



Anyone who believes exponential growth
can go on forever in a finite world
is either a madman or an economist.

Kenneth Boulding

Sustainability report 2018

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Introduction

About this report

Report obligation

The sustainability report at hand contains non-financial reporting in accordance with the HGB (German Commercial Code), section §315b, paragraph 3. For simple navigation within this report, all related parts are highlighted with light-green background. In addition, links to these parts are summarized in a table on page [19](#).

The non-financial reporting is done in accordance with §§ 315b and 315c, in conjunction with 289c to 289e, of the HGB. It serves to meet the disclosure requirements of the CSR Directive Implementation Act.

For compiling the non-financial report, we used the Sustainability Reporting Standards of the Global Reporting Initiative (GRI Standards 2016) as a framework. We used the GRI Standards as the underlying structure for describing the management approaches.

Reporting standard

[G102-49](#), [G102-54](#)

This report has been prepared in accordance with the Comprehensive option of the Global Reporting Initiative (GRI) Sustainability Reporting Standards. As a result, the report deviates from prior reporting based on the Core option and consists of a text file (the document at hand) and the GRI Content Index (included at the end of this report).

Report boundaries

[G102-1](#), [G102-50](#), [G102-51](#), [G102-52](#)

This report follows our annual reporting structure and covers the period from January 1, 2018, to December 31, 2018. It contains data relating to ADVA Optical Networking SE including all wholly-owned subsidiaries. Together, these are referred to, collectively, as "we", "us", "our", "the company", "the group", "ADVA" or "ADVA Optical Networking" hereinafter.

We report annually. The last sustainability report, which contained the non-financial report, was published in April 2018.

Report format

As part of our commitment to reduce our corporate carbon footprint, this sustainability report is available in electronic form only.

The sustainability report is also available in German. The report files can be found on our [Sustainability webpage](#).

Report content and material aspects

[G102-46](#), [G102-47](#)

This report contains a significantly improved (ISO) context and (HGB, GRI) materiality analysis with regard to the group's positioning within and impact on relevant external and sustainability aspects.

This is followed by a description of the resulting strategy, the most important initiatives and the related results and achievements that are necessary for comprehensive reporting.

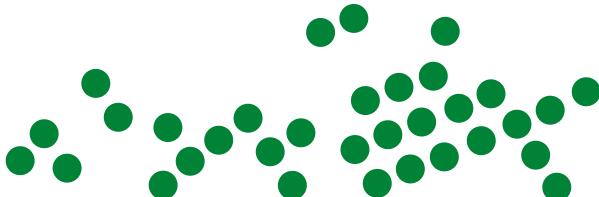
Since we use the Comprehensive-option GRI indices, all HGB-relevant areas are fully covered, and, in most areas, we report on more aspects than required for HGB compliance.

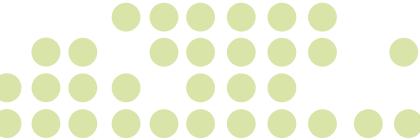
The GRI indices are marked in the respective chapter headings.

It has to be noted that the materiality analysis had a major impact on the GRI indices that we had to report on.

Specific amounts reported in annual financial statements

There are no relations to specific amounts reported in annual financial statements





Reporting metrics

Our reporting of environmental performance indicators has been changed from revenue-related intensity metrics to value-added-related intensity measures (e.g., GEVA, Greenhouse-gas Emissions per Value Added) in 2017 already. This is in line with requirements from the Science Based Targets initiative.

Report validation

G102-56

This non-financial report prepared in accordance with § 315b section 3 HGB was subjected to a voluntary, limited assurance audit by PricewaterhouseCoopers GmbH Wirtschaftsprüfungsgesellschaft (PwC) in accordance with ISAE 3000 (Revised) to verify that its disclosures comply with relevant legal requirements. More information on the assurance can be found in the independent auditor's remarks in the independent assurance report on page [61](#).

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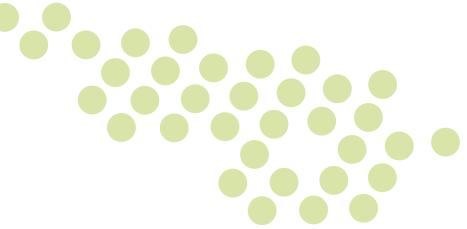
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CEO statement

G102-14

Social and environmental practices are important to ADVA Optical Networking because they support sustainable success for our business partners, our company, our children and most importantly our planet, helping to maintain a healthy quality of life well into our future.

Since our products drive our environmental impact through their long-life use, we are continuously innovating – creating better, smaller and more efficient products with reduced carbon footprint. This is also one of our targets in the Science Based Targets initiative.

In 2018, we again improved various areas of our holistic sustainability approach. Given the group's size, it might seem implausible that we can make a difference. However, we are doing just that, which also helps our customers and other stakeholders. We have implemented formal environmental design requirements for all new products. The next steps, again in line with the Science Based Targets initiative, will tackle our own sites' emissions.

To be clear, this engagement is not fully altruistic. Of course, we are focusing on increasing revenues and building profits. Our goal is enduring business success. Over the long run, sustainable practices are the only way to save resources and reduce many of the related cost.

I take full responsibility for driving ADVA forward with a balanced focus on the Triple Bottom Line. We design, produce and sell the best technology. Our solutions are transforming our customers' networks, and consequently our societies' digital landscape. We also understand business success is not just about making the best technology. To realize true leadership, we take the extra steps along the way to ensure our business success is enduring and we support the success of our people and the wellbeing of our natural world.

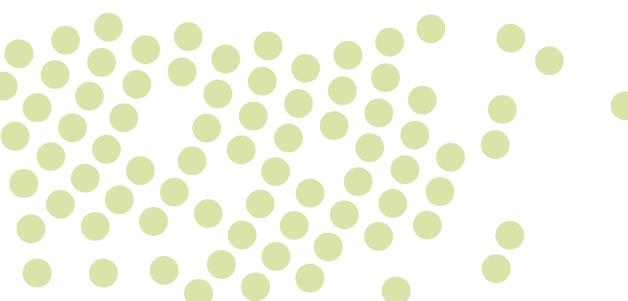
This just makes sense – good business that results in the greater good for our world and our business partners.

Brian Protiva
Chief executive officer



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About ADVA Optical Networking

Governance

[G102-18](#), [G102-19](#), [G102-20](#), [G102-21](#), [G102-24](#), [G102-25](#), [G102-26](#), [G102-27](#),
[G102-28](#), [G102-29](#), [G102-30](#), [G102-31](#), [G102-32](#), [G102-33](#), [G102-34](#)

ADVA Optical Networking SE, the parent company of ADVA Group, is organized according to the two-tier system; this means that in addition to the shareholders organized in the Annual General Meeting, it has two organs of action: the **management board** as the executive body and the **supervisory board** as the supervisory body.

The management board, which manages the company's business, consists of four executive officers (CEO, CTO, CFO, and CMSO). Governance functions are divided between the CEO, who is responsible for compliance, quality management and human resources, the CFO who is responsible for finance, risk management and legal, and the CTO who is responsible for sustainability and as such, for most environmental aspects. This includes the impact, risk and opportunity analyses for all sustainability-related aspects as feeding into the general risk management system of ADVA. All members of the management board are jointly responsible for the economic performance of the company. The correspondent review of the impact, risk and opportunities portfolio is hence performed by the joint management board at least once per year and in-line with the defined risk management process.

In addition to the management board, there is an internationally-appointed supervisory board of three. Its members are appointed by the shareholders. The supervisory board appoints the members of the management board according to criteria that include expertise/experience, independence, diversity, and avoidance of conflicts of interest. Thus, the collective knowledge of the board is also mainly influenced by nomination. The supervisory board is also responsible for the approval of the sustainability and annual reports. As such, the supervisory board is the highest governance body to review the impact, risk and opportunity analyses, including their effectiveness.

Below management-board level, several large departments (like engineering, operations, sales, service, etc.) exist that are either led centrally or on a regional basis. Departmental heads typically have the hierarchical level of an SVP/VP or (Senior) Director, depending on the department's size and relevance and the concerned individuals' seniority. The company follows a top-down strategic goal-setting process

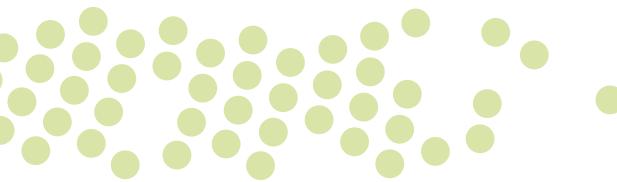
as clustered into the areas Growth & Profitability, Innovation, Operational Excellence and People, all of which are derived from

the company's mission statement, core values and leadership principles. ADVA's strategic goals are broken down into departmental and individual goals cascading through the hierarchical ladder. As an example, the CTO defines the overall sustainability strategy which results in specific goals for multiple different departments and, in effect, dozens of individual employees.

Consultation of shareholders is organized via the AGM (annual general meeting). Regular consultation of other relevant stakeholder groups (e.g. customers) is, e.g., done via a structured customer satisfaction survey as primarily supported by ADVA's quality management function. Where relevant, immediate customer or other stakeholder feedback is provided to the management board. In addition, members of the management board may also directly consult with dedicated stakeholders (e.g. strategic customers).

The evaluation of the achievements of the management board is performed regularly (i.e., yearly) by the supervisory board. In addition, a variety of monthly (financial) metrics are generated, providing for a robust reporting and allowing quick reaction to arising risks or other unplanned events or circumstances. Actions (e.g., changes in long-term strategy or in organization) are taken when required. As one related example, a dedicated sustainability department was created about three years ago in order to further strengthen ADVA's sustainability efforts (see [page 9](#) for details).

Critical concerns are communicated immediately (department leads to management board, management board to supervisory board). In 2018, no critical concerns requiring immediate communication were identified. Details hereto including the applicable processes and mechanisms are as outlined in the risk report in the [Annual report](#).



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Technology

G102-2

ADVA Optical Networking develops, manufactures and sells solutions for a modern telecommunications infrastructure. As such, the group's products enable communication between people globally by constituting substantial parts of the backbone of one of today's important infrastructures. We regard this a relevant social aspect. We address this, for example, with encryption capabilities of our products, which help making the respective infrastructure parts less vulnerable against eavesdropping.

The group's addressable market encompasses several applications for fiber-optic transmission technology, Ethernet access technology and solutions for network virtualization, synchronization, and monitoring. The demand for the group's infrastructure solutions is driven by the global ICT (information and communication technology) trends cloud computing, mobility (in particular its latest generation, 5G), IoT (internet of things), Industry 4.0, and finally smart grids/cities/buildings.

Fiber-optic transport

Optical fiber is the optimum physical medium to transmit large amounts of data over long distances. The bandwidth-over-distance capabilities of fiber by far exceed those of any other physical medium such as copper or wireless technologies. Therefore, fiber-optic transport is the unchallenged foundation for all high-speed networks. ADVA's optical transmission solutions are based on WDM (wavelength division multiplexing). With WDM, multiple data streams are transmitted simultaneously over a single pair of optical fibers by modulating, per direction, each stream onto an individual wavelength (i.e., color) of laser light. Every wavelength (more than 100 in total) carries different applications such as voice, video, data or storage traffic. Combining (i.e., multiplexing) these wavelengths at one end of the fiber, transmitting them over distance and then separating (i.e., de-multiplexing) them at the far end maximizes the fibers' capacity and makes transmission more efficient. WDM supports all data protocols and transmission speeds and is the natural foundation for all high-capacity networks.

Ethernet

Ethernet is the dominant OSI-Stack Layer-2 data-link protocol for today's networks, supporting virtually all communication

applications. ADVA Optical Networking provides feature-rich Ethernet transmission and demarcation solutions for fiber-based networks used to interconnect enterprises and mobile-network base stations with carrier networks. Features include aggregation, synchronization, monitoring, encryption, and virtualization.

Software

The importance of software in networking technology is increasing rapidly. On the one hand, network operation and monitoring are automated by means of intelligent software. This increases user-friendliness and simplifies network control and maintenance. On the other hand, more and more network functions are virtualized (network function virtualization, NFV). With NFV, the tight coupling between hardware and software in network elements is dissolved, and individual network functions can be developed and provided independently of the underlying hardware. NFV is also one of the key technologies in data centers that enables reductions in energy consumption and therefore greenhouse gas (GHG) emissions.

Synchronization

Reference clock sources that deliver highly precise frequency and time-of-day information are crucial to the effective transmission of digital signals in several applications and network domains. Especially in mobile networks, the availability of highly accurate synchronization and timing information is crucial for the network-capacity increase and therefore, best end-user experience. With a complete end-to-end solution portfolio sold under the Oscilloquartz brand, ADVA Optical Networking can offer a smooth evolution across multiple generations of synchronization technologies.

Monitoring

Monitoring is not restricted to digital performance monitoring, as it is done in our transport and Ethernet-demarcation gear. It can be extended to the passive fiber plant, in particular in the fiber-rich access space. Here, it helps to guarantee fiber integrity and to supervise complex fiber plant, even if the respective fibers are not yet lit by active gear. This enables, for example, certain service-level agreements. With the Advanced Link Monitoring (ALM) product line, ADVA Optical Networking can offer cost-effective and unique solutions that help our customers in not losing the view on their valuable passive fiber assets.

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Company key facts

G102-3, G102-4, G102-7, G102-53

Global presence

1,886 employees worldwide as of December 31, 2018.

The group operates in 21 countries with 36 sites. ADVA has significant operations in Germany, Poland, UK, USA, Israel and China. For our global presence, please see the picture below.

Quality and environmental commitment

ADVA is certified according to TL 9000, ISO 9001, ISO 14001, ISO 22301 and ISO 50001.

We also perform our product-portfolio lifecycle assessments (LCA) in accordance with ISO 14040/14044.

Public listing

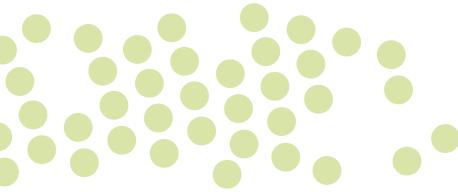
ADVA Optical Networking is listed in the Prime Standard segment of the Frankfurt Stock Exchange (Symbol: ADV).

You can find more about ADVA in our [Annual Report 2018](#).

For any questions or comments regarding sustainability, please contact us at sustainability@advoptical.com.



Global presence of ADVA Optical Networking



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Sustainability organization

G102-18, G102-19, G102-20, G102-29, G102-32

ADVA Optical Networking runs a dedicated Global Sustainability department that directly reports to the chief technology officer (CTO). Its team sets the group's sustainability strategy in close cooperation with the respective peers in other departments, e.g., Human Resources, Quality Management, Engineering or Facility. It identifies steps to be taken and tracks implementation, progress and performance.

The team also creates internal awareness for sustainability through different campaigns, provides training, and engages externally with various groups of stakeholders. It is further responsible for collecting, together with the related peers, the various tracked sustainability data and the related reporting.

Global Sustainability further provides content for dissemination at conferences etc., and contributions to research projects, e.g., the EU H2020 project [C-SERVEES](#). It answers sustainability assessments and provides the related reporting and input to respective tender sections or similar requests for information on the group's sustainability strategy, efforts, and performance. This includes ownership of the sustainability reports.

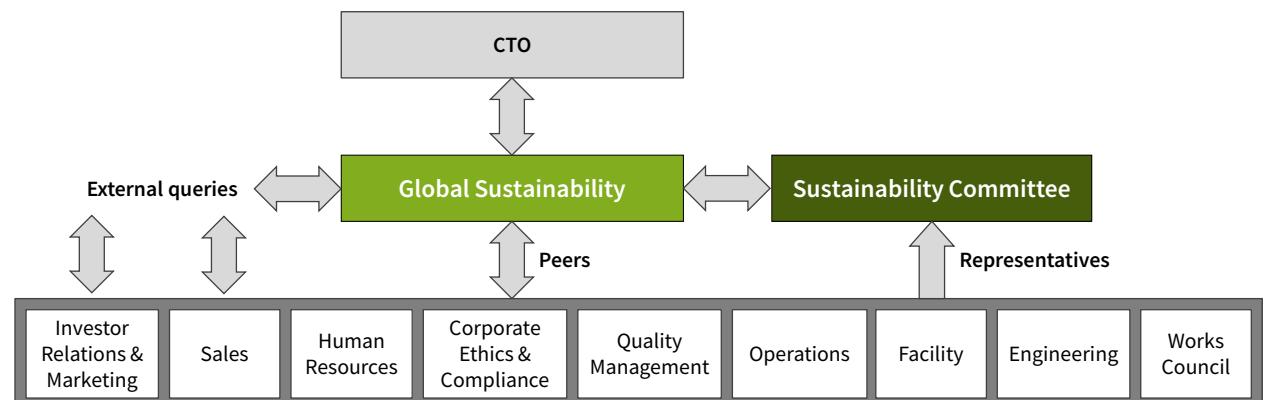
The sustainability department is the central point of contact for external sustainability-related queries, e.g., from CDP or dedicated customers. Further queries may arrive at certain other departments, e.g., Sales. Responses are compiled in cooperation with the peers of the respective departments.

Further responsibilities include the ownership of the entire product portfolio lifecycle analyses, the respective feedback into R&D and other departments, and content ownership of the group's product ecodesign guide, which is part of the product lifecycle process.

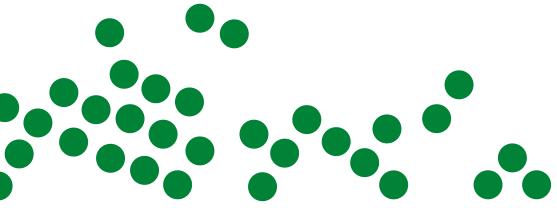
The team actively participates in the TIA Sustainability Initiative, with a dedicated focus on work in the TIA GHG subteam.

In addition, the **sustainability committee** has an advisory capacity on certain aspects and questions regarding sustainability. For example, it meets on demand when decisions on proposals that have been submitted in our Global Sustainability Challenge (see the [CSR](#) chapter) are due.

The sustainability-related organizational structure is shown below.



The group's sustainability organization



Context, materiality, risks and strategy

ICT and its environmental impact

G102-6, G102-31, G103-1

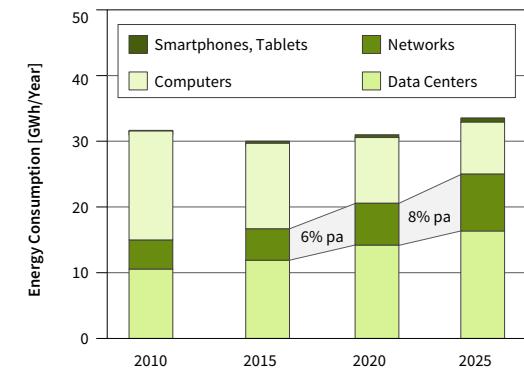
ADVA Optical Networking products are part of the global Internet, or ICT sector. As such, they are part of a sector that contributes approximately 2% to the global greenhouse gas (GHG) emissions. On the other hand, this same sector constitutes one of today's critical infrastructures that allows global communication and in addition enables GHG emissions abatement that is potentially more than 10 times higher than its own emissions. This is sometimes referred to as **Green-by-ICT**. It is one of the very few known ways of substantially reducing global energy consumption and related emissions.

