expected to account for what happens in their supply chains so they can eliminate any substandard practices. Forced labour and child labour are among the examples.

TNO values a safe, healthy and connected way of working for its employees. Within TNO, the effects of the coronavirus pandemic are being experienced in many places: reduced vitality thanks to lockdowns, working from home and the lack of face-to-face contact is having an impact on employees. The details of what work will look like within TNO after the coronavirus pandemic has passed are currently being worked out, but a lasting effect is expected on mobility, vitality and working from home.

Finally, in 2020 the strategic priorities of integrity and diversity & inclusion were more fully embedded in the organisation through the strengthening of the TNO Code, the establishment of an Integrity Advisory Board and the appointment of a Diversity & Inclusion Officer. These developments have already been presented in TNO's 2020 Annual Report. All in all, TNO thus took meaningful and concrete steps as regards CSR in 2020.

AMBITION

TNO is the largest independent research organisation in the Netherlands. It makes innovations applicable to our society. TNO is aware that its credibility and its licence to operate depend on how it fulfils its role, assumes its responsibilities and, in keeping with these, organises its operations. For society at large rightly expects TNO to make recommendations on the basis of its expertise (‘thought leadership’) and to practice what it preaches. The Corporate Social Responsibility (CSR) policy, derived from the TNO strategy, serves as the guiding principle.

STRATEGY

Since 2008, TNO has structurally embedded CSR within its organisation in an approach based on continual improvement. Work on the new TNO strategy for 2022-2025 started in 2020. Good operations management is one of the foundations for reaching the strategic goals. Socially responsible business practices occupy a central place within that foundation, as do strong organisational values and a focus on health, safety and the environment. The CSR priorities are thus strongly linked to TNO's strategic goals. Priorities are set in accordance with the 'practice what you preach' principle: TNO's own expertise and the associated way of working also serve as guiding principles within TNO's overall operations. An important focal point for 2021 is to define, together with the Strategy working group, TNO's value-creation model, and to use that to draw up key performance indicators (KPIs) for CSR.

CSR POLICY

TNO adopted its CSR policy in September 2020.
The key points of the policy are:

- TNO aims to have made its operations climate-neutral by 2040.
- It is committed to the international framework of the UN Global Compact, and endorses the 10 principles for sustainable operations (see box).
- TNO recognises its supply-chain responsibility with respect to both suppliers and customers.
- In the transition to sustainable business operations, TNO is focusing on the following topics: integrity, energy and sustainability, diversity and inclusion, and working conditions.
- TNO intends to include the CSR priorities in the annual plans of the relevant departments.

In terms of content, this policy has various levels of ambition. TNO chooses the priorities where it wants to distinguish itself in terms of sustainable operations. This is done through an incremental improvement cycle (similar to Plan-Do-Check-Act) to decide on meaningful steps, carry them out and adjust them where necessary. For example, management in each department is asked to indicate in an annual plan how it will contribute to the four priorities below and to report on this. The focal point for 2021 will be the preparation of an integrated plan for the various departments on what contributions they will make to achieving climate neutrality by 2040, including attainable milestones.

In line with this policy, TNO joined the UN Global Compact in 2020 and is committed to the 10 universal principles of sustainable operations. The implementation of these principles affects many aspects of TNO's operations, such as customer and supplier acceptance, working conditions and sustainability. Every year TNO confirms its continued support for these principles and submits a Communication on Progress (the present Sustainability Report) in which it reports on the progress it has made in the measures it is implementing.

TNO INTERNATIONAL

Research and innovation do not stop at national borders. TNO can strengthen the knowledge base in the Netherlands only by working closely with leading international knowledge partners, companies and public authorities. In addition to its locations in the Netherlands, TNO has seven sites and agencies in Brussels, North America and Asia. See also TNO's 2020 Annual Report, page 14, and www.tno.nl/en/about-tno/international/.

The report focuses, among other things, on the core areas of the UN Global Compact: human rights, labour standards, the environment and anti-corruption. The present report links these core areas to TNO's CSR priorities.

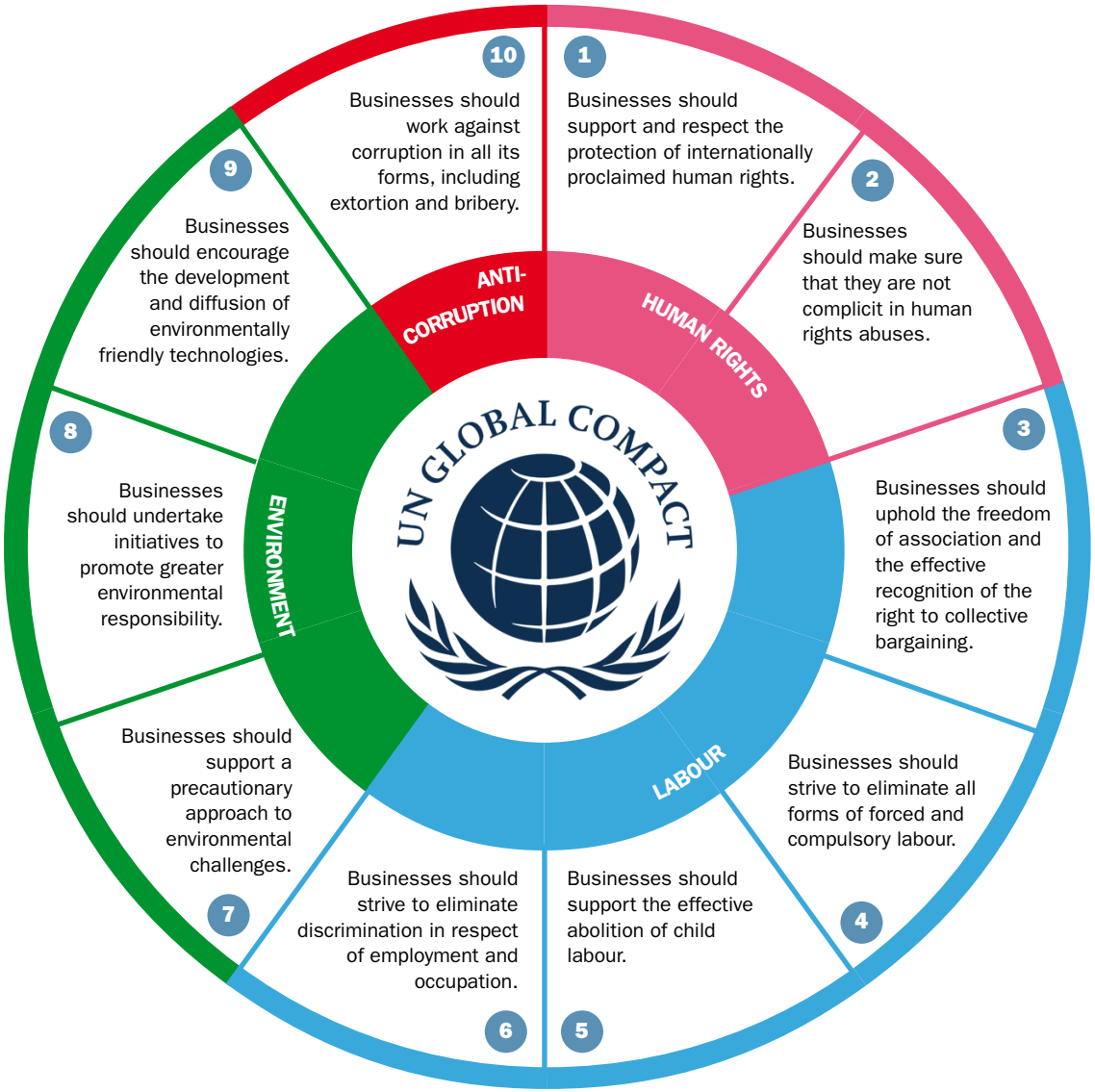
The box below shows the 10 CSR focal points that TNO has chosen. As this policy is carried out, it will further embed CSR in the organisation. Appendix 1 sets out how TNO does this. The present Sustainability Report has been prepared in accordance with the Sustainability Reporting Standards of the Global Reporting Initiative (GRI). Appendix 3 contains the GRI table, which in turn provides references to the main topics.

TNO's CSR topics	The 10 CSR priorities
Supply-chain responsibility	1. Socially responsible procurement
	2. Customer acceptance
	3. Integrity and anti-corruption
Energy & sustainability	4. Carbon footprint
	5. Business mobility
	6. Sustainable real estate
Working conditions	7. A safe, healthy and connected way of working
	8. Diversity & inclusion
Innovating responsibly	9. Responsible research and innovation + open access
	10. Research involving human subjects and animal testing

UN GLOBAL COMPACT

Since November 2020, TNO has been part of the United Nations Global Compact (UNGC; http://www.unglobalcompact.org), the world's largest grouping of companies and institutions that are committed to promoting human rights and decent labour conditions, combatting corruption and working on issues related to the climate and the environment. In joining the UNGC, TNO has committed itself to the 10 UN principles on socially responsible business practices. This was one of the steps TNO took following the adoption of the CSR policy by the Executive Board. Starting in 2021, TNO will report annually on initiatives related to the Sustainable Development Goals (SDGs) and on its progress in helping meet them.

