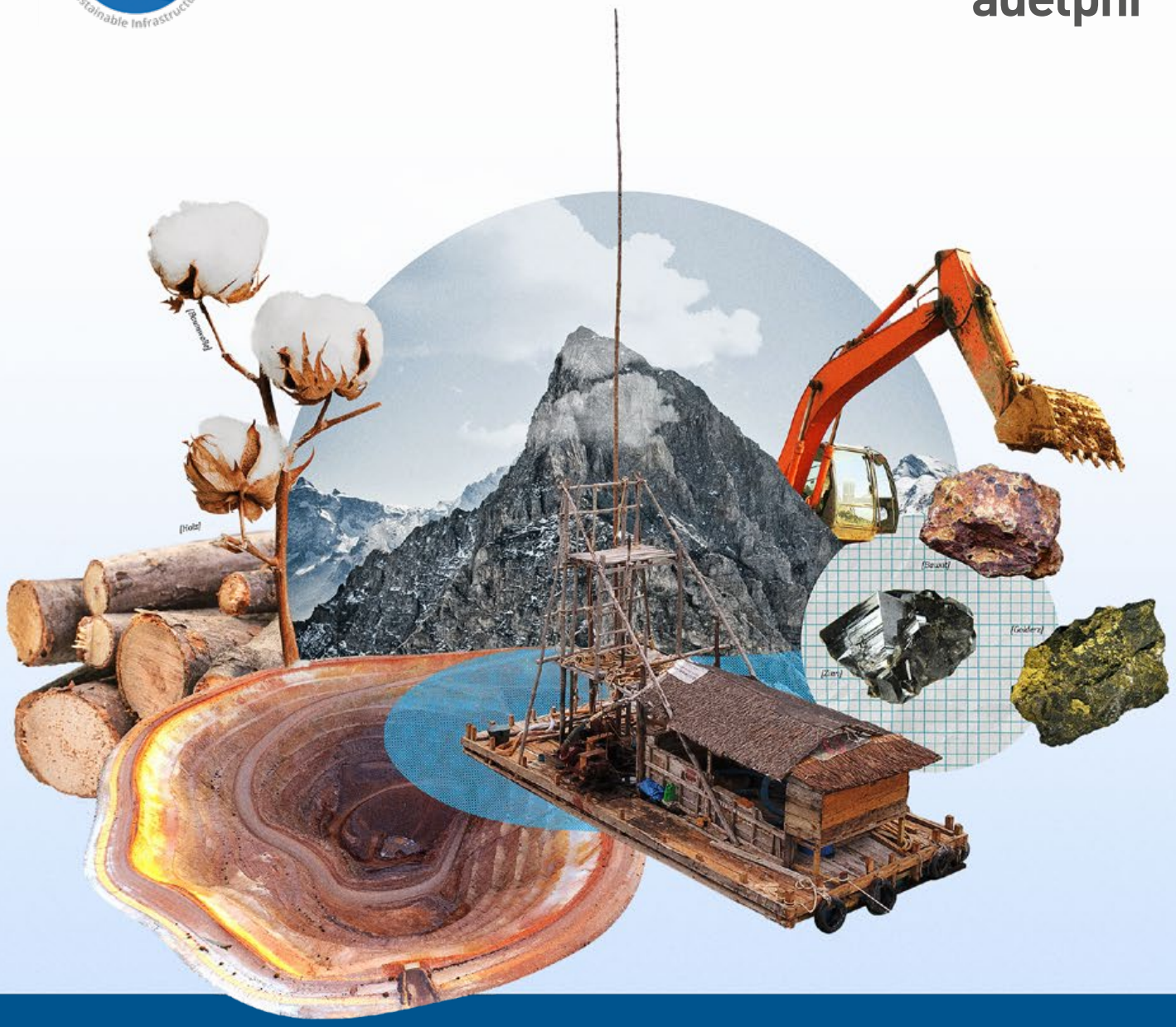
Building Partnerships for a ENVIRONMENTAL PROTECTION made in Germany Sustainable Infrastructure

adelphi



Raw materials in focus

An integrative view of human rights and environmental risks

Imprint

Please cite as follows

Please cite as follows: Markus Buderath, Daniel Weiß, Pia van Ackern, Bibiana Garcia (2021): Rohstoffe im Fokus. Menschenrechts- und Umweltrisiken integrativ betrachten. Berlin: adelphi.

Publisher

adelphi research gGmbH
Alt-Moabit 91
10559 Berlin
www.adelphi.de
office@adelphi.de
T +49 (30) 8900068-0

Authors

Markus Buderath
Daniel Weiß
Pia van Ackern
Bibiana Garcia
Lena Dovidat
Caroline Kraft
Felix Padubrin

Layout

SiMPELPLUS/+
Analogue and digital media

Status: December 2021

Supported by:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

Building Partnerships for a ENVIRONMENTAL PROTECTION made in Germany Sustainable Infrastructure

based on a decision of the German Bundestag

Table of contents

1. Introduction

The understanding that companies have a responsibility to respect human rights along their value chains has become firmly established in recent years. The United Nations Guiding Principles on Business and Human Rights (UN Guiding Principles) provide an international framework for this, which companies and national legislators can use as a guide. In Germany, the National Action Plan on Business and Human Rights (NAP), adopted in 2016, stipulates the Federal Government's expectation of companies to comply with their human right's due diligence obligations. On 11 June 2021, the German government passed the Supply Chain Due Diligence Act (LkSG). The Act, which will enter into force on 1 January 2023, creates concrete legal requirements for companies to avoid, mitigate and remedy (potentially) negative human rights impacts along their supply chains.

In addition to respect for human rights, the law calls for the protection of the environment where this is directly related to human rights impacts. While the legal requirements for environment-related due diligence are linked to those of human rights due diligence[1], the law nevertheless points the way forward and extends the concept of due diligence – at least in part – to environmental concerns.

This development is to be welcomed, as such an integrative understanding of human rights and environmental protection has both analytical and pragmatic advantages. On the one hand, there are clear overlaps between the state of the environment and the ability to protect core human rights such as the right to an adequate standard of living or the right to health. On the other, broadening the concept of due diligence to include environmental concerns also creates practical benefits, for example, in that human rights and environmental risk management can be progressively integrated and holistic or interrelated systems can be developed to simplify and standardise procedural approaches to both types of risk (see Scherf et al. 2019).

This brochure builds on this understanding by presenting and correlating human rights and environmental risks for five selected raw materials. The focus on raw materials represents a further focus of this work. The extraction of raw materials is often associated with specific risks that are relevant both for all manufacturing companies that (further) process the respective raw materials and for distribution companies that ultimately bring to market the finished products. However, tracing product risks back to the level of raw material extraction can be difficult, especially for producers of end products and for distribution companies. It therefore makes sense to have an overall view of the risks associated with raw material extraction. Furthermore, such a focus on raw materials also creates opportunities for industry-specific or cross-industry cooperation and joint work on solutions. Collaborations and mergers of this kind can in turn have a positive impact on the commodities sector as a whole. In addition to five selected "commodity profiles", this brochure also includes a profile on risks in the logistics sector. The latter is understood as a cross-cutting issue that affects all companies.

1 Concrete environmental obligations that are independent of the human rights due diligence obligation are defined with a view to the international Convention on the Use of Mercury (Minamata Convention), the control of transboundary movements of hazardous waste and its disposal (Basel Convention) and the use of persistent organic pollutants (Stockholm Convention).

1.1. Advantages of a "raw material" approach

The sector study "Respect for human rights along global value chains – risks and opportunities for sectors of the German economy" (Weiß et al. 2020) published by the Federal Ministry of Labour in June 2020 reveals that a sector-specific consideration of risks can prove useful and appropriate. To that effect, the study identified "mining and minerals" as one of a total of 29 industries with high human rights risks and also identified raw materials as a cross-cutting issue. In addition to extractive raw materials such as minerals and metals, the focus should also be on renewable raw materials. Due to their characteristics – in particular their origin, extraction method and quantity as well as use – non-extractive, renewable raw materials can also reveal risks that occur with particular frequency and relevance.

Many raw materials, whether finite or renewable, go through various additional processing or steps before they find their way into the hands of end consumers as end products. Especially for companies that are at the end of this production chain or do not have direct relationships with raw material suppliers, it can tend to be difficult to trace human rights and environmental product risks back to the level of raw material extraction. It therefore makes sense to have an overall overview of the risks associated with the extraction of various raw materials.

Such an approach can identify and take into account the various contextual factors that may cause human rights and environmental risks to vary from one commodity to another. Gold and tin, for example, belong to the so-called "conflict commodities", as they are partly mined in conflict and high-risk areas[2] and can contribute to conflict financing. The production of aluminium, on the other hand, is particularly energy-intensive. For such commodity-specific risks, companies can work together in industry-specific or cross-industry initiatives on how to understand, address and mitigate the risks. This step can then support and facilitate their company-specific risk analysis.

In this context, for example, Drive Sustainability, an industry association of car manufacturers, together with the Responsible Minerals Initiative (RMI), a cross-industry initiative, published the "Material Change" study, which captures and assesses sustainability risks for 18 prioritised raw materials. The collaboration between Drive Sustainability and RMI can be seen as leading the way for the kind of collaborative opportunities that arise from such a "commodity approach". In addition to the "Material Change" study, Drive Sustainability has also established the so-called Raw Materials Observatory, which aims to identify human rights and environmental risks in raw material and material sourcing and to develop measures that industry members can implement collaboratively.

2 The term "conflict and high-risk areas" is understood in the sense of the OECD definition. See: *http://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-for-Responsible-Business-Conduct.pdf*

1.2. An integrated view of human rights and environmental risks

In the wake of growing societal expectations and legal requirements, companies are confronted with the challenge of identifying and managing both human rights and environmental risks in their supply chains. While the UN Guiding Principles, implemented in Germany through the NAP and anchored in the Supply Chain Due Diligence Act from 1 January 2023, provide clear guidelines for the human rights due diligence process, most companies have so far tended to record environmental risks in the sense of an environmental management system (EMS). There are many synergies between EMSs and the concept of corporate due diligence in terms of dealing with risks (environmental or human rights, respectively). For example, both systems and approaches provide for the analysis and prioritisation of risks according to their significance (EMS) or materiality (due diligence concept). Furthermore, both systems are designed to continuously develop and improve risk management. In terms of scope, the due diligence approach considers the entire value chain, and environmental management systems increasingly[3] require companies to consider the extent to which they can influence environmental impacts down the supply chain.

At the same time, there are also significant differences, such as the obligation to avoid, mitigate or redress risks, which is firmly provided for in the UN Guiding Principles and, in Germany (from 2023 on), in the corresponding law; EMSs usually only provide for dealing with risks[4] (Scherf et al. 2019). The concept of corporate due diligence is more concrete in this respect and provides for a specific, step-by-step approach to risks. Nonetheless, EMSs offer a good approach for companies that want to broaden their understanding of sustainability to include human rights or to add an understanding of corporate due diligence to their sustainability management. The extent to which human rights and environmental risks can ultimately be considered holistically in a management system must be decided individually at the company level. In any case, human rights and environmental risks should be related to each other and the links between human rights and environmental concerns should also be taken into account in risk management.

Finding these interrelationships also makes sense from a corporate point of view, as this can prevent actions in one subject area from having negative effects in another subject area, which in turn could lead to non-compliance costs. Accordingly, such an integrative understanding is a future-oriented approach that offers companies the opportunity to start dealing with the growing social and legal requirements that increasingly emphasise people and the environment.

3 For example, EMAS (Eco Management and Audit Scheme) since the 2017/2019 amendment (Scherf et al. 2019).
4 The scope for dealing with risks is, of course, bound by legal requirements and, accordingly, may include reparation if provided for by law (Scherf et al. 2019).

1.3. Methodological considerations

The aim of this brochure is to make visible the risks of negative human rights and environmental impacts for five selected raw materials, which are specifically related to the extraction and, in some cases, the further processing of these raw materials, in order to then put them into a meaningful relationship with each other. In selecting the raw materials, a distinction was made between finite / extractive and renewable raw materials. This distinction was made specifically to show that even these otherwise very different types of raw materials are similar in that human rights and environmental risks can be increasingly found at the level of raw material extraction.

The following finite raw materials are considered in this brochure: bauxite, gold and tin. In the selection process, an attempt was made to select raw materials that are used in diverse industries and for different purposes in order to appeal to the widest possible range of companies. Two of these minerals, gold and tin, are included in the European Conflict Minerals Regulation ((EU) 2017/821), which came into force in January 2021 and sets out due diligence requirements for importers of conflict minerals. Following the mineral raw materials, the renewable raw materials cotton and wood are considered. While cotton production already receives a lot of (critical) attention in sustainability debates, wood is increasingly promoted as a sustainable alternative[5] for (less sustainable) building materials. A comparison of these raw materials, which are perceived very differently in sustainability debates, therefore seems interesting.

In line with the understanding that human rights and environmental risks increasingly occur at the level of raw material extraction (cf. Weiß et al. 2020; cf. Dehoust et al. 2020), the focus of the raw material profiles is clearly on this stage of the value chain. Nevertheless, for all of the selected raw materials, there are further processing steps that the respective raw material almost always goes through, regardless of which subsequent processes follow and in which end product the raw material ultimately flows. This is the case with mineral raw materials, which have to be melted, and with wood, which is in fact always cut to size in sawmills before further processing. Since cotton is used almost exclusively in the textile industry, there are also standard processes that the material goes through there. In relation to raw material extraction, however, many of these further processing operations are not comparable in severity and frequency with the risks at the level of extraction.

Other processes, in turn, are characterised by relatively high human rights or environmental risks due to their technical or structural characteristics. This is the case, on the one hand, with cotton, where labour intensity, country risks and the use of chemicals mean that the risks in further processing must also be classified as particularly relevant[6]. It is also the case with bauxite, whose processing into aluminium involves very high energy requirements and other significant environmental risks. For gold, tin and wood, on the other hand, the focus was placed on the level of raw material extraction for the reasons mentioned above. However, this does not mean that there are no risks in the further processing of these raw materials. The focus on raw material extraction is rather due to the fact that the risks at this stage of the value chain are of particular relevance and are sometimes difficult for companies to grasp, which further underlines the need to take a targeted look at this stage of the value chain. For all five commodities, only the risks abroad were considered. This does not mean, of course, that there are no risks, for example, in timber production in Germany. However, since risks abroad are generally more difficult to determine than domestic risks, the focus here is also on raw materials and intermediate products before they reach Germany and are processed locally.

5 See, for example, the efforts of the German government within the framework of the Charter for Wood 2.0 (cf. BMEL o. J.).
6 "Particularly relevant" in this context should not be understood as an absolute valuation, but rather as the relative severity and frequency of the risks in relation to the risks at the level of raw material extraction.

The fact sheets cover both significant human rights risks and significant environmental risks. While the link between human rights and environmental concerns is specifically addressed in a further section, it has already become apparent in the classification of risks that even this cannot always be clearly guaranteed. Thus, if a risk has been classified as significant from a human rights perspective, this does not automatically mean that it does not also affect the environment. Rather, the classification should be understood as priority setting. The fact that even this is not always easy to ensure underscores the point that risks should be considered in an integrated manner and the relationship between human rights and environmental concerns should be brought into focus.

In classifying the risks among significant human rights risks, a distinction is made between the following categories: 1) child labour, 2) forced labour and human trafficking, 3) health and safety, 4) freedom of association and assembly, 5) discrimination, 6) wages and working conditions, 7) land use and property rights, and 8) conflicts and security. In the area of significant environmental risks, a distinction is made between the following categories: 1) water consumption and water availability, 2) soil and (ground) water pollution, 3) air pollution and emissions, 4) biodiversity and deforestation, as well as 5) environment and waste. The categories are listed in this order and corresponding material risks are mentioned where they have been identified. If the latter is not the case, the category is skipped. Both general risks that occur independently of specifics such as country risks and concrete case studies that relate to specific countries or regions are mentioned. The mention of individual examples does not mean that similar risks do not also exist in other countries or regions, but merely serves to contextualise risks. At this point, it is important to bear in mind that the aim of the fact sheets is not to cover all human rights and environmental risks; they are not exhaustive, and they do not replace individual risk analysis. Rather, they should be seen as a guide for companies that a) want to learn more about the risks associated with a particular raw material and b) are interested in how human rights and environmental risks relate. The information provided in the fact sheets is based on a screening of secondary literature followed by validation interviews with internal and/or external experts.

In addition to the commodity profiles, a profile on the topic of transport and logistics was also drawn up. The logistics sector is to be understood as a cross-cutting issue (cf. Weiß et al. 2020), because risks in the logistics sector are often not recorded as sector-specific or commodity-specific risks, but are relevant for all companies, as the transport and storage of raw materials or products are indispensable. The logistics sector fact sheet was prepared using the same methodological approach as the commodity fact sheets.

