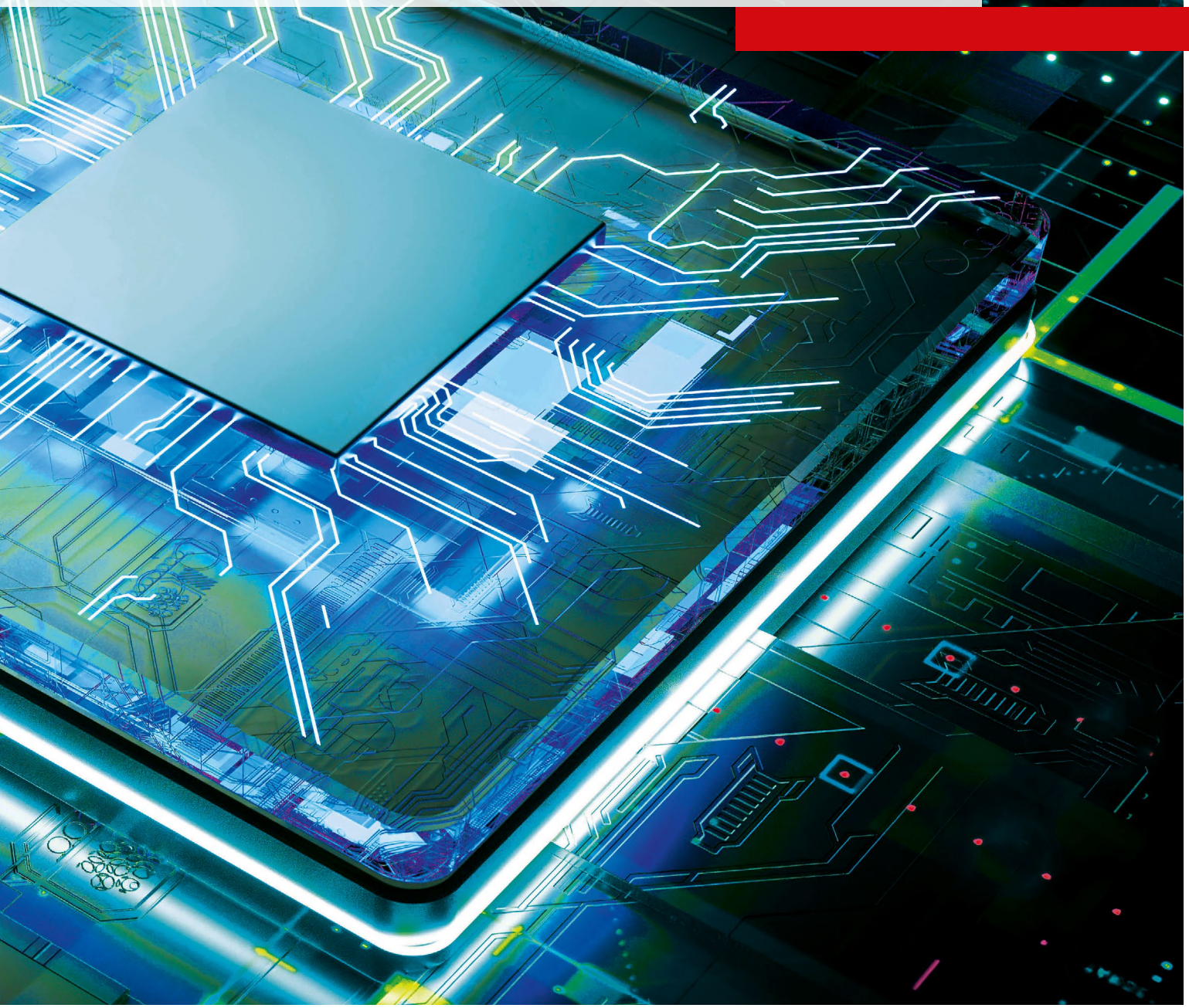
Human rights and environmental risks in the electronics sector

Implementing corporate due diligence



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Contents

Summary

In the context of increasing legal regulation of corporate due diligence, companies from a wide range of industries in Germany (and soon companies within the EU) are required to obtain an in-depth overview of sector-specific risks in their supply chains and to take corresponding preventive and remedial measures. The joint study by the Initiative for Global Solidarity (IGS) and Systain Consulting supports companies of the electronic sector in this regard. The study analyses the sector's supply chains in terms of social and environmental risks and locates them geographically by using qualitative and quantitative methods. Furthermore, interviews and the analysis of sustainability reports of selected companies are used to determine how European electronics companies address risks in their supply chains and where needs for action are prevalent. The focus of the study is particularly on manufacturing processes in the upper supply chain (Tier 1 and Tier 2 suppliers) and less in raw material extraction.

The supply chains of the German electronics sector are characterized by a high degree of international integration and many labour-intensive processes, which are generally associated with high social and environmental risks. Social risks are primarily related to working conditions in the production countries and are largely determined by the geographical location of a production process. Ecological risks, on the other hand, are primarily determined by the product category and are mainly attributable to specific production processes. In some cases, however, location-related factors must also be considered, such as the influence of the country-specific electricity mix on greenhouse gas emissions.

High social risks are especially excessive working hours, forced labour and occupational health and safety. Excessive working hours of up to 60 hours per week and more are among the most common labour law violations in the electronics sector and are mainly attributed to low hourly wages and uncertainties in production planning. Forced labour in the electronics sector particularly affects migrant workers and includes forced overtime, restrictions on termination/retirement rights, and forms of bonded labour. Occupational health and safety risks are mainly attributed to the use of toxic process chemicals in electronics manufacturing. The intensity of social risks varies geographically depending on the risk, with regional focuses in South and East Asia. Risk intensities are generally higher in the lower supply chain and less at direct suppliers. Further information on social risks in electronics supply chains can be found in chapter 3.1 of the study.

Significant ecological risks in the supply chains of the German electronics sector are greenhouse gas emissions and air pollution and, to a lesser extent, water pollution. Greenhouse gas emissions are mainly attributed to the high energy consumption of the sector and are mainly caused in Germany itself by direct suppliers, and in China in particular in the deeper supply chain. Air pollution results mainly from steel production and is also linked to greenhouse gas emissions due to the use of fossil fuels, particularly in Germany. Water consumption and pollution are mainly caused in the lower electronics supply chain and only to a very small extent by direct suppliers. Furthermore, there are ecological risks in electronics supply chains related to the extraction of abiotic and biotic resources and the associated land use through mining or deforestation. However, such risks are mainly located in the deeper supply chain (Tier 3n) and therefore play a minor role in the context of this study. Further information on ecological risks in electronics supply chains can be found in chapter 3.2 of the study.

Many German electronics companies utilize "Code of Conducts" to set minimum standards on the mentioned social and environmental risks at suppliers. In addition, many companies identify high-risk resources, consider complementary measures such as certification of the raw materials and publish individual reports on this. Ecological risks are addressed in sustainability strategies and reports of the electronics companies, specifically regarding the reduction of greenhouse gas emissions using corresponding net-zero targets.

Based on the analysis, the study identifies further opportunities for electronics companies to better address social and environmental risks in their supply chains. Here, good practices and experiences from the textile sector are considered, a sector in which many innovative approaches to fair and clean production processes have already been developed and which can therefore serve as a source of inspiration for the electronics sector:

1. Implement responsible purchasing practices:
Procurement practices and risks in supply chains are often directly related, for example through excessively tight delivery deadlines or contract values that do not allow for a living wage. The inclusion of binding clauses on responsible purchasing practices in supply contracts of electrical companies can therefore be used as an effective preventive measure. At least, companies should analyse the impacts of their purchasing behaviour and adapt their practises accordingly.

2. Use collaborative approaches:
Through participation in industry initiatives, electronics companies can pool their resources to initiate improvements in working conditions in their supply chains. There are already several collaborative approaches at the international level that electronics companies can join, which are mentioned in the study. Furthermore, cooperation with direct suppliers is crucial for jointly reducing ecological risks such as greenhouse gas emissions, but also social risks, and for enabling suppliers to implement corresponding measures with their own suppliers.

3. Create transparency:
Transparency along the supply chain enables electronics companies to obtain reliable information about labour rights violations in supply chains and thus to identify risks at an early stage, to strengthen trust towards consumers and investors and to counter risks with joint suppliers together with other companies. Disclosure of supplier operations is possible on existing open-source platforms. Publishing sustainability data, for example on energy consumption, the use of renewable energies or greenhouse gas emissions from suppliers, can also be valuable in identifying emissions hotspots in electronics supply chains and mitigating them as efficiently as possible (possibly through collaborative approaches).