The global ICT sector can be split into three areas: data centers, networks, and end-user devices. The networks segment in turn splits into two approximately equally large parts, wireline and wireless networks. All ADVA products fall into the wireline networks category.

The relative and absolute environmental impact of the networks segment in terms of its electricity consumption can be derived from the following picture. It shows the consumption for Germany, but the development is applicable to the global ICT sector. The networks segment's consumption is predicted to grow significantly over the next couple of years, with growth rates of 6 to 8% per year. Even with emission factors improving in the period considered here, ICT emissions will grow. This is also confirmed by other relevant references like the Global e-Sustainability Initiative (GeSI). It leads to the requirement of continuous improvement of network equipment with regard to emissions and is one of the main reasons for our focus on related product ecodesign and for the group's SBTi participation.

From the diagram and other references like the Cisco Virtual Network Index, a **fundamental problem of the ICT network sector** can be derived: despite all efforts regarding equipment efficiency, the energy consumption and the related carbon emissions are increasing. This is caused by the development of the ICT bitrates (or equipment or network throughput), which shows **exponential growth behavior**. This exponential growth is also predicted to sustain for the next couple of years. As a result, it is **practically impossible to achieve absolute emissions reductions in this sector** (exactly this is

shown in the diagram). It must be noted, however, that this ICT behavior is accompanied by ICT's capabilities of massively saving emissions elsewhere (the Green-by-ICT effects).

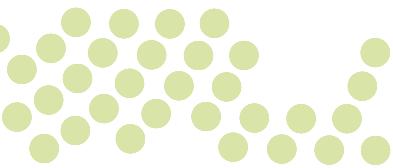


Global ICT energy-consumption projections for Germany
[Hintemann et al., Electronics Goes Green 2016+, Berlin, September 2016]

Within the wireline networks sector, ADVA ranks amongst the top 10 suppliers in the optical-networking and access-switching sub-segments. Since the wireline-networks segment also contains copper and passive optical access networks, routing and switching, none of which is covered by the group's portfolio, the total impact of our products to this sub-segment is <1%.

Following comprehensive GHG reporting and lifecycle assessment, energy consumption and the related emissions are ICT's primary environmental impact. However, there are other, less important impacts. Examples include resource depletion, (eco-) toxicity and some more.

Finally, and more related to corporate social responsibility, there are aspects of labor, health and safety, and conflict minerals. Together, all of these mandate a holistic approach to sustainability in ICT.



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ADVA impact and (ISO) context

[G102-11](#), [G102-12](#), [G102-21](#), [G102-29](#), [G102-31](#), [G102-40](#), [G102-42](#), [G103-1](#), [G103-2](#)

Determining the context of the company is required for the new versions of the ISO standards. Context analyses aim at identifying relevant stakeholders as well as areas of relevant impact on the group, or where the group does have a relevant impact on. For the environmental and energy management systems, it has to consider the relevant environmental aspects as well as other relevant external and internal aspects. It therefore has certain similarities to, but is not identical with, the sustainability materiality analysis.

In general, **interested parties and the related interactions and input** that need to be considered include (this list is fairly comprehensive, but can of course always be complemented):

- Investors, amongst others, via sustainability questionnaire
- Large customers, via bilateral communication, and feedback from customer satisfaction (CSAT) survey
- Selected value-added resellers and suppliers, via bilateral discussions and coaching
- Legal and governmental bodies, via related legislation and regulation, including – limited – feedback via industry fora
- NGOs, industry fora and other associations like Telecommunications Industry Association, Fraunhofer ExFo, EcoVadis, CDP, SBTi, via active participation, bilateral discussions and feedback and analyses regarding assessments
- Feedback and analyses from (successful) award applications
 - MuT award, a CSR award we won in Q3/2018 (see [CSR](#) section herein), and which added the communities view
 - British Telecom (BT) Game-Changing Challenge, a yearly competition amongst BT's suppliers for the best sustainability-related proposals. We won this in Q4/2018 for the second time.
 - Layer 123 award for our WDM products energy efficiency (we won one of these in 2017, see last report)
 - Other, earlier awards (QuEST Forum, strategic customers)

For the context analysis, we use the United Nations Sustainable Development Goals (SDGs) as the most relevant and general set of environmental aspects defined today.

Within the SDGs, environmental aspects are complemented by CSR and business aspects. These can be regarded as other relevant external aspects. Since the CSR area is contained here, the analysis also covers the group's context regarding, e.g., management of occupational health & safety.

The SDGs build upon the UN Millennium Development Goals and converged with the post-2015 development agenda. On 1 January 2016, the 17 SDGs of the [2030 Agenda for Sustainable Development](#) officially came into force. The goals address global challenges we all face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. They have a runtime until 2030 and are detailed in 169 more specific targets. An overview is given in the subsequent picture.

The SDGs is a comprehensive set of environmental and other external (business, CSR) aspects. They are used for our context analysis since they have crucial relevance for global development over the next 15 years. However, they are not complete in the context of our impact, actions and business. In general, many other aspects may have an influence on ADVA, or might be influenced by the group. In turn, many of these are neither specific for ADVA, nor have a material impact. Therefore, most of these additional aspects are not considered in detail hereinafter. Should any of these aspects become relevant at a later stage, it can be added to the analysis easily. However, a few aspects not (sufficiently) covered by the SDGs can be identified that do need to be considered. These comprise a mix of internal (economic performance), external (customer satisfaction, data security) and environmental (energy efficiency of our products) aspects.

Data security is an important external aspect that has a certain negative potential impact on the group. At the same time, it is a significant opportunity area since ADVA produces unique encryption solutions that do help to protect data when being transported. Both, financial performance and CSAT, can have a substantial impact on the group's business. Both, however, are also areas of significant potential opportunities, given a decent performance.

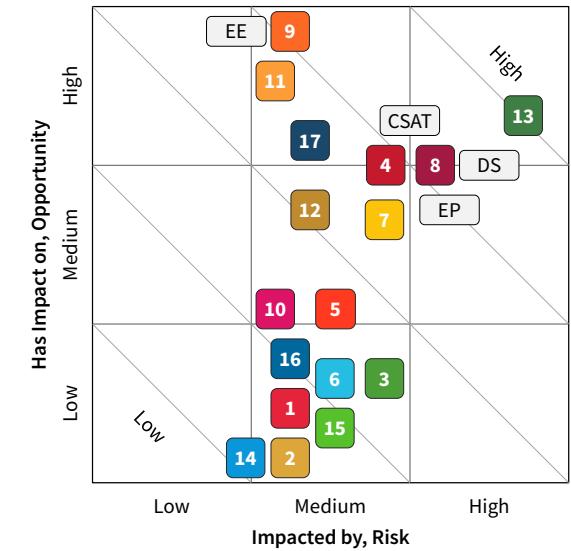
Finally, product energy efficiency is the most relevant area of related ecodesign efforts for the next 10-15 years to come, as will be pointed out in the [Sustainability strategy](#) chapter. Failure in requested improvements would have an impact on business as well as on the group's SBTi participation. Good product efficiency is becoming more and more relevant. Note that in total, the analysis covers the Triple Bottom Line.

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The 17 United Nations Sustainability Development Goals

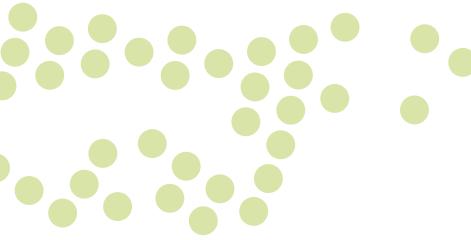
For the impact and context analysis, our own assessment is complemented, wherever available, by input from the given list of interested parties. This aims at giving a more stable and more neutral analysis. Our own assessment is based on (literature) research we conducted and is complemented and confirmed by our end-to-end lifecycle analysis. Altogether, this is leading to a weighting of the different sustainability and external/internal segments in clear favor of global warming as the most pressing threat that we identified.



Context analysis 2018 according to the UN SDGs. For the numbers of the 17 colored SDGs, please refer to the overview picture on the left. CSAT: customer satisfaction, DS: data security, EP: economic performance, EE: product energy efficiency.

The context analysis against the 17 SDGs and the four additional aspects is shown in the previous diagram, where the numbers in the colored squares refer to the sustainable development goals, and the abbreviations in the light-gray rectangles refer to the four added aspects.





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We chose to display the result of the context analysis in a two-dimensional diagram that looks similar to, but is not identical with, the one used for materiality analyses. Here, the ordinate axis displays the potentially positive context aspects, i.e., aspects that the group has a potential impact on, and that can offer opportunities for increasing business, etc. The x-axis displays a potential impact on the group that the respective aspects can have. This can also be regarded as a negative impact or risk.

In terms of impact on ADVA, the SDGs and added aspects are clustered around medium risk. The sole exception is SDG #13, climate action. Obviously, if global warming is not limited to below 1.5 °C compared to the pre-industrial state, this can have incalculable risk on everybody's business. This is also the reason why emissions reductions, ecodesign and related actions comprise our number-1 focus area within our sustainability strategy (see the [respective chapter](#)).

Regarding ADVA's impact, the assessed aspects cluster in two groups. The first group is considered to offer little to medium opportunities only. The second group contains aspects of high opportunities, which partially overlap with those of high potential risk. Again, this is the group where our sustainability focus falls into.

The ranking in our **context analysis becomes clear when the general SDGs are translated to more ADVA-specific aspects**. Then, SDG #9 can be translated to our capabilities to support sustainable innovation and infrastructure, **because we are an ICT infrastructure vendor**, and ICT infrastructure has an important role to play in other sectors – the Green-by-ICT mechanisms. SDG #8, economic growth, is strongly correlated to our attempts to support and broaden circular economy business. The same holds for SDG #12, responsible consumption and production, which is obviously also related to circular economy. For ADVA, SDG #11, sustainable cities, again refers to the ICT infrastructure. SDG #7, clean energy, refers to both, our ISO 50001 activities as well as ICT's contribution to smart grids and related aspects. Finally, SDG #13, climate action, does not require further explanation. It is related to global warming and is considered, within ADVA, by our SBTi participation.

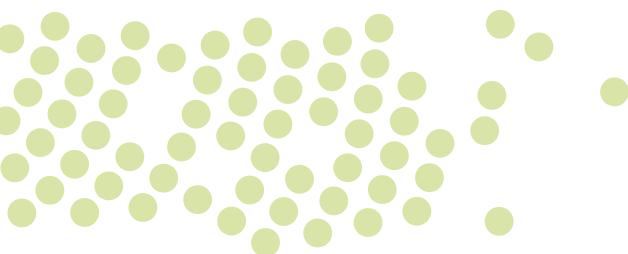
In order to derive meaningful relevant conclusions from the context analyses for the environment-related ISO standards, it must be combined with an end-to-analysis of the group's environmental impact. This impact can either be derived from a comprehensive – covering all relevant contributions!

– greenhouse-gas or carbon-footprint reporting, or, with a similar result, from a portfolio-wide lifecycle analysis that considers all products' lifecycle stages. Both are reported hereinafter in the chapters [Carbon emissions](#) and [Ecodesign](#), respectively. From there, it becomes clear that certain GHG emissions account for the majority of the total group's environmental impact. This is also reflected in the high respective ranking in the context-analysis diagram.

Next to global warming, environmental impact aspects include water quality or usage and pollution, waste generation and treatment, biodiversity, resource depletion, various toxicity parameters and others. **These are exactly the impact categories that are also considered in our portfolio-wide lifecycle assessments**, see the [Ecodesign](#) chapter. A part of these aspects, e.g., waste and its treatment, is also directly considered in our carbon reporting, see the [Carbon emissions](#) chapter. As such, all relevant environment-related parameters are considered in at least one way, and several conclusions can be drawn in the context of the ISO standards and the group's related actions and strategy.



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Relevant aspects of ISO 14001 are considered by our portfolio LCA. This refers to, e.g., waste, water usage/pollution, hazardous substances and others. This is complemented by dedicated work on ozone-depleting and other hazardous substances, and on REACH and conflict minerals. From this work, it is clear that ADVA is not responsible for industrial-scale water usage (nor its pollution). This is also confirmed in the [Environmental management](#) chapter.

The group is also not responsible for large-scale waste generation. Where applicable, dedicated waste fractions (e.g., WEEE, cardboard) are recycled. This can be derived from our carbon-emissions reporting, see the waste fraction. In addition, the use of hazardous substances is limited to a very small amount, and ODS are neither used in our sites nor in our supply chain. Instead, it is clear that the group's impact is dominated by global warming. **Therefore, we do follow ISO 14001, but it is no environmental priority-1 area for us.** This is also reflected in the indices we got from GRI. This prioritization also has an impact on the related targets or performance indicators. With the exception of the area of LCA, no quantitative targets (similar to the climate-related SBTi targets) are defined for the Environmental Management System (EMS). LCA is relevant for one of the SBTi targets (the Scope-3 one). Therefore, it must be assigned meaningful KPIs. For LCA, these two targets are the following:

1. LCA shall cover >90% of commercially relevant portfolio
2. Level of confidence in LCA results shall be >90%

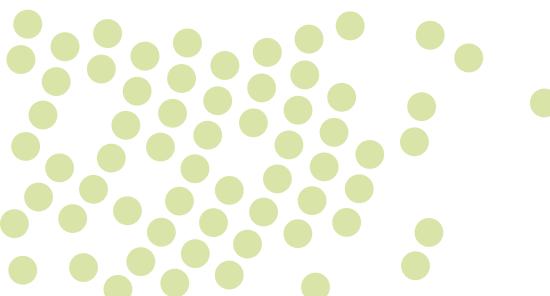
ISO 50001 activities completely overlap with our SBTi Scope-2 target and as such, with one of the relevant carbon-emissions areas. This means that ISO 50001 falls within one of our top-priority, climate-related, area. It also follows from portfolio LCA, where it addresses actions next relevant after energy-efficiency-related product ecodesign.

According to its relevance, another two targets have been defined that fall into the domain of ISO 50001:

1. SBTi Scope-2 target (-20% on absolute emissions over target runtime resulting from purchased electricity)
2. -2.1% per year in electricity consumption in relevant sites by 2020, from a 2015 base year

Note that the impact / context analysis against the SDGs also covers aspects of (occupational) health & safety. Therefore, potential conclusions can also be drawn for the area covered by ISO 45001, including KPIs. ADVA is following most ISO-45001 aspects, however, without external certification (selected aspects like fire safety, etc. are externally validated regularly). Therefore, in this area, no KPIs are communicated externally.

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Sustainability materiality analysis

G102-11, G102-47, G103-1, G103-2

Materiality analysis is required for GRI and HGB reporting. In particular, this is required by HBG to fulfill the reporting criteria. It gives a more detailed view on material matters and topics, compared to the SDG-based impact and context analysis. This aims to classify (GRI, other) **aspects that have forcing impact on our related strategy**.

To do so, we first collect environmental, social and other aspects of relevance. This is done by frequently screening GRI (sub-) categories and aspects, and ranking them by taking the **product of the likelihood of the respective aspect's impact (which can be positive or negative) multiplied by the degree of its impact**. This way, sub-categories and aspects need not be considered any further if their likelihood×impact product is low.

The GRI aspects are complemented by other relevant aspects, e.g., aspects defined by SASB (the Sustainable Accounting Standards Board) and aspects defined or selected by ADVA. These additional aspects are ranked the same way. Only aspects with a substantial likelihood×impact product are subject to reporting. Whenever new aspects appear in the frequent screening process and show a substantial likelihood×impact product, they are added to the analysis. In turn, aspects that become irrelevant for whatever reason can easily be removed.

This process is conducted on a yearly basis by representatives of several departments. This includes setting the respective thresholds for selecting or discarding aspects for the materiality analysis and for selecting those that are considered as material matters.

The actual list of relevant aspects that are used in the materiality analysis is provided in the table on the next page. The list covers aspects relevant for GRI and HGB reporting, it obviously also covers the Triple Bottom Line.

The materiality analysis is displayed in a two-dimensional diagram which looks similar to, but is not identical with, the one used for our context analysis. The x-coordinate in the diagram summarizes the impartial external and internal analysis. The ordinate axis displays the stakeholders' interest regarding the group's actions, performance and strategy.

The list of interested parties has already been provided in the previous chapter. It is further elaborated in the [Stakeholder engagement](#) chapter. In combining different stakeholders' input for the materiality analysis, we apply a certain weighting for the stakeholder groups. In particular, due to their strong economic impact on ADVA, input from investors and customers is weighted twice as much as the input of the other stakeholder groups (which is not weighted/differentiated any further).

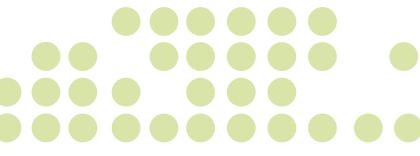
The external analysis considers factors of relevance that are external to the reporting entity, i.e., factors where the reporting entity has limited or no control on. This includes, but is not limited to:

- The most relevant environmental, economic and social determining factors – like global warming – including related legislation (e.g., the climate agreement)
- Governmental funding and initiatives
- New technical needs (in ICT, e.g., in data centers) and innovations and developments (e.g., in recycling)
- General economic framework (e.g., exchange rates, inflation)
- Media perception and support
- Respective strategy, actions and performance of the competition

The internal analysis considers all relevant strengths and weaknesses of the reporting entity. It may result from a SWOT analysis and contains aspects like (but is again not limited to):

- Technological and organizational competence (governance)
- Resources availability (people, material, space)
- Business – customer satisfaction, stickiness and expectation, new opportunities, competitive advantages
- Business – cost, price, potential savings

The update of the analysis is shown in the figure on the next page.