Sources

Bundesministerium für Ernährung und Landwirtschaft (BMEL) o. J.: Die Charta. Charta Ziele (online: BMEL). *https://www.charta-fuer-holz.de/index.php?id=11876* (last accessed 12.07.2021).

Dehoust, Günter; Manhart, Andreas; Dolega, Peter; Vogt, Regine; Kemper, CLaudia; Auberger, Andreas; Becker, Fiona; Scholl, Christine; Rechlin, Aissa and Michael Priester 2020: Environmental Criticality of Raw Materials. An assessment of environmental hazard potentials of raw materials from mining and recommendations for an ecological raw materials policy (Dessau-Roßlau: Umweltbundesamt). *https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2020-06-17_texte_80-2020_oekoressii_environmentalcriticality-report_.pdf* (last accessed 12.07.2021).

Drive Sustainability; Responsible Minerals Initiative (RMI); The Dragonfly Initiative 2018: Material Change. A study of risks and opportunities for collective action in the materials supply chains of the automotive and electronics industries (online: Drive Sustainability, RMI, The Dragonfly Initiative). *https://drivesustainability.org/wp-content/uploads/2018/07/Material-Change_VF.pdf* (last accessed 28.07.2021).

Scherf, Cara-Sophie; Gailhofer, Peter; Hilbert, Inga; Kampffmeyer, Nele and Tobias Schleicher 2019: Umweltbezogene und menschenrechtliche Sorgfaltspflichten als Ansatz zur Stärkung einer nachhaltigen Unternehmensführung (Dessau-Roßlau: Umweltbundesamt). *https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2019-09-03_texte_102-2019_ap_1-unternehmerische-sorgfaltspflichten.pdf* (last accessed 10.03.2021).

Weiß, Daniel; Garcia, Bibiana; van Ackern, Pia; Rüttinger, Lukas; Albrecht, Patrick; Dech, Marlene and Jutta Knopf 2020: Die Achtung von Menschenrechten entlang globaler Wertschöpfungsketten Risiken und Chancen für Branchen der deutschen Wirtschaft (Berlin, Stuttgart, Eberswalde: adelphi, Ernst & Young, Hochschule für nachhaltige Entwicklung Eberswalde). *https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschen-rechten-entlang-globaler-wertschoepfungsketten.pdf;jsessionid=D17573D5FC6ED7D90A64C8616B4B0E37.delivery1-replication?__blob=publicationFile&v=1* (last accessed 05.07.2021).

2. Mineral raw materials

2.1. Bauxite

Industries:

automobile, rail vehicles, mechanical electronics, packaging, construction

Typical products:

aluminium foil, components of vehicles, railways and aircrafts, components of machines, pipes, cans, household items, bicycles, electrical lines

Bauxite (Aluminium)

To the point

- Aluminium is extracted from the aluminium ore bauxite, which is mined in Australia, China, Guinea and Brazil, among other places (see world map below).
- Germany imports bauxite, which is processed into alumina in Germany's only alumina plant in Stade (Weyerer 2020).
- To meet demand, Germany also imports additional alumina, which is then processed into aluminium in aluminium smelters (see table below). In 2016, Germany was the world's second largest importer of aluminium oxides (Kind and Engel 2018).
- Other imported goods include unalloyed and alloyed raw aluminium as well as aluminium-containing waste, scrap and slag (Kind and Engel 2018).
- Aluminium is particularly important to the German automotive sector and machine industry (Kind and Engel 2018).
- Human rights and environmental risks are manifold; they range from land consumption in bauxite mining and related land use and property conflicts to the high energy demand of aluminium smelters – which is why both stages of the value chain are considered in this fact sheet.

Countries of origin

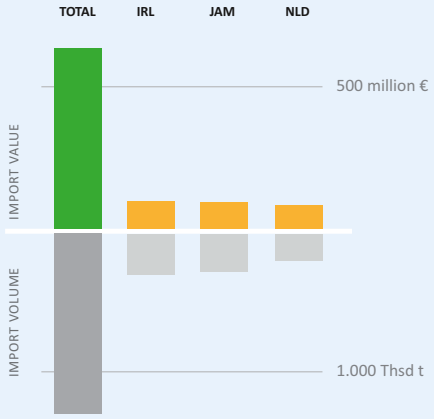
Imports of Bauxite to Germany

Total import volume and value

4 DIGIT CLASSIFICATION OF GOODS	DESCRIPTION	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
WA 2818	Corundum, aluminium oxide, aluminium hydroxide	1.302,24	640,56

Main trading partners (imports) for Aluminium oxides to Germany

COUNTRY	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
Ireland (IRL)	292,26	98,25
Jamaica (JAM)	270,89	93,20
Netherlands (NLD)	191,89	82,36



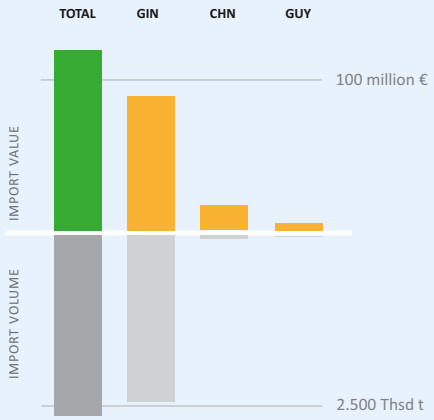
Source: Genesis – Destatis

Total import volume and value

6 DIGIT CLASSIFICATION OF GOODS	DESCRIPTION	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
WA 260600	Aluminium and its concentrates	2.636,10	119,82

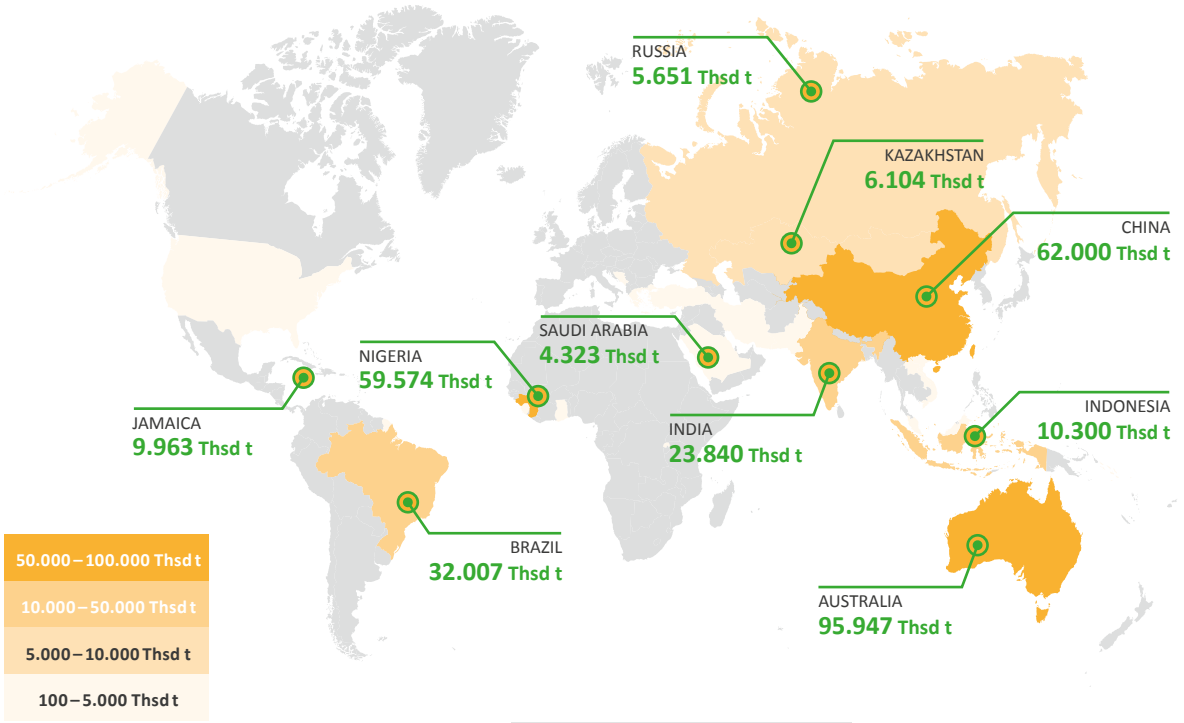
Main trading partners (imports) for Aluminium ores to Germany

COUNTRY	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
Guinea (GIN)	2.431,11	89,36
China (CHN)	47,86	16,28
Guayana (GUY)	12,34	4,72



Source: Genesis – Destatis

Production countries



Production volume in tonnes (Thsd t) per year (2018)

Global total output: **326.000 Thsd t**

Source: BGS 2020

Structural features

The main export goods of the German economy are vehicles and automotive parts as well as machinery, which together accounted for 30 % of the total export value (EUR 362.7 billion) in 2020 (Destatis 2021). Both sectors rely on the secure and constant supply of aluminium.

Aluminium is mainly extracted from the aluminium ore bauxite[7] and is primarily mined on an industrial scale. Many important bauxite deposits are located in tropical and subtropical regions near the equator (e. g. Brazil, Guyana, Guinea), where the bauxite typically occurs in relatively thin layers located a few metres under the surface (cf. Kvande 2011). Moreover, since ore deposits often extend over vast areas, bauxite extraction has a relatively high degree of land consumption. Only a small proportion of bauxite is extracted by underground mining (IAI et al. 2018). After mining, the bauxite is first crushed and then processed into alumina by the Bayer process and finally into aluminium metal by fused-salt electrolysis in aluminium smelters (Hall-Héroult process). Depending on the ore content, 4–6 tonnes of bauxite are required to refine 2 tonnes of alumina, which in turn is smelted to produce one tonne of aluminium metal (IAI et al. 2018). The further processing of bauxite into alumina produces 1–1.5 tonnes of insoluble residues per tonne of alumina produced, also known as red mud, which must then be properly stored (Kind and Engel 2018). In addition, the high electricity consumption of both the Bayer process and fused-salt electrolysis make aluminium production the most energy-intensive industrial sector in the world (Rüttinger et al. 2016; Kind and Engel 2018).

In order to meet its aluminium needs, Germany imports bauxite, which is processed into alumina in Germany's only alumina plant in Stade (Weyerer 2020). Germany also imports aluminium oxides, which together with the aluminium oxide from Stade are processed into pure aluminium in aluminium smelters. Other imported

7 Bauxite is almost exclusively extracted industrially, as small-scale mining is usually not profitable due to the relatively low price of approx. 30–45 USD/t (Vasters and Franken 2020). This is exacerbated by the high transport costs associated with bauxite extraction (Vasters and Franken 2020). In an international comparison and from a risk perspective, small-scale bauxite mining is therefore not a priority.

goods include unalloyed and alloyed raw aluminium as well as waste, scrap and slag that contains aluminium (Kind and Engel 2018).

The production of recycled (secondary) aluminium involves significantly lower risks than primary aluminium production, because secondary aluminium production not only "skips" the raw material extraction step, but also requires only around 5 % of the energy and causes only around 5 % of the emissions (Kind and Engel 2018). In 2016, recycled aluminium accounted for 52 % of total aluminium production in Germany (Kind and Engel 2018).

Significant human rights risks

Bauxite mining:

Health and safety at work

- Air pollution and the resulting poor air quality can lead to health risks for workers and people living near open pits or busy mining roads. Inhalation of particulate matter can cause emphysema, pneumonia, tuberculosis, cancer, asthma and severe organic damage (Jamaica Environment Trust 2020).

- Bauxite dust has high iron oxide content, which is why it takes on a red colour (Lee et al. 2017). This red (fine) dust is caused, on the one hand, directly by mining activities (excavations, blasting) and, on the other hand, by transport, during which large quantities of dust are stirred up, spreading to adjacent areas (HRW 2018). In addition to the above-mentioned risks related to air pollution and the inhalation of fine dust, bauxite dust can also impair visibility and affect workers and residents (Lee et al. 2016).

Discrimination

- In Jamaica, the transition from agriculture to mining and the relocation of farming families to (semi-)urban regions or to resettlement sites with sometimes very poor conditions for agriculture reportedly led to the disappearance of agricultural communal structures. This had consequences for the social and cultural life of the Jamaican (village) population. At national level, there was a decline in the active cultivation of agricultural land and an acceleration of the rural exodus (Jamaica Environment Trust 2020).

Further processing:

Health and safety at work

- The red mud[8] produced during further processing, with its high content of pollutants such as arsenic, mercury and chromium, can pose a health hazard to residents of surrounding communities if not properly stored in landfills, e. g. if leachates containing toxic residues enter groundwater (Kind and Engel 2018).

- There are currently about 80 alumina factories, 30 of which are located in China. During a red mud dam break in 2016, two villages in China's Henan Province were flooded with red mud. There were no fatalities, but many animals were buried under the mud and over 400 people had to be evacuated (Stanford 2016). There was a similar case in Hungary in 2010 in the town of Ajka, where ten people died and another 150 suffered chemical burns (Stanford 2016).

8 Red mud is a waste product produced during the processing of bauxite into alumina by Bayer process (Stanford 2016).

Bauxite mining:

Land use and property rights

- In the context of large-scale mining projects in Guinea, land use and property conflicts have occurred between mining companies and residents of surrounding communities or indigenous groups whose fertile farmland has been destroyed without adequate compensation (HRW 2018).

- Similar conflicts have occurred in Queensland and Australia because, according to observers, the government disregarded the Wik/Wik Waya indigenous group's claim to lands and awarded concessions to multinational bauxite companies. The Wik/Wik Waya were not adequately involved in decision-making processes and their claims to self-determination were disregarded, which is contrary to the right of indigenous peoples to Free, Prior and Informed Consent (FPIC) (Doyle et al. 2015).

- In Guinea, the loss of previously cultivated farmland has consequences for the food security of local residents. According to a report, the agricultural land converted to bauxite mining can no longer be used for subsistence farming, which endangers the livelihoods of local residents. Other sources of income, such as fishing, can also be affected by mining activities (HRW 2018).

Further processing:

Health and safety at work

- The production of pure aluminium by fused-salt electrolysis in aluminium smelters is very energy-intensive. In some countries, aluminium production is therefore also linked to the construction of dams to generate electricity. For example, the Sayana-Shushenskaya dam in Russia supplies four aluminium smelters in Siberia (NS Energy 2020).[9] During an accident there in 2009, more than 70 people lost their lives and several thousand fled the affected region for fear that the dam would burst. (Spiegel 2009). After extensive restoration and modernisation work, operations resumed in 2014 (NS Energy 2020).

Land use and property rights

- A further problem arises from the high degree of land consumption during the construction of dams (which in turn is linked to deforestation); indigenous groups may lose their habitat. These regions may also experience increased migration of workers and their families as a result of mining and dam activities, which may result in further displacement of indigenous groups from their lands (Rüttinger et al. 2016).

9 For a full disclosure of risks of building and operating dams, see: Russau 2016, "Das Geschäft mit der Wasserkraft: Schlaglichter auf europäische Konzerne."

Significant environmental risks

Bauxite mining:

Water consumption and water availability

- Bauxite mining can have consequences for access to clean water. Mining activities can reduce both water levels[10] and water quality, causing local communities who need water for everyday use to travel further and further in search of water sources. This is reportedly a problem in Guinea, for example, and particularly affects women and girls who are often responsible for fetching water. Pressure on already scarce water resources is further increased by the influx of people seeking work in the mines (HRW 2018).

Soil and (ground)water pollution

- Furthermore, mining activities can pollute water, the availability of which may already be limited depending on the region (cf. Kind and Engel 2018). Firstly, through chemicals used in mining, and secondly, through waste products from the mining process and seepage, which end up in surface waters or groundwater due to a lack of safety precautions (Kind and Engel 2018). A direct impact of water pollution is fish kills. The drinking water of surrounding communities can also become contaminated (Kind and Engel 2018).

10 As with other commodities, bauxite mining requires large amounts of water, for example to wash the minerals or to reduce dust by irrigating the roads and mining sites (Ugya et al. 2018). This is an increased problem in Guinea, which suffers from water scarcity (HRW 2018).

Further processing of bauxite:

Air pollution and emissions

- Due to the high energy demand, aluminium smelters are mostly located at sites with low energy costs and are operated with energy from nearby coal-fired or hydroelectric power plants (61 % of aluminium smelters worldwide obtain energy from coal-fired power plants; see Kind and Engel 2018). This leads to high greenhouse gas emissions and, in relation to the construction of dams (for example in Brazil), can also lead to massive interventions in nature[11] with unforeseeable negative consequences (Rüttinger et al. 2016).

Environment and waste

- When bauxite is processed into alumina using the Bayer process, 1–1.5 tonnes of red mud are produced for every tonne of alumina produced. In addition to the main component, iron oxide, this red mud also contains caustic soda and, depending on the origin of the bauxite, numerous toxic heavy metals. If the red mud is not properly stored or discharged into water bodies, serious environmental damage can occur. As a long-term environmental impact, red mud can lead to soil salinization, which poses a major problem, not least for agriculture (Kind and Engel 2018).