4. Guarantee access to effective grievance mechanisms:
The availability of effective grievance mechanisms could be significantly increased in the electronics sector through the introduction of an industry-wide external grievance mechanism. Initial efforts to establish such a mechanism in the electronics sector already exist. Moreover, suppliers can be trained to set up internal complaint channels on the factory-level.

The opportunities for collaborative action to make electronics supply chains sustainable are numerous. There is a wide range of initiatives and member organisations that deal with the overarching and individual issues of sustainable supply chains and that companies can use to comprehensively fulfil their due diligence obligations together. Ultimately, the due diligence approach only has a positive impact on people and the environment in the supply chain through the implementation of concrete measures.

Thorsten Metz,
Head of Programme
„Initiative for Global Solidarity“

„With the German Supply Chain Due Diligence Act coming into force on 01.01.2023, many companies now have to take a closer look at their supply chain and establish appropriate risk management. The globalised and complex supply chains of the electronics sector require special attention from companies. The study is intended to support electronics companies by identifying the greatest human rights and environmental risks in the sector and showing first approaches how these risks can be minimised and preventively addressed.“

1. Introduction

Against the backdrop of the German Act on Corporate Due Diligence Obligations in Supply Chains (Lieferkettensorgfaltspflichtengesetz, LkSG), which came into effect on 1 January 2023, companies from all different kinds of industries must now begin to take appropriate responsibility for human rights and the environment along the supply chain. Specifically, that means that companies are obliged to identify risks in their supply chains, take measures on the basis of this analysis and report on their progress. Individual social and environmental risks in supply chains may be very different, however, depending on the sector. The intensity of the risks has also been shown to vary greatly from one sector to another.[1] For companies confronted with a complex supply chain, an overview of the most relevant risks in the particular sector can be very useful.

In 2020, as part of a study on 'Respecting human rights along global value chains – risks and opportunities for sectors of the German economy', the German Federal Ministry of Labour and Social Affairs (BMAS) analysed the different sectors of the German economy in terms of the specific risks in their supply chains. Particularly high social and environmental risks were identified in the electronics sector along with ten other sectors. The present study takes a closer look at the electronics sector using qualitative (guided interviews and secondary literature) and quantitative methods *(see info box on page 9).*

The following key questions were of central importance for the study

- How are electronics supply chains structured and how do these features contribute to the sector's risk profile?
- What are the main social and environmental risks in electronics supply chains and where can they be found?
- How can companies get involved and what are possible starting points for companies to address certain risks in the supply chains?

Based on the identification of the major supply chain risks, the study uses interviews and an analysis of the sustainability reports of selected companies to determine how electronics companies have addressed the risks to date and where the greatest need for action can be seen. The study also presents opportunities and good practices, particularly from the textiles sector, which companies in the electronics sector can draw on to address risks in their supply chains and to comply with their corporate due diligence obligations more effectively. It particularly focuses on risks and the need for action related to the direct suppliers of electronics companies, in other words more in processing and less in raw materials extraction. Companies can address risks in the higher supply chain tiers (tiers 1 and 2) considerably more effectively, and legal instruments such as the LkSG also prioritise risks according to the extent to which companies can influence them.

The study is an attempt to explore this complex sector comprising a large number of product categories and aims to spark new debate on the implementation of corporate due diligence in the electronics sector. The results are particularly relevant to German companies, but also to international companies in the sector. While the quantitative analysis focuses on the German electronics sector, the guided interviews and secondary literature also open up a global perspective. The quantitative model combines quality-assured data on social and environmental risks with available trade data. The model does not claim to cover all the existing social and environmental risks in the sector, as in some areas there is not enough information or data; even in cases discussed in the media, such as forced labour in Xinjiang, there is a lack of transparency and data. Using the qualitative methods and a consultation workshop with several companies in the electronics industry in November 2022, the study has tried to at least partly close certain information gaps.

The study is a joint effort by the Initiative for Global Solidarity (IGS) and Systain Consulting. While Systain was primarily responsible for the model analysis, the guided interviews and qualitative research, IGS particularly contributed the good practices and experience from the textiles sector. IGS is a German development cooperation project implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) to promote the implementation of human rights and environmental due diligence in global supply chains. It supports buyers and manufacturers in the textiles and electronics industry in meeting their joint responsibility concerning the impacts of their business practices on people and the planet. Systain is a management consultancy with more than 20 years of experience working on the global challenges of environmental and human rights issues. It thus combines sustainability and entrepreneurial thinking.

1. https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschenrechten-entlang-globaler-wertschoepfungsketten.pdf?__blob=publicationFile&v=2

2. An overview of the electronics sector

How can the electronics sector be defined?

People often equate the electronics sector solely with consumer electronics such as televisions, mobile phones and computers. The electronics sector covers a considerably wider range of products, however, and overlaps with other sectors in a number of areas. For example, chips and smart technologies are increasingly used in household products. In view of the transition to electrical drive technology and the increase in displays and automation systems, electrification and digitalisation have long been an integral part of the automotive industry. For the quantitative model analysis, it was necessary to use a fairly narrow definition of the sector limited to the Nomenclature of Economic Activities (NACE) sectors C26 (Manufacture of computer, electronic and optical products) and C27 (Manufacture of electrical equipment),[2] whereas in the qualitative analysis neighbouring sectors were also taken into account.

How is the electronics supply chain structured?

The complexity of the electronics sector is also reflected in its supply chains. Electronic devices consist of a large number of components and materials that require many different manufacturing processes. The supply chains of individual components are very varied, involve differing numbers of upstream production steps and are often spread across the globe. Raw materials are needed not only in the lower supply chain tiers but in almost all of the tiers. Moreover, certain actors and processes are sometimes found several times in different supply chain tiers, which means that customer and supplier relations are occasionally reversed within a supply chain. This diversity makes it difficult to make general statements about individual supply chain tiers or to describe a 'typical' electronics supply chain. Instead of the term 'supply chain', it would be more accurate to talk of a 'supply network'. Supply relationships in the electronics sector are also highly dynamic. As the sector has a great capacity for innovation and increasingly short product life cycles, production volumes sometimes need to be rapidly increased or decreased. The large number of components and materials and the numerous product groups within the sector also make it more difficult to identify general sector-specific risks similar to those defined by the Organisation for Economic Co-operation and Development (OECD) for the textiles sector, for example. The environmental risks in particular depend very much on the product group or the individual component, whereas social risks are influenced more heavily by where in the world a production process takes place.

How is the electronics sector relevant to the German economy?

The electronics sector is one of the main industrial sectors in Germany. It has the fifth highest turnover – after the automotive industry, mechanical engineering, the chemical and pharmaceutical sector and the food industry.[3] In terms of the number of employees, it is the second-largest sector.[4] The majority of electronic products made in Germany are 'industrial goods' such as automation, energy or medical technology. This highlights how closely the German electronics sector is intertwined with the automotive industry and the mechanical engineering sector, Germany's two branches of industry with the highest turnover. 'Industrial goods' accounted for around 79% of all products in 2021, followed by electronic components (14%, e.g. semiconductors) and consumer goods (7%, e.g. consumer electronics).[5] In a global comparison, Germany is the world's fifth largest electronics producer after China, the United States, Japan and South Korea. Electronic components, information and communications technology (ICT) and consumer electronics in particular are areas in which exports are considerably stronger in the Asian countries than in Germany.[6]

2. https://nacev2.com/de/activity/verarbeitendes-gewerbeherstellung-von-waren
3. https://www.vci.de/vci/downloads-vci/publikation/chiz-historisch/chemiewirtschaft-in-zahlen-2022.pdf
4. https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/Regelmaessige_Publikationen/Daten_Zahlen_und_Fakten/Die_deutsche_Elektroindustrie_Daten_Zahlen_Fakten/Faktenblatt-Februar-2023.pdf
5. https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/Regelmaessige_Publikationen/Daten_Zahlen_und_Fakten/Die_deutsche_Elektroindustrie_Daten_Zahlen_Fakten/Faktenblatt-Februar-2023.pdf
6. https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/2014/august/Elektroindustrie_weltweit/Elektroindustrie-weltweit.pdf

From which countries do the suppliers of the German electronics sector come from?