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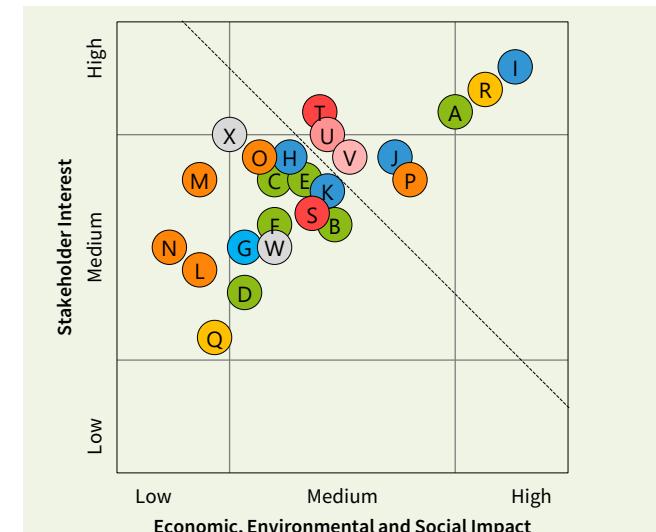
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#		Category	List of significant aspects
A	Environment	GHG emissions / climate change	
		Energy management	
		Waste	
		Water management, pollution	
		Compliance (REACH, RoHS, WEEE, CM, ...)	
		Resource efficiency	
G	Product	Safety & labeling	
		Packaging & transportation	
		Design & innovation	
		Circular economy	
		Quality	
L	Employees	Occupational health and safety	
		Labor practices (ILA)	
		Diversity & equality	
		Compensation & satisfaction	
		Training & education	
Q	Soc.	Community	
		Infrastructure	
S		Data security	
T		Anti-corruption	
U		Human rights – anti-modern-slavery	
V		Supply chain responsibility	
W		Risk management	
X		Stakeholder engagement	

When comparing the 24 aspects in the materiality analysis with the SDGs and the context analysis, the two lead to similar conclusions. This becomes particularly apparent when considering the SDGs and identified significant aspects that are most closely related to global warming – SDG #13 and significant aspect “A”. In both cases, they are the segments in the analyses that are closest to the critical region, thus underlining the importance of emissions reductions for ADVA. Note that the material aspect “I” is also associated with global warming via product design targeted at improved energy efficiency.

This is the reason for the group’s priority-1 focus on global warming and here, on product ecodesign (leading to improved energy efficiency).



Materiality analysis 2018. For the letter and the colour coding, please refer to the table on the left. Note the zoom into the medium area.

The material aspects – and matters in the HGB sense – are those on the right-hand side of and above the dashed line in the diagram. For the determination of the material statements relevant for the non-financial report, those topics were identified that are necessary for understanding the business development, the company result and the position of ADVA and the impact of its operations on the non-financial matters. As discussed in the beginning of this chapter, aspects not shown in the diagram have low likelihoodximpact product. For example, the group’s impact in the areas of water usage/pollution, and waste and related pollutions is relatively low due to the fact that ADVA is a system integrator, rather than a components manufacturer. (Components’ manufacturing is considered in our products lifecycle assessments, as pointed out in the chapter Portfolio lifecycle assessments.)

The spread in the economic, environmental and social impact of the different material aspects enables the **prioritization** of the work ADVA plans to do in the different material areas. Actions on climate change are strategically assigned priority number one, and they are the only environmental aspects that have steering character for the group.

The climate-actions area is complemented by priority-2 actions related to the other matters identified, as is described in the chapter [strategy](#).

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HGB materiality analysis

The non-financial report must contain information on certain specific matters. Matters subject to reporting contain at least the following five:

- Environmental matters
- Employee matters
- Social matters
- Respect of human rights
- Combating corruption and bribery

In addition to the five standard HGB matters, the material aspect "product" was identified in the materiality analysis.

We also report on the supply-chain topic as a cross-cutting issue as it is covered by and is a part of all other mentioned topics.

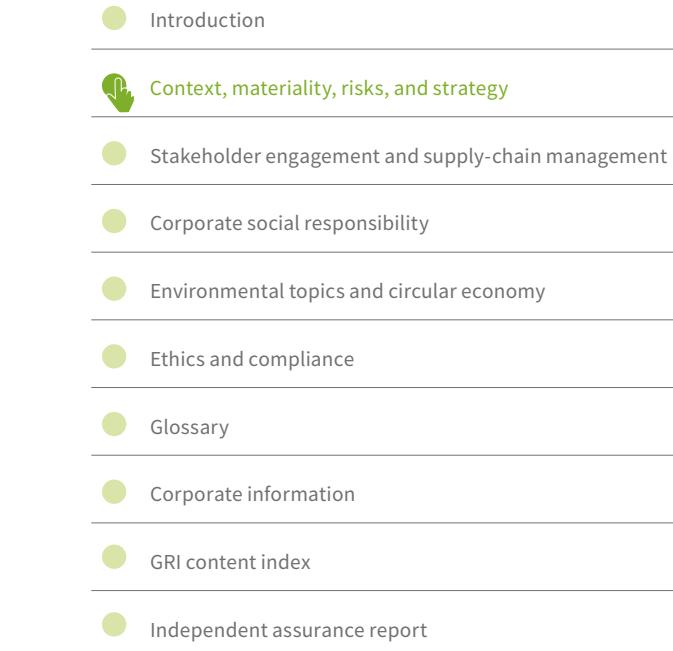
Product aspects are product design (design to energy efficiency) and circular economy (design to circular economy).

Therefore, in total we report on six matters. This is summarized in the table below.

An additional overview on the matters and the respective aspects is given in the table on the next page. It provides the mapping to the Triple Bottom Line. In addition, it indicated the respective aspect's coverage of the complete value chain. Here, the bullet size is meant to provide a rough indication, rather than precise information as to how the value chain is affected. This overview aims at demonstrating that the aspects identified in our material analysis have impact outside ADVA.

Summary of HGB matters and aspects, and where they are described.			
HGB material matter	Aspect	In this report	In the annual report 2018
Environmental matters	GHG emissions	pp. 10 , 21f , 23 , 37ff , 39ff , 45 , 46	
Product	Design & innovation Circular economy	pp. 7 , 14 , 15ff , 23f , 45 , 46	p. 28-30
Employee matters	Training & education	pp. 29 , 35	
Social matters	Infrastructure	pp. 7 , 10 , 26 , 36	
Combating corruption and bribery		pp. 47 , 48	
Respect for human rights	Anti-slavery	p. 50	
Supply chain (cross-cutting issue)		p. 23f , 28	p. 34

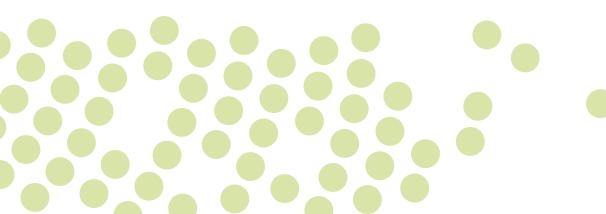




Matter and aspect	Triple Bottom Line	Value chain				
		Suppliers	ADVA	Logistics	Customers	Society
Product Design & innovation	Planet	●	●		●	
Environmental matters GHG emissions	Planet	●	●	●	●	●
Product Circular economy	Planet	●	●		●	
Employee matters Training & education	People			●		
Social interests Infrastructure	People (Planet)			●		●
Combating corruption and bribery	Profit (People)	●	●	●	●	
Supply chain	People, Profit	●	●	●		

Material aspects mapping. Bullet size under value chain indicates degree of impact

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Key risks and opportunities

G102-11, G102-15, G102-33, G102-34, G201-2

ADVA Optical Networking has an impact on, and is potentially impacted by, the different areas of the Triple Bottom Line. Details on ADVA's risk management system can be found in our [Annual report](#).

Based on our risk assessment, several sustainability-related risk factors have been identified that either contribute to risks as reported in the Annual report, or constitute stand-alone risks by themselves (the latter refers to circular economy).

Based on net analysis, no risks have been identified that are very likely to have or could have serious negative impact on the matters.

Loss of key customers or channel partners (possible, material): In recent years, more and more ADVA customers have asked for testimonials of our sustainability strategy, action plans and performance. Failure in demonstrating our sustainability leadership could have a substantial negative impact, in effect contributing to the general risk of losing a key customer or channel partner.

Uncompetitive product cost (possible, very material): Cost leadership is essential for ADVA to remain competitive. Sustainability-related (legal) requirements may nevertheless result in a regulatory or administrative burden that challenges our cost leadership. This in particular if regional legislation is resulting in a disadvantage compared to ADVA's key competitors. While not likely, the ultimate consequences may be very material. To be clear, sustainability-related aspects are not the only factor impacting such risk. Also, the general characteristics of telecommunications (high-tech segment, connecting people) further mitigate the outlined risks likelihood and potential impact.

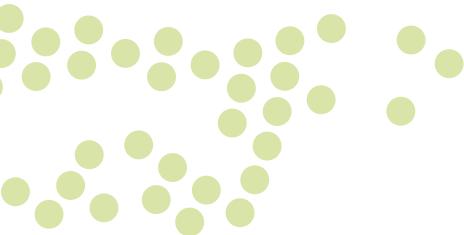
Product design quality and regulatory compliance (likely, material): Legislation related to sustainability is constantly changing, potentially requiring immediate attention. One specific area of risk are regulations on the substances that are used in ADVA's product components and a certain likelihood exists that regulations, e.g., on REACH or conflict minerals are changing without leaving adequate time for the required engineering or supply chain adaptations. This can have a significant impact on components' availability, which in turn can have a material impact on business, albeit for a limited duration. Due to the history of legislative changes, the

likelihood of any such abrupt change is nevertheless regarded as fairly limited. This risk is furthermore mitigated by related work in components engineering and by our participation at Fraunhofer ExFo (see the [Collaboration at industry alliances](#) chapter) which effectively acts as an early-warning provider.

In addition, it may be that legal requirements (e.g., related to substances, but also to emissions) are in clear favor of very large companies, either because they lead to very substantial efforts (that larger companies can more easily afford), or because larger companies with more diverse portfolios are less vulnerable to certain singular risks. This is seen as possible. This risk is neither specific to ADVA, nor to telecommunications! It would affect the majority of smaller companies. Mitigation to this risk comprises continuous screening of upcoming legal requirements and related due diligence (e.g., regarding conflict minerals).

Finally, certain risks related to product ecodesign further contribute to the overall likelihood and impact of product design risks and regulatory compliance. Ecodesign is nevertheless strongly related to our number-1 priority and the potential negative impact of this factor is thus considered very limited.

Circular economy risk (unlikely, moderate): A good example for a stand-alone sustainability risk are potentially more stringent legal requirements in the area of circular economy. In general, ADVA is in full support of circular-economy business concepts. However, legislation may lead to requirements that are not fully achievable, thus leading to a negative impact. This may happen in case unrealistically high percentages of second life and parts reuse are required, in effect constituting challenges for the group's products since reuse is limited due to the long regular product lifetime and the functional obsolescence thereafter. An accompanying risk factor of moderate impact consists of upfront investments in reverse logistics and parts of the upstream and downstream value chain that result from broad-scale take-back requirements. This potential overall impact is nevertheless considered moderate and we regard materialization of it as very unlikely. The so-called circular economy risk is furthermore tackled by pro-active actions including participation in related research projects and industry fora.



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Supply shortages (possible, material): As one contributing factor adding to this risk, environment-related developments and dependencies may ultimately affect our supply chain, e.g., via increasing bad-weather conditions that in turn are caused by global warming. While potentially material in impact, this specific risk factor is regarded as unlikely due to our diverse supplier base and our business-continuity activities in-line with ISO 22301.

Finally, global warming potentially affects more than just the supply chain. Depending on its development – more or less than 2°C increase over the pre-industrial state – it may have an unprecedented impact on national, regional and global economies. Potentially, this leads to a very material impact on our as well as everybody else's business. We do regard this the singular most severe risk observable today. This is also the reason for our clear focus on global warming as the number-1 priority.

As pointed out, the group has implemented robust strategies and processes for risk mitigation for all major risk areas. This includes the assignment of dedicated risk owners.

Our sustainability work can also lead to positive impact and related opportunities. The most notable positive effect identifiable today relates to carbon emissions abatement which is enabled by the use of our products. This effect, known as Green-by-ICT, is predicted to over-compensate emissions caused by the ICT sector by a factor of up to 10. It is also one of very few known mechanisms that can enable substantial carbon saving globally (in sectors other than ICT).

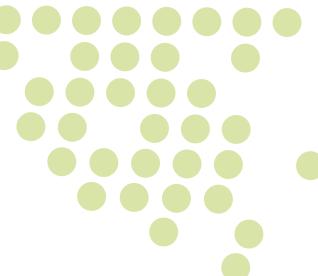
We can also directly reduce emissions. This is achievable by increasing the use of carbon-neutral energy, e.g., by purchasing it for an increasing number of our own sites, and by extending our engagement toward similar behavior in our supply chain.

Our work in the area of sustainability also supports increased positive awareness and reputation, with related potential effects on business. The actual example is our participation in the [Science Based Targets initiative](#) (see the [Sustainability strategy](#) chapter in this report), where we already got positive feedback and interest in our respective work by several stakeholders. So far, the business impact, in terms of added (pro-forma) EBIT, is moderate at best. However, we expect this to grow over time.

Finally, through our work, we can help others to focus more on sustainability issues and the value of sustainable technology. This can indirectly support the IPCC's climate goals through the related discussions and interactions with our stakeholders.

In summary, it is clear that sustainability-related effects and requirements have a high impact on the group's success. ADVA's proven track record means that sustainability thereby offers many opportunities that clearly outweigh the described limited risks. Such opportunities can consist of competitive advantages through cost advantages, lower environmental footprint (e.g., CO2 footprint), or simply better reputation. Moreover, the group's opportunities may extend into the segment of sustainability-related supply-chain management, e.g., in cases where the group supports some of its suppliers in getting better related performance. This would not only help the respective suppliers, it would also lead to potentially better relationships.

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Sustainability strategy

G102-15

The aim of our sustainability strategy is to balance the different aspects of sustainability, in the sense of the Triple Bottom Line, and according to the different sustainability requirements of all relevant groups of stakeholders. Therefore, the strategy is derived from the sustainability materiality analysis. It is also confirmed by the context or impact analysis. Note that the group aims at a stable, long-term strategy.

The group's sustainability strategy is focused at CO₂ emissions reductions. This covers the planet pillar of the Triple Bottom Line. It is underpinned by numerical KPIs, namely the ones defined for the SBTi. For other environmental areas such as water, waste or deforestation, no externally communicated KPIs have been set. This is because the impact that the group causes in these areas is smaller by orders of magnitude when compared to GHG emissions.



In late 2016, ADVA Optical Networking committed to the Science Based Targets initiative (SBTi), as one of the first 200 companies worldwide and one of the first 10 companies in Germany. The SBTi is a partnership between the Carbon Disclosure Project, UN Global Compact, the World Resources Institute and the World Wide Fund for Nature. It aims at helping companies determine how much they must cut emissions to prevent the worst impacts of climate change. Carbon-reduction targets are considered "science-based" if they are in line with the level of decarbonization required to keep global temperature increase below 2°C compared to pre-industrial temperatures, as described in [IPCC AR5](#).

In Q3/2017, the group submitted its Scope-1, Scope-2 and Scope-3 targets proposals to the SBTi for official evaluation and approval. When this report was finished, the approval of our Scope-3 target was still due. The Scope-1 and Scope-2 targets were already approvable.

In accordance with relevant SBTi references, all group targets are so-called GEVA targets, i.e., they define target reductions of GHG emissions per unit of value added (VA). This intensity normalization accounts for future company growth. All targets are aligned to have 15 years runtime, up to 2032, as preferred by the SBTi.

In line with the GEVA definition, the Scope-1 and Scope-2 targets aim at reductions of 20% over the target runtime in absolute terms. The Scope-1 target refers to the company's car fleet. We proposed GEVA reductions enabled by less consumption per car, less mileage, and possibly smaller pool size. For Scope 2, we proposed purchased-electricity GEVA reductions. These will be enabled by purchasing electricity with a higher amount of renewables, and/or installing solar panels at sites that we own. This is also supported by our ISO 50001 activities.

The group's Scope-3 target relates to GHGP sold-products use-phase emissions. This is our largest GHG contribution (see the [Carbon emissions](#) chapter), and consequently deserves attention. Our target is to massively increase the energy efficiency of our products such that **per-product-unit emissions are decreased by by 30%** in 2032, relative to the base year 2016. This is despite exponential Internet bandwidth increase and related ICT network-segment GHG emissions-increase forecast (see the [ICT and its environmental impact](#) chapter earlier in this report).

The SBTi emission-reduction targets have runtimes of 15 years, which is recommended by the SBTi. From the moment of official approval, they will replace the group's older emission-reduction goal as stated in ADVA sustainability reports before 2016. They will also define the focus area – emissions reductions – for a 15-years strategy.

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In order to also consider the other pillars of the Triple Bottom Line, two further strategic initiatives have been started in 2016 already. These initiatives relate to circular economy, and people and partners, respectively.

Regarding circular economy, the strategic goal is its preparation for broad-scale application. We already follow certain circular-economy processes, including refurbishment, parts reuse and of course WEEE recycling. However, a massive shift from linear to circular economy requires further strategic consideration, e.g., with respect to the related business models and logistics. In 2018, we started our participation in a related EU Horizon-2020 project, C-SERVEES, that aims at boosting circular-economy business in the electrical and electronics industry. Until the end of the project in 2022, no numerical KPIs will be set here.

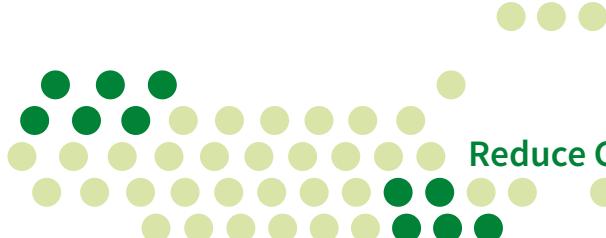
Finally, strategic initiatives relate to people and partners. Obviously, this can be assigned to the Triple-Bottom-Line people pillar.

Regarding partners, this addresses improvements in sustainability-related supply-chain management and supplier diversity. Regarding our employees, several complements to our ongoing CSR activities are under planning and implementation. Again, no externally communicated numerical KPIs have been set here. However, certain KPIs for internal use have been defined in this area.

The strategic initiatives are summarized in the following table.

Key objectives and initiatives in the three pillars of the Triple Bottom Line

Category	Key objectives	KPIs set	Key initiatives/activities	Status
Emissions	Decrease intensity-related global ADVA CO ₂ footprint (GEVA)	SBTi targets, ISO 50001 KPI, ISO 14001 LCA KPIs	Have SBTi targets approved by SBTi Achieve SBTi KPIs within stated target runtime	Ongoing Started
Circular Economy	Prepare broad scale CE business	No KPIs set yet (C-SERVEES project to be finished first)	Identify ways toward broader-scale circular-economy business, through participation in EU H2020 project C-SERVEES Improve recycling, in particular by applying the Design Guide	Started Ongoing
People & partners	Improve sustainability aspects in the people & partners area	Internal only, e.g., regarding ESS, CSAT	Improve sustainability SCM by tool roll-out and audits Complement procurement, e.g., by diversity aspects Improve our CSR in the area of trainings	Ongoing Ongoing Ongoing

 Reduce GHG intensity emissions (GEVA) in all GHGP scopes with Science-Based Targets



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Assessments and performance

G103-3

Regular assessments – self-assessments as well as external ones – are one relevant control mechanism for the management approaches in the material sustainability areas. They give an indication of the success (or shortcomings) of the work in the respective areas and can indicate where corrective action should be taken.