Read more about Global Compact Network Netherlands



MEASURING OUR IMPACT

TNO uses its innovativeness to help create a safe, healthy, sustainable and digital society. It takes the UN Sustainable Development Goals (SDGs) as its starting point in reporting on the impact its work is having. The SDGs are a universal reflection of the social challenges the world is facing. TNO's research helps meet the SDGs. In 2020, the Executive Board decided to focus on seven SDGs that are most relevant to TNO, based on its knowledge portfolio and the influence it can wield. These SDGs cover areas where TNO can achieve the greatest social impact, thanks to its knowledge and the position it occupies. In 2020, an overview on the TNO website showed TNO's contributions to the seven SDGs with illustrative examples.

However, TNO's business operations also have an impact on these goals. The SDGs can offer guidance in setting specific goals for the business operations and in measuring progress. As a first step, a clear link was made between TNO's CSR priorities and the SDG subsidiary goals, as shown in the illustration on the right. TNO is thus linking its business operations to the global agenda for sustainable development. For 2021 and beyond, the priority is to set specific indicators and goals for the sustainability of TNO's operations.

HIGHLIGHTS OF 2020

SOCIALLY RESPONSIBLE PROCUREMENT

Socially responsible procurement policy implemented

TNO among the top 10 innovation-friendly buyers

CUSTOMER ACCEPTANCE

Customer acceptance policy established

INTEGRITY AND ANTI-CORRUPTION

NO incidents of corruption reported in 2020

CARBON FOOTPRINT

-9% CO_2 per FTE (vs 2019)

BUSINESS MOBILITY

-26% CO_2 emissions from business mobility (vs the 2016 benchmark)

SUSTAINABLE REAL ESTATE

-15% electricity consumption (vs 2019)

-8% heat consumption (vs 2019)

A SAFE, HEALTHY AND CONNECTED WAY OF WORKING

Safety-culture programme 'Safety First' launched

3.46% Absenteeism (was 3.64%)

1,722 home-office allowances paid out

DIVERSITY & INCLUSION

Diversity & Inclusion Officer appointed

RESPONSIBLE RESEARCH & INNOVATION + OPEN ACCESS

1.6 million visits to TNO Repository

800,000 downloads of TNO publications

RESEARCH INVOLVING HUMAN SUBJECTS AND ANIMAL TESTING

130 human-related research projects assessed by the Medical Ethics Review Board

TNO started 'Beyond Animal Testing Index' (BATI) project with Leiden University Medical Centre

SUPPLY-CHAIN RESPONSIBILITY

TNO is linked to other stakeholders in the innovation process, for instance through purchasing, the customers it works for, and the results it delivers. TNO is a key link in the process of making an impact as businesses and in society. Because TNO's ambition is to innovate in a responsible way, it also looks at how, and for whom, innovation comes about.

This concerns both the suppliers from whom TNO get products and services (what is termed the upstream supply-chain responsibility) and the customers to whom it delivers products and services (the downstream supply-chain responsibility).

Supply-chain responsibility is becoming increasingly important for TNO following the signing of the UN Global Compact, but also in view of developments at its customers. TNO sees this as a way of promoting sustainability and preventing substandard practices.

SOCIALLY RESPONSIBLE PROCUREMENT

In 2020 TNO implemented the ISO 20400 standard for sustainable procurement. The standard contains practical tools for the design of socially responsible procurement. Implementing this standard directly helps make the TNO organisation and its supply chains more sustainable.

All procurement department employees have received training in how to apply the ISO standard. Two staff units that are jointly responsible for a significant share of the procurement volume have also had this training. TNO's CSR policy, which was adopted in 2020, makes it easier translate the organisation's objectives into strategic procurement objectives for the various parts of the TNO organisation.

Specific sustainable procurement projects in 2020 included the installation of solar panels and the creation of a sustainable data centre, the reduction of e-waste in the procurement of IT hardware, the participation of TNO sites in The Hague municipality's logistics hub, and the 'TooGoodToGo' catering project aimed at preventing food waste. With its socially responsible procurement approach, TNO also helped create an innovative climate among buyers: in 2020 it earned an enviable sixth-place spot in the Analysis of Innovation-friendly Buyers in the Public Sector by the Dutch Public Procurement Expertise Centre PIANOo.

Based on the framework and approach provided by the ISO 20400 standard, existing best practices were identified and are now being implemented within TNO. In the coming years, these will lead to results that contribute to TNO's organisational goals. TNO's procurement terms and conditions will also be adjusted accordingly.

CUSTOMER ACCEPTANCE

In 2020, TNO adopted a new customer acceptance policy and process (see TNO's 2020 Annual Report, page 34). Part of the implementation is to determine the environmental, social and governance (ESG) topics where TNO plans to impose additional requirements for its current and future customers. In 2020, the CSR Board, in cooperation with other staff units, started to make an inventory of these issues and to examine how to flesh out the additional requirements. The aim is to create a clear framework for the acceptance of customers with regard to ESG criteria within TNO, so that a well-considered decision can be made about who TNO does business with. How the policy will be implemented will be further determined in the course of 2021.

This approach is in line with the UN Global Compact principles regarding CSR. The approach makes a distinction between not accepting a customer on the basis of these principles (for example, because of human-rights violations) and helping to improve an undesirable situation by engaging with a customer (on reducing waste, for instance). This distinction also takes into consideration the customer in question's (actual or expected) level of awareness, accountability and conduct. The role of an advisory committee will be worked out in detail and tested at a practical level in 2021. This advisory committee will look not only at a possible ESG risk but also at aspects such as security and integrity risks; it will offer advice within TNO about potential risks and on whether setting additional requirements might mitigate them (see Appendix 1). This process will provide space for moral considerations in customer acceptance within a learning organisation.

INTEGRITY AND ANTI-CORRUPTION

TNO aims to live up to the highest standards of integrity in its operations. The TNO Code and the Netherlands Code of Conduct for Research Integrity (NCCRI) are the basis for this. This was reported on in TNO's 2020 Annual Report (see page 33 of that report). In 2020, implementation of the NCCRI continued. Knowledge of the TNO Code is an integral part of the TNO's terms and conditions of employment: all TNO employees must know the code and act in accordance with it. The policy on side activities was also overhauled: all TNO employees must report annually on all side activities they engage in that are relevant to TNO.

The annual employee-engagement survey shows that the majority of employees are familiar with the TNO Code (an average score of 5.7 on a seven-point scale), and that they also feel integrity is upheld (an average score of 5.9 on a seven-point scale). No incidents of corruption were reported to the Integrity Officer in 2020. In addition, there was an ongoing dialogue with the TNO management, for example in the Integrity Advisory Board, about such matters as conflicts of interest and risks related to corruption (see also Appendix 1). Employees are kept involved via the existing Dilemma Bank on the TNO intranet. From 2021 onwards, a recurring interactive webinar will be held on this topic. An organisation-wide risk assessment regarding corruption and fraud is also planned, as is an update of TNO's policy on agents.

SUPPLIER ASSESSMENT

As part of our customers' and suppliers' own supply-chain responsibilities, TNO regularly gets questions about issues related to CSR. In 2020, EcoVadis carried out a supplier assessment of TNO in connection with its collaboration with KPN. In this assessment, TNO satisfied the benchmark and found out where there was room for improvement. The main issue was that insufficient reference could be made to specific documents setting out the policy, implementation and reporting. This led to the reorganisation of a central information desk for customer questions in the Operational Excellence & Auditing department to make this information easier to find and to record it within the organisation.

ENERGY & SUSTAINABILITY

Within the Energy & Sustainability priority area, TNO focuses on emissions caused by mobility, and on energy consumption both in its buildings and related to the procurement of products and services. This is reported on annually as part of the TNO carbon footprint. In addition, TNO reports on specific policy interventions it has made in the past year.

CARBON FOOTPRINT

TNO aims to take responsibility for the greenhouse-gas emissions that result directly or indirectly from its business activities. TNO's goal is to ensure that its business activities are climate-neutral by 2040. This is more ambitious than the Paris climate agreement targets, where the aim is to reach that goal by 2050.

This ambition includes two subsidiary goals:

- TNO is aiming to make its own operations (scopes 1 and 2) climate-neutral (net zero CO_2 emissions) by 2040.
- In order to prevent an undesired shift of CO_2 emissions from our own activities (scopes 1 and 2) to the supply chain (scope 3), the total carbon footprint per euro of turnover, expressed as a five-year average, must also go down.

CO_2 EMISSIONS IN THREE SCOPES

Emissions can be broken down into three scopes:

- **Scope 1:** direct emissions from TNO's own operations (fuel for lease cars and gas consumption in buildings).
- **Scope 2:** indirect emissions from TNO's own operations (business travel, and the use of electricity and heat in buildings).
- **Scope 3:** indirect emissions from other activities in the supply chain (commuting and the procurement of goods and services such as materials and transport)

Thecarbon footprint is determined annually to provide measurement data and enable adjustments. In 2020, the calculation method used was recalibrated based on the most recent key figures. The footprint is expressed as tons of CO_2-equivalent (CO_2-eq) so that other greenhouse gases can be included in the calculation.