11 In this context, both the damming of rivers and the deforestation carried out to gain reservoir space can have massive negative impacts on the ecosystem (Rüttinger et al. 2016). See also: Russau 2016, “Das Geschäft mit der Wasserkraft: Schlaglichter auf europäische Konzerne.”

Bauxite mining:

Biodiversity and deforestation

- Bauxite extraction in opencast mines is very land-intensive. In order to reach the bauxite layers, topsoil and all vegetation must be removed (Rüttinger et al. 2016; Kind and Engel 2018), which leads to the deforestation of tropical primary forest in Brazil, for example (Rüttinger et al. 2016).

- As with many other mining activities, bauxite mining requires the creation of infrastructure in the form of roads (often to remote locations). In addition to the logging activities directly associated with it, illegal logging may additionally occur along the roads (Rüttinger et al. 2016; Griffin 2020).

- The reddish-brown dust released during bauxite mining and transport can also lead to ecosystem stress. This is a problem in Guinea, for example, where the dust settles over trees and fields during the month-long dry season, causing crops to become unproductive (HRW 2018). In Malaysia, on the other hand, heavy rainfall has in the past driven bauxite dust into surrounding water bodies and caused fish kills (Hansen 2016).

- The mined bauxite is partly transported by barge via (formerly low-use) rivers such as the Rio Nunez in Guinea or the Amazon in Brazil, which can negatively impact river fish stocks (Borges and Branford 2020; HRW 2018).

Environment and waste

- Even after the closure of bauxite mining sites, the consequences for ecosystems and biodiversity last for a long time. The former mining areas can only be used again after recultivation[12], which, however, cannot fully restore the original state of the ecosystem (Whitebread-Abrutat 2012 in Rüttinger et al. 2016).

12 If abandoned mines are poorly recultivated or not recultivated at all, it is difficult for flora and fauna to re-establish because the fertile humus soil has been destroyed. In some cases, there is a risk of toxic heavy metals or chemicals being released into the environment. Furthermore, erosion of the remaining soil layers can occur, which has a negative impact on natural river courses and, as a result, aquatic biodiversity if eroded soil layers are deposited in rivers. This is a risk in the mining sector as a whole (Coelho, Teixeira and Goncalves 2011).

Linking human rights and environmental concerns

In the mining of bauxite and the production of aluminium, human rights and environmental risks are closely related. One example is the (fine) dust pollution caused by bauxite mining. On the one hand, this puts a strain on local ecosystems, such as in Guinea, where reddish brown dust settles over trees and fields during the dry season, rendering crops unproductive (HRW 2018). On the other hand, this dust pollution also poses a health risk to local residents. As a result, dust reduction methods can have a positive impact on both the environment and human rights. In choosing such methods, attention must again be paid to unintended side effects. For example, water is often used on transport routes and extraction sites to reduce dust production. However, this can exacerbate the problem of water scarcity, particularly in arid regions.

Recommendations for actions

Find out where the aluminium/ bauxite comes from:

In principle, tracing primary aluminium back to the smelter is possible due to the manageable number of bauxite mines and primary smelters. The primary smelters would in turn need to be able to show where they source their bauxite from. Depending on what aluminium products are purchased or how many people are involved in processing and trading, traceability may prove more difficult at later supply chain stages (Melanie Williams Consulting 2016). In this context, certification schemes play an important role. Furthermore, technological solutions are currently being developed. Recently, for example, the Norwegian company Hydro and the Brazilian mining company Rio Tinto have launched blockchain solutions for aluminium traceability (Ledger Insights 2021).

Sourcing certified and traceable aluminium:

Certification systems that provide reliable information and have good social and environmental standards provide orientation for companies and consumers and increase traceability in the supply chain. One example is the Aluminium Stewardship Initiative (ASI), which certifies companies and also enables the traceability of products within the framework of its ASI CoC (Chain of Custody) standard. The ASI CoC standard uses a mass balance system that mixes ASI-certified aluminium with non-certified aluminium[13]. The Initiative for Responsible Mining Assurance (IRMA) in turn certifies mines.

13 However, non-certified aluminium must also meet certain criteria. For a detailed description of the approach, see: *https://aluminium-stewardship.org/download/64262/*.

Focus on sustainable energy in aluminium production and/or secondary aluminium:

The production of aluminium has a high level of energy consumption. Secondary production from recycled aluminium scrap requires only about 5 % of the energy compared to primary production of aluminium from bauxite ore (Kind and Engel 2018). The catalyst for improvements in the energy balance of aluminium production is therefore to increase secondary production (IEA 2020). At the same time, switching to sustainable energy sources entails a decarbonisation of the sector (IEA 2020). The sourcing of sustainable (e. g. produced from sustainable energy sources) and recycled aluminium reduces some of the risks listed here, as the bauxite is recovered instead of being newly mined. This also saves a considerable amount of energy (Gesamtverband der Aluminiumindustrie e. V. o. J.). The main focus of recycling is on the reprocessing of aluminium scrap. In addition, recycling companies should also try to recycle the materials that are needed for aluminium production in the plants, as well as new scrap from within the company (Gesamtverband der Aluminiumindustrie e. V. o. J.).

Future prospects

Circular economy solutions for aluminium:

In principle, aluminium can easily be fed into the circular economy, as it can be recycled multiple times without any loss of quality (Kind and Engel 2018). In practice, however, the various alloys and metals are not always easy to separate from the product and the sorting processes are inadequate, which is why there are often losses in quality during recycling (Schneider 2019). Another limiting factor for recycling rates is the availability of recyclable aluminium material (Kind and Engel 2018). Companies should therefore preferably strive for circular economy solutions and ensure that products are also recyclable when designing them (UBA 2019). Furthermore, better sorting of aluminium scrap can counteract the loss of alloy components (UBA 2019). Companies could also rely on new technologies and processes to ensure better processing of aluminium scrap.

Selection of initiatives and certificates

- The International Aluminium Institute (IAI)
  -> “Aluminium for future generations” Initiative
- Aluminium Stewardship Initiative (ASI)
- The Global Aluminium Foil Roller Initiative (GLAFRI)
- Initiative for Responsible Mining Assurance (IRMA)
- Extractive Industries Transparency Initiative (EITI)

Sources

British Geological Survey (BGS) 2020: World Mineral Production 2014–18 (Nottingham: BGS) *https://www2.bgs.ac.uk/mineralsuk/statistics/worldStatistics.html* (last accessed 15.07.2021).

Borges, Thais and Sue Branford 2020: MRN bauxite mine leaves legacy of pollution, poverty in Brazilian Amazon (online 04.07.2020: Mongabay). *https://news.mongabay.com/2020/06/mrn-bauxite-mine-leaves-legacy-of-pollution-poverty-in-brazilian-amazon/* (last accessed 07.07.2021).

Coelho, P.C.S.; Teixeira, J.P.F. und Goncalves, O.N.B.S.M. 2011: Mining Activities: Health Impacts. In: Encyclopaedia of Environmental Health: 788–802. DOI: 10.1016/B978-0-444-52272-6.00488-8.

Doyle, Cathal M.; Tugendhat, Helen and Robeliza Halip 2015: Mining, the Aluminium Industry, and Indigenous Peoples: Enhancing Corporate Respect for Indigenous Peoples' Rights (Chiang Mai, Gloucestershire, Gland: Asia Indigenous Peoples Pact, Forest Peoples Programme, International Union for Conservation of Nature and Natural Resources). *https://aluminium-stewardship.org/wp-content/uploads/2017/04/Mining-the-Aluminium-Industry-and-Indigenous-Peoples-Nov2015.pdf* (last accessed 01.07.2021).

Gesamtverband der Aluminiumindustrie e. V. o. J.: Aluminium Lexikon – der Werkstoff von A–Z (online: GDA). *http://www.aluinfo.de/aluminium-lexikon-detail.html?id=66* (last accessed 07.04.2021).

Griffin, Oliver 2020: Amazon road-building could deforest millions of hectares: report (online 19.11.2020: Reuters). *https://www.reuters.com/article/us-latam-deforestation-idUKKBN27Z1S6* (last accessed 12.07.2021).

Hansen, Sven 2016: Bauxit-Abbau zeitweise ausgesetzt (online 08.01.2016: Taz). *https://taz.de/Umweltzerstoerung-in-Malaysia/!5263439/* (last accessed 07.07.2021).

Human Rights Watch (HRW) 2018: "What Do We Get Out of It?" The Human Rights Impact of Bauxite Mining in Guinea (New York City: HRW). *https://www.hrw.org/sites/default/files/report_pdf/guinea1018_web2.pdf* (last accessed 07.04.2021).

International Aluminium Institute (IAI), Australian Aluminium Council (AAC) and Brazilian Aluminium Association (ABAL) 2018: Sustainable Bauxite Mining Guidelines (First Edition) (London: IAI). *https://www.world-aluminium.org/media/filer_public/2018/05/18/170518_sbmg_final.pdf* (last accessed am 07.04.2021).

International Energy Agency (IEA) 2020: Aluminium (Tracking Report) (online: IEA) *https://www.iea.org/reports/aluminium* (last accessed 07.04.2021).

Jamaica Environment Trust (JET) 2020: Red dirt. A multidisciplinary review of the bauxite-aluminium industry in Jamaica (Kingston: JET). *https://www.jamentrust.org/wp-content/uploads/2021/01/JET%20-%20Red%20Dirt%20Book%20FINAL%20-%20For%20print.pdf* (last accessed 21.05.2021)

Kind, Tobias and Katalina Engel 2018: Rohstoffboom zwischen Gewinnen und Verlusten. Deutschlands ökologischer Fußabdruck durch Stahl und Aluminium (Berlin: World Wildlife Fund). *https://www.Kind und Engel 2018.de/fileadmin/user_upload/KIND UND ENGEL 2018-Analyse-Stahl-und-Aluminium-Rohstoffboom-zwischen-Gewinnen-und-Verlusten.pdf* (last accessed 07.04.2021).

Kvande, H. 2011: "Production of primary aluminium" in Fundamentals of Aluminium Metallurgy: Production, Processing and Applications (Sawston: Woodhead Publishing Series in Metals and Surface Engineering). *https://www.sciencedirect.com/science/article/pii/B9781845696542500031#!* (last accessed 01.07.2021).

Leder Insights 2021: Aluminium firm Hydro pilots DNV blockchain solution for sustainable traceability (online 02.03.2021: Leder Insights). *https://www.ledgerinsights.com/aluminium-firm-hydro-pilots-dnv-blockchain-sustainable-traceability/* (last accessed 08.07.2021).

Lee, K.Y.; Ho, L.Y.; Tan, K.H.; Tham, Y.Y.; Ling, S.P.; Qureshi, A.M.; Ponnudurai, T. and Nordin, R. 2017: Environmental and Occupational Health Impact of Bauxite Mining in Malaysia: A Review. In: International Medical Journal of Malaysia 16 (2): 137–150. *https://doi.org/10.31436/imjm.v16i2.346* (last accessed 08.07.2021)

Melanie Williams Consulting 2017: Tracing aluminium through the supply chain (online 12.09.2016: Melanie Williams Consulting). *https://melaniewilliamsconsulting.com/news/Tracing%20aluminium%20through%20the%20supply%20chain/* (last accessed 07.04.2021).

NS Energy 2020: Russia's top five hydroelectric power plants profiled (online 27.02.2020: NS Energy). *https://www.nsenergybusiness.com/features/russias-top-five-hydroelectric-power-plants-profiled/* (last accessed 07.07.2020).

Russau, Christian 2016: Das Geschäft mit der Wasserkraft: Schlaglichter auf europäische Konzerne – Die Auswirkungen auf Menschen und Umwelt einer vermutlich umweltfreundlichen Technologie (Berlin, Köln: GegenStrömung, Institut für Ökologie und Aktions-Ethnologie (INFOE)). *https://www.gegenstroemung.org/web/wp-content/uploads/2017/03/STUDIE_STAUDA%CC%88MME_online.pdf* (last accessed 07.07.2021).

Rüttinger, Lukas; Treimer, Robert; Tiess, Günter and Laura Griestop 2016: Umwelt- und Sozialauswirkungen der Bauxitgewinnung und Aluminiumherstellung in Pará, Brasilien (Berlin: adelphi). *https://www.umweltbundesamt.de/sites/default/files/medien/378/dokumente/umsoress_fallstudie_bauxit_brasilien_finale_version.pdf* (last accessed 07.04.2021).

Schneider, Andreas 2019: Darum ist Aluminium nicht gut für die Umwelt (online 13.09.2019: Quarks). *https://www.quarks.de/umwelt/muell/darum-ist-aluminium-nicht-gut-fuer-die-umwelt/* (last accessed 02.06.2021).

Spiegel 2009: Mehr als 70 Tote nach Kraftwerksunglück befürchtet (online 18.08.2009: Spiegel). *https://www.spiegel.de/panorama/sibirien-mehr-als-70-tote-nach-kraftwerksunglueck-befuerchtet-a-643474.html* (last accessed 07.07.2021).

Standford, Ken 2016: Red mud – addressing the problem (online 15.11.2016: aluminiuminsider.com). *https://aluminiuminsider.com/red-mud-addressing-the-problem/* (last accessed 05.07.2021).

Statistisches Bundesamt (Destatis) 2021: Wichtigstes deutsches Exportgut 2020: Kraftfahrzeuge. (online 2021: DESTATIS) *https://www.destatis.de/DE/Themen/Wirtschaft/Aussenhandel/handelswaren-jahr.html* (last accessed 21.05. 2021).

Statistisches Bundesamt (Destatis), GENESIS-Online Datenbank, *https://www-genesis.destatis.de/genesis/online* (last accessed 30.06.2021)

Ugya, A; Ajibade, Fidelis O. and Temitope F: Ajibade 2018: Water Pollution Resulting from Mining Activity: An Overview. Proceedings of the 2018 Annual Conference of the School of Engineering &Engineering Technology (SEET), The Federal University of Technology, Akure, Nigeria. *https://www.researchgate.net/publication/326925600_Water_Pollution_Resulting_From_Mining_Activity_An_Overview* (last accessed 22.04.2021).

Umweltbundesamt (UBA) 2019: Aluminium. Factsheet (Dessau-Roßlau: UBA). *https://www.umweltbundesamt.de/sites/default/files/medien/3521/dokumente/factsheet-aluminium_fi_barrierefrei.pdf* (last accessed 07.04.2021).

Umweltbundesamt (UBA) 2021: Gesundheitsrisiken durch Ozon (online 08.02.2021: UBA). *https://www.umweltbundesamt.de/daten/umwelt-gesundheit/gesundheitsrisiken-durch-ozon* (last accessed 02.06.2021).

Vasters, Jürgen and Gudrun Franken 2020: Aluminium. Informationen zur Nachhaltigkeit (Hannover: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)). *https://www.deutsche-rohstoffagentur.de/DE/Gemeinsames/Produkte/Downloads/Informationen_Nachhaltigkeit/aluminium.pdf?__blob=publicationFile&v=2* (last accessed 15.07.2021).

Weyerer, Godehard 2020: Deutschlands einzige Fabrik für Aluminiumoxid (online 01.10.2020: Deutsche Welle). *https://www.dw.com/de/deutschlands-einzige-fabrik-f%C3%BCr-aluminiumoxid/a-51919971* (last accessed 02.06.2021).

2.2. Gold

Industries:

jewellery sector, industrial sector, electronic industry, medical and dental industry

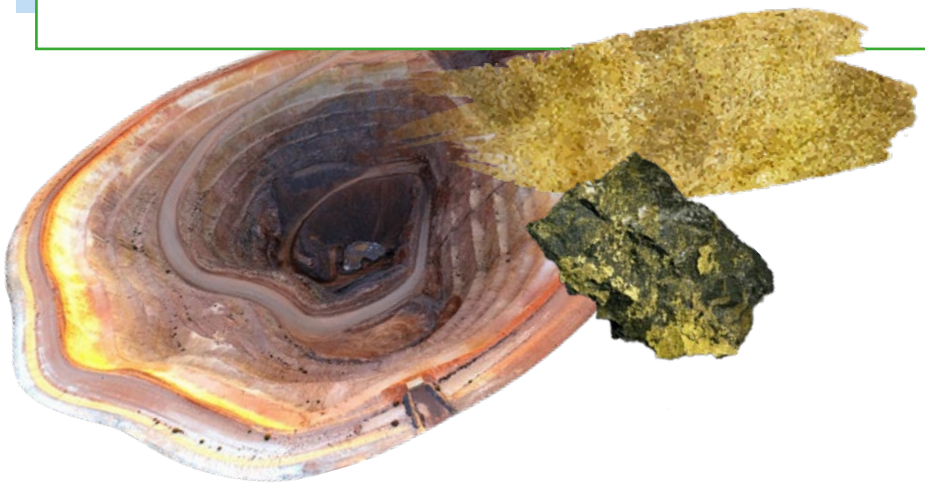
Typical products:

rings, chains, printed circuit boards, switching contacts, processors, chips, fuel cells

Gold

To the point

- Gold is sourced from industrial mining (LSM), artisanal and small-scale mining[14] (ASM) and recycling.
- About 80 per cent of global primary gold production comes from industrial mining, which employs only 10 per cent of the global gold mining workforce (Gronwald 2019).
- The remaining 90 per cent of the workforce is employed in small-scale mining (approximately 20 million people), which takes place in the formal and informal sectors of about 80 countries (Gronwald 2019).
- While small-scale mining is particularly vulnerable to human rights and environmental risks, it also holds enormous potential for the socio-economic development of the mining regions.
- Human rights risks in industrial mining are mainly related to land use and property conflicts, while environmental risks are mainly found in the area of biodiversity and deforestation.
- Gold is considered a so-called “conflict mineral” and is covered by the EU Conflict Minerals Regulation, which came into force in January 2021.