Assessments are regularly performed for participants of the Telecommunications Industry Association (TIA) Sustainability Initiative. The TIA Sustainability Initiative is the successor of the former QuEST Forum Sustainability Initiative, and they use a holistic 10-segments model to cover the area of sustainability. We reported about the model in the recent reports repeatedly.

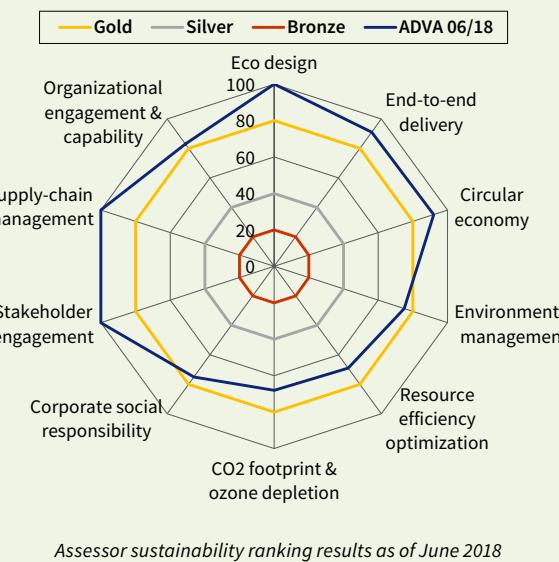
An overview is given in the following picture.



The sustainability model used in the TIA Sustainability Initiative

The model was originally developed by British Telecom for sustainability assessments in their supply chain. Later, it was adopted by the QuEST Forum and TIA Sustainability Initiative, and consequently, it is used by several other companies in telecommunications. The group uses the model since six years due to its proven capability to provide structured and prioritizing guidance throughout all aspects of sustainability.

The TIA sustainability model is complemented by the TIA Sustainability Assessor, a web-based tool which supports sustainability (self-) assessments. In the TIA Sustainability Initiative, regular assessments are recommended. We use this tool and the model and their predecessors (from QuEST Forum and from British Telecom) for several years now. The latest group's results of 2018 showed our second consecutive "Gold" ranking across the segments of the sustainability model



Assessor sustainability ranking results as of June 2018

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As a holistic model, the TIA model has a very strong overlap with the (Comprehensive option) GRI sub-categories and indices and also covers the majority of the HGB matters. For this reason, older versions of our materiality analysis used the TIA segments instead of GRI and other material aspects. This had little impact on the outcome of the analysis, i.e., our strategy decisions.

The use of the Assessor tool in ADVA's supply-chain management started in late 2016. The prospect of its use is to help developing our suppliers' sustainability performance and strategy by using a relatively simple yet meaningful assessment tool. The tool introduction to the supply chain is currently on hold for organizational reasons (the efforts in switching from the BT Assessor to the TIA Assessor).

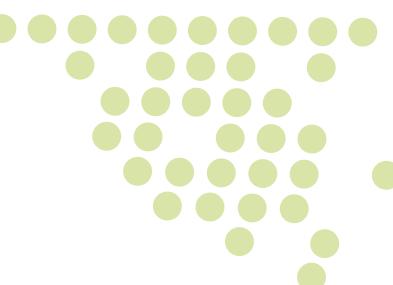
Furthermore, the group is regularly assessed regarding its sustainability performance on behalf of large customers on other independent platforms. These include the assessment platforms of the Carbon Disclosure Project (CDP) and EcoVadis.

In 2018, we achieved our second consecutive EcoVadis “**Gold**” ranking. Assessment areas included environment, labor & human rights, ethics, and sustainable procurement.



In 2018, we also achieved, for the first time, **B- ranking in the CDP assessment**. This assessment consisted of the CDP Climate Change Questionnaire and the Supply Chain module. This rating is the group's highest CDP rating achieved so far.

As indicated earlier, and in line with our materiality analysis, the aspects related to water and deforestation are not included in our CDP assessments.



Stakeholder engagement and supply-chain management

Stakeholder engagement

G102-21, G102-40, G102-42, G102-43, G102-44, G103-1, G103-2

Stakeholder engagement is relevant in the sustainability context as it helps to identify the different stakeholders' expectations and to update the prioritization of the sustainability-related activities. As such, it is instrumental for the materiality analysis (see the [related chapter](#)).

Regarding sustainability, relevant groups of stakeholders are those who have an interest in, or influence, the group's actions, strategy, or reputation in that area. This includes parties that are influenced by the group's actions.

The following **groups of stakeholders** have been identified:

- Customers
- Shareholders, investors
- Suppliers, contract manufacturers
- Associations, alliances, NGOs
- OEMs, VARs, service partners
- Logistics partners
- Communities
- Employees

The group's general approach to stakeholder engagement is to keep in dialogue with the respective stakeholders in a regular fashion. For certain stakeholders, e.g., certain strategic customers, associations, communities, this happens on a daily-business basis. Other stakeholders are served periodically or even aperiodically via dedicated campaigns.

In 2018, our supply chain again was a key area of our sustainability engagement. We continued the initiative of collecting photonics-components LCA data (that is not available in LCA databases like GaBi or ecoinvent) from selected suppliers. This led to certain improvements in our portfolio LCA calculations. It also confirmed the fact that continued engagement with the supplier base is necessary since still response is often very slow, incomplete or even missing. Given the group's size and the size of the supplier base, this is also a challenging task.

Collaboration at industry alliances

G102-13

ADVA Optical Networking regularly contributes to sustainability-related industry alliances. Examples include our collaboration with the TIA Sustainability Initiative. Here, we periodically share best practice and contribute to the GHG subteam.

In 2018, we also continued our work with the ExFo (Experts' Forum) at Fraunhofer IPA in Stuttgart, Germany. The work of this forum is centered on the areas of REACH, RoHS, WEEE and conflict minerals. As an industry forum, the ExFo can provide advanced warnings in cases where the related regulations and directives become updated.



For the past couple of years, ADVA has also been a supporter of the Carbon Disclosure Project (CDP). The CDP is one of the platforms used by the group for carbon-emissions reporting, please also see the [Assessments and performance](#) chapter.

This work was complemented by several projects related to our communities, please refer to the [Social engagement](#) chapter.

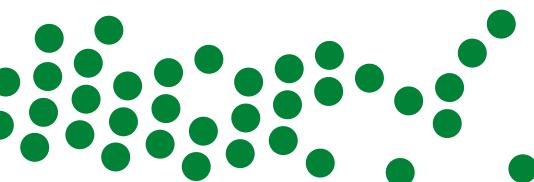
Research project C-SERVEES

G102-12



In May 2018, the EU Horizon 2020 project C-SERVEES was officially started, after acceptance in a two-stage applications process. The project aims to boost a resource-efficient circular economy in the electrical and electronic sector through the development, testing, validation and transfer of new circular economic business models based on systemic eco-innovative services. The consortium of the project consists of a well-balanced mix of academia, research institutions and industrial SMEs and large companies. You can find more about the project, including the possibility to become a stakeholder, under c-serveesproject.eu/.

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Buheesi E-/FTTV project

G413-1

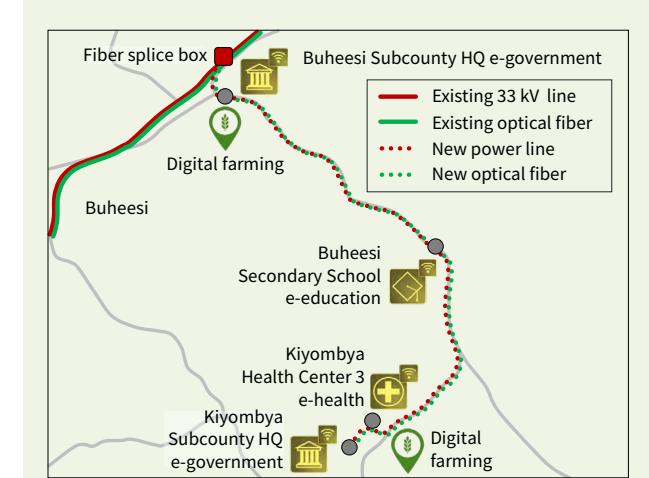
The Electricity & Fiber To The Village (E-/FTTV) project aims to find sustainable solutions for Uganda's energy-access challenge. It will make a significant contribution to the local Buheesi subcounty infrastructure.

ADVA used already existing studies in order to be able to re-use any infrastructure that was already in place in an optimum way and to develop an ICT concept most suitable to local requirements. This aimed at creating a long-term solution and to minimize financial risk.

Regular reporting on this project to the CTO is on place.

The project is driven by the ADVA headquarter. It goes back to the GIZ's (Gesellschaft für Internationale Zusammenarbeit, the German society for international cooperation) lab of tomorrow Design Thinking workshop in June 2017. The E-/FTTV concept is based on a simultaneous rollout of fiber for broadband access with the power grid to rural areas. The ICT part makes use of ADVA's network function virtualization technology and infrastructure sharing to reduce cost.

Partners include the Ugandan Ministry of Energy and Mineral Development, the Rural Electrification Agency, the National Information Technology Authority Uganda (NITA-U), and the Uganda Communication Commission's Rural Community Development Fund. Further support is drawn from the Strategic Partnership for Digital Africa.



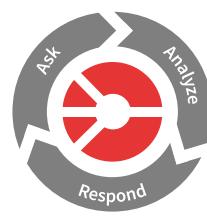
The ICT part of the project addresses the UN's SDGs 3, 4, 8, 9, 10 and 16, some of which have very high rating in our context analysis, refer to the [ADVA impact and \(ISO\) context chapter](#).



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Customer satisfaction rating

G102-43, G102-44



Our customer satisfaction is measured by the Net Promoter Score (NPS). For 2018, ADVA's NPS was +52%. This result underlines the company's focus on customer satisfaction and its commitment to continuous improvement. The development of our NPS is shown in the table below.

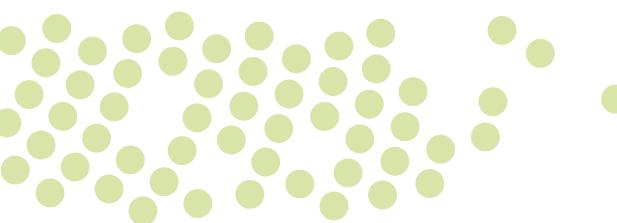
This time, we conducted 60 interviews and got almost 800 ratings in nine categories, and more than 1000 specific comments. Per category, one to six questions with answers potentially scaling from 1 to 10 were asked. In particular, we asked for aspects that add the most value for our customers, and for the most important things that we should improve.

In 2017, we started the integration of sustainability-related questions, but still without rating. In the 2018 survey, this changed, and sustainability was included in the overall NPS rating.

Development of our NPS

Net Promoter Score	2018	2017	2016	2015	2014
Overall	52%	56%	60%	41%	40%
Technology & innovation	33%	25%	38%	20%	8%
Product quality & reliability	46%	48%	48%	24%	20%
Fault correction	50%	49%	60%	32%	34%
Proposals	53%	74%	70%	59%	63%
Order management	47%	85%	70%	59%	69%
Shipping & invoicing (6R)	-	65%	67%	57%	63%
Sustainability	73%	-	-	-	-
Project & account mgmt.	79%	82%	76%	62%	64%
Technical services	61%	41%	73%	44%	47%
Web content	32%	39%	10%	10%	22%



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Sustainability supply chain management

G102-9, G308-1, G308-2, G407-1, G408-1, G409-1, G414-1

Sustainability-related supply chain management is relevant in that it helps to improve upstream sustainability performance and reduces related risks. It requires close cooperation with our suppliers and is one relevant area of stakeholder engagement.

In order to assess compliance with our [Supplier Code of Conduct](#) (CoC), which is based on the EICC CoC, ADVA has implemented a supplier assessment process intended to uncover risks and address them. This process consists of a supplier survey, a risk assessment performed by us, and finally on-site supplier audits.

New suppliers are assessed by 100%, including environmental and CSR aspects. This includes, where necessary, corrective actions to be taken.

Existing suppliers are also re-assessed, where the re-assessment period depends on supplier relevance and specific risks identified. In 2018, a total number of 5 suppliers were re-assessed regarding sustainability aspects. No significant actual problems were found. Consequently, no specific improvements were required, and no relationships were terminated. The total number of all re-assessments is actually higher. We are currently still upramping the environmental and CSR parts in the re-assessments.

In general, significant environmental impact has been identified in the supply chain. This follows from our portfolio-wide lifecycle assessments, which show that a significant portion of greenhouse-gas emissions and other environmental impact is associated with (the emissions embedded in) the components. This is not supplier-specific. It relates to the fact that components that are required have a certain impact. This is also the reason why we address this aspect primarily via ecodesign, not via specific supply-chain actions, see the [Ecodesign](#) chapter.

In late 2016, we started with the introduction of TIA Assessor tool into the supply chain, also see the [Assessments and performance](#) chapter. Currently, further work on and with the Assessor is on hold. This is due to the necessary shift from the BT version of the tool toward the TIA version, which is not fully finished yet.

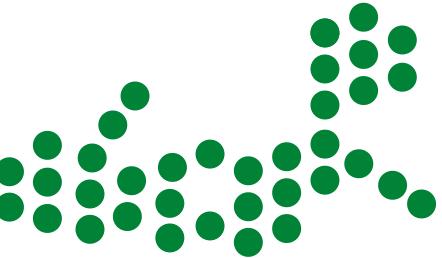
RoHS, REACH, Conflict minerals

Regarding the restriction of hazardous substances (RoHS), all products of the group are fully compliant with the Directive 2011/65/EU. This is ensured by respective engagement with the related components suppliers and contract manufacturers. In addition, we also file the RoHS exemption in our internal databases. This allows fast identification and reaction in cases where certain specific exemptions expire.

Registration, evaluation, authorization and restriction of chemicals (REACH) is required according to Regulation (EC) No 1907/2006. The regulation applies to manufacturers or importers of substances, if respective substances amount exceeds 1 t/a. Since the group neither manufactures nor imports such amount of substances, it does not fall under the registration and authorization obligations of the regulation. Instead, the group collects the data on the substance composition of the components it uses. Further actions would become necessary in cases where any substances used in any of these components were moved from the REACH candidates list into Annex XIV of the REACH Regulation. In such cases, the respective substances become subject to authorization and should be replaced.

Due to the high number of components and the slow and often incomplete feedback, the composition of substances is known for slightly less than 50% of all components the group is using.

Regarding the main conflict minerals (cassiterite, wolframite, coltan, and gold ore, coming from Eastern Congo and certain other countries), the group follows the due-diligence and supply-chain traceability requirements of the Dodd-Frank Wall Street Reform and Consumer Protection Act and the Conflict Mineral Law of the US Securities and Exchange Commission (SEC). Similar to the REACH efforts, total supply-chain coverage is ~50%, caused by incomplete or missing answers.



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Corporate social responsibility

Material topics, boundaries, management approach, and evaluation of this approach

[G103-1](#), [G103-2](#), [G103-3](#)

According to our [Sustainability materiality analysis](#) and the resulting strategy, relevant – priority-2 – sustainability aspects fall into the area of corporate social responsibility (CSR). Next to the priority-1 carbon-emissions aspects, CSR covers the People segment, thus balancing the material areas and related strategy across the complete Triple Bottom Line. Within ADVA, CSR covers aspects of social and employees' interest – including training – and human rights. In turn, these cover substantial parts of the ILO Conventions. It further covers engagement in local communities.

We constantly re-evaluate the materiality rating, based on own analyses and relevant stakeholders' input, and change it if required. The CSR area is not (yet) served via externally certified management systems like ISO 45001. However, we implemented internal management covering relevant aspects of such systems. This includes assignment of responsibilities, definition of internal KPIs, and evaluation on a half-year basis. It also includes highest-governance responsibility by the CEO. The work is also regularly (at least, on a yearly basis) evaluated through assessments (TIA, covering all CSR, and EcoVadis, covering certain supply-chain CSR aspects mainly). Corrective actions are taken according to the related findings.

Following employees' feedback, the material aspect of training has highest-governance responsibility by the CEO as well. In recent years, this led to improvements regarding our internal training program, and a new-hire orientation process, which formalizes respective trainings.

The material CSR aspects hold for the whole group. Unlike the areas of EMS and EnMS, there is no focus on larger sites.

Note that certain human-rights aspects are also covered in the [Ethics and compliance](#) chapter.

Labor and human rights

[G408-1](#), [G409-1](#)

ADVA Optical Networking is an equal opportunity employer and has an on-going commitment to the creation of a workplace free of discrimination and harassment. No one should be held in slavery or servitude. The company is committed to a zero-tolerance policy. We also expect our suppliers to follow our [Supplier Code of Conduct](#). For your reference, you can also refer to the [Group Code of Conduct](#).

The group is also committed to uphold the human rights of workers, and to treat them with dignity and respect as outlined in the Universal Declaration of Human Rights as well as in ADVA's Position on Slavery and Human Trafficking published in February 2018. The latter can be found in the [Ethics and compliance](#) chapter in this report and online [here](#).

International labor standards are an essential component for ADVA to ensure equitable and sustainable growth for all employees.

The labor standards are:

- Freely chosen employment
- Child labor avoidance
- Working hours
- Wages and benefits
- Humane treatment
- Non-discrimination
- Freedom of association

The company recruits, hires, trains and promotes individuals on all job levels without regard to race, religion, ancestry, sexual orientation, marital status, national origin, age, gender and physical or mental disability.



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Information on employees

G401-1, G405-1

ADVA Optical Networking is continuously focused on balancing the male/female split in the overall ADVA workforce.

Our average employee age is between 30 and 50, and we employed people of approximately 50 nationalities across 36 company sites as of December 31, 2018. Being an international company, the diversity of nationalities, age, gender and religion is crucial in helping us continually improve our work environment and be a great workplace with a unique culture based on strong core values. Our human resource information system (HRIS) provides detailed reporting functionalities and helps us to ensure diversity going forward. We as a company are committed to equal opportunities and to hiring minorities and employing veterans and people with disabilities.

Quotas ensure either a certain percentage of people with disabilities in our employment base or a penalty payment to the government. Moreover, we cooperate on a long-term basis with Bundesvereinigung Lebenshilfe e.V. in Germany to integrate people with disabilities in supportive roles.