CARBON FOOTPRINT IN KILOTONS (CO_2-EQ)

Scope 1
DIRECT EMISSIONS

2020	vs 2019
5.6	-8% / -0.5 CO_2

2019	6.1
2018	6.5
2017	6.2
2016	7.4

Scope 2
INDIRECT EMISSIONS

2020	vs 2019
16	-23% / -6 CO_2

2019	22
2018	24
2017	21
2016	22

Scope 3
EMISSIONS IN THE SUPPLY CHAIN

2020	vs 2019
138	-6% / -9 CO_2

2019	147
2018	130
2017	129
2016	114

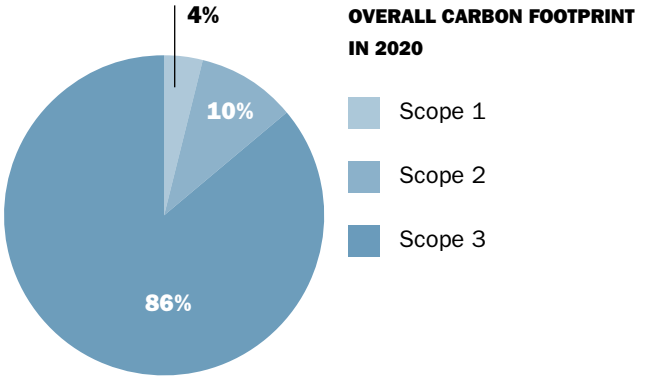
Total
SCOPES 1, 2 AND 3

2020	vs 2019
160	-9% / -15 CO_2

2019	175
2018	160
2017	156
2016	143

The method used is explained further in Appendix 2. In 2020, the totalcarbon footprint of TNO was 160 kilotons of CO_2-eq. In the overview on the right, the footprint is broken down into the three scopes.

TNO's overall carbon footprint in 2020 was, on average, 9% lower than it was the year before. This was primarily because of a decrease within scope 1 (-8%) and a sharp decrease in scope 2 (-23%). These results are in line with subsidiary goal 1. The decrease within scope 3 is less significant (-6%). Furthermore, scope 3 has become an increasingly large part of the total carbon footprint over the years (86% of the total in 2020). This is probably because of the shift of emissions from scopes 1 and 2 to 3 ('carbon offsetting') as a result of leasing or purchasing services instead of performing them in-house. This needs to be closely monitored if subsidiary goal 2 is to be reached.



EMISSIONS IN SCOPE 3 (IN TONS OF CO_2-EQ)

Emissions category	2016	2017	2018	2019	2020	vs 2019
Contracting research and staff	43,104	45,165	41,235	47,588	42,926	-10% ↓
Labs	24,224	23,414	31,476	39,173	39,834	+2% ↑
Buildings	21,184	35,425	32,068	28,196	31,304	+11% ↑
Offices	9,006	7,738	7,596	9,728	9,465	-3% ↓
Mobility	9,514	9,489	9,829	13,773	8,159	-41% ↓
Printed matter and customer relations	4,394	4,973	4,409	4,861	3,939	-19% ↓
Facility services	2,454	2,561	2,493	3,095	1,416	-54% ↓
Waste	464	466	507	546	575	+5% ↑
Water	14	14	15	16	17	+6% ↑
Total	**114,358**	**129,244**	**129,629**	**146,977**	**137,635**	**-6.4% ↓**

Total

EMISSIONS IN SCOPE 3 (IN TONS OF CO_2-EQ)

2020

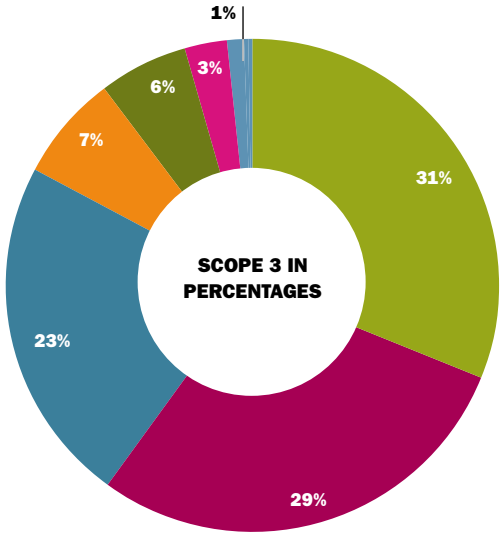
137,635

vs 2019

-6.4%

-9.3 TONS

The emissions in scope 3 encompass several kinds. What is striking is that more than three-quarters of the emissions are related to the contracting of research and staff, labs and other buildings. The coronavirus measures have not led to a significant reduction in this. Emissions relating to contracting fell slightly compared to 2019, while emissions from new construction and real estate increased. This was caused by two major new construction and renovation projects at the Delft and Petten locations. Within mobility, commuting decreased substantially compared to the previous year (see also business mobility). More minor effects of the coronavirus pandemic include a halving of emissions within the facility services category (including catering and recreation) and an increase in the hiring of test subjects. Neither affects the total.



It is also important to consider the total carbon footprint (scopes 1, 2, and 3) in relation to TNO's size in terms of the number of employees (FTEs) and the revenue generated (in euros). The table on the right presents this relative carbon footprint over the last five years. To monitor subsidiary goal 2, the five-year average of the total footprint per euro of revenue is reported.

This shows that both the relative CO_2 emissions and the five-year average have gone down. This was achieved in a year in which both the number of FTEs and revenue increased. This is a positive result that is probably partly due to the coronavirus measures. For TNO, the priority for 2021 is to make a clear and feasible plan for the necessary reduction in CO_2 emissions in order to achieve climate neutrality by 2040.

CARBON FOOTPRINT IN RELATION TO WORKFORCE AND REVENUE

NUMBER OF EMPLOYEES (FTES)	
2020	vs 2019
3,243	+5% +164 FTEs
2019	3,079
2018	2,860
2017	2,627
2016	2,618

RELATIVE EMISSIONS (TONS OF CO_2-EQ/FTE)	
2020	vs 2019
49	-14% -8 CO_2
2019	57
2018	56
2017	60
2016	55

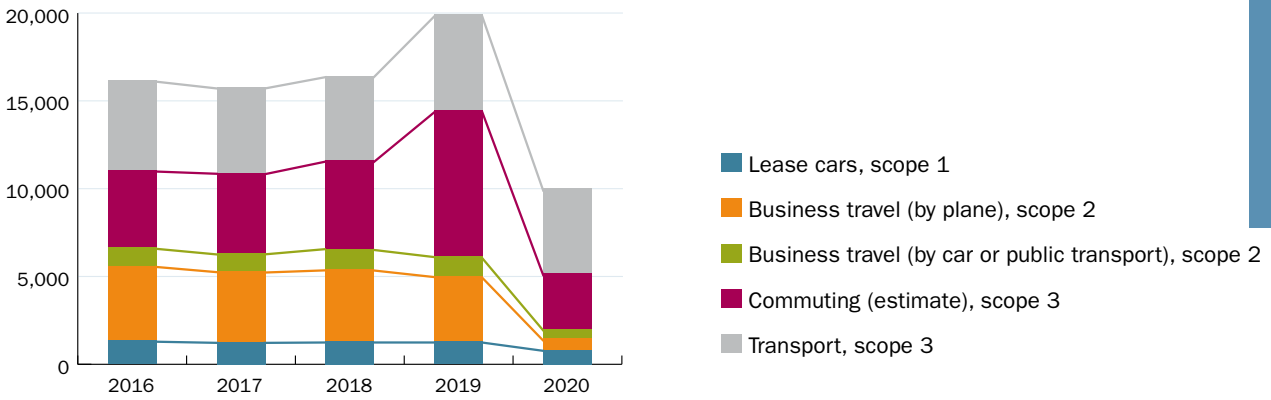
REVENUE (MILLIONS OF EUROS)	
2020	vs 2019
547	+6% +30 million
2019	517
2018	482
2017	426
2016	430

FIVE-YEAR AVERAGE FOR EMISSIONS (KG CO_2-EQ/EURO)	
2020	vs 2019
0.33	-15% -0.05 CO_2
2019	0.34
2018	0.34
2017	0.34
2016	0.35

BUSINESS MOBILITY

In 2020, an Energy Efficiency Directive (EED) audit was carried out for energy consumption due to mobility, among other things. These quadrennial reports give a detailed overview of energy consumption from mobility. Not surprisingly, TNO saw a strong decline in mobility in 2020 because of the coronavirus measures. TNO used its coronavirus protocol (which was adjusted regularly) to encourage working from home and online meetings wherever possible, and to discourage domestic business trips. At the same time, the number of business plane journeys dropped due to government advice not to travel to other countries.

TNO's footprint from business mobility in 2020 was half of what it was the year before, at over 10 kilotons. Emissions per FTE were also half of what they were in 2019. This drop was caused mainly by the restrictions on mobility associated with the requirement to work from home. As a result, some of the emissions shifted from office to home as employees used more electricity and heat at home. As shown in the table, this sharp decline can be seen across all types of mobility. This applies in particular to air travel (-83%) and commuting (-61%) (see also the separate box on commuting).