An analysis of the gross value added along the sector's supply chain shows the geographical distribution of suppliers to the German electronics industry. If one looks solely at the direct suppliers (tier 1), it becomes visible that by far the most value is added in Germany itself or elsewhere in the European Union (Fig. 2). In contrast, in the lower supply chain (tiers 3-n), a much larger share of value is added outside Germany. China, in particular, is becoming more important as a supplier country (Fig. 3). In other words, the lower we look in the supply chain, the more suppliers are located outside Germany. This is true of every product category in the sector.

Fig. 1 | Added value in the electronics industry per country – supply chain level 1 from the perspective of German companies
[based on estell 2022]

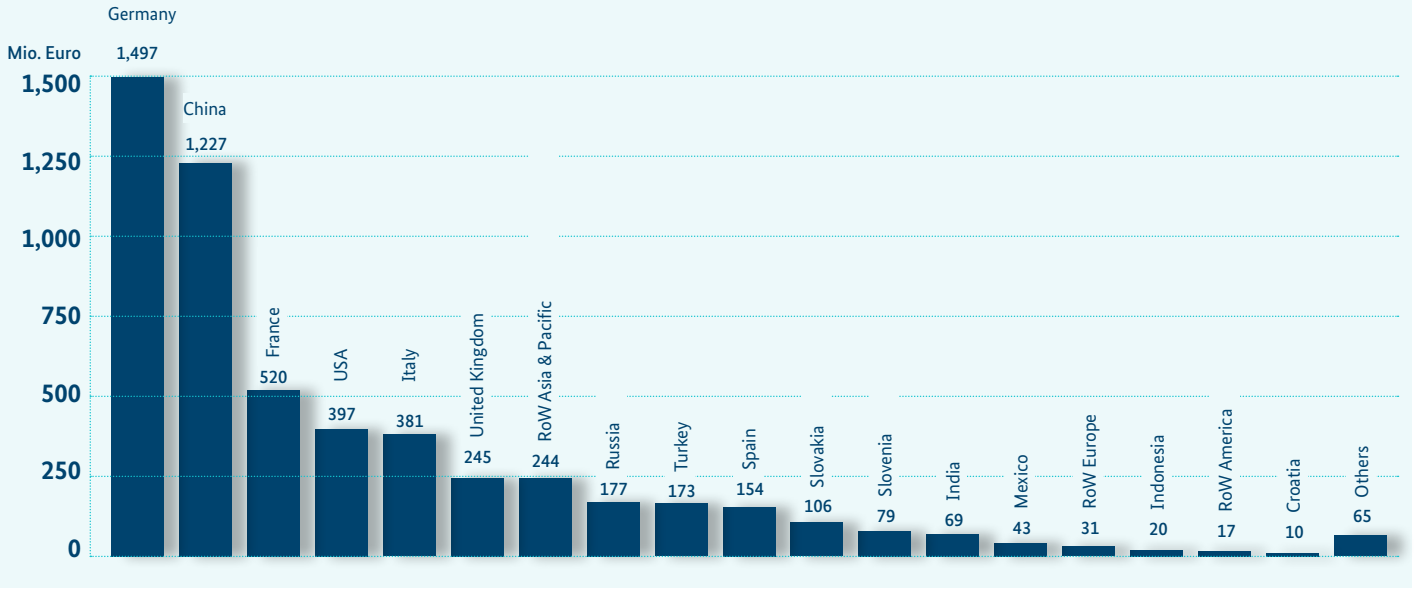
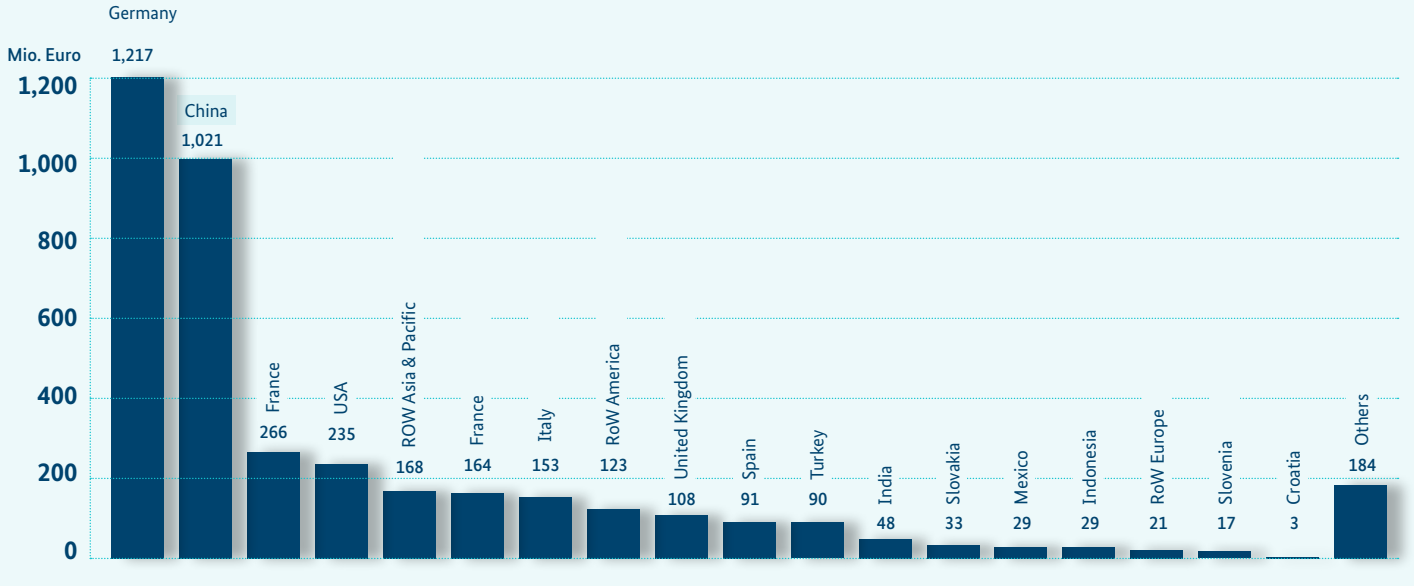


Fig. 2 | Added value in the electronics industry per country - supply chain level 3-n from the perspective of German companies
[based on estell 2022]



3. Risks in electronics supply chains

As already indicated, electronics supply chains are highly interconnected at international level and involve a large number of labour-intensive processes, which often take place in countries facing greater human rights and environmental challenges. Both the extraction of raw materials – as the basis for electronics products – and processing and part manufacturing are generally linked to high social and environmental risks. The electronics sector can therefore be referred to as a high-risk sector in this context. In its analysis of the industry, BMAS classifies the sector as a 'focus industry' due to the human rights risks, for example.[7] The most relevant environmental and social risks in the supply chains of the German electronics sector will be analysed below using the extended Multi-regional Input-Output (MRIO) 'estell' model (see info box). The report will also take a global perspective of risks in electronics supply chains by referring to existing research.

3.1 Social risks

What are the most serious social risks in the electronics supply chains?

Electronics supply chains present a number of social risks, which are primarily connected with working conditions in the production countries. There are high risks concerning the violation of the right to assembly, excessive working hours, forced labour, low wages, and health and safety in the workplace. Furthermore, the environmental pollution caused by the electronics industry can also have far-reaching social impacts on the local population at the production sites. In the following, we will particularly focus on the risks of excessive working hours, forced labour, and health and safety in the workplace as they are particularly relevant in electronics supply chains. The concept of risk hours and intensity was used (see info box) to quantify social risks in individual countries and product categories.

Excessive working hours

Excessive working hours are a widespread phenomenon in the electronics industry, and workers are sometimes forced to work overtime without pay. According to the Validated Assessment Program (VAP) audit by the Responsible Business Alliance (RBA) – a standardised audit process by the world's largest sector initiative for sustainable electronics supply chains – exceeding the threshold of 48 working hours per week set by the International Labour Organization (ILO) is one of the most common breaches of labour law in the electronics sector.[8] The average working hours recorded as part of the audit primarily among direct suppliers of RBA's member companies was around 52 hours per week in 2021. Particularly in the lower supply chain tiers, people usually work for 60 hours or more. One of the reasons for excessive working hours in the electronics sector is that workers are forced to work longer hours due to low wages. In addition, short production cycles and fluctuations in demand for components lead to uncertainties in production planning. Production volumes have to be greatly increased at short notice in certain product segments. In terms of locations, the highest risks related to working hours are predominantly found in Asia, for instance in India, Turkey and Indonesia (see Fig. 4).