The development of our gender ratio for all employees and in management can be derived from the next two tables.

ADVA global	2018	2017	2016
Males total	78.4%	77.9%	78.0%
Males in management	87.6%	88.5%	89.2%
Females total	21.6%	22.1%	22.0%
Females in management	12.4%	11.5%	10.8%
Team leader	2018	2017	2016
No male	60.1%	60.4%	59.8%
No female	19.0%	19.8%	19.8%
No total	79.1%	80.2%	79.6%
Yes male	18.3%	17.5%	18.2%
Yes female	2.6%	2.3%	2.2%
Yes total	20.9%	19.8%	20.4%

The age distribution per gender is displayed in the following table.

Gender	Age group	2018	2017	2016
	<30 years	10.8%	9.8%	11.0%
Male	30-50 years	57.6%	59.7%	62.2%
	>50 years	31.5%	30.6%	26.7%
Male average		43.8 years	43.7 years	41.4 years
	<30 years	11.3%	10.0%	11.9%
Female	30-50 years	61.8%	62.0%	64.2%
	>50 years	27.0%	28.0%	24.0%
Female average		42.7 years	42.3 years	42.7 years

In the next table, the absolute numbers are listed in terms of gender and age. In 2018, the voluntary turnover rate was at 6.5% and the total number of new hires was 180.

Gender	Age group	2018	2017	2016
	<30 years	160	144	152
Male	30-50 years	852	881	856
	>50 years	466	451	368
Male total		1,478	1,476	1,376
	<30 years	46	42	46
Female	30-50 years	252	259	249
	>50 years	110	117	93
Female total		408	418	388
Employees total		1,886	1,894	1,764



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More employee data

G102-7, G102-8

On December 31, 2018, ADVA had 1,886 employees, including 31 apprentices (prior year: 1,894 including 27 apprentices).

The distribution of our employees across the different functions in the company is given in the following table.

Function	2018	2017	2016
Finance / Admin / IT	158	165	155
Operations	216	217	214
QM	20	22	19
R&D	958	963	902
Sales / Marketing / Services	503	500	453
Apprentices	31	27	21
Employees total (year-end)	1,886	1,894	1,764

Our focus on R&D can clearly be derived from this table.

On average, ADVA had 1,830 employees during 2018, down from 1,834 during 2017 (and not considering apprentices). Furthermore, at year-end 2018 and 2017, there were 39 and 13 external temporary employees as well as 24 and 19 internal fixed-term employees each working for the company, respectively.

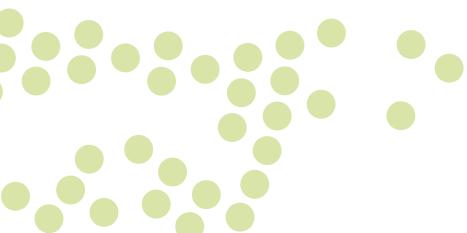
The distribution of our employees, again at year-end, across the different countries where ADVA has operations is provided in the last table in this section. It becomes clear that we have significant operations in Germany, Poland, UK, USA and China.

The data reported here is provided via our HRIS.

Employees per country (year-end)	2018	2017	2016
Germany*	500	499	497
Austria	3	3	3
Switzerland	40	46	49
Italy	13	12	10
Spain	2	2	3
France*	16	17	17
Poland	318	300	298
Finland	9	10	8
Sweden	3	4	3
United Kingdom*	107	110	114
Netherlands	2	2	-
South Africa	4	5	6
USA	437	461	412
Canada	12	-	-
Brazil	2	2	4
Australia	11	5	-
China	132	131	138
Hong Kong	3	4	5
Japan	7	8	7
India	86	89	88
Singapore	15	17	14
Malaysia	2	-	-
United Arab Emirates	1	1	1
Israel	130	139	66
Total*	1,855*	1,867*	1,746*

*Without apprentices

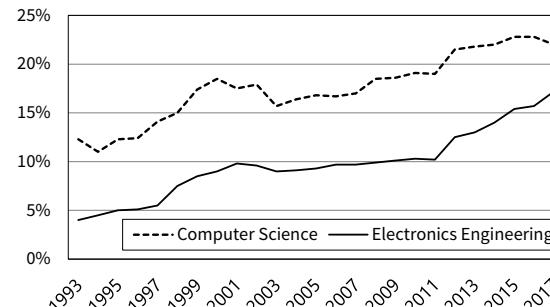
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Girls' Day 2018

405-1, G413-1

As a telecommunication systems provider, ADVA Optical Networking works in the STEM field (science, technology, engineering, math). Historically, gender distribution has been quite asymmetric in this domain, see the following chart.



Women in engineering studies in Germany

The diagram displays the percentage of women in electronics engineering and computer science in Germany – based on data from the Federal Statistical Office from 2017. The data for other regions, e.g., UK, does not differ significantly. The ratio of women in engineering and computer science is barely 25%. Consequently, it is very difficult to achieve gender parity in our technical departments. On the other hand, the company is committed to increasing the percentage of women working in our company.

One of the ways this can be achieved is by engaging with girls at schools regarding technical and engineering (STEM) studies. Just as we have in previous years, we did this in 2018, supporting the Girls' Day in Germany.



On April 26, 2018, some 100,000 girls attended the Girls' Day all over Germany. Following our practice of the previous years, ADVA participated in this important initiative. In 2018, we did this in two sites, in our main factory in Meiningen and, for the first time, also in the headquarter in Munich. At both sites, this consisted of firsthand insight into the world of electronics by means of practical work (small hardware and software projects, respectively), complemented by site tours and the introduction to ICT-related background information.



Occupational health & safety

G401-2, G403-1, G403-2, G403-3

As mentioned at the beginning of the CSR chapter, ADVA is not externally certified with regard to ISO 45001. However, much of its approach and content is followed already. We have a management system in place, including assignment of responsibilities to the HR department and its local-site representatives, definition of internal KPIs, and regular evaluation. This includes responsibility on the highest governance level by our CEO. The work is also regularly evaluated through assessments using the TIA Assessor.

Different statutory rules across the globe require the company to have coherent actions and reporting in place. This also helps to ensure that employees facing specific risks at work receive dedicated training on a regular basis. The attendance is mandatory and is documented in personal files.

Being a high-tech company, more than 90% of our workforce fulfill office-related jobs. Consequently, the risk of accidents at work is relatively low.

We support a flexible, diverse and casual work environment, which stimulates change and motivates our people. We have designed the work and life program around our people because we know that they will spend the majority of their life at work.

The program consists of several benefits. These include (but are not limited to):

- First-aid training, incl. certification
- Labor safety and labor security
- Vision care
- Back check
- Fitness-center discount program

In addition, our employees have access to the company doctor and several inoculation offerings.

It is the management layer's responsibility to implement and indemnify the set working conditions on a day-to-day basis. Regular management training on labor law is provided to secure the knowledge and further educate our team and line managers.

Next to the general (first-aid, safety) training, all eligible employees (e.g., those working in certain labs) have to attend trainings on:

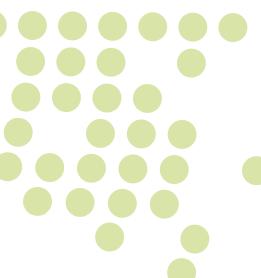
- Laser safety
- ESD (Electrostatic Discharge)
- Special chemical training

Further benefits of the work and life program are described in the next two chapters.

Due to the care we take, and the majority of office-related jobs, the occurrence of injuries etc. is low. The regional statistics are provided in the following table.

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Description G403-1, G403-2, G403-3	Region		
	Europe	Americas	APAC
A. The level at which each formal joint management-worker health and safety committee typically operates within the organization.	A. Site level (all major sites, small branch offices may not have such committees, in accordance with local legal requirements) B. 90%	A. Site level B. 100%	A. Site level (Emergency Response Committee in Shenzhen) B. 100%
B. Percentage of workers whose work, or workplace, is controlled by the organization, that are represented by formal joint management-worker health and safety committees.			
A. Types of injury, injury rate (IR), occupational disease rate (ODR), lost day rate (LDR), absentee rate (AR), and work-related fatalities, for all employees, with a breakdown by region and gender.	A. For UK: 5 Non-serious accidents (4 cuts, 1 slip/fall) 0 lost days 0 fatalities For Germany: Number of occupational accidents - 11 Number of commuting accident - 8 15 male, 4 female 37 lost days For rest of Europe: 0 occurrences. B. C.	A. 2 slips/falls B. 2 lost days C. 0 fatalities-2 slips/falls D. E. Accidents are logged in OSHA report and filed according	A. 0 occurrences in 2018
B. Types of injury, injury rate (IR), and work-related fatalities, for all workers (excluding employees) whose work, or workplace, is controlled by the organization, with a breakdown by region and gender.			
C. The system of rules applied in recording and reporting accident statistics.	A. Accidents are reported to a first aider and then logged in the Accident Book For Germany: In addition to the report to the first aiders, worse accidents are reported to HR to fill in an accident report form that has to be sent to the Health Protection Agency. If employees are on sick leave for more than 3 days, we have to inform the German employer's liability insurance association.		
Workers with high incidence or high risk of diseases related to their occupation	None	None	None



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Further benefits

G404-2

Next to health & safety benefits (see preceding chapter), the company offers a range of further benefits to its employees. These include (but are again not limited to):

- Stock-options program
- Retirement provision
- Tuition reimbursement
- Food/snacks/beverages
- Various possibilities for time off. These include family medical leave, parental/maternity leave, jury duty leave, bereavement leave, military leave and more
- Team-building activities and group off-sites
- Various sports activities
- For the USA: life insurance, disability and invalidity coverage

These benefits are available at all group sites, not just at significant locations. Part of these benefits is available to temporary and part-time employees as well.

Training and career development

G404-2

ADVA's career development is an organized planning method used to match our needs with the career goals of our employees. This is supported by different, regular involvement of employees, such as the Employee Satisfaction Survey or so-called "Breakfast meetings" of small groups of employees with a member of Executive Board. It is further supported by regular performance reviews that include training plans. It helps us to keep our employees informed and address employee satisfaction. The latter also supports a low employee turnover rate. Formulating a career development plan thus helps both, ADVA and our employees.

This can involve employees managing their careers either within or between organizations. It also includes learning new skills. Together with the employee's manager, they can set goals and objectives for their own personal career development.

ADVA also launched a global in-house management training program, the MTP. This includes 16 active modules and is targeted at all leaders who have people-management

responsibilities. The MTP helps managers maximizing both, individual and team performance.

ADVA University

G404-1, G404-2

ADVA Optical Networking is committed to sponsoring a state-of-the-art education, development and training program that also includes an e-learning program. This includes comprehensive on-the-job training as well as specific continuing education opportunities in order to advance our employees' personal and professional development.

These development-related aspects are identified, documented and reviewed semi-annually within an electronic performance appraisal and competency management system.



The ADVA University portal is structured to be a single point of reference for all training needs. Courses on various technical and non-technical topics that are regularly requested are offered. This includes technical trainings that are mostly conducted internally by ADVA's own technical experts.

In 2018, the number of all training attendees was 2772, meaning that several employees attended more than one training in 2018. The training durations were between 0.5h and 78h.

The ADVA University is regularly updated based on employees' feedback. It is complemented by a new-hire orientation process, which formalizes global, regional and functional new-hire orientation trainings.

Next to the technical (in-house) trainings, the actual ADVA University offering includes courses in the areas of languages, professional & communication skills, customer service, leadership and management, safety, social media and marketing, sales and negotiation, interpersonal skills, teamwork, time and project management, MS software, desktop publishing, and finance and accounting.

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Social engagement/volunteerism

G413-1

All major ADVA sites (i.e., with the exception of small, local sales offices), covering >90% of total headcount, have local community engagement and development programs in place which are run by each site's local HR department. This includes development programs and events that address local communities' needs, local committees, and a local community grievance process.

Our employees regularly join volunteer teams. The volunteer programs help others and also allow our volunteers to develop their own skills and make contacts. Volunteering takes on many forms. An overview on the numbers and types of events of our volunteer programs is given in the following table.

Distribution and type of events in 2018

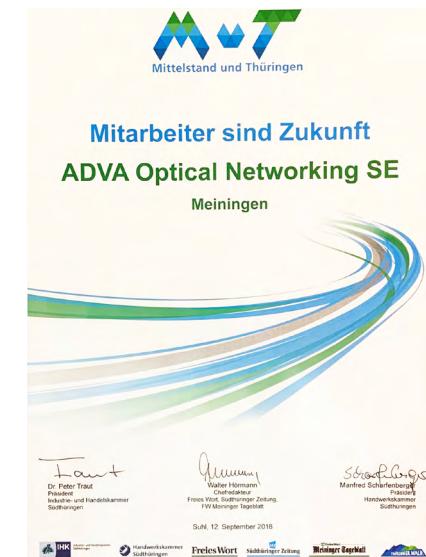
Events per region		
53 in Europe	10 in Americas	13 in APAC
Type of events		
20 donations and collections	11 runs and walks	45 sponsorships and awareness

Our engagement is not restricted to communities where ADVA has local sites. A short description of a very ambitious infrastructure-development project in Uganda is given in the [Buheesi E-/FTTV project](#) chapter under [Stakeholder engagement](#).

MuT award

The chamber for industry and commerce in Thuringia, Germany, organizes a yearly welcome reception for representatives of local businesses and politics. This reception is being held near Meiningen, our main site.

Part of this reception is the concession of the business award MuT. MuT stands for small and medium enterprises and Thuringia. The MuT award is a joint initiative of the chamber for industry and commerce in southern Thuringia, the chamber of crafts, regional marketing and several regional newspapers.



The award is granted to people and businesses with outstanding contributions to regional economic development. It appreciates corporate engagement or outstanding performance, which are often combined with or enabled by taking high personal or economic risk.

In 2018, ADVA was granted the MuT award in the category "Employees are the future". It was granted after careful evaluation by an experts jury.

Environmental topics and circular economy

Material topics, boundaries, management approach, and evaluation of this approach

G103-1, G103-2, G103-3

According to our [Sustainability materiality analysis](#) and the resulting [strategy](#), the most material (priority-1) aspects that fall under sustainability are those that relate to carbon emissions and their reduction. This refers to direct (Scope-1, -2) emissions, energy consumption and ecodesign (the latter influencing the dominant Scope-3 emissions). These are the aspects that determine our strategy the most. Following (priority-2, still material) are the non-carbon-related aspects (water, waste) and circular economy.

We constantly re-evaluate this rating, based on own analyses and relevant stakeholders' input, and change it if required. As high-priority aspects, they are managed with dedicated processes (e.g., ecodesign guide) and systems (e.g., EMS, EnMS). This includes assignment of dedicated staff, and highest governance responsibility by the CTO. It also includes definition of certain KPIs. The work is regularly (at least, on a yearly basis) evaluated through assessments (TIA, CDP, EcoVadis) and external validations (ISO, this report). Corrective actions are taken according to the related findings.

The material aspects hold for the whole group, with a focus on larger sites (see the boundaries in the [About this report](#) chapter).

Environmental management

G305-6, G305-7, G306-1, G306-2, G306-4, G306-5

ADVA Optical Networking runs an Environmental Management System (EMS) according to ISO 14001, which is re-certified on a yearly basis. The latest surveillance audit in Q4/2018 revealed some minor deviations only. Corresponding corrective actions have already been carried out.

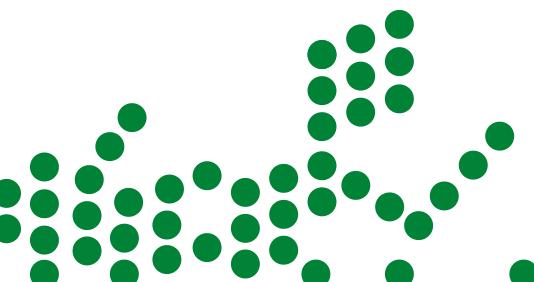
Material aspects in the EMS context have been described in the [ADVA impact and \(ISO\) context](#) chapter. Apart from running office buildings and a car fleet, the group does not produce any dedicated air emissions or discharges to water. The group does not emit significant amounts of NOx, SOx and other particles into the air. Likewise, environmental aspects like the use of ozone-depleting or hazardous substances are

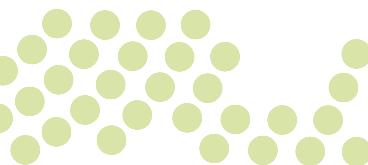
not critical. ADVA is screening its sites and its suppliers for the use of ODS and neither we nor our suppliers use them. Yearly consumption of hazardous substances is small and accounted for 220 l (including 160 l of Isopropyl Alcohol used as a cleaning agent) at ADVA site in Meiningen, whereas approx. 165 l of substances for cleaning purposes were used in Gdansk. Empty containers of approx. 385 l were transported inland in 2018 respectively.

Therefore, the relevant performance under environmental compliance relates to waste generation and treatment. Waste production and water consumption for 2018 are provided in the table below.. Plastics, cardboard and e-waste (WEEE) all go into the respective recycling.

Waste disposal	Weight [t]	GWP [tCO ₂ e]
Cardboard	118	2.5
Waste incineration	96.4	2.1
Plastic	12.4	0.3
E-scrap	21.3	0.5
Water consumption	Volume [m ³]	GWP [tCO ₂ e]
Water	9,190	3.2

Finally, the ISO 14001 surveillance audit also considers the group's capabilities regarding lifecycle assessment (LCA). According to the context analysis, LCA is relevant for the group due to its support function for ecodesign. Correspondingly, KPIs have been defined, as mentioned in the [ADVA impact and \(ISO\) context](#) chapter earlier. In the last audit, in particular portfolio coverage of our LCA work was successfully verified.





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Resource efficiency

G302-1, G302-3, G302-4

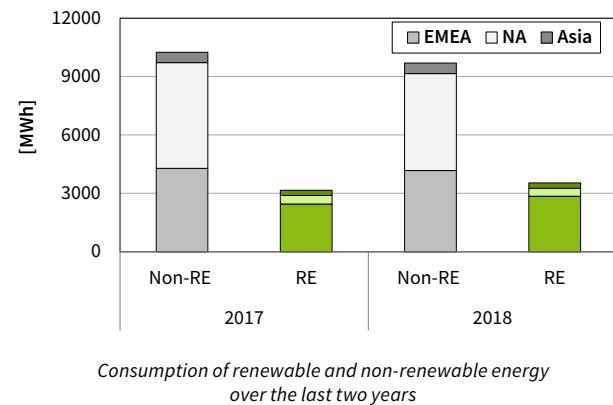
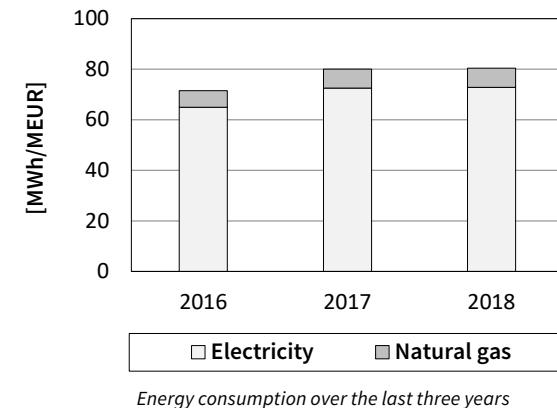
As pointed out in the [ADVA impact and \(ISO\) context](#) chapter, the most relevant resources aspect for the group refers to the energy consumed. For the vast majority, this relates to purchased electricity. This particular area is covered by our ISO 50001 Energy Management System (EnMS) and related activities and also by the Scope-2 target within our SBTi commitment.