EMISSIONS PER TYPE OF MOBILITY (IN TONS OF CO_2-EQ)

	Scope	2016	2017	2018	2019	2020	vs 2019
Lease cars	scope 1	1,357	1,281	1,315	1,307	828	**-37%** ↓
Business travel (by plane)	scope 2	4,227	4,020	4,090	3,699	635	**-83%** ↓
Business travel (by car or public transport)	scope 2	1,069	999	1,180	1,134	527	**-54%** ↓
Commuting (estimate)	scope 3	4,413	4,611	5,023	8,321	3,226	**-61%** ↓
Transport	scope 3	5,101	4,878	4,806	5,452	4,831	**-11%** ↓
Total tons of CO_2-eq		**16,166**	**15,789**	**16,413**	**19,914**	**10,048**	**-50%** ↓
Total tons of CO_2-eq/FTE		*6.18*	*6.01*	*5.74*	*6.47*	*3.10*	**-52%** ↓
Difference with respect to 2016 benchmark		*benchmark*	*-3%*	*-7%*	*+5%*	*-50%*	

TOTAL MOBILITY
(TONS OF CO_2-EQ)

2020	vs 2019
10,048	**-50%** ↓ **-9,866**

2019	**19,914**
2018	**16,413**
2017	**15,789**
2016	**16,166**

TOTAL PER FTE
(TONS OF CO_2-EQ)

2020	vs 2019
3.10	**-52%** ↓ **-3.37**

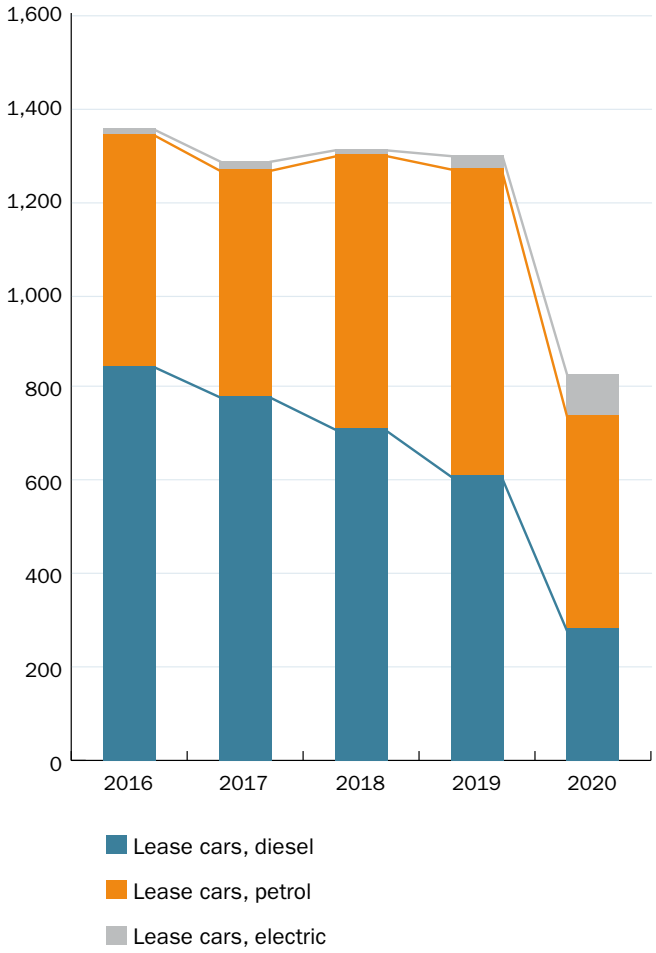
2019	**6.47**
2018	**5.74**
2017	**6.01**
2016	**6.18**

In 2020, TNO joined the Travel Differently Coalition to make it clear that it supports the goals for making business mobility more sustainable. Specifically, the Coalition's goal is to halve CO_2 emissions per FTE from business travel by 2030 compared to the 2016 benchmark. The figures for business mobility in 2020 were already half of what they were in 2016 (see the mobility-type table), mainly because measures related to the coronavirus pandemic led to fewer business flights and less commuting.

The objective of the Travel Differently initiative and the plan to achieve climate neutrality by 2040 will have a major influence on TNO's new mobility policy. This applies to both business mobility and commuting. TNO is working to further increase the sustainability of the lease-car fleet 271 lease cars, of which 108 are fully electric or hybrid. In 2020, the trend towards electrification continued with double the number of kilometres driven compared with the previous year. Meanwhile, emissions from diesel are falling the fastest. Emissions from cars that run on petrol are not yet falling.

Because of the coronavirus pandemic, the revision of TNO's mobility policy has been postponed until 2021. This policy comprises the set of principles and measures governing how TNO employees travel for their work. The new mobility policy has a high ambition with regard to sustainability, while taking into account costs and flexibility from the employees' perspective. The coronavirus pandemic is expected to lead to a lasting reduction of about 25% in business mobility in the coming years. Partly for this reason, in 2021 TNO plans to get a better picture of employee attendance and commuting by means of a work-style survey and an improved registration system.

ELECTRIFICATION OF THE FLEET OF LEASED VEHICLES (EMISSIONS IN TONS OF CO_2-EQ)



COMMUTING IN 2020

To date, TNO has not recorded data on commuting (number of kilometres and type of transport). The figures have been estimated based on the number of employees, working days and place of work. The breakdown by type of transport (car, train and other) is an estimate based on an employee survey from 2016. TNO is therefore reporting the maximum emissions from commuting. The complete calculation method is given in Appendix 3.

In view of the coronavirus measures in force (periodic lockdowns, more working from home and less use of public transport), many employees commuted less in 2020. The prevailing policy was: work from home when you can. Some employees did come to the office because of their function or role, or their home situation. Based on the recorded attendance figures at sites in 2020, it is estimated that commuting was 60% lower on average over the course of the year.

This estimate is based on the following assumptions:

- The level of commuting was normal in the first two months of 2020 (= 80%).
- For three-quarters of the year, coronavirus measures were in force ("work at home if you can"), thus bringing the percentage down to an average of 33%. Attendance figures show that in the summer there were more employees present as restrictions were relaxed, while in the spring and autumn there were fewer employees at the office because of the stricter lockdowns.
- It follows that, overall, about 40% of the usual number of commuting kilometres were travelled in 2020. The CO_2 emissions from commuting in 2020 are thus reported at 40% of the maximum.

SUSTAINABLE REAL ESTATE

Building on the work of previous years, three scenarios regarding ambitions for the Energy & Sustainability Policy for Real Estate were developed in 2020. Each scenario outlines a possible route towards realising a carbon-neutral buildings portfolio and provides insights into the costs and benefits of this transition. These routes are in line with TNO's ambition to achieve climate neutrality by 2040. In this regard, TNO has also committed to the 'Paris-Proof' ambition of the Dutch Green Building Council to cut its building-related energy consumption by two-thirds by 2040. To work towards these ambitious goals, the Energy & Sustainability in Real Estate programme was launched in 2020. Ongoing initiatives have been bundled together in this programme. Dynamic implementation, including an annual review of progress, resources and capacity, will also help meet this ambition.

An important pillar of the programme involves the monitoring and management of energy usage. In this area, a significant step was taken in 2020 with the systematic measurement of energy usage at all TNO sites; this will facilitate efforts to focus on energy consumption and how to reduce it. An EED audit of the entire real estate portfolio was carried out in 2020. These quadrennial reports give a detailed overview of energy consumption at the sites, and offer the prospect of short-term energy savings.

BUILDING-RELATED ENERGY CONSUMPTION (SCOPES 1 AND 2) (IN TONS OF CO_2)

Scope 1 CONSUMPTION OF NATURAL GAS

2020	vs 2019
4,822	0%
2019	4,794
2018	5,196
2017	4,914
2016	6,077

Scope 2 ENERGY, ELECTRICITY

2020	vs 2019
14,323	-8% -1,320 ↓
2019	15,643
2018	17,635
2017	15,066
2016	15,575

Scope 2 ENERGY, HEAT

2020	vs 2019
918	-15% -163 ↓
2019	1,081
2018	897
2017	909
2016	793

With its tendering procedure for electricity, TNO has committed itself to continuing to buy sustainable electricity from Dutch wind and biomass sources in the coming years. Combined with the plan to generate its own electricity with solar panels, this mix of power sources fits in well with the topics TNO contributes to with its research. To facilitate the use of electric vehicles, nine additional electric charging stations have been installed at the TNO sites. Energy consumption at the sites in the TNO portfolio was 8% lower (for electricity) and 15% lower (for heat) in 2020 than it was in 2019, as shown in the table. It is worth noting that TNO's actual emissions are lower because since 2010 it has been using energy purchased from renewable sources (see also Appendix 2, section 3.1).

The reduction is due primarily to the effects of the coronavirus crisis (more working from home) and the impact of energy-saving measures. The consumption of natural gas use remained almost unchanged.

In addition to reduction through energy savings, since 2013 TNO has also offset energy consumption at 12 sites by purchasing green certificates. This concerns the larger sites owned by TNO or for which TNO itself purchases electricity and natural gas. For electricity, TNO buys green certificates – Guarantees of Origin. In 2020, it bought 20,000 Guarantees of Origin (equivalent to 12,980 tons of CO_2), thus offsetting more than 90% of its electricity consumption.

For natural gas, TNO buys CO_2 emissions rights in the form of Gold Standard VERs (Verified Emission Reductions) for forest protection projects in Zimbabwe. In 2020, 2,555 tons of CO_2 were offset, as much as is generated by the natural gas that TNO purchased and more than 52% of what is generated by the natural gas consumption in its entire accommodation portfolio. In terms of improvement, TNO is investigating whether compensation can be automatically included in the next energy-supply tendering procedure. In addition, there is a need to clarify the compensation for energy resupply by third parties and lessors, and whether this option might be expanded.

For 2021 and beyond, it is important to work out the specific implications in the short and medium term of the goal of making the real estate more sustainable. Together with the other departments, an integrated plan will be drawn up to realise this goal. This should be combined with the structural embedding of the strategic objectives within the regular business operations. In order to make better use of TNO's own innovations in its business operations, the Applying Innovation programme will continue in 2021 (see box). Finally, an information and awareness campaign will involve employees more fully in the sustainable transition of TNO's business operations.