METHODOLOGICAL APPROACH OF THE STUDY

Extended multi-regional Input-Output (MRIO) model

Systain has developed an approach called estell that allows quantitative indicators relating to environmental impacts, resource extraction and social risks to be recorded along the entire value chain of a company and all the sectors involved. The estell approach is based on an input-output model to which selected environmental and social factors have been added. Taking the purchase value of a product, estell can be used to model the value chain of the product at a country-specific and sector-specific level, including the environmental and social impacts in each case. One of the main advantages of estell is its ability to model the entire value chain. This enables the social and environmental impacts of a product to be assigned to the supply chain tier in which they are caused. Moreover, the model is based on consistent and transparent data updated on an annual basis.

In estell, social risks are measured in 'risk hours', i.e. the number of working hours along the supply chain that are characterised by a particular social risk. Higher values therefore equate with higher risks.

In order to model social risks using estell, the risk of negative social impacts is divided into risk categories on the basis of statistical analyses. The overall risk is the sum of the working hours and the risk intensity.

As the modelling of the value chains in estell is based on statistical data, the value chain and the associated environmental and social impacts of individual companies may deviate from the modelled results.

7. https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschenrechten-entlang-globaler-wertschoepfungsketten.pdf?__blob=publicationFile&v=2
8. https://responsiblebusiness.sharefile.com/share/view/s33f910bd64fe415883aaaee637e8e548

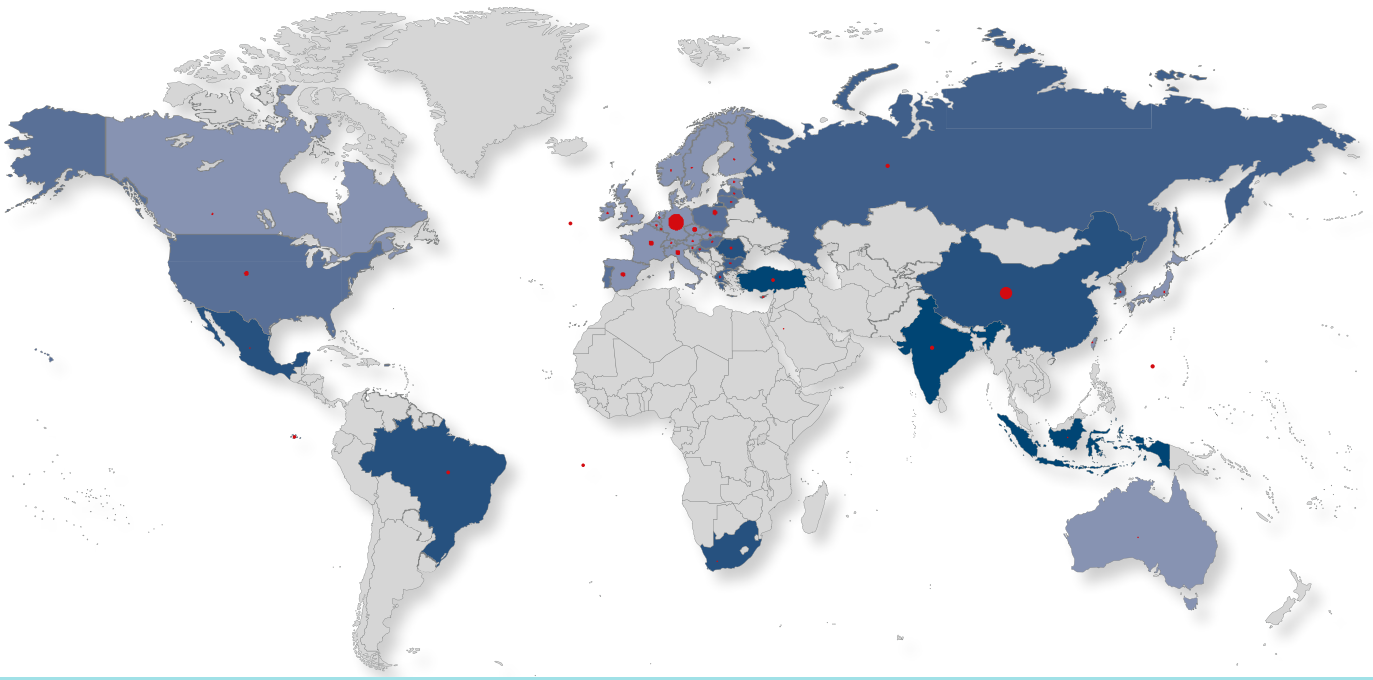


Fig. 3 | Intensity of the risk of excessive working hours (the darker, the more risk-intensive) and number of total risk hours (the larger the circle, the more risk hours) – all supply chain levels [based on estell 2022]

Forced labour

In the electronics sector, forced labour may take various forms and includes forced overtime and restrictions of the right of termination or the right to retire. Moreover, forced internships can also be deemed to be forms of forced labour. These kinds of practices are reported to be particularly widespread in the Chinese electronics industry.[9] Migrant workers are particularly often subjected to forced labour in the electronics sector. According to the 2020 annual report by the independent monitoring organisation Electronics Watch, migrant workers may have their identity documents confiscated or may be promised wages and bonuses that they do not receive, for example.[10] Investigative journalists from Danwatch have reported that Nepalese and Indonesian workers in electronics factories in Malaysia have to pay a large share of their wages to labour agencies and are threatened with violence by these agencies to prevent them from leaving their jobs and returning to their home countries.[11] Due to high agency fees, many of the migrant workers have to work to pay off debts.[12] The agencies often charge workers huge amounts for them to get their confiscated passports back.[13] Although some large electronics companies already have regulations to address forced labour in supply chains, implementing relevant measures in lower supply chain tiers is often a challenge. Forced labour therefore continues to be a considerable problem, particularly in the lower electronics supply chain tiers. There are high risks of forced labour in the electronics sector in countries such as China,[14] the Philippines[15] and Malaysia.[16]

Health and safety

In the electronics sector, health and safety risks in the workplace are primarily related to the use of toxic process chemicals. According to Electronics Watch (2020), more than 400 chemical substances are used in the production of semiconductor elements alone, some of which have toxic properties (around 10% contain carcinogenic substances).[17, 18] In addition, new chemicals are often introduced in production processes without any public announcement, which makes it difficult to keep lists of high-risk chemicals up to date. Other challenges include the lack of transparency in chemical inventories and disinformation of workers about the dangers involved in handling the chemi-

9. https://old.danwatch.dk/en/undersogelse/servants-of-servers/
10. https://electronicswatch.org/electronics-watch-annual-report-2020_2591374.pdf
11. https://danwatch.dk/en/undersoegelse/forced-labour-behind-european-electronics/
12. https://danwatch.dk/en/undersoegelse/the-labour-supply-chain-how-foreign-workers-end-up-indebted-in-malaysia/
13. https://danwatch.dk/en/undersoegelse/i-feel-scared-going-out-how-migrant-workers-become-outlaws-in-malaysias-electronics-industry/
14. https://old.danwatch.dk/en/undersogelse/servants-of-servers/
15. https://electronicswatch.org/en/when-overtime-is-forced-labour_2548782
16. https://electronicswatch.org/when-compliance-is-not-enough-why-victims-of-forced-labour-should-be-partners-in-the-remediation-design_2572369.pdf
17. https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschenrechten-entlang-globaler-wertschoepfungsketten.pdf?__blob=publicationFile&v=2
18. Kim, S. et al. (2018) https://europepmc.org/article/PMC/6237170

cals. As a result, workers are often exposed to the chemicals for too long and without adequate protective equipment.[19]

Building safety in electronics factory is another area of high risk. In May 2022, 27 people died and 12 were injured in a fire in a factory in Delhi where CCTV hardware is made.[20] Without appropriate monitoring and effective grievance mechanisms, the health and safety risks are often not controlled. Risks related to health and safety in the workplace exist in the electronics industry in countries such as Indonesia,[21] India[22] and Viet Nam.[23]

How are German electronics companies addressing these social risks?