A small fraction of the energy consumed by the group relates to natural gas. This applies to four ADVA sites only. No dedicated cooling or steam consumption is in place.

The diagrams on the right present the developments of energy consumption (Scope 1, natural gas, plus Scope 2, purchased electricity) over the last five years, and the mix of renewable vs. non-renewable energy over the last two years, as per our electricity providers and data from regional grids. Electricity supplier of our important operation site in York, UK, was switched to 100% renewable energy. As a result, the overall share of renewable energy increased to 27% globally. The consumption parameters in the first diagram are normalized against the group's yearly VA (value added).

In the last two years, and following major acquisitions (Overture, MRV), no energy-consumption reductions were achieved. Next to absolute company growth, this is attributed to the fact that some of the related new sites were not yet integrated in particular in the ISO 50001 activities. Since the aspect of purchased electricity (emissions) is also one of our SBTi targets, we expect this to change within the next years.

For the ADVA sites not affected by acquisitions in the last years, the EnMS target of 2.1% energy-consumption reduction per year was (over-) achieved. This holds for the large sites (i.e., those with impact) which are considered in the EnMS.





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Carbon emissions (Scope 1-3)

G302-1, G305-1, G305-2, G305-3, G305-4, G305-5

Over the past years, ADVA Optical Networking has repeatedly improved its tracking and reporting capabilities with regard to its Global Warming Potential (GWP) contributions. We now report all GHGP categories that are relevant for the group. GHG emissions are reported on the basis of operational control, and Scope-2 data is location-based. We do consider the relevant GHG other than CO₂.

The electricity-related carbon emissions heavily depend on the emission factors that apply for the respective sites or areas. This mainly relates to Scope-2 purchased electricity, and Scope-3 use of sold products. Electricity emission factors are based on data we got from our electricity suppliers, subregion grid factors published by the US EPA's Emission & Generation Resource Integrated Database, the UK Department of Environment, Food and Rural Affairs, and the ecoinvent database. The globally weighted emission factor for electricity consumed at ADVA sites was 0.438 kgCO₂e/kWh in 2018. Based on our customer base, a weighted average emission factor of 0.382 kgCO₂e/kWh has been used for assessing GHG emissions of sold products. WDM and Ethernet equipment is used in 24/7 always-on mode and has an expected lifetime of eight years. Emissions from the use of products include total expected lifetime emissions from all products sold in 2018.

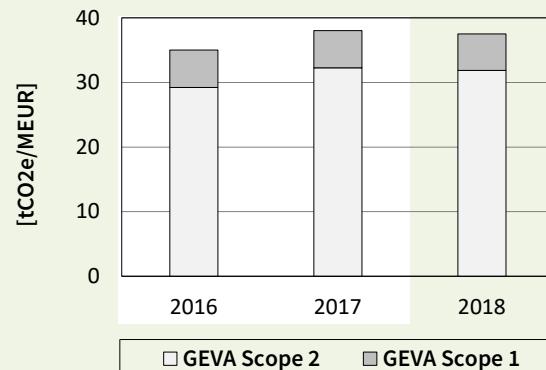
Employees commuting is based on (company-specific) average data, which considers average commute mode, distances, and emission factors. The respective emission factors are summarized below.

Commuting emission factors

Average commuting emission factors 2018 [kgCO₂e/(p)km]

Car	Bus	Tube, commuter train	Pushbike, per foot
0.180	0.0750	0.0640	0.0

The development of the total ADVA Scope-1 and Scope-2 GEVA intensity (GHG emission per value added) is shown in the following diagram.

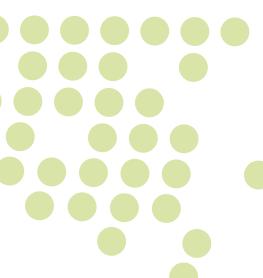


GEVA development over the last three years

In the last two years, and following major acquisitions (Overture, MRV), no Scope-1/2 emissions reductions were achieved. Next to absolute company growth, this is attributed to the fact that some of the related new sites were not yet integrated in particular in the ISO 50001 activities. Since both, Scope 1 (car fleet emissions) and Scope 2 (purchased electricity emissions) are SBTi targets, we expect this to change within the next years.

The complete ADVA GHG inventory, including all Scope 3 emissions for 2018, is summarized in the following table.

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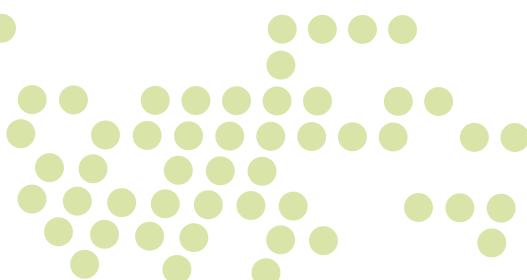
2018	Source/category	Consumption	GWP [tCO ₂ e]
Scope 1	Natural gas ¹	1,309 MWh	241
	Owned transport	5,635,065 km	773
	Total Scope 1	1,014	
Scope 2	Purchased electricity ^{2,3}	13,251 MWh	5,800
	Capital goods	11,774 kEUR	4.286
	Purchased goods		
	Production-related		53,841
	Non-production-related (other than paper)		353
	Purchased paper	10.6 t	8.4
	Transmission and distribution losses	680 MWh	297
	Waste disposal		
	Cardboard	118 t	2.5
	Plastic	12.4 t	0.3
Scope 3	Waste incineration	96.4 t	2.1
	E-scrap	21.3 t	0.5
	Business travel		
	By air	22,184,382 (p)km	2,815
	By car	658,505 km	96
	By train	203,610 (p)km	0.7
	Employee commuting		2,900
	Transportation and distribution (outbound)	3,755,036 t·km	3,912
	Use of sold products	959 GWh	366,382
	End-of-life treatment of sold products		479
	Total Scope 3	447,718	
	Total all Scopes	451,531	

¹The emission factor for the calculation of emissions from all ADVA sites using natural gas was taken from the UK Government GHG Conversion Factors for Company Reporting 2018.

²Electricity consumption of all major ADVA sites covering >90% of total headcount

³For the calculation of Scope-2 emissions, provider-specific emission factors were used where available. Therefore, the calculation is a mix of the Market and Location-Based methods.

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Scope 3 is clearly dominated by sold-products use-phase emissions. In the last years, these emissions did not decrease for reasons of company growth (increase in revenue plus price decrease per product unit and therefore, more product units sold), and because of the exponential ICT bitrate increase our products have to cope with. The latter is explained in more detail in the [Energy efficiency, emissions and the SBTi](#) chapter.

So far, the development described there made it impossible to achieve substantial Scope-3 GHG reductions. Following the SBTi Scope-3 target, we intend to reverse this trend in the next years.

The second-biggest emissions contribution results from production-related purchased goods. These are the emissions embedded in the components and (sub-) modules the group purchases. These emissions are addressed by respective product design, see the [Energy efficiency, emissions, and the SBTi](#) chapter. This work is supported by supply-chain management.

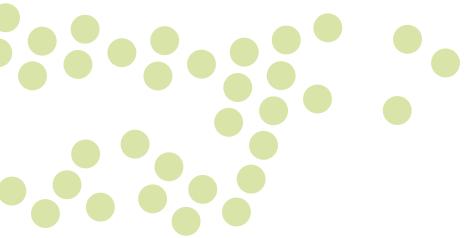
With the exception of purchased electricity (Scope 2, addressed by ISO 50001 and the SBTi Scope-2 target), the next relevant emissions are associated with transport, travel and commuting. Since these are Scope-3 emissions, they are not considered in the SBTi.

Transport is addressed in the next chapter. It is subject to continuous consideration and related improvements (which must be seen in the context of increasing tonnage).

For business travel and commuting, there is certainly overlap with the Scope 1, owned-transport (car fleet) emissions, which cannot be fully eliminated due to some limited data ambiguity. Regarding the group's total GWP, this, however, leads to a negligible error. For both Scope-3 contributions, however, the group runs several emissions-reductions initiatives. These include

- Yearly bike-to-work campaign. This is a joint effort together with one of the large health insurance companies in Germany. It encourages our employees to use bicycles for commuting more frequently. In 2018, this campaign reduced commuting-related emissions by almost 3 tCO₂e in Germany. Similar campaigns ran in the UK and the US as well.
- Home-office arrangement. This is a permanent arrangement which allows – and encourages – employees, where applicable, to make use of the home-office option. On average, this saved almost 10% commuting for the complete group.
- Grant for local public-transport tickets. This is available at certain ADVA sites. It helps encouraging the employees to make use of local public transport (and thus stabilizes/ increases the respective fraction of commuting mode).
- Video conferencing. This is used, where possible, to avoid business travel. It holds in particular for journeys that are done only to participate short meetings. In total, it reduces business-travel emissions as well as cost, however, the exact amount of reduction cannot yet be calculated.

In total, these measures helped to reduce, or at least to stabilize, the related emissions, despite the fact that our employee number increased in 2018.



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End-to-end delivery

G305-3

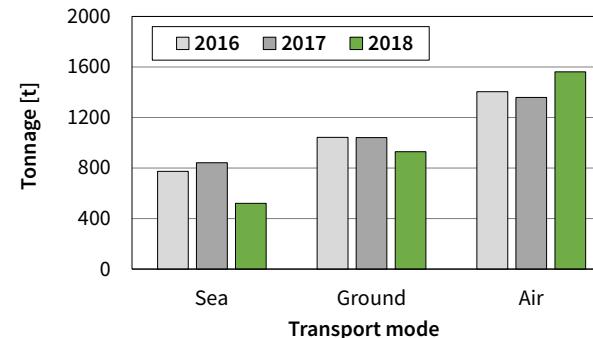
This chapter contains relevant environmental aspects from the perspective of both, the end-to-end value chain as well as the products' complete lifecycle. These have an impact on carbon emissions and resource efficiency.

According to the TIA model, the main aspects in this segment are transport distances, modes and emissions, and packaging.

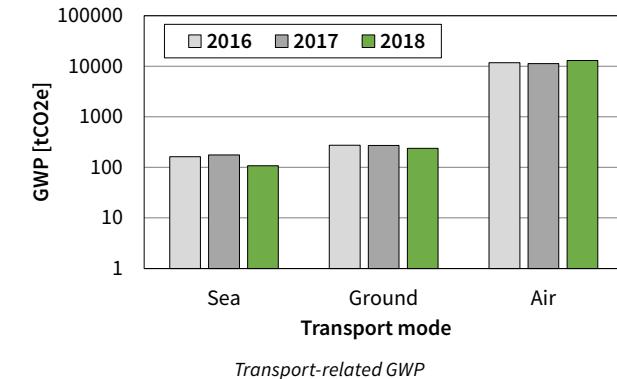
Transport mode and emissions

Transport – inbound plus outbound – is the main contributor to the end-to-end delivery segment and to total GWP, as seen from the previous GHG inventory. In 2018, the group continued its efforts to reduce its transport-related environmental impact, i.e., reduce where possible air freight. These attempts are still limited by large customers' requirements for short delivery times.

The freight-split development over the last three years is displayed in the following diagram. Note that scale is linear here.



The GWP resulting from transport is shown in the diagram below. Note the logarithmic scale in this diagram.

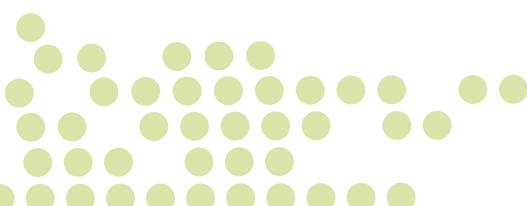


The underlying transportation emission factors have already been listed in the [Carbon emissions](#) chapter.

New transport mode: railway

All goods transported for the group are constantly checked for alternative transport methods, be it sea freight, trucks or railway. In 2017 and 2018, we investigated the new connections between China and Europe via the Trans-Siberian railway. It offers a good compromise between CO₂ emissions, transport delay and cost. It is considered for parts of the FSP 150 portfolio. It leads to both, transport GWP and cost reduction.

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Packaging optimization

G305-3

The other area of consistent improvements in logistics relates to the packaging of our products. This optimization addresses cost and GHG reductions and avoidance or reduction of certain materials. The latter refers to foam and plastics. These materials, however, cannot be fully avoided when it comes to packaging optics.

Over time, our packaging has been optimized with regard to its form factor, its re-usability and the amount of renewable materials (namely, cardboard replacing foam and plastics where possible). The form factor has been adopted in order to fit standard pallets size most efficiently.

The latest optimization example, realized in 2018, refers to the plastics clamshells that are necessary for pluggable transceivers (SFPs, XFPs). As mentioned, plastic cannot be fully avoided because the optics of these transceivers are sensitive against dust. Therefore, the latest generation of these packages has been massively reduced in size, thereby minimizing the amount of plastic that is required. In addition, the new clamshells have 40% less staging volume which reduces transportation cost and contributes a small transportation GWP reduction. Finally, the new packaging itself is significantly lower in cost, compared to the old one. A comparison between the two generations of SFP clamshells is given in the following picture.



New (left) vs. old (right) clamshells for pluggable transceivers

The SFP/XFP clamshell optimization is relevant since it affects very large quantities. Another pluggable-transceiver (CFPs) packaging has already been improved earlier. Therefore, this part of logistics optimization is still ongoing, but meanwhile covers the majority of all packaging. This is also reflected in the rating of the logistics segment (EEC) in the [Sustainability materiality analysis](#). This rating is comparatively low, indicating that the segment does not require dedicated focused work anymore.



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Circular economy

(G305)

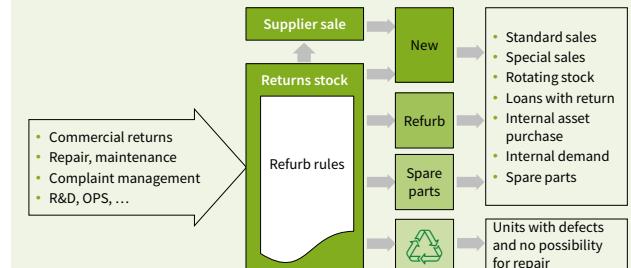
Circular economy (CE) is necessary to reduce the amount of raw material, energy and waste that is associated with (the production of) any products and services. The main savings are projected to result from an extended lifetime (incl. second life where applicable, and enabled by design for refurbishment or remanufacture), full or partial parts reuse and finally optimized recycling. The latter must avoid downcycling (in the worst case: energy recovery by incineration) by recovering close to 100% of all precious materials in best-achievable quality and purity. This obviously needs to be supported by respective ecodesign aspects.

In the recent years, we implemented a number of smaller take-back, refurbishment and recycling processes especially in the UK, and a larger-scale refurbishment and recycling process on our main site in Meiningen, Germany, called Supplier Sale.

In the UK, we implemented, on a daily-business basis, several processes with two large customers. These include take-back, refurbishment and recycling. For both customers, logistics and reverse logistics are optimized through respective logistics providers that offer dense networks of suitable logistics hubs. The processes cover our own as well as third-party equipment. The take-back and refurbishment processes scale up to 4-digit product-unit numbers per year.

In addition to these customer-specific processes, we implemented a refurbishment / parts reuse / recycling process for equipment sent back to our site in Meiningen. A process overview is shown in the figure below.

All equipment sent back is analyzed for potential parts reuse and refurbishment. This includes selling substantial amounts of components back to their suppliers. Systems or components without a possibility for reuse are professionally recycled by a contract WEEE recycler located close to Meiningen, which also minimizes truck-roll mileage. Depending on the degree of reuse potential, the components are sold back (supplier sale, new) or get into respective stocks for new, refurbished or spare parts, as per the figure below.



Supplier-sale refurbishment and reuse process

Despite our efforts, we still do not see large-scale CE business. Since we regard the CE concept material (see the context and materiality analyses), we decided to join an EU Horizon 2020 research project, C-SERVEES, which aims at boosting CE business. A brief description was already given in the [Stakeholder engagement](#) chapter. Additional information is also available under c-serveesproject.eu/.

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Ecodesign

G302-5, G305-3

Portfolio lifecycle assessment

According to our combined context, materiality and end-to-end emissions analyses, ecodesign is ADVA's most material aspect. It can enable the group's highest emission savings and also constitutes substantial opportunities through competitive advantages.

Ecodesign must be guided by lifecycle assessment (LCA) covering the (commercially) largest portion of the portfolio. LCA, e.g., according to ISO 14040/14044, considers all phases of the entire product life, from production via distribution and use to end of life. Consequently, ecodesign should consider these aspects as well.

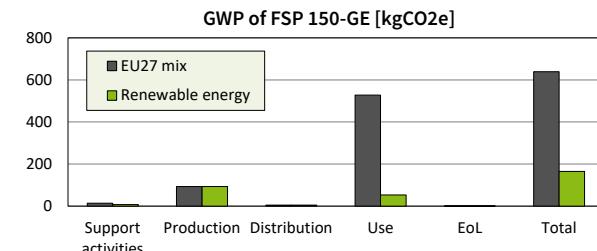
Since almost two years, ADVA conducts portfolio-wide LCA. This is also reflected in the ISO 14001 KPIs, see the [ADVA impact and \(ISO\) context](#) chapter. This allows us to derive relevant conclusions, amongst them

- Portfolio GWP optimization, in particular when the allowable effort is limited and focus on products with the highest GWP is required
- GWP lifetime optimization. This is independent from the portfolio GWP optimization above. It refers to the maximum lifetime a product should be given, and beyond which replacement with a more efficient successor is GWP net positive.
- Identification of aspects next relevant after use-phase efficiency. This is particularly important when products run already on renewable energy and have to further be improved.

Considering average electricity mix like the EU27 mix, we know that LCA of virtually all our products is entirely dominated by the use-phase. This refers to global warming potential (GWP) as well as to other environmental impacts like (freshwater) ecotoxicity, acidification etc. This has already been shown in the previous sustainability reports. This dominance holds as long as the related energy consumption is not yet fully based on carbon-neutral renewables.