APPLYING INNOVATION PROGRAMME

The Applying Innovation programme helps TNO to use its own innovations to improve its buildings and make them more sustainable. In 2020, six projects put in for the Applying Innovation programme. Two of these, VR Conferencing and Heat Battery, were in the feasibility phase at the time of writing. One, FITS4TNO, was in the design phase, and two, Solar Visuals and Pulse, are currently being implemented. One project, PV façade HTC21, was dropped during the feasibility phase. The Solar Visuals innovation is a good example of the 'practice what you preach' principle. It involves the use of solar panels that are installed on building façades and integrated into the aesthetic design of the building through the use of an innovative printing technique. These panels were developed in cooperation with TNO, and are currently being commercialised by Solar Visuals BV, a spin-off. During the renovation of the Solar Lab in Petten, the Solar Visuals panels were incorporated into the façade. With these panels, electricity can, in theory, be generated on all building surfaces. This is an important step in the energy transition and in making TNO buildings more sustainable.

WORKING CONDITIONS

TNO wants to be a ‘House for Talent’ for current and future employees. Being a good employer means investing in people. After all, the knowledge and employability of its staff are crucial to TNO’s ability to reach its strategic goals. TNO is committed to an equal relationship with its employees, based on mutual added value (via the Empower programme, see TNO’s 2020 Annual Report, pages 17 and 18). TNO fosters a safe, healthy and connected way of working that is geared towards the sustained employability of staff.

A SAFE, HEALTHY AND CONNECTED WAY OF WORKING

In 2020, TNO's workforce grew to 3,562 employees (for further key figures, see TNO's 2020 Annual Report, pages 46 and 47). TNO has a strong ambition to keep working conditions for employees as favourable and safe as possible, and to increase the sustained employability of staff. Especially in view of the coronavirus measures, this proved to be more necessary than ever. TNO puts this into practice under the heading 'A safe, healthy and connected way of working-together'. The safety culture within TNO, the Fit For Your Future programme and various training courses are specific elements of this. This effort had a positive effect both internally and externally in 2020: the employee satisfaction score rose to an average of 7.5 in the annual employee engagement survey (vs 7.3 in 2019), and TNO was named a Favourite Employer in the Technology category of the 2020 Image Survey of the career magazine Intermediair.

SAFE – Further improving the safety culture

TNO employees working in laboratories, in the field or elsewhere off-site must deal with regulations on working safely with hazardous equipment, substances and biological agents. In order to support and encourage safe behaviour among employees safety-culture programmes have been set up in various parts of the organisation under the 'Safety First' rubric. An assessment of the current safety culture was carried out through an online survey and interviews with the departments involved. Based on this, newly appointed Safety Coaches provided training on a quarterly basis to staff on risks and on measures to mitigate them. Increasing the intrinsic motivation of employees, exemplary behaviour on the part of managers, and facilitating a culture of holding one another to account are also part of these programmes. In 2021, TNO plans to broaden this approach within the organisation and to encourage the exchange of positive examples.

LEARNING FROM INCIDENTS

More and more incidents and dangerous situations are being reported, thanks to a growing awareness among employees. Good internal communication directly helps raise this awareness. For instance, the regular Quality, Safety, Health & Environment newsletter for prevention officers describes incidents that other TNO employees can learn from. An example of this is a dangerous situation that arose during the relocation of a glove box in a chemical laboratory. Based on this, all glove boxes within TNO were checked for suction/extraction and maintenance.

TNO wants employees to report incidents and dangerous situations so that we can learn from them (see also separate box). Despite a dip caused by the coronavirus pandemic, the number of reports of dangerous situations was 50% higher in 2020 than it was in 2019. This seems to be a direct result of the increasing awareness among many departments of the need to make reports. There are no indications that the safety situation within TNO has deteriorated.

Incidents must be followed up with corrective and above all preventive measures. To this end, TNO has set a KPI that tracks timely handling by the owner of the incident. The timely handling of reports of incidents and dangerous situations rose from 85% in 2019 to 95% in 2020. TNO thus comfortably exceeded its target figure of 90%.

HEALTHY – Sustained employability

TNO's HR policy is geared to the sustained employability of its staff. Employability is enhanced by the health and vitality of employees and the provision of opportunities for development, among other things. Vitality is important, and that was especially so when the coronavirus measures forced employees to work from home for long periods. In one positive development, absenteeism dropped slightly (3.46% in 2020 vs 3.64% in 2019). However, employees have for years now been reporting a higher percentage of complaints related to burnout than the national average (21% across TNO versus the national average of 17%). Employees indicate that the work has become more complex due to the coronavirus pandemic (see the 2020 EES). The 2020 EES results identify specific interventions that can reduce this high percentage.

The TNO Talent Centre, which offers a lot of e-learning and other training courses, facilitates the development of employees and their talents, as well as their mobility. The pandemic meant that there was a good deal more online training in 2020, but there were also many more more cancellations, so that the overall level of participation in training was lower than usual. TNO staff between them completed over 9,500 e-learning courses and participated in more than 3,000 other training courses. Most of the development activities fell into the categories 'Knowledge and Tooling', 'Career and Mobility', and 'Safety, Health and Environment'. Various programmes are aimed specifically at increasing sustained employability. One example is the Senior Talent programme, in which senior employees gain more control over their careers in the space of a few weeks. Twenty-five staff members took part in the programme in 2020. In the Vital Leadership course, 12 managers took training in how to help create an even healthier working environment and thus enhance their own vitality and that of their employees. Both programmes were given four out of five stars.

CONNECTED – Staying connected while working from home

One major change caused by the pandemic was that TNO staff worked from home more. TNO made sure its staff could do so responsibly and in accordance with all relevant health and safety standards. In 2020, every employee was eligible to receive an allowance so they could set up a proper home office. 1,771 employees took advantage of this. Furthermore, a number of initiatives on the Fit For Your Future intranet site helped keep colleagues connected with one another. One important question for employees is what their work will be like after the coronavirus pandemic. In 2021, a work-style survey will be conducted among employees to provide further support in IT, the office environment, and mobility. The business operations will then be adjusted as needed.

DIVERSITY & INCLUSION

TNO's 2020 Annual Report presents the most important developments as regards diversity and inclusion. To avoid duplication, the reader is referred to TNO's 2020 Annual Report (for the make-up of the workforce, see page 18 of that report). The reports of the Diversity & Inclusion Officer will be included in the Sustainability Report from 2021 onwards.

INNOVATING RESPONSIBLY

Innovation is TNO's stock in trade. How innovations come about falls within the domain of responsible research and innovation and the TNO policy on human and animal research. The TNO publication policy deals with how the results of TNO research are made available to society and how much use is made of this information.

RESPONSIBLE RESEARCH AND INNOVATION

As a partner in the European JERRI project (2015-2018), TNO formulated its long-term goal for responsible research and innovation (RRI). This goal is to achieve confirmation of the value of applied research in society in two ways: the impact of TNO in society is valued across the board, and TNO is open to input from society that further enhances the value of applied research. In this way, TNO can validate its research agenda (our contribution to society) and obtain a check of the organisation and its way of working (sustainable, safe and connected). TNO and its stakeholders strive thus to align its innovations with social issues and societal values throughout the programming, execution and implementation cycle. This requires the research organisation and individual researchers to have a position in line with society's expectations, which in turn strengthens TNO's 'licence to operate' in society's eyes.

Finally, the RRI concept has contributed to the process for TNO's new 2022-2025 strategy, which will be finalised in 2021. The input from RRI focuses on an adaptive and reflexive response by TNO to social issues, whereby it plays a clear role in the development of broad prosperity for society.

TNO has set up its Risk Management and Control system to guarantee the realisation of its operational, quality and financial objectives, among other things by managing the associated risks. This system is described in TNO's 2020 Annual Report, pages 30 and 55.

In 2020, the following specific results were achieved relating to this ambition:

- The establishment of more diverse and inclusive strategic advisory councils for the various units, including relevant social actors;
  - a scientific article on this topic was published in 2020.
- The creation of opportunities to share knowledge and knowledge products more effectively via open source, open access, and open data;
  - in 2020, the content available from the TNO Repository increased (see below).
- The promotion of diversity and inclusion in the workforce;
  - in 2020, this was one of TNO's strategic focal points, see TNO's 2020 Annual Report, page 18.
- Helping to solve challenges facing society, as defined in the Sustainable Development Goals (SDGs);
  - in 2020, information was provided on the contributions various TNO projects had made to reaching the seven SDGs.
- The regular facilitation of ethical deliberations within innovation projects, both within TNO and for customers;
  - in 2020, sessions to discuss ethics were conducted in 10 projects.

OPEN-ACCESS PUBLICATIONS

In 2020, TNO's publication policy was amended to ensure that information is made available in accordance with the requirements of the Netherlands Code of Conduct for Research Integrity (NCCRI).

The amended publication policy stimulates the publication and accessibility of scientific information wherever possible, as well as the underlying 'research artefacts' (such as datasets). As regards open access, TNO applies the principle 'open if possible, closed if necessary', as can be seen in its 2020 Annual Report (see its publication policy, page 34). A carefully designed policy ensures that publicly funded research is protected by intellectual real estate rights where necessary. This policy was revised in 2020 to bring it into line with the NCCRI and formally readopted. The new publication policy includes making research artefacts available through open-access repositories in accordance with the principles of 'findable, accessible, interoperable and reusable' (FAIR). TNO uses iThenticate to check publications for originality and the correctness of references. To facilitate the principle of openness, TNO publications are made available via various platforms.