14 Although there are still significant differences between artisanal mining methods and other forms of small-scale mining, these are not examined in more detail below. Instead, the term "small-scale mining" is used as an umbrella term that refers to artisanal, small-scale and micro-mining processes.

Countries of origin

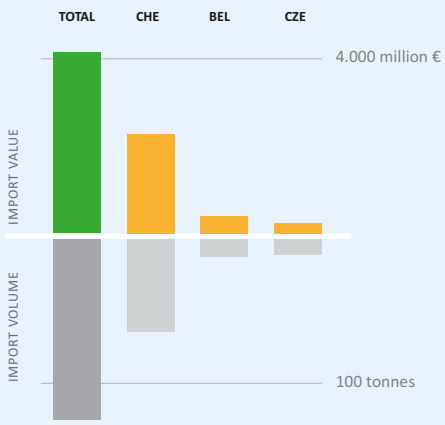
Imports of Bauxite to Germany

Total import volume and value

4 DIGIT CLASSIFICATION OF GOODS	DESCRIPTION	IMPORT VOLUME (tonnes)	IMPORT VALUE (MILLION €)
WA 7108	Gold, in raw form, as semi-finished product or in powder	125,20	4.067,55

Main trading partners (imports) for Gold in raw form to Germany

COUNTRY	IMPORT VOLUME (tonnes)	IMPORT VALUE (MILLION €)
Switzerland (CHE)	64,00	2.209,20
Belgium (BEL)	12,00	426,03
Czech Republic (CZE)	10,80	228,78



Source: Genesis – Destatis

Structural features

Gold is sourced from industrial mining, artisanal and small-scale mining, and recycling. While recycled gold is relatively low risk[15], gold mining poses specific risks to human rights and the environment, depending on whether the gold ore is extracted through industrial mining or small-scale mining. The majority of gold mined worldwide comes from industrial mining. However, as industrial mining is highly mechanized, only a comparatively small proportion of all gold mining workers are involved in industrial gold mining (Hütz-Adams and Müller 2012). It is estimated that only about 10 % of the world's gold miners work in industrial mining, and the remaining 90 % work in small-scale mining (Gronwald 2019). As small-scale mining is often located in the informal sector[16], it is particularly vulnerable to negative human rights and environmental impacts (Gronwald 2019). In addition to informal mining, illegal small-scale mining also exists. The latter is characterised in particular by the fact that formalization or licensing is not desired or is not sought (Rüttinger et al. 2015). Since in some mining locations criminal, armed groups also finance themselves through gold mining (Gronwald 2019), gold is considered a so-called "conflict mineral" and is covered by the EU Conflict Minerals Regulation, which came into force in January 2021.

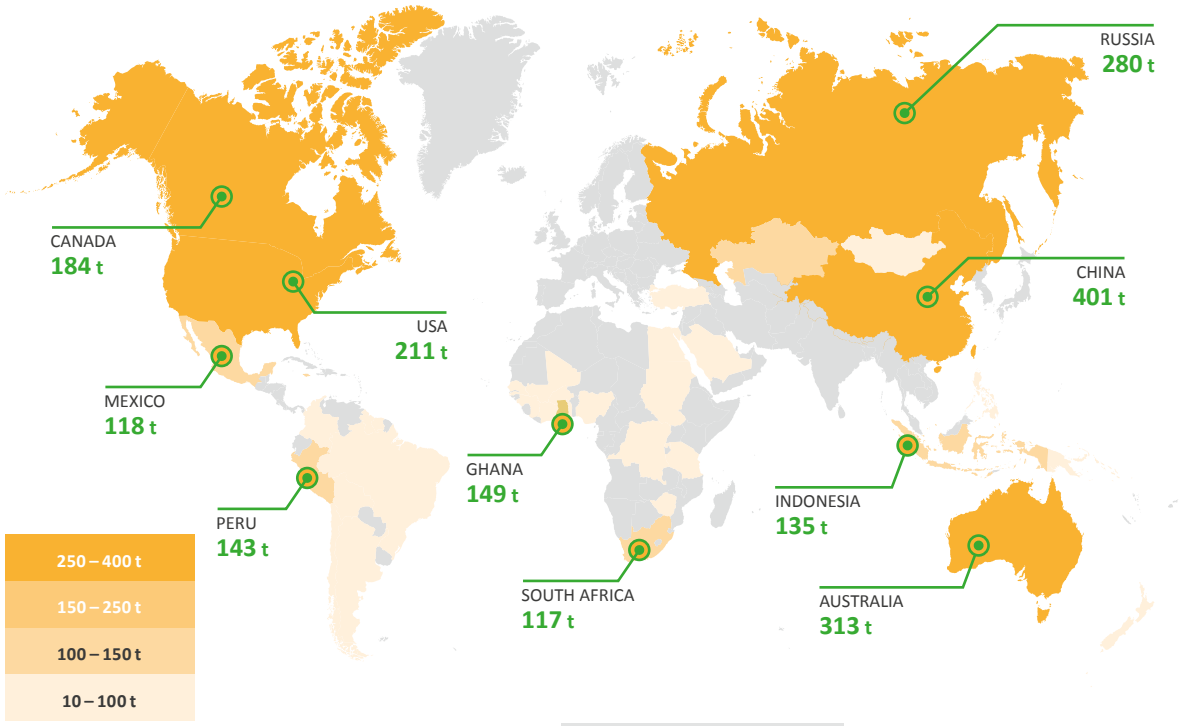
15 Although recycled gold is in principle less risky than primary gold, due diligence obligations (e. g. in the sense of EU Conflict Minerals Ordinance) are not always applied to recycling materials and by-products such as production residues (cf. BDI et al. 2020). In principle, there is a risk that primary gold will be illegally channelled into the recycling refineries. For a discussion of the issue, see for example Hütz-Adams and Müller 2012, "In search of clean gold: small-scale mining and gold in Peru and DR Congo".

16 Small-scale mining is located in both the formal and informal sectors. In some countries, 70–80 % of small-scale miners work in the informal sector (IGF 2018 in Gronwald 2019).

Small-scale mining is of great socio-economic importance, as it is a way out of poverty for many people and partly takes place in regions where there are insufficient economic alternatives (Fritz et al. 2017). It is estimated that 350–400 tons of the world's mined gold (3,350 tons in total; see world map above) comes from small-scale mining. Major producing countries include Sudan, Peru, Ghana, Nigeria, Colombia, Indonesia, the Philippines, Tanzania, the Democratic Republic of Congo (DRC), and Madagascar and Burkina Faso (BGR 2018 in Nearer 2021).

The process from the mining of gold ore to the further processable metal gold comprises several steps. In primary raw material deposits, gold occurs as gold ore, i. e. rock with a gold content. In the first step, these gold ores are mined. In the second step, after mining, the gold ores are crushed and then dissolved out of the rock mixture, often with the help of cyanide (in industrial mining) or mercury (in small-scale mining) (Gronwald 2019). Next, the gold enters refineries[17], which play the central role between the upstream and downstream gold supply chains (Gronwald 2019). Four of the world's nine largest refineries are located in Switzerland (the main supplier of gold to Germany and the world's largest gold exporter) and process up to 70 % of the world's mined gold in their smelters (Franciolli 2019). Refiners in Germany specialize in the extraction of recycled gold (Gronwald 2019). In addition to the gold imports mentioned above (see table), Germany also imported 5,441 tons of gold-bearing waste and scrap worth €601.5 million in 2018 (gold content unknown) (Destatis 2021). In Germany, a few kilograms of river gold are also extracted annually from rivers such as the Rhine or the Eder (Gronwald 2019).

Production countries



Production volume in tonnes (t) per year (2018)

Global total output: **3.350 t**

Source: BGS 2020

17 The term "refineries" is used here as a generic term and refers to both gold smelters (smelter) and refineries (cf. Gronwald 2019, p. 19 ff.).

Significant human rights risks

Industrial mining:

Health and safety at work

- Working in (gold) mines underground can lead to silicosis (pneumoconiosis), lung cancer and pulmonary tuberculosis, among other things, if workers are not adequately protected from inhaling fine dust and crystalline silica modifications. Hearing loss is another risk (Eisler 2003[18]; Spohr 2016[19]).

- Due to various factors, mines can collapse, which often ends fatally for mine workers (Spohr 2016).

Freedom of association and assembly

- In some countries and regions, it is not always possible for mine workers to join trade unions and campaign for the improvement of their working conditions. Joining trade unions is sometimes prevented by threats or punished by verbal insults, lower wage payments or dismissals[20] (Spohr 2016[21]).

18 The source looks at cases or reports of health impacts in Australia, Canada, Colombia, Brazil, Gabon, Ghana, Zimbabwe, Kenya and South Africa.

19 The source does not refer specifically to risks in gold mining, but to risks in industrial underground mining in general.

20 One example is the strike against unpaid overtime in the case of the open-pit gold mine "Essakane" in Burkina Faso, which is operated by the Canadian company Iamgold. Although the strike was legally carried out by the union in 2011, the company subsequently dismissed 77 employees (Engels 2016).

21 The case studies from the countries Zambia, Mexico and Peru do not refer specifically to gold mining, but to the mining of copper and silver. However, it can be assumed that these risks also exist in the gold sector, as the (indirect) prohibition of trade union membership by mining companies occurs particularly in countries where the right to freedom of association is not sufficiently protected by the state. According to reports by the International Trade Union Confederation (ITUC), this is the case in all of these countries, all of which received the second worst score (level 4 out of 5) in the 2020 ITUC Global Rights Index (ITUC 2020). In 2018 (see ITUC 2018), the countries' scores were similar (worse in the case of Mexico and Peru), suggesting that this is not a data bias due to the Corona pandemic, but systemic problems.

Small-scale mining:

Child labour

- More than one million children work in small-scale mining worldwide, often facing major health hazards (HRW 2018). Reports about child labour exist, among others, in Peru, Colombia (USDOL o. J.) and in the Philippines (HRW 2015). During gold mining, they can come into contact with mercury, for example, which is often used to extract gold from rock sands and can cause considerable damage to health. Mine collapses pose another risk (HRW 2018). Children working underground in mines are on average between nine and 17 years old (cf. Hütz-Adams and Müller 2012; HRW 2015).

Forced labour and human trafficking

- Forced labour in (illegal) small-scale gold mining poses a risk in the Democratic Republic of Congo (DRC), Burkina Faso and Peru, among others (USDOL 2018). In the context of forced labour, sexual violence in illegal small-scale mining also poses an increased risk (Gronwald 2019).

Health and safety at work

- Small-scale mining is very labour-intensive and is mostly done with the help of very simple machines. Working in self-dug, unstable and unsecured shafts is very dangerous. For example, tunnel collapses can occur and kill workers (Hütz-Adams and Müller 2012).

Industrial mining:

Discrimination

- In the case of forced relocation, discrimination is another risk, as illustrated by a case in Burkina Faso, where people were relocated to less fertile areas, which significantly worsened their living conditions (they depended on subsistence agriculture). In this process, women were disproportionately affected, as on the one hand they were largely not involved in decision-making processes[22] and on the other hand, they were mainly responsible for food production and water procurement. Resettlement to less productive land with fewer or lower-quality water resources in this way mainly affected women (Winkler and Straumann 2016).

Land use and property rights

- The development or expansion of mining areas can violate the land use and consultation rights of indigenous groups. Such cases have occurred in the past, for example, in Guatemala, Peru, Colombia and Uganda (Spohr 2016). Furthermore, cultural rights can be violated and unlawful forced displacement can occur (Spohr 2016).

Conflicts and security

- Mining projects that are carried out without (full) consultation can lead to conflicts with local residents and indigenous groups who are displaced from their land (Spohr 2016, 2019).

- Another cause of conflict is water: mining activities require a lot of water and can pollute bodies of water at the same time. This can jeopardise access to water for the local population, which can cause conflicts between the local population and industrial mining companies (Feldt 2011).

22 Participatory processes are part of the IFC Performance Standard (International Finance Corporation), according to which the resettlements of the mine "Essakan" of the Canadian company Iamgold in Burkina Faso have allegedly been carried out since 2009 (cf. Winkler and Strautmann 2016).

Small-scale mining:

Health and safety at work

- Mercury is often used to extract gold from alluvial deposits, e. g. in rivers. Occupational safety is often inadequate, and small-scale miners in countries such as Peru, the DRC, the Brazilian Amazon region, Surinam, Mongolia, Ghana and Tanzania are often directly exposed to toxic mercury (Hütz-Adams and Müller 2012; Spohr 2016). Direct skin contact and inhalation of vapours can lead to illness as well as long-term damage to the lungs, liver and kidneys. High doses can cause miscarriages and even death (Hütz-Adams and Müller 2012).

- Underground gold mining quickly leads to dust formation, and poor or missing ventilation systems contribute to the aggravation of dust exposure for workers. The health consequences for mine workers can include respiratory diseases such as asthma or lung cancer (Hütz-Adams and Müller 2012).

Freedom of association and assembly

- Many (informal) small-scale miners are not organised in trade unions, or only to a limited extent (Engels 2016). In some regions, however, union or union-like structures have emerged in recent years. In Bolivia, for example, miners who formerly worked in industrial mines and switched to small-scale mining have maintained their union membership or formed cooperatives. In Peru, on the other hand, there are cases of companies being set up by miners who have received training from development organisations (ELLA n. d.).

Discrimination

- Approximately 30 % of small-scale miners are women, who are often paid less than their male counterparts and mainly perform support tasks (ARM n. d.). Moreover, women are often not included in important decision-making processes in, for example, mining associations (Weldegiorgis et al. 2018).

Industrial mining:

Conflicts and security

- The criminalisation of protests also poses a risk. In several Latin American countries, including Panama, Honduras and Mexico, residents protested against the activities of Canadian (gold) mining companies[23] because the local population was not included in the governments' decisions. This reportedly resulted in, among other things, the closure of dialogue institutions and (police) violence. In Mexico, Colombia, El Salvador and Honduras[24], individuals resisting the Canadian companies have been the victims of threats, violence and sometimes even fatal attacks (Working Group on Mining and Human Rights in Latin America 2014).

23 The companies concerned are mainly gold producers. The incidents involve mining projects by the following companies: Gold Corporation Inc. (Honduras), Fortuna Silver Mines Inc. (Mexico), Petaquilla Minerals Ltd. (Panama).

24 The companies involved are predominantly gold producers. The incidents involve mining projects of the following companies: Pacific Rim Mining Corp. (El Salvador), Goldcorporation Inc. (Honduras and Colombia), Blackfire Exploration Ltd. (Mexico), Fortuna Silver Mines Inc. (Mexico).

Small-scale mining:

Wages and working conditions

- While small-scale mining is an important source of income for millions of people worldwide, some small-scale miners working in the informal sector do not have employment contracts and/or regulated employment relationships, which exposes them to potentially exploitative working conditions (Hütz-Adams and Müller 2012). Furthermore, given the informality of the sector, small-scale miners can often face various bureaucratic hurdles (e. g. problems accessing financial services or arbitrary demands by authorities). For many small-scale miners, formalization of the sector is a crucial goal (cf. case studies on Peru and eastern Congo in Hütz-Adams and Müller 2012).

Land use and property rights

- In small-scale mining, land conflicts can arise between indigenous groups and small-scale miners. This was the case in Peru, for example, where land concessions held by small-scale miners overlapped with land concessions held by indigenous groups and individual legal regulations on rights of use were not always widely accepted, but were met with violence (Hütz-Adams and Müller 2012).

Conflicts and security

- In conflict and high-risk areas[25] (e. g. DRC or Colombia), mines are sometimes controlled by armed groups that finance themselves through the income from the gold trade[26] (and other minerals) (Betancur Betancur 2020).

25 The term "conflict and high risk areas" is understood in the sense of the OECD definition. See: *http://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-for-Responsible-Business-Conduct.pdf*.

26 To disguise the illegal origin of gold, gold traders or jewellers either melt and process the gold themselves or market it as recycled gold. Such smelters are largely located in North Africa, India, East Asia and the Middle East (Hütz-Adams and Müller 2012).