Since the Act on Corporate Due Diligence Obligations in Supply Chains (LkSG) came into force, if not before, large German electronics companies have had to examine in depth their responsibility along the supply chain and the associated social and environmental risks. However, there has already been a trend towards more responsible business practices for some time now, and many companies began publishing sustainability reports several years ago in which they present their objectives, strategies and successes. The various sustainability strategies adopted by the largest European electronics companies have many aspects in common, even though the companies operate in fairly different subsectors.

The sustainability strategies take account of social risks in the supply chain in a variety of ways. One of the main tools used by the companies is a 'code of conduct for suppliers', which almost all companies have adopted and which sets out the companies' expectations of their suppliers regarding social issues. Moreover, many companies identify high-risk resources used in their production processes (e.g. metallic raw materials), consider adopting supplementary measures such as certification of these raw materials and publish individual reports on them.

What action can companies take?

Although many German electronics companies are already addressing the topic of social risks in their supply chains, action still needs to be taken within the sector on various fronts.

Cooperating with suppliers to assume responsibility and implement responsible procurement practices

As already indicated, many German electronics companies primarily use a code of conduct to address social and environmental risks in the supply chain. Although codes of conduct can be an important tool to stipulate minimum standards, they sometimes make the suppliers solely responsible for complying with these standards. In recent years, however, it has become evident that companies' procurement practices have a key influence on compliance with social and environmental standards and that companies must therefore assume a share of this responsibility in line with the due diligence approach defined in the UN Guiding Principles on Business and Human Rights (UNGP) and the OECD Guidelines. According to a report by ILO (2017), for example, breaches of labour rights in supplier firms are directly connected to the procurement practices of buyers in the electronics sector. Particular features of the sector include outsourcing, subcontracting and highly fluctuating, unpredictable demand, which in turn leads to unstable employment conditions, excessive overtime, low wages and difficult working conditions.[24] The topic of responsible procurement practices has received little attention in the sustainability strategies published by German electronics companies to date. If we look at other countries, there are particularly serious deficits in the electronics sector in this area too. According to the ICT Benchmark Report published by KnowTheChain (2022), which ranks the major ICT companies in terms of their sustainability, very little progress has been made in the sector with regard to responsible procurement practices. Overall, the companies evaluated in this area obtained an average score of only 2 out of 100 points. None of the companies studied said that it included agreements on procurement practices in its contracts with suppliers.[25]

19. https://electronicswatch.org/how-to-protect-workers-from-chemical-hazards-in-electronics-supply-chains-guidance-for-public-buyers-v-1-0-november-2020_2582525.pdf
20. https://www.industriall-union.org/deadly-fire-in-electronics-factory-in-india
21. https://electronicswatch.org/en/when-no-voice-and-no-remedy-equals-poor-health_2548722
22. https://electronicswatch.org/en/why-purchasing-practices-have-consequences-for-workers_2548735
23. https://vov.vn/xa-hoi/tin-24h/ngo-doc-khi-methanol-o-bac-ninh-1-cong-nhan-tu-vong-post1004947.vov
24. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_541524.pdf
25. https://knowthechain.org/wp-content/uploads/KTC-2022-ICT-Benchmark-Report.pdf

Addressing individual risks

Individual risks such as excessive working hours, forced labour and the use of harmful process chemicals in the supply chain are only rarely explicitly addressed by the companies outside their codes of conduct. Due to the influence they have on suppliers, however, larger electronics companies in particular can initiate improvements in individual working conditions in their supply chain and have the necessary resources to do so. One electronics company that is already addressing individual labour rights in the supply chain is the Dutch smartphone manufacturer 'Fairphone'. By introducing a price markup, the 'living wage premium' (around USD 2 per smartphone), Fairphone is trying to implement living wages in the supply chain. Fairphone subsequently verifies that the relevant bonuses are being paid out by conducting worker surveys in the factories.[26] The company has also published a guide on its website on how companies can introduce living wages in the supply chain, a tool to calculate the price markup and a sample agreement on distributing the premium to the workers.[27] A study conducted by Business Fights Poverty, the University of Cambridge and Shift points out that the advantages companies gain by implementing living wages in their supply chains are greater than the associated costs. Higher wages lead to greater productivity among suppliers and more resilient supply chains, for example, and also result in the company establishing a good reputation with consumers and investors.[28]

In general, individual social risks in supply chains such as excessive working hours, forced labour, and health and safety risks in the workplace can be addressed and mitigated most effectively by companies working together, as they can pool resources and exert a concerted influence on suppliers. Sector initiatives therefore provide important leverage in efforts to improve working conditions in supply chains. In the electronics sector, there are already a number of initiatives that represent the different interests of their members. With regard to the above-mentioned social risks in electronics supply chains, the activities of the Responsible Business Alliance (RBA), should be mentioned. Within RBA, there are various working groups and task forces, in which electronics companies can work to help overcome problems such as excessive working hours and forced labour in their supply chains. RBA also addresses issues connected with health and safety in the workplace. Another initiative is the Clean Electronics Production Network (CEPN), which focuses on minimising workers' exposure to toxic process chemicals in electronics supply chains. In the Towards Zero Exposure Program initiated by CEPN, electronics companies team up with suppliers to collect data on the process chemicals used in the supply chain, to eliminate and find substitutes for harmful chemicals and to report on the progress made in this area. CEPN provides the companies with a data collection tool and issues a list of chemicals to be prioritised and safe alternatives, for example. Membership in the aforementioned sector initiatives can also give German electronics companies the opportunity to address individual risks in the supply chain and hence fully meet their responsibility in the supply chain.

GOOD PRACTICES FROM THE TEXTILES SECTOR

Standards on responsible purchasing practises

The importance of responsible procurement practices in improving working conditions in global supply chains is attracting increasing attention in various sectors, not least in connection with the corporate duty of due diligence that is enshrined in legislation. For example, there are already various initiatives in the textiles sector looking at the issue of how a compulsory standard for responsible procurement practices can be defined and integrated in practice into contracts between buyers and producers. The Sustainable Terms of Trade Initiative (STTI), an alliance of 15 business associations in the textiles industry from 11 countries, has produced a White Paper containing specific recommendations on how textiles companies can make their purchasing practices more responsible. The initiative is currently agreeing on measures with buyers in the textiles industry and developing relevant model contract clauses to facilitate mandatory integration of responsible procurement practices into contracts. The Common Framework of the MSI Working Group on Responsible Purchasing Practices provides a practical framework of reference for textiles companies that want to work on improving their purchasing practices. In a Learning and Implementation Community (LIC), various companies from the textiles sector meet regularly to work on implementation of the Common Framework together and to share tried and tested approaches and experience. There are also a wide variety of cross-sectoral initiatives to support companies in implementing responsible purchasing practices. The American Bar Association and Rutgers Law School offer model contract clauses and a Responsible Buyer Code of Conduct that give companies the opportunity to align their contracts with current and planned legislation on due diligence and to work with their suppliers to improve the working conditions in their supply chains. The instruments mentioned can also assist companies in the electronics sector in including agreements on responsible purchasing practices in their contracts. This could enable companies to move away from a system of one-sided responsibility on the part of the suppliers towards shared responsibility for human rights and environmental due diligence in supply chains.

26. https://www.fairphone.com/en/2020/12/18/living-wage/
27. https://www.fairphone.com/en/livingwage/
28. https://businessfightspoverty.org/register-the-case-for-living-wages/

Creating transparency

Due to the complex and highly internationalised nature of electronics supply chains, effective monitoring of human rights and environmental risks along the supply chain is predicated on transparency. It is often difficult for companies to continually monitor problems in supplier firms on the basis of audits and inspections alone. Moreover, many companies are not aware of which suppliers are behind their direct business partners. Particularly in the electronics sector, in which risks steadily increase in the lower supply chain tiers, it is important for companies to increase their own knowledge. This is the only way to become better at recognising risks and to address them effectively.

Disclosing supplier firms enables companies to obtain credible information from workers and civil society organisations and hence to recognise and address the relevant risks at an early stage. Transparent supply chains can also help ensure that affected workers gain access to remedy more promptly. Ideally, by disclosing their supply chains, companies can identify common suppliers and can address the relevant risks together. Furthermore, transparency along the supply chain fosters trust among consumers and investors.29 Despite these advantages, few German electronics companies publish lists of supplier firms with names and addresses; at an international level, there is also little transparency about supply chains in the sector. Other sectors are considerably more transparent. In the clothing sector, for example, 49% of the largest companies publish a list of their direct suppliers, whereas only around 20% of companies do so in the electronics sector.30 German electronics companies also lack transparency in many of their processes such as risk analysis or in specific measures in the supply chain, which means that it is almost impossible for outsiders to evaluate the sector and very difficult to transfer good practices to other companies.