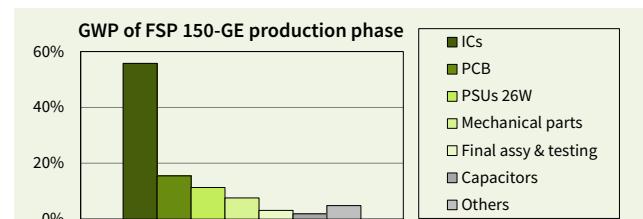
When the latter becomes true – and only then! – the next relevant aspects must be targeted for improvement. These aspects can be identified from the LCA when using renewable-energy emission factors.

An example is given for the FSP 150-GE10X below. Here, known average data was used for the lifetime, the use mode, inbound transport, ADVA site contribution and emission factors. We used 0.433 kgCO₂e/kWh for the EU energy mix, and 0.043 kgCO₂e/kWh for renewable energy. The latter does not have zero emission factor for obvious reasons like the production and installation of its power plants etc.



Comparison of the GWP for FSP 150-GE10X lifecycle stages when using electricity EU27 emission factors and renewable energy. Note the different emission factors were applied for support activities (our sites) and use only.

From the analysis, production is identified as the second most important contributor to LCA (GWP in this case). Now, production can be further analyzed, as shown in the following diagram. From here, ICs and PCBs can be identified as the most relevant components to concentrate on for further improvements in ecodesign beyond energy efficiency.



Most relevant contributions to production-phase GWP for FSP 150-GE10X

The analysis presented here was the basis for ADVA's win in the 2018 British Telecom Game-Changing Challenge.



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Energy efficiency, emissions and the SBTi

G302-5

The use-phase dominance in LCA in general and GWP in particular is the main guidance for our ecodesign. This is reflected in the fact that ecodesign and product energy efficiency are dedicated and relevant aspects in our materiality and context analyses (see these chapters).

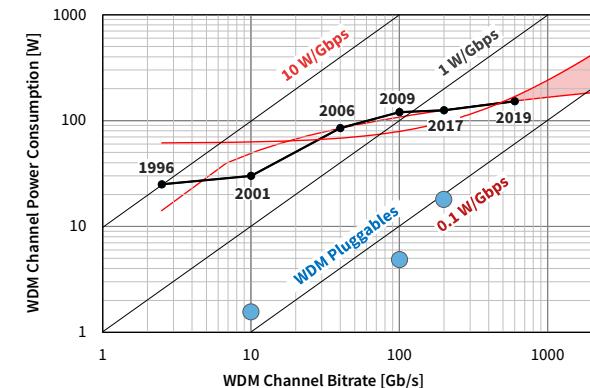
We are constantly improving the energy efficiency (measured in watts per Gbps) of our products to the best achievable extent. However, our WDM and a substantial part of the Ethernet products are also affected by the ICT trend of exponentially increasing bitrates. This trend can be derived from well-known references like the Cisco Virtual Network Index (VNI, see [vni-wp.html](#)).

For WDM systems, the bitrate increase so far has been somewhat faster than the energy-efficiency increase. Therefore, WDM generations tend to consume increasing power over time. This is shown in the following log-log-scale diagram for our WDM equipment. The figure shows power consumption in dependence of the WDM channel-card bitrates. The x-axis also represents the time axis, as indicated. Our WDM equipment started at ~10 W/Gbps more than 20 years ago. It has now reached benchmark-setting efficiency of almost 0.2 W/Gbps.

The absolute increase in power consumption is despite the fact that all measures are taken to increase efficiency. In other words, to date, no technologies are known that would allow overcompensation of the bitrate increase. This is a common trend in telecommunications today, it can be seen, e.g., for core IP routers as well.

For the Science Based Targets initiative, this means that absolute per-product emissions reductions are very challenging since further bitrate increase is predicted. Given the long runtime of the SBTi targets, see the [Sustainability strategy](#) chapter, such reductions may become achievable only if improving emission factors are factored in. Due to the heavy bitrate increase and the uncertainty related to its long-term prediction, it would be preferable to use an intensity metric for the affected products (WDM, core routers, etc.). Similar to common energy-efficiency ratings, such a metric could have the dimension kgCO₂e/Gbps/year. At the time this report was prepared, this approach was not followed by the SBTi. It is, however, under discussion in the TIA GHG subteam, as a potential metric that will be used in

future versions of the Assessor tool (see the [Assessments and performance](#) chapter).



Development of WDM channel-card power consumption over time. The light-red area indicates the potential range of future power consumption, should bitrate increase persist. We also included WDM pluggable, where it has to be noted that these lack certain functionalities compared to the channel cards.

Within the group, ecodesign is supported by a [design guide](#) that covers the most relevant environmental aspect for the design of electronic equipment. In particular, this considers **energy efficiency** and the **circular-economy aspects** of raw-material intake and recyclability. As such, it supports optimizing both, energy efficiency as our most material aspect, but also subsequent aspects like the environmental impact of PCBs and integrated circuits. According to internal process evaluation, the design guide is regarded appropriate and sufficient to ensure the required improvements regarding energy efficiency and circular-economy product design.

It must also be noted that ICT enables GHG abatement outside the ICT sector which is substantially higher than the ICT energy consumption itself. Hence, ICT can be regarded as one of the few enablers of decreasing global GHG emissions. According to [GeSI Smarter2030](#), the ICT-enabled GHG abatement is almost 12x higher than the ICT GHG footprint itself. Other sources quote even higher GHG reduction potential in the range of 19:1 compared to the ICT emissions [The role of ICT in reducing carbon emissions](#), British Telecom, 2016].



Ethics and compliance

Material topics, boundaries, management approach, and evaluation of this approach

G103-1, G103-2, G103-3

Anti-corruption and bribery has a medium-high rating, according to the [Sustainability materiality analysis](#). It falls into the area of ethics & compliance, where it is complemented by some other relevant aspects. These include, but are not restricted to, reporting mechanisms for compliance violations and our statement on Modern Slavery and Human Trafficking. We constantly re-evaluate this rating, based on own analyses and relevant stakeholders' input, and change it if required. As a high-priority area, it is managed with a dedicated Compliance function and is reported to ADVA's CEO who is thus responsible for implementing a robust compliance management system. Its responsibility includes definition of certain KPIs. The work is yearly evaluated through assessments (TIA, EcoVadis). Corrective actions are taken according to the related findings.

The anti-corruption and other material ethics & compliance aspects hold for the whole group and all sites (see the boundaries in the [About this report](#) chapter).

Our values

G102-16, G205-2

Our sustainable success is based on strong core values, modeled by the top and demonstrated by example. All line managers are aware of their respective responsibilities. Specific leadership principles foster such understanding. The following core values and leadership principles (collectively: "Values") support sustainability in everything we do.

Teamwork. We embrace open communication and collaboration. We are committed to promote an inclusive work environment that values diversity of people and thought. With 1,886 employees at year-end 2018 located in more than 20 different sites and representations around the globe and an international ADVA Works Council without trade-union ties, teamwork is what makes ADVA exceptional.

Excellence. We are striving towards excellence in whatever we do. This includes our commitment to consistently exceed customer expectations. In order to measure our respective success, annual surveys are conducted measuring the group's

Net Promoter Score. Throughout the last years, significant improvements were achieved yielding high scores. They are shown in the detailed overview in the Customer satisfaction rating chapter in this report.

Accountability. Our strategic goals "Growth and Profitability", "Innovation", "Operational Excellence" and "People" are the cornerstones of our corporate development. They are tied to specific performance indicators and updated on an annual basis. Meaningful departmental, team and employee objectives support the achievement of our strategic goals and are reviewed and updated every six months.

Motivation. The group strives to engage and motivate its employees. Besides anonymous satisfaction surveys, regular breakfast meetings with a member of ADVA's board are organized and allow for a personal discussion of areas of concern. Resulting action items are followed up with by the board.

Integrity and honesty. Compliance with applicable laws and regulations and the adherence to the company's ethical standards and principles ("Compliance") is essential for establishing trust with our customers, suppliers, partners and colleagues. Our commitment to integrity and honesty translates into our [Group Code of Conduct](#) and a clear and precise allocation of responsibilities for ensuring compliance.

Decisiveness. Timely and informed decision-making is essential for keeping up with our industry's ever-increasing pace of innovation. To ensure continuous personal development, we implemented a holistic management-training program which is mandatory for all concerned employees.

Respect. The group takes on an active role in the local communities that we are operating in. This includes humility in our manners and respect and courtesy when treating others. The same applies also internally and regardless of the level of hierarchy involved.

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Compliance management system

G102-17, G205-2, G206-1

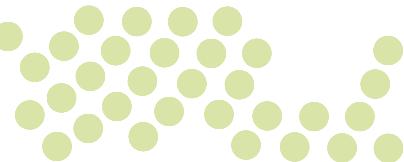
Our values are the cornerstone of who we are. They translate into the ADVA Group Code of Conduct ("Code") which sets forth the ethical standards that every employee, manager, director and officer of the company (collectively "Employee/-s") needs to comply with. Ensuring compliance requires an organizational framework based on applicable laws and regulations, international standards and industry best practices. While such may deviate from country to country, they are very similar in terms of the required **compliance management system (CMS)**. Considering this, we implemented a CMS in particular consisting of:

- A corporate culture characterized by integrity, accountability, transparency and a strong "tone from the top" ("Leadership")
- Periodic identification of the company's compliance risks ("Risk Assessment")
- Proportionate risk mitigating processes ("Documented Procedures")
- Adequate training and communication of all compliance elements and measures as well as respective processes ("Training and Communication")
- Means for in-person as well as anonymous reporting of potential compliance violations including clear internal reporting lines, an external ombudsman and a third party Ethics and Compliance Helpline ("Reporting and Whistleblowing")
- Proportionate responses to compliance violations in line with our principle of zero tolerance ("Investigations and Response")
- Continuous improvement of the CMS based on identified weaknesses ("Monitoring and Auditing")

The group's CMS is supported by a central compliance department located in Munich, Germany, and six regional compliance officers (RCO/-s) that support compliance in addition to their regular function at the company. The RCOs strengthen ADVA's local culture of compliance, erase any potential boundaries preventing employees from reporting concerns, and contribute their specific functional expertise to the group's CMS. Their activities are coordinated by ADVA's chief compliance officer who reports to the chief

executive officer and the supervisory board. Whenever employees have questions or suggestions related to compliance or suspect incidents of non-compliance, they are encouraged to speak up. Besides a variety of clearly defined and actively communicated internal points of contact, an external ombudsman and an externally operated [Ethics and Compliance Helpline](#) enable confidential and anonymous reporting.

Any employee is eventually responsible for his/her own actions. This understanding is acknowledged and documented by all employees when signing the company's compliance acknowledgments and supported by in-person compliance trainings. Documentation of the written agreement is done via an electronic personnel management system. At the time of this report, this covered some 80% of all employees. This included employees from newly acquired companies. Moreover, in-person compliance trainings were conducted in 5 main sites of ADVA, supported by several additional webinars also covering specific Compliance areas such as data protection or compliance with insider dealing regulation. Total number of participants is well beyond 1000 employees, some of them participating in multiple trainings. Participation of employees is tracked and documented only for all mandatory trainings. Finally, no confirmed incident of corruption or anti-competitive behavior had taken place within the reporting period and no such case had been brought against the company at the time of this report.



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Business partner compliance

Our commitment to compliance extends to our suppliers, service providers and intermediaries ("business partners"). As we could be exposed to substantial legal as well as reputational risks in this area, a two-step approach ensures effective risk mitigation. First, risk-based due diligence is exercised for any (new) business partner. Second, robust contracting and continuous monitoring aim to further mitigate our related risks. Business partners provide a broad variety of different services. The risk of unethical behavior differs accordingly and may involve corruption, labor law violations, product compliance concerns or other unwanted conduct. In order to allow for a targeted and risk-based due diligence prior to entering into a business relationship, specific business partner categories and proportionate financial thresholds were defined. As for anti-corruption, relevant types of business partners in particular include the following:

- Sales reseller and sales agents
- Customer service provider
- Logistics service provider
- Marketing/event service provider
- Organizations or associations

In order to ensure robust and standardized evaluations, we implemented a tool-based due diligence process which is semi-automated as far as possible. This typically includes a first high-level risk assessment on the basis of predefined criteria, an internal feedback loop and a rigid questionnaire, which has to be completed and signed by the concerned business partner's management. Besides non-disclosure agreements (NDAs), no contractual relationship is entered without the prior closure of the required due diligence activities.

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ADVA's position on slavery and human trafficking

Our commitment

Integrity is at the core of who we are. At ADVA, we are committed to running our business responsibly. We strive to live up to our ethical standards embodied in our values and documented in our [Group Code of Conduct](#) ("Code"). Our efforts are supported by periodic training sessions for all employees and a dedicated team with clearly allocated responsibilities within the areas of compliance, sustainability and corporate social responsibility. In addition, we actively encourage all individuals to report any perceived deficiency either to our ombudsman or via our Ethics and Compliance Helpline.

Modern slavery and human trafficking

Nobody should be forced to undertake work against their will. For millions of people around the world this statement unfortunately does not reflect reality as they are exploited and forced into work. As a result, they often suffer physical, psychological and sexual abuse.

ADVA tries to ensure that modern slavery is not taking place in any part of our business or supply chain. Our standards include a variety of different policies and practices to address slavery and human trafficking issues in the different areas where they may occur. This addresses the United Kingdom Modern Slavery Act of 2015, the California Transparency in Supply Chains Act of 2010 (SB 657) and other similar laws and regulations. As the focus of our activities is the development, selling and servicing of network equipment but not the production of such, our business depends on hundreds of suppliers and service providers and several contract manufacturers. It is hence in our supply chain where we see the highest risk for modern slavery and human trafficking.

ADVA's supply chain

We buy a wide range of different things, including hardware components for our solutions and expert services to help develop, produce, maintain or even dispose of our products. To ensure that slavery and human trafficking does not occur within our supply chain, we took multiple actions, including the following:

- **Our Code and Supplier Code of Conduct.** Our Code derives from our values and sets forth the ethical standards that every employee, manager, director and officer of ADVA (collectively "Employees") needs to comply with. All Employees receive periodic training and need to acknowledge their adherence in writing. Our commitment extends to our business partners

and we strive to work with companies that operate under similar principles. In addition to our Code, our Supplier Code of Conduct addresses specific issues for our strategic suppliers and is modeled on the EICC's framework. We do not tolerate any form of forced or compulsory labor.

- **Risk assessment.** Risk profiling helps us effectively assess our focus with regard to all different types of business partners, including strategic suppliers. Our risk assessment includes the type of product and service as well as the business partner's location. Throughout 2018, we started with the implementation of a specialized IT-based solution to further improve any such risk assessment as well as the subsequent screening and qualification.

- **Screening, qualification and contracting.** ADVA implemented screening, qualification and contracting processes for strategic suppliers and other selected business partners. Our measures include standardized questionnaires, technical and operational support and contracting according to pre-defined master purchasing agreements that require compliance with our ethical values, applicable laws or regulations.

- **Auditing and monitoring.** ADVA utilizes online assessment and auditing tools to evaluate strategic suppliers. In addition, clear and specific key performance indicators help us to continuously evaluate our strategic suppliers' performance and to drive improvements where required. Furthermore, on-site audits are conducted where needed.

Ethical conduct does not simply happen. It is the product of a corporate culture based on integrity and accountability which is modeled by the top management and demonstrated by example. Constant reinforcement and improvement are required. This statement describes our key measures for preventing slavery and human trafficking relevant to our supply chain. It is applicable for the period January 1 to December 31, 2018 and has been approved by the management board of ADVA Optical Networking SE.



Brian Protiva
Chief Executive Officer
January 2019

Glossary

E

EICC (Electronic Industry Citizenship Coalition)

The EICC is a nonprofit coalition of electronics companies committed to supporting the rights and wellbeing of workers and communities worldwide affected by the global electronics supply chain. EICC members commit and are held accountable to a common code of conduct. In 2017, the EICC became the Responsible Business Alliance (RBA).

F

FSP (Fiber Service Platform)

The Fiber Service Platform is ADVA Optical Networking's comprehensive product portfolio that provides carriers and enterprises with innovative connectivity solutions for access, metro and long-haul networks.

G

GeSI (Global e-Sustainability Initiative)

In collaboration with major ICT companies, GeSI is a leading source of impartial information, resources and best practices for achieving integrated social and environmental sustainability through ICT.

GEVA (GHG Emissions per unit of Value Added)

GEVA is one way of defining intensity metrics for emissions, i.e., metrics that account for company growth. It is one of the metrics that are accepted by the SBTi. You can find out more online here: [sciencedirect.com/science/article/pii/S0301421512003461](https://www.sciencedirect.com/science/article/pii/S0301421512003461).

GHG (Greenhouse Gas)

GHG are gases that are responsible for the effect of global warming. The most relevant GHG are water vapor, carbon dioxide, methane, nitrous oxide, ozone and several chloro- and hydrofluorocarbons.

GHGP (Greenhouse Gas Protocol)

Through the GHGP, World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) work with businesses to develop standards and tools that help companies measure, manage, report and reduce their carbon emissions. More: ghgprotocol.org.

GRI (Global Reporting Initiative)

GRI is an international independent organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as climate change, human rights, corruption and many others.

ICT Ecology Guideline Council

The Japanese ICT Ecology Guideline Council is composed of five telecommunications industry organizations. Its object is to take further industry-wide measures to prevent global warming by creating, disseminating and promoting the Ecology Guideline for the ICT Industry (which define relevant TEER).

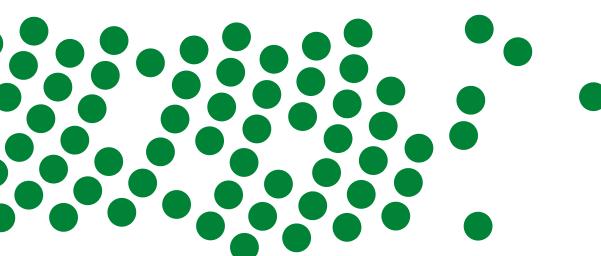
IPCC (Intergovernmental Panel on Climate Change)

The IPCC is the international body for assessing the science related to climate change. The IPCC was set up in 1988 by the World Meteorological Organization (WMO) and United Nations Environment Program (UNEP) to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.

ISO 14001

A standard developed and published by the [International Organization for Standardization](#) (ISO). It defines an environmental management system (EMS) for the manufacturing and service industries.

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ISO 14040 / ISO 14044

Two standards developed and published by the ISO. ISO 14044 replaces the former standards ISO 14041 to 14043. The standards fall into the area of environmental management, they define lifecycle assessments.