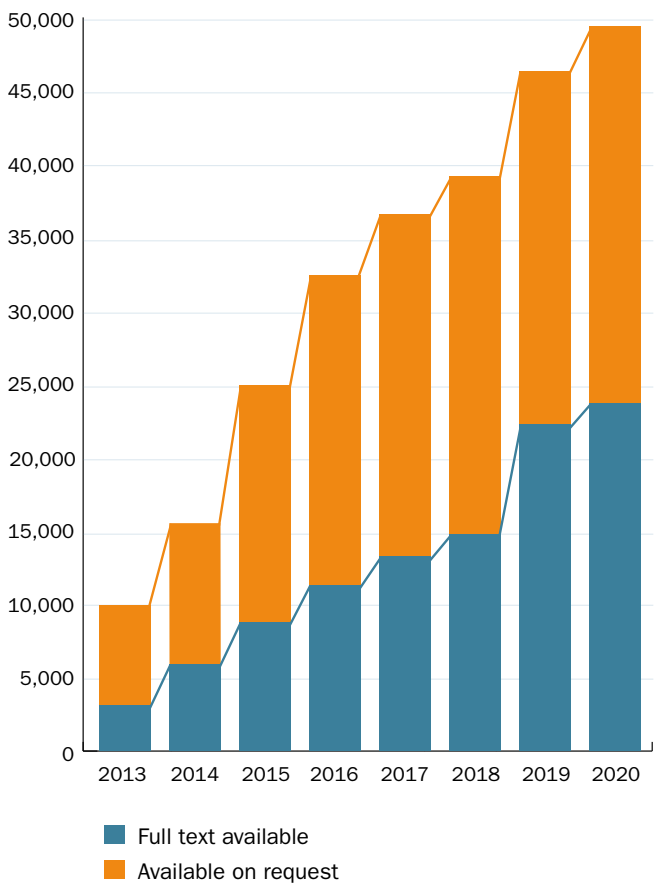
OPEN ACCESS

Publishing in accordance with the open-access principle means making scientific information freely available (free of charge) usually online. This means that the author, and any rights holders such as the publisher, agree to the distribution of the work, but also that there is a suitable platform to support that distribution.

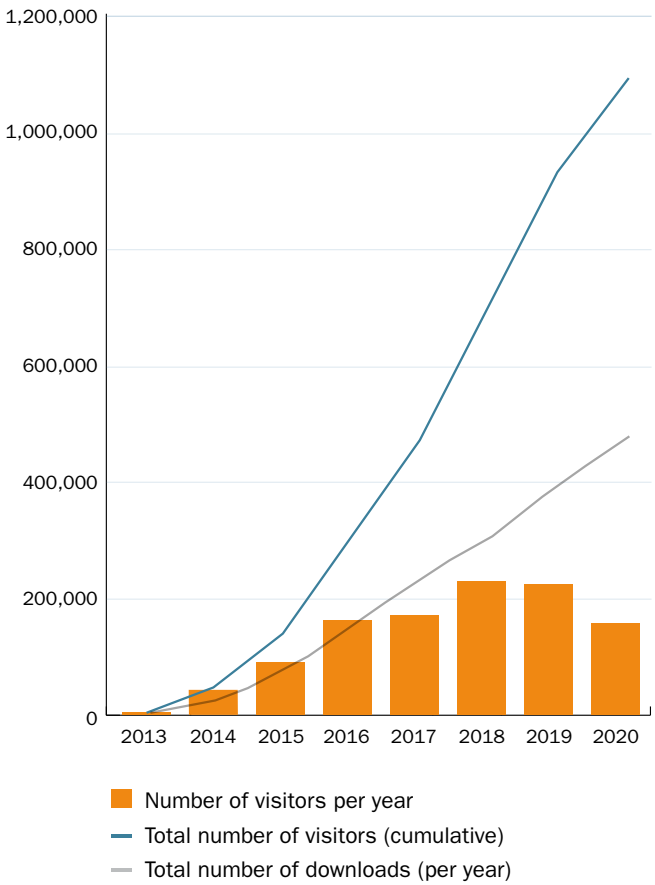
The TNO Repository has been online since 2013. It is a free database that now contains almost 50,000 TNO publications. Of these, about half are directly available in their entirety, while the rest are available on request. The increase in the number of digitally available publications over the years is clear. Within the Digitisation programme run by the Research Information Support Department, a selection of older publications were made digitally available in 2020 as well.

The TNO Repository had almost 1.6 million visits in 2020. Almost 800,000 TNO publications were downloaded in 2020. In total, this free database has had almost five million downloads since its launch.

CONTENT IN THE TNO REPOSITORY



VISITORS AND DOWNLOADS



The number of downloads in 2020 was slightly lower than in 2019, probably because of lower employment numbers in connection with the worldwide pandemic. Since 2016, a record has been kept of the countries visitors are from. It turns out that visitors come from more than 200 countries. The table shows that most downloads are made from the Netherlands, followed by the United States and Germany.

In 2020, the United Kingdom took the place of China in the top four countries that downloaded the most publications from the TNO Repository.

TOP 10 COUNTRIES BY NUMBERS OF DOWNLOADS

Country	Number	% total
Netherlands	216,573	**27.1%**
United States	148,629	**18.6%**
Germany	101,052	**12.7%**
United Kingdom	22,631	**2.8%**
China	13,909	**1.7%**
Belgium	12,154	**1.5%**
Russia	9,867	**1.2%**
France	9,030	**1.1%**
Ukraine	4,090	**0.5%**
India	3,293	**0.4%**
Other		**32.4%**
Total	**798,151**	

RESEARCH INVOLVING HUMAN SUBJECTS AND ANIMAL TESTING

Relevant developments in research involving human subjects have already been presented in TNO's 2020 Annual Report (see page 34 of that report).

TNO's aim is to perform excellent biomedical research focused on safeguarding and improving human health. This sometimes requires the use of laboratory animals. TNO does its utmost to carry out the research involved in a meaningful way, using as few animals and causing as little distress as possible.

The basic principles of TNO's policy are:

- TNO conducts research involving laboratory animals only in cases where this is required by law or where no reliable alternatives are available.
- TNO actively contributes to the development and application of alternatives to research involving laboratory animals, in accordance with the three Rs: replacement, reduction and refinement of studies.
- In doing so, of course, TNO strictly adheres to all legal rules and regulations.

The policy on research involving laboratory animals is described in more detail on the TNO website. The following key points regarding research involving animals are worth mentioning for 2020:

- Within TNO, the Animal Welfare Body (AWB) supervises animal welfare, the three Rs, and the implementation of the Animal Experiments Act. There is an active working group on Animal Testing and Alternatives, which meets several times a year and which draws on knowledge from various units. Annual plans are drawn up in coordination with the Chief Operations Officer (COO).
- TNO participates in national networks on animal welfare and the replacement of animal testing. For example, TNO is active in the AWB Platform, it contributes to codes of practice on refinement, and it is part of the innovation network for the transition to a situation without the use of lab animals, which is coordinated by the Ministry of Agriculture, Nature and Food Quality. TNO also cooperates regularly with the Proefdiervrij ('No Animal Testing') foundation.
- During the COVID-19 pandemic, studies were continued to the highest standards. Already in March 2020, TNO discussed agreements on 'what-if' scenarios so it could keep delivering high-quality research.
- In 2020, extra attention was paid to the experimental design and statistical analysis of the studies. This has resulted in further fine-tuning of the choice of groups and thus contributes to the three Rs.
- In cooperation with Leiden University Medical Centre, TNO launched the Beyond Animal Testing Index (BATI) project. It involves drawing up an index that focuses on creating openness, transparency and a culture of care within research institutes. TNO is helping with the preparation of questionnaires.

LOOKING AHEAD

Further meaningful steps are planned for 2021, and will be presented in next year's Sustainability Report.

STRATEGY

TNO will determine the KPIs for CSR on the basis of the new strategy. What CSR goals do we want to set, and what impact can we have on the Sustainable Development Goals?

SUPPLY-CHAIN RESPONSIBILITY

TNO aims to determine specific ESG criteria for accepting clients in a largely automated process. TNO also plans to tighten the sustainability criteria for the products and goods it purchases.

ENERGY & SUSTAINABILITY

TNO wants to specify the interim targets on the way to climate neutrality in 2040. What is the pathway to reducing CO_2 and what activities can help achieve this? This will feed into the new mobility and procurement policies.

WORKING CONDITIONS

TNO wants to further improve employee vitality and draw up a strategic plan for diversity and inclusion.

INNOVATING RESPONSIBLY

TNO wants to make more open-access publications available where possible, and hold sessions to deliberate the ethics around socially sensitive subjects.