One way in which electronics companies can demonstrate their commitment to transparency in the supply chain and benefit from the transparency of other companies is by disclosing their supply chain through the Open Supply Hub (OS Hub). The OS Hub is a cross-sectoral platform for mapping supply chains that works on the basis of the open source principle. Companies and other stakeholders can enter data and use the platform. By providing standardised global supply chain data, the platform not only offers a better insight into certain production locations; companies can also benefit from the standardised data on names and addresses and the universal identification number allocated to all production facilities. This makes it easier to identify common suppliers and to team up with other companies and stakeholders to make working and production conditions more sustainable. More than 150,000 supplier firms are currently mapped on the OS Hub.31

Guaranteeing comprehensive access to effective grievance mechanisms

The availability of effective grievance mechanisms is essential for companies to recognise social risks in the supply chain at an early stage and to take relevant steps to address them. Although several large German electronics companies have already set up internal grievance mechanisms within the company, they usually do not provide any information about whether these mechanisms are effective or are actually used by employees. Against the backdrop of the LkSG, companies now have a greater obligation to disclose data on their grievance mechanisms and to demonstrate their efficiency. A cross-sectoral external mechanism that meets the criteria of the UN Guiding Principles on Business and Human Rights does not (yet) exist in the electronics sector.[32] In order to meet the effectiveness criteria of the UN Guiding Principles, grievance mechanisms should be legitimate, accessible, predictable and equitable, among other things, and the steps involved in the mechanism should be transparent.[33]

To fully comply with their corporate due diligence obligations, German electronics companies should ensure that workers and their representatives in the supply chain can access independent and effective grievance mechanisms to report breaches of labour rights. Ideally, the relevant complaints channels should be available not only in the direct supplier firms but also in lower supply chain tiers.[34] This requires greater transparency along the supply chain by disclosing supplier firms (see above). With regard to implementing a cross-sectoral external grievance mechanism, initial efforts have already been undertaken in the electronics sector and are being driven particularly by the NGO Electronics Watch. Electronics Watch is an independent monitoring organisation that supports public procurement actors in protecting and monitoring workers' rights in electronics supply chains in cooperation with civil society partners in production regions. As part of this system, local civil society partners help workers to submit complaints, which are subsequently processed by Electronics Watch.

3.2 Environmental risks

What are the most serious environmental risks in electronics supply chains?

In order to gain an overview of environmental risks in electronics supply chains, the externalised costs caused by the sector in individual areas can be quantified (see info box). If we look at the German electronics sector, we can see that the highest externalised costs are found in the areas of greenhouse gas emissions and air pollution.

29. https://transparencypledge.org/why-disclose/#:~:text=Supply%20chain%20transparency%20can%20help,first%20step%20towards%20that%20goal.
30. https://knowthechain.org/wp-content/uploads/KTC-2022-ICT-Benchmark-Report.pdf
31. https://opensupplyhub.org/facilities
32. https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschenrechten-entlang-globaler-wertschoepfungsketten.pdf?__blob=publicationFile&v=2
33. https://www.auswaertiges-amt.de/blob/266624/b51c16faf1b3424d7efa060e8aaa8130/un-leitprinzipien-de-data.pdf
34. https://internationalaccord.org/

Water pollution also plays a role, albeit a considerably smaller one. Moreover, there are environmental risks in electronics supply chains in the context of abiotic and biotic resources, which are related to excessive land use through mining and deforestation. These risks occur mainly in the lower supply chain (Tier-3n) and are therefore not covered in this publication. They are however considered in a new study by the German Federal Environment Agency, which focuses on ecological risks in the electronics sector and will be published in 2023.

Greenhouse gas emissions

More greenhouse gas emissions are caused in the lower supply chain tiers of the German electronics sector (44% in tiers 3–n compared with 27% by tier 1 suppliers and 29% by tier 2 suppliers) and are mainly due to the high energy consumption in the sector. Many of the production processes are automated and carried out by machines. Average production plants that manufacture semiconductors are estimated to use around as much power as 50,000 households, while larger factories use even more than plants in the automotive industry.[35] At the same time, the generation of electricity in the production countries is largely based on fossil fuels. In terms of geography, greenhouse gas emissions by direct suppliers are largely caused in Germany itself, while China is a particular emitter in the lower supply chain tiers. Other relevant drivers of emissions in the direct supplier firms are production processes for steel, glass and electronic machines in particular, while processes to extract coal, oil and gas are relevant in the lower supply chain tiers. If we look at individual subsectors of the electronics industry, the absolute emission figures are highest for the production of semiconductor circuits and components, but the worst emission intensity is found in battery manufacturing.

Air pollution

In electronics supply chains, it is mainly caused by steel production, particularly by direct suppliers. Like the greenhouse gas emissions, the externalised costs resulting from air pollution by the direct suppliers are primarily caused in Germany itself, as the majority of the suppliers are located there. China accounts for an increasing share in the lower supply chain tiers. In general, air pollution is closely linked to greenhouse gas emissions.

GOOD PRACTICES FROM THE TEXTILES SECTOR

Cross-sectoral grievance mechanism

Significant progress has been made in the textiles sector in recent years in terms of the availability of grievance mechanisms across the sector. This is partly due to the considerable public attention that the sector has attracted due to serious industrial accidents such as the collapse of Rana Plaza factory in 2013. A number of initiatives were subsequently set up and have put in place various complaints structures to identify problems in supplier firms at an early stage and to address these issues. One of the most influential initiatives is the International Accord for Health and Safety in the Textile and Garment Industry, a legally binding agreement between buyers in the textiles sector such as adidas, H&M and KiK and globally operating trade unions. The agreement covers issues such as setting up an independent grievance mechanism to address health and safety issues, regular safety inspections in supplier firms and capacity building measures in the production country (the International Accord operates solely in Bangladesh so far).[36]

Cross-sectoral grievance mechanisms such as the International Accord regularly receive complaints in the textiles sector (the International Accord receives an average of 400 a year) and can thus act as an early warning system for compliance breaches in supply chains. However, for grievance mechanisms to be effective, it is particularly important that they achieve appropriate and rapid remedies for affected workers. Findings from the textiles sector have shown that local actors such as civil society organisations and workers and their representatives need to be closely involved for this to work. These parties should be involved both in designing and implementing mechanisms and in creating access to remedy.[37] It has also proved useful to harmonise and combine mechanisms in order to prevent the creation of a patchwork of mechanisms and to pool resources. A cross-sectoral grievance mechanism should also be adapted to comply with local statutory provisions in order to generate leverage. In addition, capacity building in the production countries and extensive awareness-raising measures are necessary to ensure that the local workers have confidence in the complaints channels and therefore actually use them.

35. https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/operations/pdfs/bringing_fabenergyefficiency.ashx
36. https://internationalaccord.org/
37. https://electronicswatch.org/en/what-we-do_2548040

As the generation of electricity in Germany is still largely based on coal, the air pollution associated with the production processes is also very high. The externalised costs of air pollution are spread fairly evenly across direct suppliers, indirect suppliers and the lower supply chain tiers.