Significant environmental risks

Industrial mining:

Water consumption and availability

- Large-scale industrial mining activities[27] often take place in (semi-)arid regions where water is scarce. As a result, mining can have a negative impact on water availability. In particular, mine drainage is problematic if the mine is located below the water table and large amounts of water have to be pumped out, which reduces the availability of water for the local population and environment (Spohr 2016).

Air pollution and emissions

- As with other minerals, gold mining releases (fine) dust through direct mining activities such as explosions and extraction processes and indirect activities like the construction of access roads and the transport of mine products. Fine dust can cause respiratory health problems and pollute soils, vegetation and water bodies (Spohr 2016).

Soil and (ground)water pollution

- Acid mine drainage[28], which occurs on spoil heaps or in abandoned mines, poses a risk to the environment as it can contaminate groundwater and soils (Spohr 2016).

- Large quantities of cyanide are used to dissolve the gold from the extracted rock. The cyanide leaching is mostly done in large open-air basins. If these retention basins are not safely constructed or are poorly maintained, there is a risk that the dams break and large quantities of chemicals escape in an uncontrolled manner, causing severe environmental damage. Leaks in the sealing liner can also cause chemicals to seep into the groundwater (Spohr 2016).

27 The source (Spohr 2016) refers to risks in the mining sector as a whole.
28 Acid mine drainage results from the oxidation of sulphide metals. As part of their commodity-based assessment scheme, Dehoust et al. (2020) assess the risk of acid mine drainage occurring in gold mining as high (level five out of five).

Small-scale mining:

Water consumption and water availability

- When mining primary gold deposits underground, large amounts of water are needed to blast gold ores out of the hard rock. In mountainous regions such as the Andes, however, water is scarce, which is why mining activities repeatedly lead to conflicts between small-scale miners and neighbouring communities (Hütz-Adams and Müller 2012).

Air pollution and emissions

- Mercury is most often used to separate rock and gold, which is improperly disposed of into nature and leads to the pollution of the environment, water and air. Approximately 40 % of the mercury escapes into the air (Hütz-Adams and Müller 2012).

Soil and (ground) water pollution

- Mercury disposed of in rivers can have far-reaching negative consequences for the ecosystem and can also lead to health impacts for humans if the mercury is ingested via fish as food (Welfens et al. 2013).

- The direct discharge of tailings into rivers, in combination with increased erosion due to deforestation and the use of dredgers, leads to the contamination of water bodies in Peru, for example, sometimes at distances of up to hundreds of kilometres from the mining activities (Rüttinger et al. 2015).

Industrial mining:

Biodiversity and deforestation

- Gold is a limited commodity and due to high mining rates, easily accessible gold deposits are largely depleted, which is why gold mining is expanding into socially and environmentally precarious areas (MiningWatch Canada 2019). This problem is exacerbated by the high land consumption of gold mining, which is fundamentally associated with considerable landscape changes (Wittmer et al. 2011).

- About 44 % of all mines (1,539 mines) are located in forests[29] (see Maddox et al. 2019). In addition, there are 1,826 mines that are currently being developed or are not in operation. The majority of these mines are open-pit mines. While these figures refer to industrial mining as a whole, the main minerals in mines located in forests are gold, iron and copper (Maddox et al. 2019). Industrial gold mines located in forests are found in Peru, Georgia, Turkey, Ghana, Indonesia, Suriname, French Guyana, and the Philippines, among other countries (Maddox et al. 2019).

- 7 % of all industrial mining projects located in forests are in tropical rainforests, which are particularly biodiverse and important for carbon sequestration (Maddox et al. 2019).

29 According to a World Bank analysis based on the 2015 Hansen Global Forest Loss Datasets, the Food and Agriculture Organization (FAO) definition of forests, and the 2015 Raw Materials Database (see Maddox et al. 2019).

Small-scale mining:

Biodiversity and deforestation

- In order to develop new gold deposits, large areas of forest are being cleared, for example in the Madre de Dios region in Peru, including forest areas in nature reserves (Rüttinger et al. 2015).

- Gold mining involves moving large amounts of soil material, resulting in the destruction of the natural landscape and increased soil erosion (Rüttinger et al. 2015)

Environment and waste

- Due to the use of rudimentary technology and the often inadequate training of miners in informal small-scale mining, the risks for negative environmental impacts in the sector are comparatively high (Gronwald 2019).

- If abandoned mines are poorly recultivated or not recultivated at all, it is difficult for flora and fauna to reestablish themselves because the fertile humus soil has been destroyed. In some cases, there is a risk of toxic heavy metals or chemicals being released into the environment. Furthermore, erosion of the remaining soil layers can occur, which has a negative impact on natural river courses and, as a result, aquatic biodiversity if eroded soil layers are deposited in rivers. This is a risk in the mining sector as a whole and also affects industrial mining[30] (Coelho, Teixeira and Goncalves 2011).

30 For example, there are abandoned industrial gold mines, some of which date back to colonial times and have been insufficiently or not at all recultivated. Some small-scale miners operate in such mines today, which leads to further risks for small-scale miners and the environment. Such cases exist in South Africa (Mhlongo and Akintola 2020; see also Festin et al. 2019) and the Democratic Republic of Congo (Geenen and Marijsse 2020), among others.

Linking human rights and environmental concerns

Human rights and environmental risks in gold mining can be closely interrelated. There are clear "co-impacts", such as in the context of mercury use in small-scale mining: released mercury can lead to significant air and water pollution, which in turn impairs the health of workers and residents and represents a human rights risk in addition to an environmental one. Measures that companies can take to reduce mercury use in small-scale mining can therefore have a positive effect on people and the environment alike. However, as much of the small-scale mining takes place in the informal sector and the people who work there often lack economic opportunities, environmental protection measures can also lead to conflicts with socio-economic goals if, for example, small-scale miners cannot implement the measures (due to a lack of knowledge or resources) and fines or other punitive measures are imposed. It is therefore important that the socio-economic situation of the workers is also taken into account in environmental protection measures. Accordingly, one could for example, combine environmental protection measures with state-sponsored formalisation and training processes to reduce mercury use in mining and create legal opportunities for miners.

Recommendations for action

Find out where the gold came from:

This step is initially central to avoiding the sourcing of "conflict gold". The European Conflict Minerals Regulation ((EU) 2017/821), which entered into force in January 2021, provides a legal framework to establish responsible sourcing standards for European gold imports and to ensure that European refiners source gold responsibly. Among other things, the regulation provides for a list of trusted refiners, although this does not constitute proof in terms of due diligence. However, there are recognised systems[31] considered as proof of due diligence (BDI et al. 2020). As the regulation only concerns imports of primary raw materials and most German refineries do not import primary raw materials, they are not affected by the regulation. In return, however, refiners must credibly demonstrate that they only source waste and scrap or recycled material.

Source certified or traceable gold:

Sourcing certified and traceable gold is the safest way to minimise human rights and environmental risks in commodity procurement. At the European level, there are now some refiners who source part of their gold from responsible small-scale mining and can offer traceability up to a certain purchase quantity (cf. Gronwald 2019). Above a certain purchase quantity, the mass balance system applies, meaning that traceability is not possible any longer and that all that can be said is how much of the purchased gold was reponsibly sourced (Gronwald 2019; Stähr and Schütte 2016). Since certificates and initiatives fundamentally focus on responsible small-scale mining rather than industrial mining, this path also offers the opportunity to proactively participate in shaping the sustainable gold sector. There are a number of initiatives and projects (see selection below) that pursue different approaches and, in some cases, offer the opportunity to participate directly in development projects. This is especially interesting with regard to the high number of workers in small-scale mining, who benefit directly from a sustainable design of the sector.

31 Within the framework of the Conflict Minerals Regulation, the EU Commission plans to officially recognize systems for the certification of implemented due diligence. However, a list of recognized systems is not yet available (Küblböck 2021).

Procure German river gold:

Some goldsmiths and jewellery companies that want to source responsibly-sourced gold also rely on German river gold from the Eder or the Rhine (Gronwald 2019). This is particularly low-risk, but also correspondingly expensive (cf. ESG o. J.).

Sourcing recycled gold:

With recycled gold, the human rights and environmental risks associated with gold mining are basically eliminated. Nevertheless, the purchase of recycled gold is not completely risk-free, as illegal gold is sometimes marketed as recycled gold in order to disguise the origin of the gold (Hütz-Adams and Müller 2012). Thus, in principle, there is a risk of illegal goods labelled as recycled gold. Accordingly, it is also central when purchasing recycled gold that it is subject to detailed due diligence. However, provided such due diligence is carried out, recycled gold is a desirable alternative to primary gold with a very good life cycle assessment (EU Recycling 2020).

Selection of certificates and initiatives

- Fairtrade International – Fairtrade Gold (Focus ASM)
- Alliance for Responsible Mining – Fairmined Gold (Focus ASM)
- Alliance for Responsible Mining – Code for Risk-mitigation for artisanal and small-scale mining in engaging in Formal Trade (CRAFT) (Focus ASM)
- Swiss Better Gold Association – Better Gold Initiative (Focus ASM)
- IMPACT – Just Gold (Focus ASM)
- Bundesanstalt für Geowissenschaften und Rohstoffe – Certified Trading Chains (Focus ASM of gold, tin, tungsten, tantalum, etc.)
- Responsible Minerals Initiative (RMI)
- Extractive Industries Transparency Initiative (EITI)
- Responsible Jewellery Council
- London Bullion Market – Good Delivery
- Solidaridad (Focus ASM)

Sources

Alliance for Responsible Mining (ARM) o. J.: Gender equity in artisanal and small-scale mining (online: Alliance for Responsible Mining). *https://www.responsiblemines.org/en/gender-equity-and-mining/* (last accessed 10.06.2021).

Betancur Betancur, María Soledad 2020: Mining Production, Territory and Conflict in Colombia: Global and Local Challenges for the Protection of Human Rights (Berlin, Medellín, Bogotá: Germanwatch e. V., Instituto Popular de Capacitación, Broederlijk Delen). *https://germanwatch.org/sites/default/files/Mining%20Production%2C%20Territory%20and%20Conflict%20in%20Colombia.pdf* (last accessed 08.06.2021).

British Geological Survey (BGS) 2020: World Mineral Production 2014–18 (Nottingham: BGS). *https://www2.bgs.ac.uk/mineralsuk/statistics/worldStatistics.html* (last accessed am 15.07.2021).

Bundesverband der Deutschen Industrie (BDI), Deutscher Industrie- und Handelskammertag (DIHK), Verband der chemischen Industrie e. V. (VCI), WV Metalle 2020: Merkblatt: Die EU-Konfliktmineralien-Verordnung (Berlin: BDI, DIHK, VCI, WV Metalle). *https://www.ihk-muenchen.de/ihk/Umwelt/Konfliktmineralien_Merkblatt_2020.pdf* (last accessed 14.06.2021).

Dehoust, Günter; Manhart, Andreas; Dolega, Peter; Vogt, Regine; Kemper, CLaudia; Auberger, Andreas; Becker, Fiona; Scholl, Christine; Rechlin, Aissa and Michael Priester 2020: Environmental Criticality of Raw Materials. An assessment of environmental hazard potentials of raw materials from mining and recommendations for an ecological raw materials policy (Dessau-Roßlau: Umweltbundesamt). *https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2020-06-17_texte_80-2020_oekoressii_environmentalcriticality-report_.pdf* (last accessed 12.07.2021).

Eisler, Ronald 2003: Health risks of gold miners: a synoptic review. In: Environmental Geochemistry and Health 25: 325–345. DOI: 10.1023/a:1024573701073. *https://pubmed.ncbi.nlm.nih.gov/12971253/* (last accessed 12.07.2021).

Engels, Bettina 2016: Mining conflicts in sub-Saharan Africa: Actors and repertoires of contention. GLOCON Working Paper, No. 2; (Berlin: Freie Universität Berlin). *https://www.econstor.eu/bitstream/10419/199095/1/GLOCON-WP-02.pdf* (last accessed 10.06.2021).

EU Recycling 2020: Gute Noten für Recycling-Gold und seine Ökobilanz (online Januar 2020: EU Recycling). *https://eu-recycling.com/Archive/25928* (last accessed 16.06.2021).

ESG Edelmetall-Service GmbH (ESG) o. J.: Flussgold (online: ESG). *https://www.scheideanstalt.de/gold/au/flussgold/* (last accessed 14.07.2021).

Evidence and Lessons from Latin America (ELLA) o. J.: Small-scale and informal mining: a big problem for Latin American states (Lima: ELLA).*https://www.extractiveshub.org/servefile/getFile/id/5770* (last accessed 10.06.2021).

Feldt, Heidi 2011: Glück auf? Die Auswirkungen des Bergbaus auf Kinder Ökologische Kinderrechte: Fakten, Fälle, Forderungen (Osnabrück: terre des hommes). *https://www.tdh.de/fileadmin/user_upload/inhalte/10_Material/Themeninfos/tdh_Bergbaustudie_12-02.pdf* (last accessed 07.06.2021).

Festin, Emma Sandell; Tigabu, Mulualem; Chileshe, Mutale N.; Syampungani, Stephen and Per Christer Odén 2018: Progresses in restoration of post-mining landscape in Africa. In: Journal of Forestry Research 30: 381–396. *https://doi.org/10.1007/s11676-018-0621-x* (last accessed 12.06.2021)

Francioll, Riccardo 2019: The shady origins of gold refined in Switzerland (online 08.01.2019: swissinfo.ch). *https://www.swissinfo.ch/eng/multinationals_the-shady-origins-of-gold-refined-in-switzerland/44621040* (last accessed 10.06.2021).

Fritz, Morgane; McQuilken, James; Collins, Nina and Fitsum Weldegiorgis (Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development) 2017: Global Trends in Artisanal and Small-Scale Mining (ASM): A review of key numbers and issues (Winnipeg: IISD). *https://www.iisd.org/system/files/publications/igf-asm-global-trends.pdf* (last accessed 10.06.2021).

Geenen, Sara and Simon Marijsse 2020: The Democratic Republic of Congo: From Stones in the River to Diving for Dollars. In: Verbrugge B., Geenen S. (eds) Global Gold Production Touching Ground (Cham: Palgrave Macmillan). *https://link.springer.com/book/10.1007%2F978-3-030-38486-9* (last accessed 07.07.2021).

Gronwald, Victoria 2019: Der Goldsektor in Deutschland. Marktstudie für verantwortungsvolles Gold aus dem Kleinbergbau (Hannover: BGR – Bundesanstalt für Geowissenschaften und Rohstoffe). *https://rue.bmz.de/de/publikationen_aktuelles/aktuelleMeldungen/2019/Januar/Marktstudie_ASM_Gold/index.html* (last accessed 08.06.2021).

Human Rights Watch (HRW) 2015: "What … if Something Went Wrong?" Hazardous Child Labour in Small-Scale Gold Mining in the Philippines (New York: Human Rights Watch). *https://www.hrw.org/report/2015/09/29/what-if-something-went-wrong/hazardous-child-labor-small-scale-gold-mining* (last accessed 10.06.2021).

Human Rights Watch (HRW) 2018: The Hidden Cost of Jewelry. Human Rights in Supply Chains and the Responsibility of Jewelry Companies (New York: Human Rights Watch). *https://www.hrw.org/report/2018/02/08/hidden-cost-jewelry/human-rights-supply-chains-and-responsibility-jewelry* (last accessed 08.06.2021).

Hütz-Adams, Friedel and Marie Müller 2012: Auf der Suche nach dem sauberen Gold: Kleinbergbau von Gold in Peru und DR Kongo (Bonn: Bonn International Center of Conversion). *https://www.bicc.de/uploads/tx_bicctools/BICC_brief_46_d.pdf* (last accessed 08.06.2021).

Küblböck, Karin 2021: Die EU-Konfliktmineralienverordnung – ein Probelauf für verantwortungsvolle Beschaffung im Rohstoffsektor? Policy note (Wien: Österreichische Forschungsstiftung für Internationale Entwicklung – ÖFSE). *https://www.ressourcenwende.net/wp-content/uploads/2021/03/PN36-Konfliktmineralien.pdf* (last accessed 14.06.2021).

Maddox, Thomas; Howard, Pippa; Knox, Jonathan; and Nicky Jenner 2019: Forest Smart Mining: Identifying Factors Associated with the Impacts of Large-Scale Mining (LSM) on Forests (Washington D.C.: The World Bank). *https://documents1.worldbank.org/curated/en/104271560321150518/pdf/Forest-Smart-Mining-Identifying-Factors-Associated-with-the-Impacts-of-Large-Scale-Mining-on-Forests.pdf* (last accessed 10.06.2021).

Mhlongo, Sphiwe Emmanuel and George Oluwole Akintola 2021: Artisanal and small-scale mining activities as post-mining land use in abandoned mine sites: a case of Giyani and Musina areas, Limpopo Province of South Africa. In: Journal of Degraded and Mining Lands Management 8 (3): 2815–2827. *https://doi.org/10.15243/jdmlm.2021.083.2815* (last accessed 12.06.2021).