ISO 22301

This ISO standard specifies requirements for setting up and managing an effective business continuity management system (BCMS).

ISO 50001

An ISO standard that supports organizations and companies in setting up a systematic energy management system (EnMS).

the quality and sustainability of products and services in the ICT industry. QuEST Forum is the producer of the telecommunications quality standard TL9000. In 2018, QuEST Forum merged with TIA. For further information, please see questforum.org/.

R

REACH (Registration, Evaluation, Authorization and Restriction of Chemicals)

A regulation issued by the European Union addressing the production and use of chemical substances and the potential impact of these substances on human health and the environment.

RoHS (Restriction of Hazardous Substances)

A directive issued by the European Union regarding the restriction of specific hazardous substances used for the production and processing of electronic devices and components.

S

SBTi (Science Based Targets initiative)

The SBTi is a partnership between the Carbon Disclosure Project, UN Global Compact, the World Resources Institute and the World Wide Fund for Nature. It aims at helping companies determining how much they must cut emissions to support the restriction of global warming to within 2°C compared to pre-industrial temperatures. Find out more under sciencebasedtargets.org/.

T

TEER (Telecommunications Energy Efficiency Rating)

TEER is a guideline to measure/calculate the energy efficiency of telecommunications equipment at a given functionality (e.g., WDM transport capacity). Relevant standards and guidelines are the Ecology Guideline for the ICT Industry, Version 8.1, 2019 (available online under https://www.tca.or.jp/information/pdf/ecoguideline/guideline_eng_8_1.pdf), the ANSI ATIS-0600015 series or ECE C1.2.

Q

QuEST Forum

A global association of companies dedicated to impacting

TIA (Telecommunications Industry Association)

TIA is the leading trade association representing the global information and communications technology (ICT) industry through standards development, policy initiatives, business opportunities, market intelligence and networking events. TIA enhances the business environment for companies involved in ICT and the greening of technology. In 2018, TIA merged with the QuEST Forum. TIA is accredited by ANSI. For more information, please refer to www.tiaonline.org.

TL 9000

In 1998, QuEST Forum developed the TL 9000 quality management system (QMS) to meet the supply-chain and operational-quality requirements of the global ICT industry. TL 9000 is built on ISO 9001.

W

WDM (Wavelength Division Multiplexing)

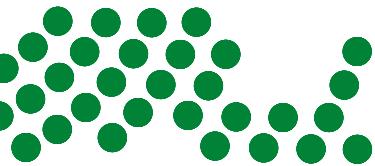
WDM is a standardized technology used for maximizing the fibers' transport capacity. It uses different laser wavelengths per fiber, each carrying individual information.

WEEE Directive 2012/19/EU



A directive issued by the European Union to improve the environmental management of WEEE (waste electrical and electronic equipment) and to contribute to a circular economy. To enhance resource efficiency, it focuses at the improvement of collection, treatment and recycling of electronics at the end of their life. Amongst others, it features the wheelie bin.





Corporate information

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Corporate headquarters

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ADVA on the web

More information about ADVA Optical Networking, including solutions, technologies and products, can be found on the company's website at www.adva.com.

The PDF file of this sustainability report including the associated GRI content index as well the previous GRI reports are located on the ADVA Optical Networking website and can be downloaded at www.advoptical.com/en/about-us/sustainability

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GRI	Disclosure	Reference	Comments
GRI 102: General disclosures			
Organizational profile			
102	102-1 Name of the organization	3	ADVA Optical Networking SE
	102-2 Activities, brands, products, and services	7	For further information: www.advoptical.com/en/about-us
	102-3 Location of headquarters	8, 54	
	102-4 Location of operations	8	
	102-5 Ownership and legal form		ADVA Optical Networking SE is a European stock corporation ("Societas Europaea")
	102-6 Markets served	SR18: 10 AR18: 23, 42	
	102-7 Scale of the organization	SR18: 8, 31 AR18: 42. 46	More than 550,000 of modules and systems were shipped in 2018
	102-8 Information on employees and other workers	31	
	102-9 Supply chain	SR18: 28 AR18: 32f;	ADVA has a globally dispersed supplier base, with a center in China. Total number of relevant suppliers, ranging from components suppliers to contract manufacturers is in the range of 80. This also includes logistics suppliers.
	102-10 Significant changes to the organization and its supply chain		Full integration of MRV Communications in 2018 (acquired in 2017).
	102-11 Precautionary Principle or approach	11ff, 15ff, 19	
	102-12 External initiatives	11, 25	
	102-13 Membership of associations	25	
Strategy			
102	102-14 Statement from senior decision-maker	5	
	102-15 Key impacts, risks, and opportunities	SR18: 19f, 21 AR18: 57ff	
Ethics and integrity			
102	102-16 Values, principles, standards, and norms of behavior	47	
	102-17 Mechanisms for advice and concerns about ethics	48	
Governance			
102	102-18 Governance structure	SR18: 6, 9 AR18: 11ff	
	102-19 Delegating authority	6, 9	
	102-20 Executive-level responsibility for economic, environmental, and social topics	6, 9	
	102-21 Consulting stakeholders on economic, environmental, and social topics	6, 11, 25	
	102-22 Composition of the highest governance body and its committees	AR18: 11ff	

	102-23	Chair of the highest governance body	AR18: 11ff	
	102-24	Nominating and selecting the highest governance body	<u>6</u>	
	102-25	Conflicts of interest	<u>6</u>	
	102-26	Role of highest governance body in setting purpose, values, and strategy	<u>6</u>	
	102-27	Collective knowledge of highest governance body	<u>6</u>	Collective knowledge is also maintained via feedback by the department leaders.
	102-28	Evaluating the highest governance body's performance	<u>6</u>	
	102-29	Identifying and managing economic, environmental, and social impacts	<u>6, 9, 11</u>	
	102-30	Effectiveness of risk management processes	SR18: <u>6</u> AR18: 57ff	
102	102-31	Review of economic, environmental, and social topics	<u>6, 10, 11</u>	
	102-32	Highest governance body's role in sustainability reporting	<u>6, 9</u>	
	102-33	Communicating critical concerns	SR18: <u>6, 19f</u>	
	102-34	Nature and total number of critical concerns	AR18: 59	
	102-35	Remuneration policies	AR18: 54ff	
	102-36	Process for determining remuneration		Performance-based, no consultants
	102-37	Stakeholders involvement in remuneration		Shareholder involvement via AGM
	102-38	Annual total compensation ratio		On-target earnings (targeted base salary plus variable pay) ratio. Full-time and part-time employees (excluding apprentices) are included with full-time equivalent compensation. Overall compensation ratio is 8.6
	102-39	Percentage increase in annual total compensation ratio		No increase of highest-paid individual
	Stakeholder engagement			
102	102-40	List of stakeholder groups	<u>11, 25</u>	
	102-41	Collective bargaining agreements		0%
	102-42	Identifying and selecting stakeholders	<u>11, 25</u>	
	102-43	Approach to stakeholder engagement	<u>25, 27</u>	
	102-44	Key topics and concerns raised	<u>25, 27</u>	
	Reporting practice			
	102-45	Entities included in the consolidated financial statements		This report covers all entities covered in the financial statement (Annual Report).
	102-46	Defining report content and topic Boundaries	<u>3</u>	
	102-47	List of material topics	<u>3, 15ff</u>	
	102-48	Restatements of information		No changes
102	102-49	Changes in reporting	<u>3</u>	Change from GRI "Core" to "Comprehensive" option
	102-50	Reporting period	<u>3</u>	From January 1, 2018 to December 31, 2018
	102-51	Date of most recent report	<u>3</u>	Last report, Sustainability Report 2017, was published in April 2018
	102-52	Reporting cycle	<u>3</u>	Annual
	102-53	Contact point for questions regarding the report	<u>8</u>	

	102-54	Claims of reporting in accordance with the GRI Standards	3	This report has been prepared in accordance with the GRI Standards: Comprehensive
	102-55	GRI content index	55ff	
	102-56	External assurance	4	
GRI 200: Economic				
Economic performance				
	103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	47, 10, 11ff, 15ff, 23, 25f	
	201-1	Direct economic value generated and distributed	AR18: 43	
	201-2	Financial implications and other risks and opportunities due to climate change	SR18: 19f AR18: 59	
	201-3	Defined benefit plan obligations and other retirement plans		Does not apply. ADVA Optical Networking has no defined retirement program.
	201-4	Financial assistance received from government	AR18: 99, 104	
Anti-corruption				
	103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	47, 10, 11ff, 15ff, 23, 25f	
	205-1	Operations assessed for risks related to corruption	AR18: 57ff	All significant operations are regularly assessed.
	205-2	Communication and training about anti-corruption policies and procedures	47, 48	
	205-3	Confirmed incidents of corruption and actions taken		No confirmed incidents of corruption have occurred in 2018.
Anti-corruption behavior				
	103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	47, 10, 11ff, 15ff, 23, 25f	
	206-1	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	48	Antitrust is an important part of ADVA's compliance framework and covered within the company's code of conduct. No known cases of violations do exist.
GRI 300: Environmental				
Energy				
	103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	37, 10, 11ff, 15ff, 23, 25f	
	302-1	Energy consumption within the organization	38, 39f	
	302-2	Energy consumption outside of the organization		Scope 3 emissions are reported, not energy consumption (see GRI 305-3).
	302-3	Energy intensity	38	
	302-4	Reduction of energy consumption	38	
	302-5	Reductions in energy requirements of products and services	45, 46	
Emissions				
	103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	37, 10, 11ff, 15ff, 23, 25f	
	305-1	Direct (Scope 1) GHG emissions	39f	
	305-2	Energy indirect (Scope 2) GHG emissions	39f	
	305-3	Other indirect (Scope 3) GHG emissions	39ff, 42, 43, 45	
	305-4	GHG emissions intensity	39	

305-5	Reduction of GHG emissions	39	
305-6	Emissions of ozone-depleting substances (ODS)	37	None
305-7	Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	37	
Effluents and waste			
103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	37, 10, 11ff, 15ff, 23, 25f	
306-1	Water discharge by quality and destination	37	
306-2	Waste by type and disposal method	37	
306-3	Significant spills		None
306-4	Transport of hazardous waste	37	
306-5	Water bodies affected by water discharges and/or runoff	37	None
Supplier environmental assessment			
103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	37, 10, 11ff, 15ff, 23, 25f	
308-1	New suppliers that were screened using environmental criteria	28	
308-2	Negative environmental impacts in the supply chain and actions taken	28	
GRI 400: Social			
Employment			
103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29, 10, 11ff, 15ff, 23, 25f	
401-1	New employee hires and employee turnover	30	This is not tracked by gender and age group.
401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	33, 35	Note some of these benefits are also available to temporary or part-time employees.
401-3	Parental leave		35 employees took parental/maternity leave. 9 employees returned to work after parental/maternity leave ended.
Labor/management relations			
103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29, 10, 11ff, 15ff, 23, 25f	
402-1	Minimum notice periods regarding operational changes		2 weeks to 12 months, depending on region and type of change.
Occupational health and safety			
103-1, -2, -3	Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29, 10, 11ff, 15ff, 23, 25f	
403-1	Workers representation in formal joint management-worker health and safety committees	33f	
403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	33f	
403-3	Workers with high incidence or high risk of diseases related to their occupation	33f	
403-4	Health and safety topics covered in formal agreements with trade unions		None

	Training and education		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
404-1	Average hours of training per year per employee	35	This is not tracked by gender and employee category.
404-2	Programs for upgrading employee skills and transition assistance programs	35	
404-3	Percentage of employees receiving regular performance and career development reviews	100%	
	Diversity and equal opportunity		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
405-1	Diversity of governance bodies and employees	30 , 32	
405-2	Ratio of basic salary and remuneration of women to men		This is not tracked. The ratio is not influenced by gender, but rather by the assignment to different departments.
	Non-discrimination		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
406-1	Incidents of discrimination and corrective actions taken		No incidents
	Freedom of association and collective bargaining		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
407-1	Operations and suppliers in which the right to freedom of association and collective bargaining may be at risk	28	None. This is addressed by our Group CoC and Supplier CoC as stated in the main report. It is validated by self and supplier audits.
	Child labor		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
408-1	Operations and suppliers at significant risk for incidents of child labor	28 , 29	None. This is addressed by our Group CoC and Supplier CoC as stated in the main report. It is validated by self and supplier audits.
	Forced or compulsory labor		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
409-1	Operations and suppliers at significant risk for incidents of forced or compulsory labor	28 , 29	None. This is addressed by our Group CoC and Supplier CoC as stated in the main report. It is validated by self and supplier audits.
	Local communities		
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f	
413-1	Operations with local community engagement, impact assessments, and development programs	26 , 32 , 36	
413-2	Operations with significant actual and potential negative impacts on local communities		None

	Supplier social assessment	
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f
	414-1 New suppliers that were screened using social criteria	28
	414-2 Negative social impacts in the supply chain and actions taken	No respective suppliers (with negative impact) are known, following regular assessments and due diligence.
	Public policy	
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f
	415-1 Political contributions	None
	Customer health and safety	
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f
	416-1 Assessment of the health and safety impacts of product and service categories	During the development phase, all products are subject to H&S assessments according to the given standards (TL, ISO, REACH, RoHS ...) and certification requirements (CE, UL, WEEE, (laser) safety ...). H&S is continuously monitored across all products and services, and appropriate actions are taken if needed.
	416-2 Incidents of non-compliance concerning the health and safety impacts of products and services	None
	Socioeconomic compliance	
400	103-1, -2, -3 Explanation of the material topic and its boundary; the management approach and its components; evaluation of the management approach	29 , 10 , 11ff , 15ff , 23 , 25f
	419-1 Non-compliance with laws and regulations in the social and economic area	No known fines of non-compliance with laws and regulations concerning the provision and use of products and services.

SR18: [Sustainability Report 2018](#)

AR18: [Annual Report 2018](#)

Independent Practitioner's Report on a Limited Assurance Engagement on Non-financial Reporting¹

- Introduction
- Context, materiality, risks, and strategy
- Stakeholder engagement and supply-chain management
- Corporate social responsibility
- Environmental topics and circular economy
- Ethics and compliance
- Glossary
- Corporate information
- GRI content index
-  Independent assurance report

To ADVA Optical Networking SE, Martinsried/München

We have performed a limited assurance engagement on the separate non-financial group report pursuant to § (Article) 315b Abs. (paragraph) 3 HGB ("Handelsgesetzbuch": "German Commercial Code") of ADVA Optical Networking SE, Martinsried/München, (hereinafter the "Company") for the period from 1 January to 31 December 2018 which comprises the sections marked with a light green background in the Sustainability Report 2018 of the Company (hereinafter the "Non-financial Report").

Responsibilities of the Executive Directors

The executive directors of the Company are responsible for the preparation of the Non-financial Report in accordance with §§ 315b and 315c in conjunction with 289c to 289e HGB.

This responsibility of the Company's executive directors includes the selection and application of appropriate methods of non-financial reporting as well as making assumptions and estimates related to individual non-financial disclosures which are reasonable in the circumstances. Furthermore, the executive directors are responsible for such internal control as they have considered necessary to enable the preparation of a Non-financial Report that is free from material misstatement whether due to fraud or error.

Independence and Quality Control of the Audit Firm

We have complied with the German professional provisions regarding independence as well as other ethical requirements.

Our audit firm applies the national legal requirements and professional standards – in particular the Professional Code for German Public Auditors and German Chartered Auditors ("Berufssatzung für Wirtschaftsprüfer und vereidigte Buchprüfer": "BS WP/vBP") as well as the Standard on Quality Control 1 published by the Institut der Wirtschaftsprüfer (Institute of Public Auditors in Germany; IDW): Requirements to quality control for audit firms (IDW)

Qualitätssicherungsstandard 1: Anforderungen an die Qualitätssicherung in der Wirtschaftsprüferpraxis - IDW QS 1) – and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Practitioner's Responsibility

Our responsibility is to express a limited assurance conclusion on the Non-financial Report based on the assurance engagement we have performed.

Within the scope of our engagement, we did not perform an audit on external sources of information or expert opinions, referred to in the Non-financial Report.

We conducted our assurance engagement in accordance with the International Standard on Assurance Engagements (ISAE) 3000 (Revised): Assurance Engagements other than Audits or Reviews of Historical Financial Information, issued by the IAASB. This Standard requires that we plan and perform the assurance engagement to allow us to conclude with limited assurance that nothing has come to our attention that causes us to believe that the Company's Non-financial Report for the period from 1 January to 31 December 2018 has not been prepared, in all material aspects, in accordance with §§ 315b and 315c in conjunction with 289c to 289e HGB.

In a limited assurance engagement, the assurance procedures are less in extent than for a reasonable assurance engagement, and therefore a substantially lower level of assurance is obtained. The assurance procedures selected depend on the practitioner's judgment.

¹PricewaterhouseCoopers GmbH has performed a limited assurance engagement on the German version of the separate non-financial group report and issued an independent assurance report in German language, which is authoritative. The following text is a translation of the independent assurance report.

 Introduction
 Context, materiality, risks, and strategy
 Stakeholder engagement and supply-chain management
 Corporate social responsibility
 Environmental topics and circular economy
 Ethics and compliance
 Glossary
 Corporate information
 GRI content index
 Independent assurance report

Within the scope of our assurance engagement, we performed amongst others the following assurance procedures and further activities:

- Obtaining an understanding of the structure of the sustainability organization and of the stakeholder engagement
- Inquiries of personnel involved in the preparation of the Non-financial Report regarding the preparation process, the internal control system relating to this process and selected disclosures in the Non-financial Report
- Identification of the likely risks of material misstatement of the Non-financial Report
- Analytical evaluation of selected disclosures in the Non-financial Report
- Comparison of selected disclosures with corresponding data in the consolidated financial statements and in the group management report
- Evaluation of the presentation of the non-financial information

Assurance Conclusion

Based on the assurance procedures performed and assurance evidence obtained, nothing has come to our attention that causes us to believe that the Company's Non-financial Report for the period from 1 January to 31 December 2018 has not been prepared, in all material aspects, in accordance with §§ 315b and 315c in conjunction with 289c to 289e HGB.

Intended Use of the Assurance Report

We issue this report on the basis of the engagement agreed with the Company. The assurance engagement has been performed for purposes of the Company and the report is solely intended to inform the Company about the results of the limited assurance engagement.

The report is not intended for any third parties to base any (financial) decision thereon. Our responsibility lies only with the Company. We do not assume any responsibility towards third parties.

München, 15 April 2019

PricewaterhouseCoopers GmbH
Wirtschaftsprüfungsgesellschaft

Hendrik Fink
Wirtschaftsprüfer
[German public auditor]

ppa. Mirjam Kolmar