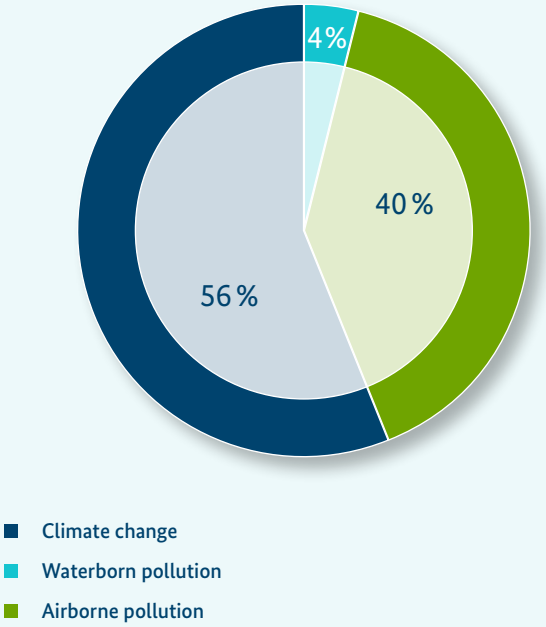
Water consumption and pollution

Both is mainly caused in the lower electronics supply chain tiers and only to a very small extent by the direct suppliers. Among the direct suppliers, around a third of water pollution is due to the use of chemicals, while in the lower supply chain tiers around 75% is caused by extraction processes for metallic raw materials. Overall, water pollution accounts for only around 4% of the total externalised costs of the German electronics sector. Despite the small share of the total costs, water consumption and pollution pose a high risk in electronics supply chains. Many processes in various supply chain tiers require large amounts of water – ranging from the extraction and production of metals to refining and flotation processes and cooling in processing methods. Around 15 million litres of water are used every day to produce semiconductors, for example.[38] Another problem is that the production facilities for metal extraction and processing are often found in regions where water is scarce. Mining processes can thus deplete the local water reserves and put a strain on water resources throughout entire regions.[39] In addition, the use of chemicals is one of the most serious risks in electronics supply chains in both environmental and social terms. Chemicals are often not disposed of properly, for example, which can lead to problems such as the pollution of wastewater with toxic solvents and heavy metals.

How are German electronics companies addressing the aforementioned environmental risks?

Environmental risks are addressed by electronics companies in their sustainability strategies and reports particularly in terms of cutting greenhouse gas emissions. All the companies exam-

Fig. 4 | Distribution of the externalised costs of the German electronics industry in terms of the three highest risks
[based on estell 2022]

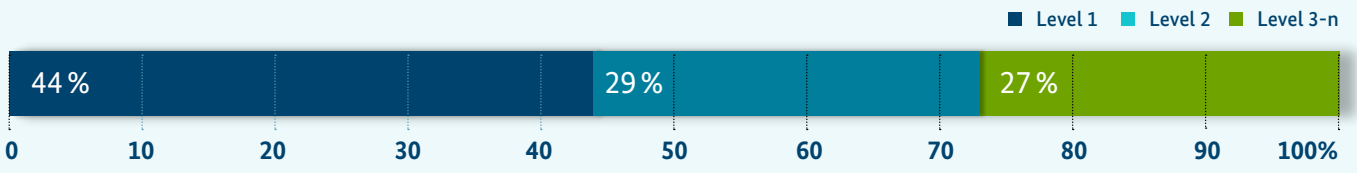


INFO: Externalised costs

Externalised costs are those that arise as a result of individual economic production processes but have to be met by society as a whole.

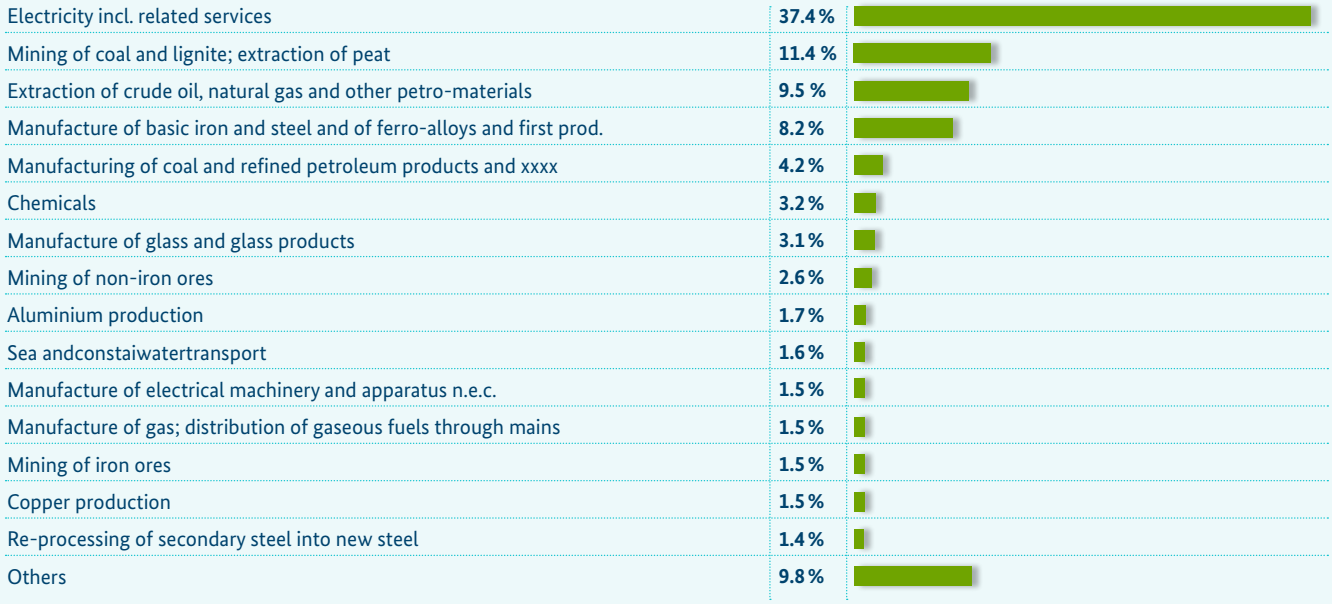
Environmental and social damage is currently often not included in price calculations. The basic idea behind the concept of externalised costs is that the social and environmental dimension of economic activities is taken into account and included in decision-making processes.

Fig. 5 | Distribution of the externalised costs of greenhouse gas emissions within the supply chains of the German electronics sector
[based on estell 2022]



38. https://electronicswatch.org/electronics-watch-policy-brief-3-the-climate-crisis-and-the-electronics-industrylabour-rights-environmental-sustainability-and-the-role-of-public-procurement_2574400.pdf
39. https://www.sciencedirect.com/science/article/abs/pii/S0921344921005358

Fig. 6 | Drivers of the externalised costs of greenhouse gas emissions – all supply chain tiers [based on estell



ined set reduction targets, whereby 2030 is usually given as the target year for becoming climate neutral in the company itself (scopes 1 and 2) and 2050 for the entire supply chain (scopes 1, 2 and 3). In addition, the topic of resource efficiency, for example in connection with water, is mentioned in many sustainability strategies. Saving resources is connected almost entirely to the companies' own business activities, while direct or indirect suppliers are barely mentioned in planning. Few companies explicitly address air or water pollution in their supply chains, for example as a result of the use of chemicals. Moreover, it is noteworthy that although many of the companies set themselves sustainability targets, they do not disclose how they plan to achieve these goals or what measures they have already taken, particularly with regard to their supply chains.

Where is the greatest need for action and what action can companies take?

As already described, the main environmental risks in the electronics sector are connected with the high emission of greenhouse gases and the air pollution closely associated with these emissions. The risk of water pollution in electronics supply chains is considerably lower in comparison and is mainly linked to the use of chemicals, which has already been discussed in Section 3.1 in connection with health and safety in the workplace. As the majority of emissions in the electronics sector are caused in the supply chain (scope 3), this is also where the greatest need for action is to mitigate environmental risks. Although many companies in the German electronics sector have already set themselves ambitious targets for reducing greenhouse gas emissions in the supply chain, implementing decarbonisation often poses a considerable challenge in practice. The sector is making very slow progress at an international level too.[40] Emissions in electronics supply chains may be distributed over hundreds or even thousands of individual suppliers based in many different countries of the world. Moreover, a company's suppliers are often not a fixed group, and parts of the supplier base may change from year to year.[41] Nevertheless, a wide variety of approaches to decarbonise the supply chain have proven successful in different sectors:

Cooperating with direct suppliers

Cooperation with direct suppliers (tier 1) can be a good starting point to achieve initial successes in reducing greenhouse gases in the supply chain. Many companies from various sectors are already supporting their suppliers by providing training and technical support and by sharing knowledge. In the textiles sector, companies that have signed the Fashion Charter for Climate Action, including adidas, Burberry, Puma and Hugo Boss,

40. https://www.greenpeace.org/static/planet4-eastasia-stateless/2022/10/89382b33-supplychange.pdf
41. https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf

have teamed up to provide their suppliers with free, public online training in cooperation with GIZ (Climate Action Training). The training gives participants a basic knowledge of climate change, the impacts of the textiles industry, energy efficiency and renewable energies, and practical knowledge about greenhouse gases and greenhouse gas accounting. This helps prepare suppliers to reduce their emissions by 30% by 2030 and to achieve net zero emissions by 2050.[42] In the electronics sector, only a few isolated companies with international operations, such as Apple, have provided training for their suppliers.[43] However, studies show that sharing knowledge and cooperating with suppliers in a constructive way are vital for successful decarbonisation of the supply chain.[44] Suppliers are only able to cut emissions if they have the relevant basic knowledge and the necessary resources. Buyers can take active steps to support their suppliers and thus assume a share of the responsibility. This can be done most efficiently as part of joint initiatives. In the cross-sectoral Industry Net Zero Accelerator Initiative launched by the World Economic Forum (WEF), for example, a collaborative platform is being created on which buyers and suppliers can share knowledge and best practices on cutting greenhouse gas emissions. The initiative has also developed a practical guide to help companies reach scope 3 targets with their suppliers. In addition, partnerships can be set up to enable direct suppliers to implement measures with their own suppliers, thus creating a cascade effect down into the lower supply chain tiers.