MiningWatch Canada 2019: Behind the Glitter: The Gold Facts (online 05.02.2019: MiningWatch Canada) *https://miningwatch.ca/blog/2019/2/5/behind-glitter-gold-facts?__cf_chl_jschl_tk__=3945720f18155248eb9c81f7c38ed6c1fcc0e82c-1623742506-0-AVxODHrkJ5dkqgX7jP5MYntWQHMpR2kcFIdocW-8CAg_QLupEj4HUUAplAiwwXi8RWjHkRSGB8DpBShGqRgP_Fkm-7mOMea-K8w9qtJ1AGpSHnaRakA_mb-5fJhwDaCoIGxc1sz-4WMq-_GlHenjsNH8-EPVWj8-b_OTEn-3eyYE2WOE1QwzTGVDXUxA9nRUG0lTc1cVNkGBUsQhGk8wHnU9q8HXa-5sGSDAfjM0-35fKRdVGKOt9A0NEmblCQEZJPicQ8wwExeMRYfXKB7MhPiOCRi6s7_V2l1A-1P_F299ONMIJrLRAH9PI3FUePpOsUSIlz27d-GrI1aAJuZ615LuZKBQzgNlqbVNLEKODam9Bp6kl2CSkoQw5kNLxI9sH_taU2430tQ2P_Nw8ICJTP-KOz-sl_MeQQOZBp0zHKXUmk50JJn5nz9BXetbaWTJf32uw* (last accessed 15.06.2021).

Näher, Uwe 2021: Der Beitrag des Gold-ASM Sektors zur wirtschaftlichen Entwicklung in der Demokratischen Republik Kongo (DRC) (Kinshasa: BGR – Bundesanstalt für Geowissenschaften und Rohstoffe). Digitaler Vortrag am 05.05.2021 im Rahmen der Veranstaltungsreihe „Verantwortungsvolles Gold in Deutschland."

Rüttinger, Lukas; Treimer, Robert; Tiess, Günter and Laura Griestop 2015: Umwelt- und Sozialauswirkungen der Goldgewinnung in Madre de Dios, Peru (Berlin: adelphi). *https://www.umweltbundesamt.de/sites/default/files/medien/378/dokumente/umsoress_fallstudie_gold_peru_final.pdf* (last accessed 08.06.2021).

Spohr, Maximilian and Max Planck Foundation for International Peace and the Rule of Law (MPFPR) 2016: Human Rights Risks in Mining. A Baseline Study (Hannover: BGR – Bundesanstalt für Geowissenschaften und Rohstoffe). *https://rue.bmz.de/includes/downloads/BGR_MPFPR__2016__Human_Rights_Risks_in_Mining.pdf* (last accessed 08.06.2021).

Stähr, Fabian and Philip Schütte 2016: Der Bezug von Gold aus dem Kleinbergbau Prüfbericht zur Pilotierung verantwortungsvoller Rohstoff-Lieferketten (Hannover: Bundesanstalt für Geowissenschaften und Rohstoffe – BGR). *https://rue.bmz.de/includes/downloads/Bericht_gold_kleinbergbau.pdf* (last accessed 16.06.2021).

Statistisches Bundesamt (Destatis) 2021: Aus- und Einfuhr (Außenhandel): Deutschland, Jahre, Warenverzeichnis (8-Steller) – Abfälle und Schrott von Gold (WA71129100) (online: Destatis). *https://www-genesis.destatis.de/genesis/online?operation=previous&levelindex=2&levelid=1623739954464&step=2#abreadcrumb* (last accessed 15.06.2021).

Statistisches Bundesamt (Destatis), GENESIS-Online Datenbank, *https://www-genesis.destatis.de/genesis/online* (last accessed 30.06.2021)

The International Trade Union Confederation (ITUC) 2018: 2018 ITUC Global Rights Index. The World's Worst Countries for Workers (Brussels: ITUC – The International Trade Union Confederation). *https://www.ituc-csi.org/IMG/pdf/ituc-global-rights-index-2018-en-final-2.pdf* (last accessed 08.07.2021).

The International Trade Union Confederation (ITUC) 2020: 2020 ITUC Global Rights Index. The World's Worst Countries for Workers (Brussels: ITUC – The International Trade Union Confederation). *https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf* (last accessed 08.07.2021)

United States Department of Labour (USDOL) 2018: List of Goods Produced by Child Labour or Forced Labour (Washington: United States Department of Labour). *https://www.dol.gov/sites/dolgov/files/ILAB/ListofGoods.pdf* (last accessed 08.06.2021).

United States Department of Labour (USDOL) o. J.: Somos Tesoro (We Are a Treasure): Project to Reduce Child Labour in Colombia (Washington D.C.: Bureau of International Labour Affairs). *https://www.dol.gov/agencies/ilab/somos-tesoro-we-are-treasure-project-reduce-child-labor-colombia* (last accessed 10.06.2021).

Weldegiorgis, Fitsum; Lawson, Lynda and Hannelore Verbrugge (Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development) 2018: Women in Artisanal and Small-Scale Mining: Challenges and opportunities for greater participation (Winnipeg: IISD). *https://womenandmining.org/wp-content/uploads/2019/07/igf-women-asm-challenges-opportunities-participation.pdf* (last accessed 08.06.2021).

Welfens, M.J.; Nordmann, J.; Stengel, O.; Bienge, K.; Kennedy, K.; Lemken, T.; Seibt, A. and E. Alexopoulou 2013: Factsheet 5b Soziale Auswirkungen der Gewinnung von Gold (Wuppertal: Wuppertal Institut für Klima, Umwelt, Energie GmbH). *https://www.verbraucherzentrale.nrw/sites/default/files/migration_files/media225959A.pdf* (last accessed 08.06.2021).

Winkler, Doro and Anja Straumann 2016: Profit wichtiger als Menschenrechte? Gold aus Burkina Faso und die Verantwortung der Schweiz (Luzern: Fastenopfer). *https://sehen-und-handeln.ch/content/uploads/2016/02/OEK2016_Studie_Gold.pdf* (last accessed 07.06.2021).

Wittmer, Dominic; Erren, Martin; Lauwigi, Christoph; Ritthoff, Michael and Christoph Dressler 2011: Umweltrelevante metallische Rohstoffe. Meilensteinbericht des Arbeitsschrittes 2.1 des Projekts „Materialeffizienz und Ressourcenschonung" (MaRess) (Wuppertal: Wuppertal Institut für Klima, Umwelt, Energie GmbH). *https://epub.wupperinst.org/frontdoor/deliver/index/docId/3971/file/MaRess_AP2_2.pdf* (last accessed 16.06.2021).

Working Group on Mining and Human Rights in Latin America 2014: The impact of Canadian Mining in Latin America and Canada's Responsibility (online 03.04.2014: Working Group on Mining and Human Rights in Latin America). *www.dplf.org/sites/default/files/report_canadian_mining_executive_summary.pdf* (last accessed 15.07.2021)

2.3. Tin

Industries:

electronics, chemistry, food, metallurgy, handicraft

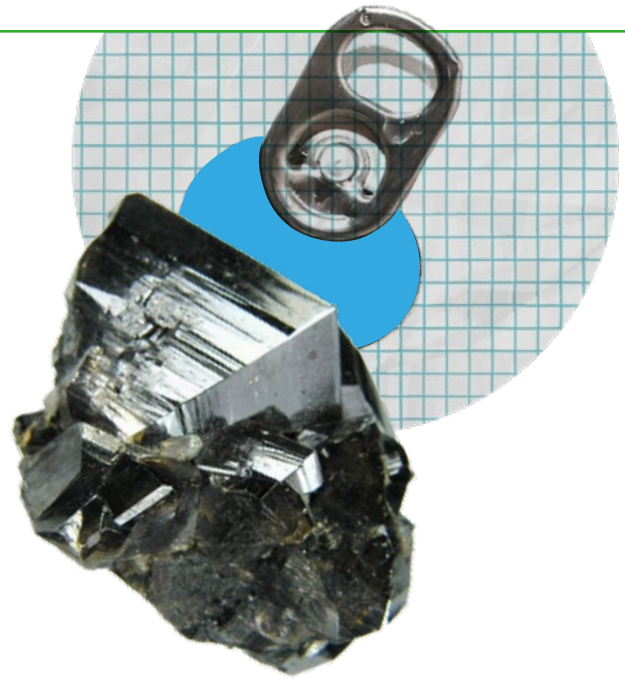
Typical products:

inter alia: solder (47 % of total consumption), beverage cans and tin cans for foodstuffs (tinplate), tin oxide films for solar cells, alloys of bronze and storage metals, float glass (flat glass or window glass, mirrors and car windows), organ pipes

Tin

To the point:

- Germany imports tin from all over the world and often via third countries, which is why it is sometimes difficult to determine the origin of tin (Elsner et al. 2014). In principle, traceability beyond the smelter/refinery is often not guaranteed.
- Germany's most important trading partner for refined tin is Indonesia, which both produces and smelts tin, followed by Belgium and the Netherlands.
- Belgium is not a producing country, but it operates two smelters; however, the refined tin produced in the latter comes mainly from recycled tin-bearing scrap (Elsner et al. 2014).
- In the Netherlands, tin is neither mined nor smelted, so it is re-exported, arriving at the port of Rotterdam and being transported onwards.
- Tin is considered a so-called conflict mineral nd is covered by the EU Conflict Minerals Regulation, which came into force in January 2021.
- Risks in the procurement of tin lie primarily in the extraction of raw materials and include child and forced labour, health and safety at work, water scarcity and loss of biodiversity.



Countries of origin

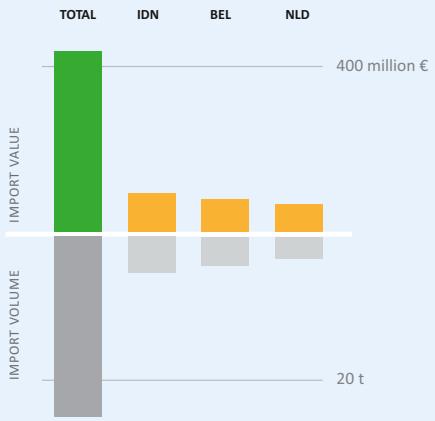
Imports of Tin to Germany

Total import volume and value

2 DIGIT CLASSIFICATION OF GOODS	DESCRIPTION	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
WA 80	Tin and products made from tin	24,98	436,60

Main trading partners (imports) for Tin and products made from tin

COUNTRY	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
Indonesia (IDN)	5,43	93,10
Belgium (BEL)	4,48	79,10
Netherlands (NLD)	2,75	47,40



Source: Genesis - Destatis

Structural features

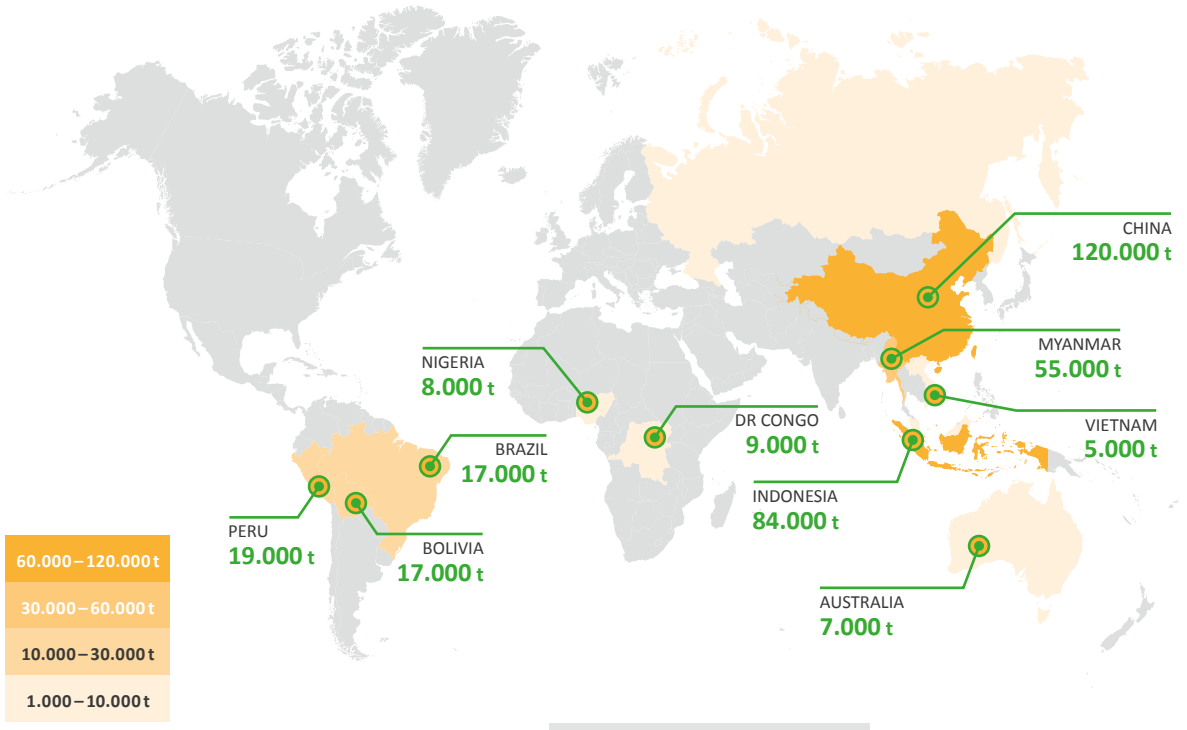
Tin is mainly used in the electronics industry, as solders account for about 47 % of global tin consumption. Tin is also used in the chemical industry (18 %), for the production of tinplate (13 %), for lead-acid batteries (7 %) and for copper alloys (5 %). Other applications include medicine, float glass production or organ pipes, which can only be made from primary tin (Vasters and Franken 2020; Elsner et al. 2014).

The most important tin ore is cassiterite and is extracted either from solid rock (primary tin deposits) or placer deposits (secondary tin deposits[32]). Mining from hard rock is mostly done by conventional blasting and drilling operations and takes place depending on the type of deposit, either underground along tin veins or, if the deposits are close to the surface, in opencast mining (Vasters and Franken 2020). The most significant hard rock deposits are located in China (responsible for 34.1 % of global tin depositional layers), Myanmar (15.6 %), Peru (5.3 %), Bolivia (4.9 %), the Democratic Republic of Congo (DRC) (2.5 %) and Australia (2 %). The mining of tin placers from unconsolidated sediments, which occur in quite thin layers of deposits, takes place on land (onshore) in so-called gravel pumping operations (often along still intact or former river courses) or at sea (offshore) with pump dredges (mainly in Indonesia) (Vasters and Franken 2020). The most important placer tin deposits are located in Indonesia (23.9 % of global tin production), Brazil (4.9 %) and Malaysia (1.1 %).[33]

32 Placer tin deposits are called secondary deposits. They consist of so-called detrital material, which was formed by weathering (or erosion) of the source rock and was finally transported by rivers to be deposited in the alluvial areas of the rivers (Mineral Atlas o. J.)
33 Own calculation based on BGS 2020 with 2018 data. Percentages are rounded to the first decimal place.

Human rights and environmental risks may differ depending on the mining location and mining method. Onshore placer mining in Indonesia, for example, is particularly land-intensive, in contrast to underground hardrock tin mining (in Bolivia and elsewhere) (Vasters and Franken 2020). There are further differences between industrial mining (formal sector) and artisanal and small-scale mining[34] (often informal sector). While human rights risks or impacts are sometimes (but not always) very different in industrial and small-scale mining (see Rüttinger et al. 2014), in the case of environmental impacts it may not always be easy to determine whether the origins are in industrial or small-scale mining. In particular, in some areas in Indonesia where both industrial onshore placer mining and small-scale mining operations are carried out, it is more difficult to separate the environmental impacts of each operation (cf. Rüttinger et al. 2020). The following breakdown in the risk assessment therefore serves as an initial assessment or prioritisation based on various examples.

Production countries



Production volume in tonnes (t) per year (2018)

Global total output: **352.000 t**

Source: BGS 2020

34 Although there are still significant differences between artisanal mining methods and other methods used in small-scale mining, these will not be differentiated in more detail below. Instead, the term small-scale mining is used as an umbrella term that refers to artisanal as well as small-scale and micro-mining methods.

Significant human rights risks

Industrial mining:

Health and safety at work

- The industrial underground mining sector poses various health risks. Accidents due to mine collapses and health consequences due to chemical exposure are the risks that occur most frequently (Spohr 2016).
- In addition, mining activities (including transport) contribute significantly to overall particulate pollution, which is particularly harmful to the health of the human respiratory system. This can be harmful not only for employees but also for residents (Spohr 2016; Tian et al. 2019).

Freedom of association and assembly

- In some mining countries (e. g. Bolivia), labour rights such as freedom of association are regularly violated (International Trade Union Confederation 2020).