APPENDICES

TNO innovation for life

APPENDIX 1. ORGANISING CORPORATE SOCIAL RESPONSIBILITY (CSR) WITHIN TNO

Within TNO, CSR is the responsibility of the Marketing and Communication Department. (For the organisation chart of TNO, see its 2020 Annual Report, page 45.) At the board level, the Chief Operations Officer (COO) is responsible for CSR. At the operational level, the CSR Officer is responsible for initiating and coordinating the development of CSR policy. In 2020, Mr Joram Nauta held this role up to 1 September, after which Mr Jan Willem Streefkerk took over as the new CSR Officer. On the basis of their own annual plan, the CSR Officer coordinates the various sustainability initiatives within the organisation, develops the policy, and is responsible for reporting on the priorities around energy and sustainability and on working conditions. In 2020, a total of 880 hours were spent on these activities, mainly by the CSR Officer. The CSR Officer is supported by, and is accountable to, the CSR Board, which is chaired by the Director of Marketing & Communication. In 2020, this board met four times, two of which were virtual meetings because of the coronavirus measures. The CSR Officer also has meetings with the Chair of the CSR Board and the COO every four to six weeks. Specific results achieved by the CSR Officer in 2020 (other than those already referred to in this document):

- Updates and other amendments of the CSR Statement of Policy, which is available on the TNO internet site, www.tno.nl.
- Involvement in policy development in energy and sustainability, real estate, procurement, mobility and customer acceptance.
- Contributions to the new TNO strategy for 2022-2025.
- Implementation of CSR actions referred to in TNO's 2019 Annual Report.

CURRENT COMPOSITION OF THE CSR BOARD

Ms R. van Hoof	Director of Marketing & Communications (Chair of the CSR Board)
Ms I.C. van den Broek	Director of Human Resources
Mr L.N. van der Burg	Business Developer, Energy Transition Unit
Ms T.M. van Daalen	Market Director, Energy Transition Unit
Mr L.J.M.G. Dortmans	Science Director, Circular Economy Unit
Mr R.J.A. Kersten	Director of Operations, DSS Unit
Mr M. Schuringa	Director of Corporate Real Estate & Facilities
Mr J.W. Streefkerk	CSR Officer, ICT Unit
Mr M.G.L.H. Tossings	TNO Chief Operations Officer

The CSR Officer also sits on the Risk Acceptance Committee, which includes representatives from Legal, Security, Export Control, Integrity, CSR, Public Affairs and Compliance, and which advises on project and customer acceptance for new projects. In this way, the CSR Officer helps ensure supply-chain responsibility.

Integrity, a priority theme, is led by the Integrity Officer and the Integrity Advisory Board, in terms of the development and monitoring of this theme and reporting on it in the UN Global Compact. For the Diversity & Inclusion priority theme, the Diversity & Inclusion Officer, who was appointed in 2020, takes the lead under the supervision of the Diversity & Inclusion Steering Committee, which is chaired by the CEO, Mr Paul de Krom.

APPENDIX 2.

DETERMINING OUR CARBON FOOTPRINT

TNO calculates itscarbon footprint each year, and reports its findings in the Annual Report. This appendix contains a brief explanation of the approach and the method used.

1. OBJECTIVE AND APPROACH

TNO's carbon footprint is determined in order to give direction to its CSR policy and to monitor the effect of measures taken. TNO's environmental impact comes about through its emissions, both direct and indirect (scopes 1 and 2), and through emissions and the use of raw materials that takes place during the production of the energy, products and services that TNO purchases (scope 3). TNO can influence all these factors with its policies, and that is why it determines the carbon footprint across all three scopes.[3] For the sake of comparison with other organisations, TNO opted to determine its carbon footprint starting with its 2013 Annual Report. Before that, it had calculated an overall environmental footprint.

2. METHOD

The carbon footprint is calculated by multiplying annual figures on the consumption of products and services (see section 2.1) by the corresponding CO_2 emissions (see section 2.2).

2.1 Data on annual use

The annual figures for energy (electricity, gas and municipal heating), commuting and business travel have been determined on the basis of 'physical' consumption: passenger-kilometres, kilowatt hours of electricity, cubic metres of natural gas, and so on. The level of consumption of other products and services has been determined on the basis of the purchase cost in euros.

[3] The terms scope 1, 2 and 3 are used in reporting on greenhouse gas emissions [8]. Scope 1 covers the environmental impact of direct emissions, scope 2 adds the direct emissions from the generation of energy and business travel, and scope 3 further adds all emissions from the production and purchase of the energy, goods and services a company uses.

Consumption data based on physical units is preferred to financial consumption data because financial data is affected by inflation and price negotiation, whereas price does not affect thecarbon footprint of the service purchased, or at least not directly. TNO has chosen to use physical data if available in its records, and to supplement that as much as it can with financial data taken from procurement records. For example, there are no records of all the different office supplies used (type or quantity). For this group of products, an average environmental profile was drawn up for the environmental impact of the production of office products per euro (see section 2.2, Environmental profile). Multiplying the spending on office supplies by this environmental profile gives an estimate of the environmental impact of the production of office supplies. Because TNO purchases many different office products throughout the year, the average over the year represents a good basis for determining the total CO_2 emissions produced.

The accounting items that TNO uses in its procurement records have been taken over and categorised to make its carbon footprint clear. For example, all purchases for desk research have been clustered together, as have all purchases for lab research. This approach does not take into account any build-up or run-down of stocks because of a difference between quantities purchased and quantities used.

For figures on water and waste, TNO does not have readily accessible records. Average figures per employee for waste and water at government organisations have been used instead [10] [11]. These have been multiplied by the number of employees at TNO. This analysis shows that water and waste hardly contribute at all to TNO's carbon footprint, certainly compared with activities in the other categories. Accordingly, any uncertainty regarding these figures only has a minor influence on TNO's estimated carbon footprint, and this approach has therefore been kept.

The effort that would be required to collect specific figures for TNO would not be worth it, given how little water and waste influence the organisation's carbon footprint.

2.2 CO_2 emissions by consumption category

CO_2 emissions are determined per unit of product for the production of goods and services. For this purpose, the SKAO Handbook [12] has been used for scopes 1 and 2. Where similar data is used (such as for commuting), the same emissions figures are used for scope 3. For the other categories in scope 3, TNO used the life-cycle assessment (LCA) software SimaPro and various databases containing data on emissions and use of raw materials in the production of products, processes and services. Within this software, CO_2 equivalents are calculated instead of just CO_2 emissions. In order to tally up the influence of the different greenhouse gases, the emission figures are are all converted to CO_2 equivalents.

For the physical usage data, the Ecoinvent database [1] was used, while the USA input-output database [2] was used for the environmental profiles per euro. The Ecoinvent database is the state-of-the-art inventory database that is most commonly used by the LCA community. It is valued for its transparency. In Ecoinvent, emissions and the use of raw materials are modelled 'from cradle to gate': from the extraction of raw materials through transport to energy consumption, emissions and the disposal of waste related to production processes.

In an input-output database, the emissions generated within a sector (which are known from the registration of emissions) and the total turnover that sector generates are combined with the deliveries that the sectors make to each other (economic databases and models). For example, the butchery sector generates its own emissions and buys from livestock farmers, who themselves generate emissions and buy animal feed from other farmers and the food industry. In this way, the average environmental impact of an average product from a sector can be calculated across the entire supply chain. The USA input-output database was chosen because it is the most detailed, covering 500 sectors. Research carried out in Denmark [3] has shown that a high level of detail is more important for reducing the margin of uncertainty than the geographical origin of the figures. This is partly because the differences between sectors are relatively large, and these differences are not taken into account at a high level of aggregation. In addition, since the economy is global, many products in Europe are comparable to those in the United States, since in both cases they are produced in Asia.

TNO's procurement data is sometimes only available at a higher level of aggregation than that from the input-output database. Based on the experience of TNO's procurement organisation, average environmental profiles are made for products (including processes and services) that fall within a certain category and that are representative of those that TNO purchases.

2.3 Missing data

TNO has decided not to report the energy consumption for some of its small locations. These are rental locations that have a relatively small area (between 30 and 250 m^2) and where only a few people work (one to five people). As the energy consumption that is attributable to TNO at these sites is probably small relative to what TNO consumes overall, it was decided not to devote efforts to obtaining data on the sites. Indeed, because facilities at these locations are shared, it is debatable whether data could be obtained at all for the TNO users only.

No data were collected for water and waste (scope 3), given their small impact on total emissions. Quantities have been estimated based on the number of employees. The number of kilometres travelled by car was used to calculate the number of kilometres for business travel on public transport (scope 2). This is because the number of kilometres travelled on public transport is not available. In order to be able to include the number of kilometres thus travelled, the statistical breakdown given by Statistics Netherlands was used.

3. INTERPRETATION OF THE RESULTS

3.1 Monitoring annual trends

TNO monitors its CO_2 emissions annually; it presented this data for the first time in its 2013 Annual Report. The data from 2009 onwards are included in order to give a historical overview. In order to monitor the effect of CSR policies, the changes over the years could be compared against (yet to be determined) targets for reduced emissions.

Because TNO's CO_2 emissions are measured against those from previous years, it is important that the calculation method be the same for all years. Thecarbon-footprint profiles per unit of use have thus not been changed. That way, comparisons can still be made. Only the usage amounts are adjusted annually. Also, for the sake of a consistent comparison over the years, the figures for waste and water usage per employee have not been adjusted.

The only exception is CO_2 emissions from electricity: according to the SKAO Handbook [12], a different CO_2 parameter should be used for 2009 than for later years. One of TNO's focal points is sustainable procurement.

TNO thus aims to buy products that, among other things, have a lowercarbon footprint. However, this has not yet been included in the method TNO uses to calculate its carbon footprint. One example is the purchase of green electricity. Since 2010, TNO has been purchasing power generated from sustainable sources.

The environmental profile of a kWh of energy from a renewable source is much better than the same profile for grey energy. If TNO were to use the environmental profile for electricity from renewable sources, then based on the same usage, electricity consumption would no longer be visible in the carbon footprint. In order to avoid giving an impression that TNO no longer uses electricity, it was decided to keep basing this calculation on the environmental profile of grey electricity and to include an explanation of what method has been used.