Creating transparency

While many German electronics companies already disclose sources of greenhouse gas emissions in their own business area (scopes 1 and 2) and publish reports about progress made in reducing them, significantly less data is made available on emissions in the supply chain. The electronics sector tends to be less transparent in this area in other countries too. According to a report published by Greenpeace, none of the largest global electronics brands publishes a regionalised breakdown of their suppliers' energy use, renewable energy attributes or carbon emissions.[45] Disclosure of such data would be extremely useful, however, in order to identify emission hotspots in electronics supply chains and to mitigate these hotspots as efficiently as possible (using collaborative approaches, where appropriate). In addition, publishing data on emissions in the supply chain would help clearly demonstrate the progress made by individual companies and the sector as a whole in terms of reducing scope 3 emissions. However, it should be noted that collecting data on greenhouse gas emissions caused by suppliers creates huge challenges for many companies. As already described, many German electronics companies have hundreds of suppliers and it can be complicated even to identify suppliers below tier 1. Even if a company is aware of all the suppliers, that does not guarantee that reliable emissions data is available.[46] Here, too, open exchange and cooperation with supplier companies is essential in order to improve the availability of data and to be able to publish progress reports. WEF has published specific guidance on how companies can cooperate with their suppliers to decarbonise supply chains.

42. https://asiagarmenthub.net/Members/7f7ce7d0432946d5b71a6a99d3945527/climate-action-trainings-for-the-fashion-industry
43. https://www.apple.com/newsroom/2022/10/apple-calls-on-global-supply-chain-to-decarbonize-by-2030/
44. https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf
45. https://www.greenpeace.org/static/planet4-eastasia-stateless/2022/10/89382b33-supplychange.pdf
46. https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf

4. Conclusion

If we look at the human rights and environmental risks in electronics supply chains, we can see that social risks are primarily linked to the production locations and countries. In contrast, environmental risks largely depend on the product category, while the location-specific electricity mix affects the greenhouse gas emissions. Social risks in consumer electronics supply chains are determined above all by which countries the products are manufactured in, how likely individual risks are in those countries and how many working hours it takes to manufacture the products, for example. By contrast, environmental risks such as greenhouse gas emissions and air or water pollution are mainly due to particular production processes, which vary greatly depending on the product category. In addition, the analysis shows that the human rights risks in the German electronics industry increase continually in the lower supply chain tiers, whereas the environmental ones are distributed across the entire supply chain depending on the particular risk.

Many companies are in the process of making their supply chains more sustainable, and some of the risks identified are already being actively addressed or at least ambitious goals are being set, particularly for reducing greenhouse gas emissions. With regard to other individual risks, such as hazardous chemicals and excessive overtime, however, few companies, if any, are taking action according to their reports.

The publication shows that sustainable procurement practices and transparency in the supply chain are overarching areas of activity in which there is also a greater need for action among companies in the electronics sector. Responsible procurement practices generate important leverage for companies to make improvements in the supply chain and to at least ensure that they have not actively contributed to causing harm. Transparency in the supply chain is an essential factor without which it is impossible to work on human rights and environmental risks with suppliers.

Collaborative measures by buyers in the same subsector and cooperation between buyers and suppliers as partners can also lead to sustainable and effective improvements in the supply chain. There are numerous ways of doing this. A large number of initiatives and member organisations exist that address individual aspects and sustainable supply chains as a whole; companies should make use of them to develop resources and take part in sector-wide measures between different companies that are designed to make supply chains more sustainable. The analysis showed by way of example how companies can get involved in particular areas to go beyond mere risk analysis and reporting and to team up with suppliers in taking specific measures as required by the LkSG. It is only by implementing these measures that the due diligence approach can have a positive impact on people and the environment in the supply chain.

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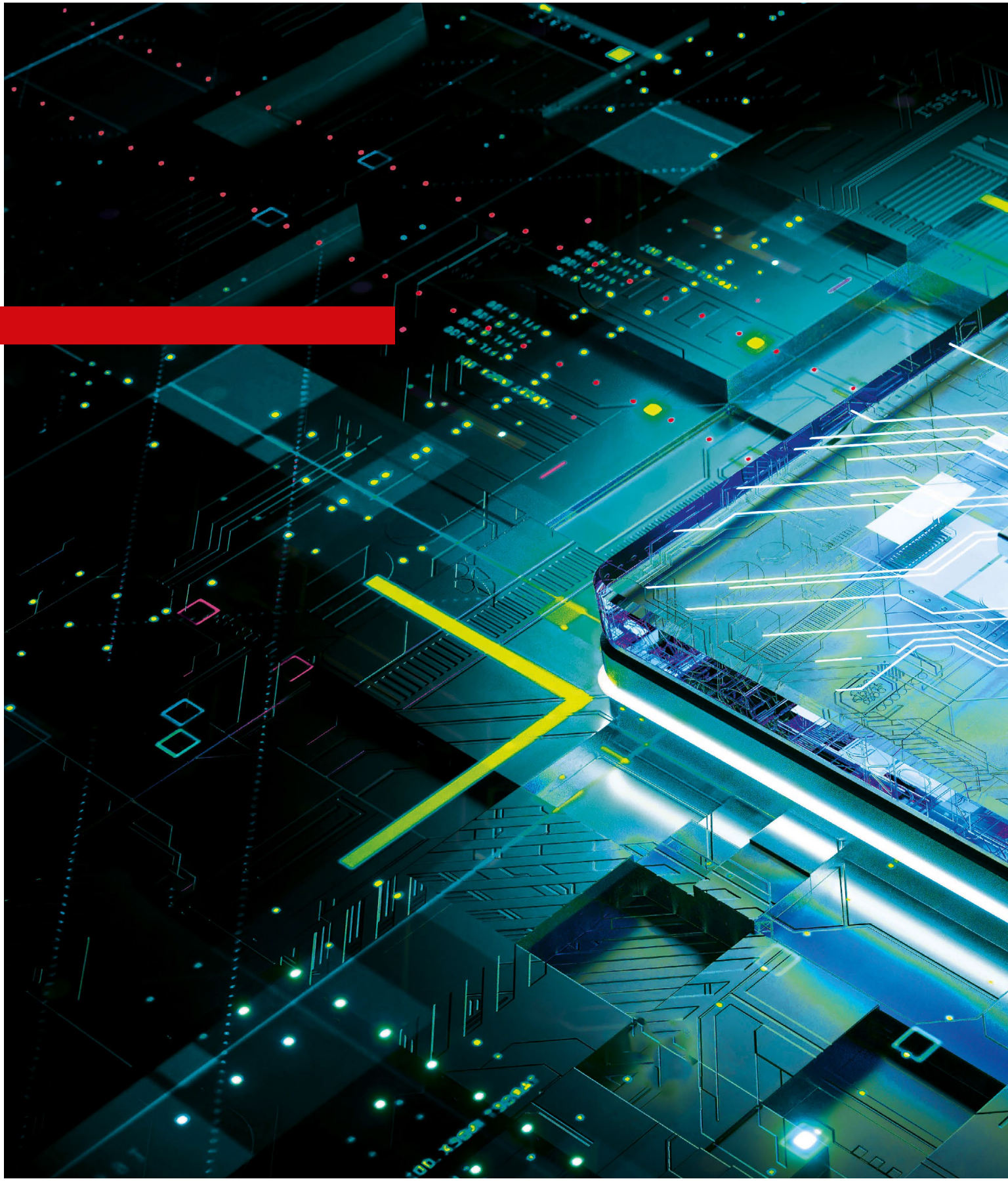

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