Discrimination

- In areas with offshore production (e. g. Indonesia), local fishermen may lose access to their source of income if the fish stocks in these areas are affected by tin mining. This in turn can lead to them having to spend more time and money fishing further offshore (Milieudefensie 2016).

Land use and property rights

- In Peru, conflicts regularly arise between the local population and mining companies (Observatorio de Conflictos Mineros de América Latina 2018). Conflicts arise due to water and environmental pollution by mining companies (DIHR and Socios Peru 2017), which have led to unrest and police violence in the past (Coordinadora Nacional de Derechos Humanos 2016; Stern 2016).

Small-scale mining:

Child labour

- Child labour is widespread in small-scale mining, including tin mining. Reports show child labour in the tin small-scale mining in Indonesia (Domke and Reinwald 2020), Bolivia (ILAB 2020a) and the DRC (ILAB 2020b).

Forced labour and human trafficking

- In addition to child labour, forced labour is also a problem in the DRC (BGR n. d.; United States Department of Labour 2018). Child and forced labour are often interrelated: in the eastern conflict regions of the country, children are forced to work in small-scale mining under dangerous conditions (ILAB 2020b).

Health and safety at work

- Health and safety violations are widespread in the main tin mining countries. The problems are particularly prevalent in the informal mining sector (e. g. in Indonesia or the DRC). Miners and surrounding communities are put at risk from mine collapses or the spread of diseases such as malaria[35] (Maplecroft 2017).

Discrimination

- In the mining sector in Bangka (Indonesia) there are many migrant workers who support their families in other parts of Indonesia with money transfers. Migrant workers are to be understood as a vulnerable group, who are mostly inexperienced in mining and work without the necessary (protective) equipment. Due to the lack of qualifications and occupational safety, they are exposed to particularly precarious working conditions, including an increased risk of accidents (Milieudefensie 2016).

35 Onshore placer mining in Indonesia can lead to areas or holes in the ground being filled with water and becoming a breeding ground for mosquitoes that transmit malaria (Rüttinger et al. 2020)

Small-scale mining:

Conflicts and security

- Tin mainly originates from countries with medium to weak governance, e. g. eastern DRC or Myanmar, where armed insurgent groups have in the past sometimes financed themselves by mining and selling tin ore, which is why tin falls under the EU Conflict Minerals Regulation as a so-called 'conflict mineral' (Heimig et al. 2019; Vasters and Franken 2020).

Significant environmental risks

Industrial mining:

Water consumption and water availability

- Local communities often have problems with water that has been polluted or siltated by mining. This can have a negative impact on access to drinking water and can also affect farmers who rely on clean water for agriculture. This risk is found in China, Indonesia, Myanmar, Brazil, and Bolivia, among others (Maplecroft 2017; Elsner et al. 2014)

- Water scarcity can be exacerbated in dry regions by mining activities: in Peru, water scarcity occurs outside the rainy seasons, especially in mining areas. The high water consumption of mines has a negative impact on the livelihood of the local population, which often relies on livestock and agriculture (Häntsche et al. 2014).

Small-scale mining:

Water consumption and water availability

- In order to reduce freshwater consumption and prevent the release of dirty water into river systems, systems exist in industrial placer mining that allow the filtration and reuse of water (cf. Rüttinger et al. 2020). However, such systems are not established in Indonesian small-scale mining (Friends of the Earth and WALHI 2014 in Rüttinger et al. 2020).

Biodiversity and deforestation

- The mining of placer tin deposits along former river courses or still existing river courses destroys natural space or economically used land or endangers it through erosion (Vasters and Franconia 2020).

- There are no monitoring and/or mitigation measures in place for unregulated offshore tin mining. These unregulated practices are reported to have a negative impact on the marine ecosystem (Pöyhönen 2009 in Rüttinger et al. 2020).

Industrial mining:

Soil and (ground) water pollution

- Acid mine water[36], which can arise on spoil heaps or in abandoned mines, poses a threat to the environment as it can contaminate groundwater and soils (Spohr 2016).

Biodiversity and deforestation

- Onshore placer mining is mostly carried out in gravel pumping operations, where large volumes of soil are shifted, resulting in the destruction of the original topography and soil conditions. These destroyed landscapes are difficult to recultivate, as the original soil conditions and natural soil layers cannot be restored (Vasters and Franken 2020).
- Primary tin ore extraction in conventional opencast mining also has a high land consumption (although not as high as in placer mining), as the creation of larger external stockpiles is necessary in addition to the operating areas (Vasters and Franken 2020).
- Offshore mining of placer tin deposits (mainly in Indonesia) damages coastal ecosystems, especially coral, seagrass and mangrove areas. The dredgers can dig 15 to 50 metres below sea level, moving large amounts of overburden that is then dumped directly into the ocean. Even if this is done some distance from reefs, it can contribute to the smothering of corals and seagrass, as suspended sediments can spread over an area of more than 5,000 square kilometres (Vasters and Franken 2020).

36 Acid mine drainage results from the oxidation of sulphide metals. In their raw material-based assessment scheme, Dehoust et al. (2020) identify a medium risk for the formation of acid mine drainage in tin mining (level three out of five).

Small-scale mining:

Environment and waste

- Although the requirements for environmental protection and recultivation[37] of abandoned mining sites in countries such as Indonesia and Myanmar have meanwhile increased, there are often problems with implementation. Particularly critical in this context is the illegal post-mining of already recultivated mining sites by artisanal miners who search for residual stocks of tin and in the process reopen areas without (re)cultivating them afterwards (Vasters and Franken 2020).

37 If abandoned mines are poorly recultivated or not recultivated at all, it is difficult for flora and fauna to reestablish themselves because the fertile humus soil has been destroyed. In some cases, there is a risk of toxic heavy metals or chemicals being released into the environment. Furthermore, erosion of the remaining soil layers can occur, which has a negative impact on natural river courses and thus aquatic biodiversity if eroded soil layers are deposited in rivers. This is a risk in the mining sector as a whole (Coelho, Teixeira and Goncalves 2011).

Industrial mining:

Environment and waste

- Underground tin mining can lead to environmental exposure to radioactivity if radon gas is released (Vasters and Franken 2020).
- In placer mining, in addition to tinstone, other heavy minerals such as monazite and zircon, both of which contain radioactive elements, are found in the tin preconcentrates. Therefore, when separating the tinstone, care should be taken to temporarily store or dispose of the by-products according to their radiation properties (Vasters and Franken 2020).

Linking human rights and environmental concerns

Around 27 % of those employed in global tin production work in artisanal and small-scale mining, which on the one hand makes the sector a source of livelihood for many people in countries of the Global South, e. g. Indonesia, DRC or Bolivia (Vasters and Franken 2020). On the other hand, the sector harbours increased human rights and environmental risks due to a lack of regulation (Vasters and Franken 2020). Poor and unsafe working conditions are particularly critical from a human rights perspective. In terms of the environment, poor working conditions and a lack of awareness and financial resources lead to environmental damage. In addition, renaturation of the extraction sites often fails to occur (especially in informal tin mining). In offshore tin mining, there are similar parallels between environmental damage and socio-economic factors. For example, offshore mining of tin placers (both industrial extraction and small-scale mining) can cause fish stocks to decline, leading fishermen to fish further offshore or even to give up fishing as a livelihood and switch to (informal) mining (Milieudefensie 2016). Better environmental protection measures in offshore mining can therefore also contribute to the protection of vulnerable groups. However, as environmental protection measures are difficult to implement in unregulated, informal mining, approaches that focus on providing vulnerable groups with alternative livelihoods are also particularly useful. Alternative livelihood programmes can reduce the number of people who switch to informal mining out of economic hardship in the long term and strengthen parallel sectors (e. g. sustainable agriculture or tourism) that also benefit the environment (International Tin Association n. d.). In such an approach, it is again important to ensure that these alternative paths also make sense in real economic terms and enable people to generate adequate returns and secure their livelihoods.

Recommendations for action

Find out where the tin came from:

Tin is considered a so-called conflict mineral and is accordingly covered by the EU Conflict Minerals Regulation, which came into force in January 2021. The regulation directly affects all companies that import conflict minerals into the EU. Even if processing companies are often not directly affected, the law explicitly requires the downstream industry to conduct voluntary due diligence. Even if tin does not originate from conflict and high-risk areas[38] (such as the DRC), tin sourcing may be linked to governance risks in the mining countries or risks related to the mining method (e. g. differences between hard rock tin mining and placer mining).

Obtain certified or traceable tin:

Sourcing certified and traceable tin is a sensible way to minimise human rights and environmental risks in raw material sourcing. As certificates and initiatives generally focus on responsible small-scale mining rather than industrial mining, this route also offers the opportunity to proactively participate in shaping the sustainable tin sector. For example, tin from responsible small-scale mining in the DRC can be sourced through Certified Trading Chains (see below).

Obtain recycled tin:

The recycling potential of tin differs depending on the type of scrap, but is relatively high overall, with an end-of-life recycling rate of more than 50 % and a recycling input rate of 30.7 % in 2016 (including refined and unrefined products). For example, while tin dross and solder pastes are almost fully recycled, with up to 70 % of tin alloys recovered, tin recycling is much more difficult (Elsner et al. 2014). If recycled tin can be sourced, many of the human rights and environmental risks normally associated with raw material sourcing are eliminated. Furthermore, the EU Conflict Minerals Regulation does not apply to recycled materials. Nevertheless, due diligence processes should also be applied to suppliers of recycled materials and suppliers should be screened as a matter of principle. It should be noted, for example, that cross-cutting risks such as corruption can still pose a risk.

Selection of certificates and initiative

- ITRI Tin Supply Chain Initiative (iTSCi)
- Better Sourcing Program
- Bundesanstalt für Geowissenschaften und Rohstoffe – Certified Trading Chains (Focus ASM of gold, tin, tungsten, tantalum, etc.)
- Better Mining
- FairLötet
- Responsible Minerals Initiative (RMI)

38 The term “conflict and high risk areas“ is understood in the sense of the OECD definition. See: *http://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-for-Responsible-Business-Conduct.pdf*.

Sources:

British Geological Survey (BGS) 2020: World Mineral Production 2014–18 (Nottingham: BGS) *https://www2.bgs.ac.uk/mineralsuk/statistics/worldStatistics.html* (last accessed 15.07.2021).

Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) o. J.: DR Congo (online: BGR). *https://www.bgr.bund.de/EN/Themen/Min_rohstoffe/CTC/Mineral-Certification-DRC/CTC_DRC_node_en.html* (last accessed 04.05.2021).

Bureau of International Labour Affairs (ILAB) 2020a: 2019 Findings on the Worst Forms of Child Labour: Bolivia (Washington: Bureau of International Labour Affairs). *https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2019/Bolivia.pdf* (last accessed 04.05.2021).

Bureau of International Labour Affairs (ILAB) 2020b: 2019 Findings on the Worst Forms of Child Labour: Democratic Republic of Congo (Washington: Bureau of International Labour Affairs). *https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2019/Congo-Democratic-Republic-of-the.pdf* (last accessed 04.05.2021).

Coelho, P.C.S.; Teixeira, J.P.F. and Goncalves, O.N.B.S.M. 2011: Mining Activities: Health Impacts. In: Encyclopaedia of Environmental Health: 788–802. DOI: 10.1016/B978-0-444-52272-6.00488-8.

Coordinadora Nacional de Derechos Humanos 2016: Policia Nacional sí presta servicios a empresas mineras, brindándoles protección y seguridad (online 03.11.2016: Coordinadora Nacional de Derechos Humanos). *http://derechoshumanos.pe/2016/11/policia-nacional-si-presta-servicios-a-empresas-mineras-brindandoles-proteccion-y-seguridad/* (last accessed 04.05.2021).

Dehoust, Günter; Manhart, Andreas; Dolega, Peter; Vogt, Regine; Kemper, CLaudia; Auberger, Andreas; Becker, Fiona; Scholl, Christine; Rechlin, Aissa and Michael Priester 2020: Environmental Criticality of Raw Materials. An assessment of environmental hazard potentials of raw materials from mining and recommendations for an ecological raw materials policy (Dessau-Roßlau: Umweltbundesamt). *https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2020-06-17_texte_80-2020_oekor-essii_environmentalcriticality-report_.pdf* (last accessed 12.07.2021).

Domke, Ruben and Eva-Maria Reinwald 2020: Rohstoffe für Handys und Co.: Zinnabbau in Indonesien (Bonn: SÜDWIND e. V.). *https://www.suedwind-institut.de/files/Suedwind/Publikationen/2020/2020-25%20FS%20Rohstoffe%20f%C3%BCr%20Handys%20und%20Co%20-%20Zinnabbau%20in%20Indonesien.pdf* (last accessed 04.05.2021).

Elsner, Harald; Schmidt, Michael and Philip Schütte 2014: Zinn – Angebot und Nachfrage bis 2020 (Berlin: DERA). *http://www.deutsche-rohstoffagentur.de/DE/Gemeinsames/Produkte/Downloads/DERA_Rohstoffinformationen/rohstoffinformationen-20.pdf?__blob=-publicationFile&v=4* (last accessed 04.05.2021).

Häntsche, Patrick; Eidam,Frank; Schmitz, Martin; Winkelmann, Lothar; Ellermann, Siegfried; Deutsch-Peruanische Industrie- und Handelskammer (AHK Peru) und Deutsche Rohstoffagentur (DERA) 2014: Peru. Herausforderungen und Chancen für eine nachhaltige Entwicklung im Rohstoffsektor (Bonn: Germany Trade and Invest). *https://www.deutsche rohstoffagentur.de/DERA/DE/Downloads/studie_peru_gtai.pdf?__blob=-publicationFile&v=8* (last accessed 04.05.2021).

Heimig, Christian; Schütte, Philip; Franken, Gudrun and Christoph Klein 2019: Zinn aus Myanmar – Ein Anwendungsszenario zur EU-Verordnung zur Sorgfaltspflicht in Rohstofflieferketten (Hannover: BGR – Bundesanstalt für Geowissenschaften und Rohstoffe). *https://www.deutsche-rohstoffagentur.de/DE/Gemeinsames/Produkte/Downloads/Commodity_Top_News/Rohstoffwirtschaft/61_zinn_Myanmar.pdf?__blob=publicationFile&v=3* (last accessed 04.05.2021).

International Tin Association o. J.: Unconventional Mining in Bangka-Belitung, Indonesia (Frogmore: Inter-

national Tin Association). *https://www.internationaltin.org/wp-content/uploads/2018/02/Unconventional-Mining-in-Bangka-Belitung-Indonesia.pdf* (last accessed 04.05.2021).

Maplecroft 2017: Tech supply chains risk links to human rights abuses outside 'conflict minerals' hotspots – Research (online 06.04.2017: reliefweb.int). *https://reliefweb.int/report/democratic-republic-congo/tech-supply-chains-risk-links-human-rights-abuses-outside-conflict* (last accessed 04.05.2021).

Mileudefensie 2016: Responsible Mining: Tin (Amsterdam: GoodElectronics). *https://www.somo.nl/wp-content/uploads/2016/04/Tin.pdf* (last accessed 04.05.2021).

Mineralienatlas o. J.: Zinn (online: Mineralienatlas). *https://www.mineralienatlas.de/lexikon/index.php/Geologisches%20Portrait/Lagerst%C3%A4tten/Seifenlagerst%C3%A4tten* (last accessed 04.05.2021).

Observatorio de Conflictos Mineros de América Latina 2018: Conflictos Mineros en América Latina (online: Observatorio de Conflictos Mineros de América Latina). *https://mapa.conflictosmineros.net/ocmal_db-v2/* (last accessed 04.05.2021).

Rüttinger, Lukas; Treimer, Robert; Tiess, Günter and Laura Griestop 2014: Fallstudie zu Umwelt- und Sozialauswirkungen der Zinnförderung in Bangka-Belitung, Indonesien (Berlin: adelphi). *https://www.umweltbundesamt.de/sites/default/files/medien/378/dokumente/umsoress_fallstudie_zinn_indonesien_finale_version.pdf* (last accessed 04.05.2021).

Rüttinger, Lukas; Scholl, Christine; van Ackern, Pia; Rustige, Jannis; Corder, Glen; Golev, Artem and Thomas Baumgartl 2020: KlimRess – Impacts of climate change on mining, related environmental risks and raw material supply (Dessau-Roßlau: Umweltbundesamt). *https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/texte_106-2020_klimress_case_study_indonesia.pdf* (last accessed 04.05.2021).

Statistisches Bundesamt (Destatis), GENESIS-Online Datenbank, *https://www-genesis.destatis.de/genesis/online* (last accessed 30.06.2021)

Spohr, Maximilian and Max Planck Foundation for International Peace and the Rule of Law (MPFPR) 2016: Human Rights Risks in Mining. A Baseline Study (Hannover: BGR – Bundesanstalt für Geowissenschaften und Rohstoffe). *https://rue.bmz.de/includes/downloads/BGR_MPFPR__2016__Human_Rights_Risks_in_Mining.pdf* (last accessed 04.05.2021).