The databases used to determine the CO_2 emissions factors are updated from time to time. CO_2 emissions factors per euro can be corrected, at least for inflation. The method for translating all emissions and the consumption of raw materials into an environmental impact is also being developed further. It is estimated that these updates will only have a minor effect on the understanding of the organisation's carbon footprint, provided that the updated calculation method is applied to all the years being compared. In order to keep up with the latest developments in databases and methods of determining environmental burdens, the method of calculation could be revised every three to five years.

3.2 Uncertainties

The uncertainties in the reported numbers for CO_2 emissions stem from:

- 1) uncertainties in input data
- 2) any recalculations needed to derive consumption from the input data
- 3) uncertainties in the CO_2 factor per unit of consumption

Furthermore, the uncertainties differ by scope and are greatest for scope 3. The uncertainties in the CO_2 emission profiles per unit of product/service do not affect the comparison of TNO's carbon footprint over the years, because the environmental profiles have for the most part been kept the same (see section 3.2.1).

3.2.1 Uncertainties for CO_2 emissions in scope 1

Scope 1 includes direct emissions from the consumption of fuels, such as gas, petrol and diesel. At this level, we estimate that the uncertainties are relatively small. CO_2 emissions are calculated directly from the petrol and diesel consumption of the lease cars and from the consumption of gas in buildings, multiplied by a CO_2 emissions factor.

3.2.2 Uncertainties for CO_2 emissions in scope 2

Scope 2 includes indirect emissions from energy purchased and business travel. The uncertainties in scope 2 consist of:

- The CO_2 emissions factor for electricity that is purchased for both electric vehicles and buildings. The CO_2 emissions factor is calculated for the energy mix for grey electricity in the Netherlands, based on the SKAO manual [12]. This CO_2 emissions factor is thus not specific to the supplier from which TNO purchases electricity.
- Conversion of input data for air travel. TNO collects data on the number of flights taken to various regions around the world. An assumption is made about the average distance by plane from the Netherlands to each region. That distance is multiplied by the average CO_2 emissions factors for short, medium and long distances travelled by air. These CO_2 emissions factors are not specific to the types of aircraft actually flown or to the exact distances involved. Because TNO employees fly relatively often with different airlines, the uncertainty involved in using the average CO_2 emissions factor for the aviation sector is relatively small, provided that the figures used are updated to keep up with developments in the sector.
- Conversion of input data for train travel. TNO collects data on the costs of the train journeys made. Based on the calculated average cost per kilometre, the number of passengers per train is calculated. This is then multiplied by the average CO_2 emissions factor per passenger-kilometre. Annual price fluctuations in train journeys are not taken into account in the calculation.

3.2.3 Uncertainties for CO_2 emissions in scope 3

Scope 3 includes other indirect emissions for commuting and for the products and services TNO purchases. The uncertainties in scope 3 have to do with:

- The conversion of input data for commuting. TNO collects data on the distance between the place of employment and the home address of each employee. By means of an employee survey, a determination is made, for each distance category, of how employees commute to work, whether on foot, by bicycle, by public transport or by car. From the number of employees per distance category, an average distribution among the modes is determined, and that is then multiplied by the total distance for commuting. For each mode, the number of kilometres is multiplied by average CO_2 emission factors for each mode. One of the uncertainties comes from the fact that it is not known what type of car is used for commuting, and thus what proportion of the cars used run on diesel, petrol or electricity. The type of public transport used – bus, tram, metro, or train – is also unknown.

- Uncertainties in emissions factors for services and products purchased. TNO collects data on annual expenditures in various procurement categories. For each category, a CO_2 emissions factor is calculated from various data sources. This is where the uncertainties are the greatest. If suppliers increase their prices, the calculated CO_2 emissions factor also increases, whereas inflation does not directly affect actual CO_2 emissions. The emissions factors for procurement were calculated in 2009 for TNO's first CSR report, and have not changed since then. Furthermore, it is not known to what extent the figures that have been calculated are representative of the actual products or services provided.

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APPENDIX 3. GRI TABLE

GRI INDICATOR	DESCRIPTION	EXPLANATION OR REFERENCE	PAGE NUMBER	EXPLANATORY NOTES
ORGANISATIONAL PROFILE				
102-1	Name of organisation	TNO	Cover and 1-33	
102-2	Brands, products and/or services	Introduction	3	
102-3	Location of headquarters	Anna van Buerenplein 1 2595 DA The Hague, the Netherlands	36	
102-4	The number of countries in which the organisation operates	Internationally active	5	Within the EU research programmes, TNO works across borders with partners from various European countries. More information on TNO's international activities and locations can be found at: TNO as an international partner
102-5	Ownership structure and legal form	Introduction	3	The Dutch Organisation for Applied Scientific Research (TNO) was established by law in 1932. TNO's aim is to make knowledge useful for companies and public authorities. As a public organisation, we have an independent position.
102-6	Sales markets	Introduction	3	
102-7	Size of the organisation	Working conditions	20	TNO's 2020 Annual Report, pages 46 and 47.
102-8	Composition of the workforce	Working conditions	21	TNO's 2020 Annual Report, page 18.
102-9	Supply-chain information	Supply-chain responsibility	9 and 10	
102-10	Significant organisational changes during the reporting period			None
102-11	Explanation of the use of the precautionary principle	Innovating responsibly	22	TNO's 2020 Annual Report, pages 30 and 55.
102-12	External initiatives that the organisation endorses	Introduction	3	TNO's 2020 Annual Report, page 19.
102-13	Membership of associations and interest groups	Organising Corporate Social Responsibility (CSR) within TNO	28	
STRATEGY				
102-14	Statement from the most senior decision-maker about the relevance of sustainable development to the organisation	Preface	3	
102-15	Key impacts, risks and opportunities	Introduction Ambition	3 4-7	
ETHICS AND INTEGRITY				
102-18	Operational structure of the organisation	Profile Organisation Chart	3 28	TNO's 2020 Annual Report, page 45

GRI INDICATOR	DESCRIPTION	EXPLANATION OR REFERENCE	PAGE NUMBER	EXPLANATORY NOTES
GOVERNANCE				
102-18	The governance structure of the organisation, including committees under the highest governance body, as well as the committee responsible for decision-making on economic, environmental and social issues	Strategy Organising Corporate Social Responsibility (CSR) within TNO	5-8 28	
STAKEHOLDER ENGAGEMENT				
102-40	List of stakeholder groups the organisation engages with	–	–	
102-42	Principles for the identification and selection of stakeholders	Ambition	5-8	
102-43	Manner in which stakeholders are kept involved	Ambition	5-8	
102-44	Key topics and issues that have arisen from stakeholder consultations, and how the organisation has responded to them	Ambition	5-8	
REPORTING PRINCIPLES				
102-46	Process for defining the content and specific scope of the report and the assumptions it uses	Ambition Organising Corporate Social Responsibility (CSR) within TNO	5-8 28	TNO's CSR priorities
102-47	Substantive issues identified in the process of determining the content of the report	Ambition	5-8	TNO's CSR priorities
102-48	Consequences of any restatement of information contained in a previous report and the reasons for any such restatement	Not applicable		
102-49	Significant changes with respect to previous reporting periods in terms of scope and boundaries	Not applicable		
102-50	Reporting period	1 January 2020 – 31 December 2020		
102-51	Publication date of the most recent report			The 2020 Sustainability Report is TNO's first formal sustainability report
102-51	Response by the organisation to the issues raised as a result of contact with stakeholders	Ambition	5-8	In 2021, another stakeholder dialogue will be facilitated in order to further align materiality with the CSR strategy
102-52	Reporting cycle	Annual		
102-53	Contact for questions regarding the report or its contents	csr@tno.nl		This is TNO's first Sustainability Report
102-54	GRI application level	GRI 4 Core (2016 guideline)	33	
102-55	GRI content index		33	

GRI INDICATOR	DESCRIPTION	EXPLANATION OR REFERENCE	PAGE NUMBER	EXPLANATORY NOTES
MATERIAL TOPICS				
203-1	Impact of procurement	Socially responsible procurement	10	
205-1	Anti-corruption	Integrity and anti-corruption	10	
206-1	Anti-competitive behaviour	Customer acceptance	10	
302-1	Energy consumption within the organisation	Energy & sustainability	11-18	
302-3	Energy intensity	Energy & sustainability	11-18	
302-4	Reduction of energy consumption	Energy & sustainability	11-18	
305-1	Direct emissions (scope 1)	Energy & sustainability	11-18	
305-2	Indirect emissions (scope 2)	Energy & sustainability	11-18	
305-3	Other indirect emissions (scope 3)	Energy & sustainability	11-18	
305-4	Intensity of emissions	Energy & sustainability	11-18	
305-5	Reduction of greenhouse gas emissions	Energy & sustainability	11-18	
401-1	Employee intake and turnover	Working conditions	19-21	Reporting on diversity & inclusion will be included in the Sustainability Report from 2021 onwards
403-2	Health and safety at work	Working conditions	19-21	
404-1	Training and education	Working conditions	19-21	
404-2	Programmes for improving the skills of employees	Working conditions	19-21	
405-1	Diversity within governing bodies and staff	Working conditions	19-21	Reporting on diversity & inclusion will be included in the Sustainability Report from 2021 onwards

PUBLICATION DETAILS

If you would like to find out more about TNO, or have questions after reading this report or any ideas you would like to share, please drop us a line: csr@tno.nl.

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