Stern, Rachel 2016, Deutsche Welle: All that glitters is not gold: Indigenous communities in Peru protest mining.*https://www.dw.com/en/all-that-glitters-is-not-gold-indigenous-communities-in-peru-protest-mining/a-19328199* (last accessed 04.05.2021).

The Danish Insitute for Human Rights (DIHR) and Socios Perú 2017: Human Rights and Business Country Guide. Peru (Copenhagen, Lima: DIHR – The Danish Institute for Human Rights, Socios Perú). *https://globalnaps.org/wp-content/uploads/2017/11/peru.pdf* (last accessed 04.05.2021).

The International Trade Union Confederation (ITUC) 2020: 2020 ITUC Global Rights Index. The World's Worst Countries for Workers (Brussels: ITUC – The International Trade Union Confederation). *https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf* (last accessed 04.05.2021).

Tian, Shuhan; Liang, Tao; Kexin, Li 2019: Fine road dust contamination in a mining area presents a likely air pollution hotspot and threat to human health. In: Environment International 128: 201–209. DOI: 10.1016/j.envint.2019.04.050

United States Department of Labour 2018: List of Goods Produced by Child Labour or Forced Labour (Washington: United States Department of Labour). *https://www.dol.gov/sites/dolgov/files/ILAB/ListofGoods.pdf* (last accessed 04.05.2021).

Vasters, Jürgen and Gudrun Franken 2020: Zinn. Informationen zur Nachhaltigkeit (Hannover: BGR -Bundesanstalt für Geowissenschaften und Rohstoffe). *https://www.deutsche-rohstoffagentur.de/DE/Gemeinsames/Produkte/Downloads/Informationen_Nachhaltigkeit/zinn.pdf;jsessionid=FA909C8D1AAE9FD2B2ED3F-70022F625A.2_cid331?__blob=publicationFile&v=3* (last accessed 04.05.2021).

3. Renewable raw materials

3.1. Cotton

Industries:[39]
home textiles, medical textiles, automotive, cosmetics and hygiene

Typical products:
t-shirts, shirts, sweaters, jeans, (car) seat covers, curtains, bed linen, towels, carpets

Cotton

To the point

- Germany imports about 90 % of the textiles and clothing sold in the German retail sector, mainly from China, Bangladesh and Turkey (UBA 2019).
- The various stages of textile processing for the clothing industry mainly take place in low-wage countries; spinning, for example, mainly takes place in China, India, Pakistan and Bangladesh (OECD and FAO 2021).
- Cotton is grown in more than 80 countries. The largest producers are India (24 %), China (22 %), USA (16 %), Brazil (11 %) and Pakistan (5 %). Other growing regions include the sub-Saharan region (4 %) and the north-east of Africa, as well as regions in Central Asia (see world map below).
- Major risks in textile sourcing lie in both raw material extraction and textile processing and range from child and bonded labour in both stages of the value chain to environmental issues such as water consumption in cotton farming or soil and water pollution by chemicals in textile production.

39 The term “industries” in this case refers to sub-industries within the textile industry, or to other industries or areas in which textile products are processed and applied.

Countries of origin

Imports of clothing and textiles to Germany

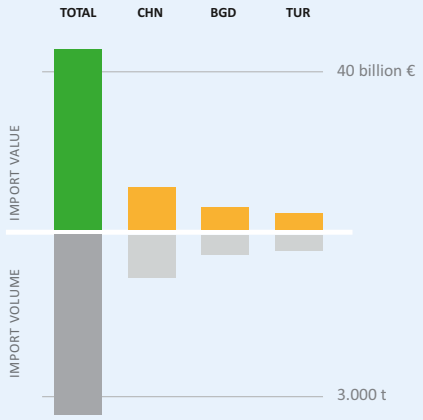
Total import volume and value

2 DIGIT CLASSIFICATION OF GOODS	DESCRIPTION	IMPORT VOLUME (THSD t)	IMPORT VALUE (BILLION €)
GP19-13	Textiles	1.893,76	11,10
GP19-14	Clothing	1.433,45	34,54
	Clothing and textiles (total)	3.327,21	45,64

Main trading partners (imports) for Clothing and textiles* to Germany

COUNTRY	IMPORT VOLUME (THSD t)	IMPORT VALUE (BILLION €)
China (CHN)	793,24	10,70
Bangladesh (BGD)	363,72	5,66
Turkey (TUR)	286,61	4,11

*Cotton content not known



Source: Genesis – Destatis

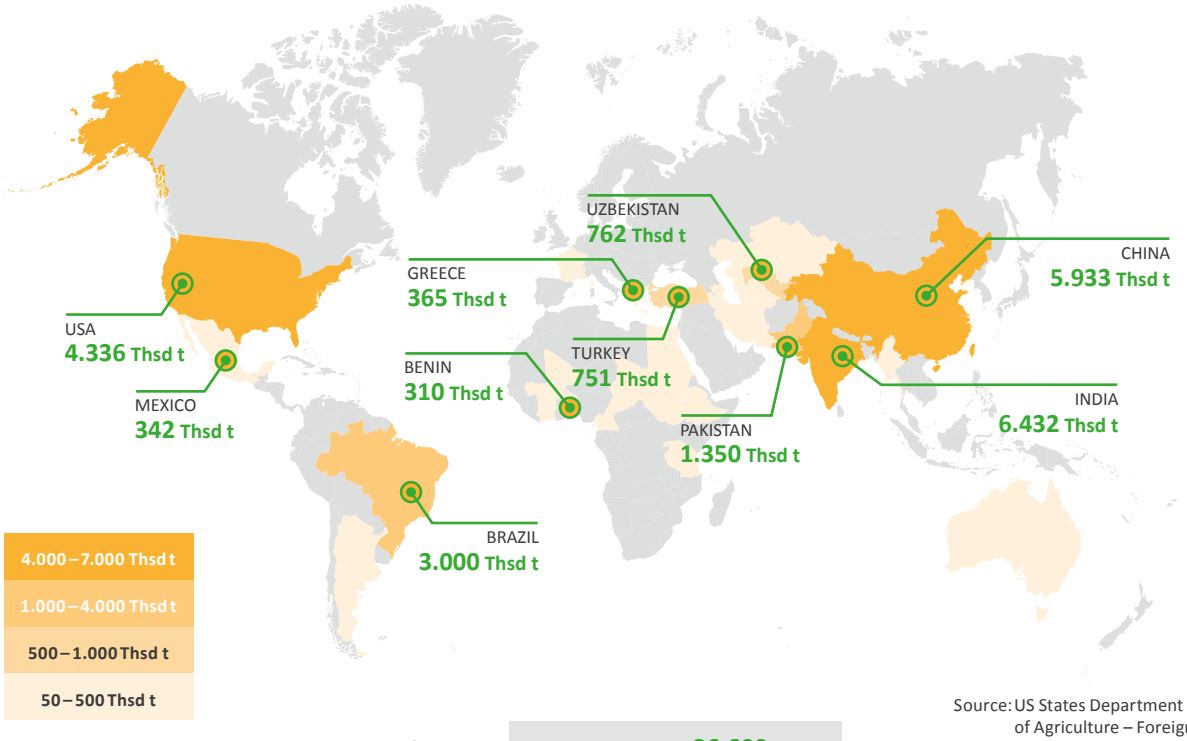
Structural features

Cotton grows in tropical and subtropical areas in more than 80 countries. The largest producers include India (24 %), China (22 %), the US (16 %), Brazil (11 %) and Pakistan (5 %), as well as sub-Saharan African countries, particularly in West Africa, where Benin, Mali, Côte d'Ivoire and Burkina Faso account for about 4 % of global production (FAS 2020). In addition, cotton production takes place in other Central Asian as well as Northeast African countries (see world map above). In conventional[40] production, which accounted for a full 99.07 % of total global production in 2019 (Textile Exchange 2020), cotton is grown as an annual and in monocultures to increase yields. After harvesting, the harvested cotton bolls are ginned by machine or by hand and packed into cotton bales that are traded globally and often spun into yarns in low-wage Asian countries such as China (29 %), India (21 %), Pakistan (9 %) or Bangladesh (8 %) (OECD and FAO 2021). The subsequent production steps, such as weaving and knitting (manufacture of textile surfaces), wet processing (desizing, bleaching, dyeing, embroidering, printing), finishing (e. g. coating, impregnation, flame retardant, stain resistant, non-iron, anti-static) and the finishing of end products take place mainly in often different low-wage countries.

40 "Conventional" here refers to non-organic cotton cultivation. We distinguish between conventional and organic cotton cultivation.

Germany is also a major industrial producer of textiles (Oxford Economics 2021). In 2018, the German clothing industry reached a gross value added (GVA) of 2.3 billion, making it the highest producing country in the European Union after Italy (Eurostat in Oxford Economics 2021). In terms of value, Germany was also the world's third largest textile exporter after India and China in the same year (Oxford Economics 2021). More than 50 % of the textiles produced in Germany are so-called technical textiles, which are used in the production and construction industries as well as in medicine, among others (UBA 2019). There are also risks in the production of (technical) textiles in Germany.[41] However, as around 90 % of the clothing sold in German retail outlets comes from imports (UBA 2019), mainly from China, Bangladesh and Turkey (see table above), the following risk assessment focuses on risks in cotton production and processing abroad.

Production countries



Production volume in tonnes (Thsd t) per year (2019/20)

Global total output: **26.600 Thsd t**

Source: US States Department of Agriculture – Foreign Agricultural Service

41 For more information see: UBA 2019, "The textile industry in Germany."

Significant human rights risks

Cotton farming:

Child labour

- In sub-Saharan Africa, about 20 million people live from cotton cultivation. Most of the producers are smallholders, who often do not generate sufficient income to secure their livelihoods. There are also known cases of child labour in the fields (BMZ 2019). Also, from most of the other cultivating countries such as India, Brazil, Pakistan, China, Uzbekistan or Turkey, there are reports of child labour (ILO/FUNDAMENTALS 2016).

Forced labour and human trafficking

- Child labour is also often associated with forced labour. Bonded labour is a form of forced labour in which adults and children are held captive by withholding wages, restricting freedom of movement and working excessive overtime (ILO n. d.). Bonded labour of children is widespread in Pakistan and India, among other countries, both in the cultivation and processing of cotton (Ferenschild 2019).

Health and safety at work

- The cotton plant is very susceptible to pests and diseases, which is why an above-average number of pesticides are used in cotton cultivation. Although cotton cultivation takes up only 2.5 % of the world's available arable land (Naturtextil 2018), up to 25 % of all insecticides and around 10 % of all pesticides are used for cotton cultivation (UBA 2019). If used inadequately or excessively, this poses significant health risks. Short-term consequences can include skin irritations, breathing difficulties and unconsciousness (Umweltinstitut München e. V. 2016). Long-term health consequences can include various cancers, neurodegenerative diseases and altered gene expressions, as well as miscarriages and malformations. Acute pesticide poisoning can even lead to death (Greenpeace 2015).

Further processing (spinning, weaving, dyeing, finishing, making up):

Child labour

- While child labour is still a common practice in labour-intensive cotton production, it is hardly present in textile manufacturing due to increased controls in the formal sector (Stamm et al. 2019). However, child labour is believed to be more common for employment carried out by subcontractors, as well as in informal settings, such as workshops without legal registration (Stamm et al. 2019; FLA and Development Workshop Cooperative 2017). Both cases escape legal controls, so child employment is undetectable.

Forced labour and human trafficking

- Bonded labour in the processing textile industry (especially spinning) continues to be a problem, as shown, among other things, by research conducted by the NGOs SOMO, ICN and FEMNET in Tamil Nadu (southern India). In this context, girls in particular are affected by the risk of working in bonded labour (Business and Human Rights Resource Centre 2014; The Freedom Fund 2014; Theuws and Overeem 2014; Ferenschild 2019).

Health and safety at work

- Overtime or overwork, but also the handling of hazardous chemicals without sufficient and appropriate occupational safety measures can lead to major health risks for employees (BMAS 2020). Furthermore, noise pollution caused by various machines and work processes can lead to hearing loss and tinnitus. Inadequate or missing protective devices on machines pose a risk of accidents and injuries (European Agency for Safety and Health at Work 2008). Furthermore, ergonomic workplace conditions (sitting posture, lighting, ventilation) are often not given sufficient attention.

Cotton farming:

Discrimination

- In many countries in the Global South[42], women in cotton farming receive lower wages than men. In some countries (Cameroon, Malawi, Mali and Uganda), it is common in smallholder cotton production for women not to be paid directly[43] for their work (ITC 2011).

Wages and working conditions

- Wages in agriculture are often very low in developing countries. Wages below the minimum wage are also paid in cotton cultivation in countries such as India and Pakistan (Ferenschild 2019).

Land use and property rights

- Cotton cultivation can have a negative impact on food security in certain regions. This is the case when cotton competes with food crops in food insecure areas[44] (IUCN 2016: 10). Land-use competition is a problem in African countries, among others, as cotton and other export commodities are predominantly grown on land with the best production conditions. In addition, domestic food production declines due to lower profits compared to export goods, which can make developing countries in particular dependent on food imports (Paulitsch 2004; Südwind 2013).

42 Salary differentials vary widely by region and occupation. In Africa, women working in cotton fields earn on average 80 % of the salary of men (ITC 2011). In Latin America, the average salary for women working in cotton fields is 95 % of that of men (TC 2011). Women who are organised in cooperatives, increasingly the case in Latin America, tend to earn the same as men (cf. ITUC 2011).

43 This has to do with the fact that the money usually goes to the farm owners or contractors. The latter are mostly men. If women are then employed as family workers, for example, they often do not know how much their husbands earn (ITC 2011).

44 Cotton, along with coffee, cocoa, tea and bananas, belongs to the group of highly export-oriented agricultural products, the so-called "cash crops", which are produced for the world market and can compete with traditional forms of subsistence agriculture for arable land and water resources.

Further processing (spinning, weaving, dyeing, finishing, making up):

Freedom of association and assembly

- In some countries supplying clothing to Germany, e. g. Bangladesh and Cambodia, trade unions are restricted in their scope for action or it is fundamentally difficult to establish trade unions. While the situation in Bangladesh has improved due to international attention, it must be taken into account that freedom of association and assembly as well as other labour rights in special economic zones[45] are often legally restricted or prohibited in order to attract foreign investors (Richardson and Harrison 2017; Stamm et al. 2019; Cotula and Mouan 2021). An effective improvement of working conditions is thus hardly possible for the employees (BMAS 2020).

Discrimination

- Women make up the largest share of the ready-made garment workforce and are particularly vulnerable to human rights abuses. The high level of discrimination experienced by women in the industry poses additional risks for them. Women are often paid less than their male counterparts, forced to work longer hours, and given fewer opportunities for advancement and training. Pregnant women are sometimes fired. Furthermore, women can become victims of sexual harassment and violence, but also of mental abuse (Niebank 2018).

45 Special economic zones are particularly widespread in the textile industry: the majority of workers who work in special economic zones are employed in the textile sector (Kerkow and Martens. 2010).

Further processing (spinning, weaving, dyeing, finishing, making up):

Wages and working conditions

- More than 75 million people work in the textile industry worldwide, especially women in developing and emerging countries such as Pakistan, China, Indonesia, Bangladesh, Cambodia and Myanmar. The wages paid are often not living wages (even if they correspond to the legally regulated minimum wages) (Stamm et al. 2019).
- Exceeding legally regulated working hours and unpaid overtime pose a risk in many production countries (BMAS 2020).
- In the textile industry, many workers are only employed on a short-term basis as "contract" or "casual labourers". As a result, they often do not receive written and thus legally binding employment contracts that would protect them from unlawful dismissal (Stamm et al. 2019). They also receive fewer to no social benefits and have no income security, as existing contracts are only temporary and seasonal.[46]

46 In the Delhi National Capital Region, an estimated 80–90 % of workers in textile mills are "contract labourers" and receive lower wages than permanent workers* (Fair Wear Foundation 2019).

Significant environmental risks

Cotton farming:

Water consumption and availability

- Cotton is originally a tropical plant. Today, however, it is mainly grown in arid regions in order to avoid rain during harvesting. Nevertheless, the plant requires a lot of water during the growth phase, which is often supplied with the help of artificial irrigation in the form of surface water by diverting or damming rivers (Stamm et al. 2019). This increases the pressure on the water supply (Umweltinstitut München e. V. 2016). On average around 11,000 litres of water are required worldwide for the production of one kilogram of cotton →

Further processing (spinning, weaving, dyeing, finishing, assembling):

Water consumption and availability

- Wet processing is particularly water-intensive. In Bangladesh and Pakistan, for example, wet processing accounts for around 85 % of water consumption in textile processing. Since groundwater is primarily used here, the textile inustry contributes significantly to the decline of groundwater levels in many parts of Bangladesh (e.g. the greater Dhaka area) and causes supply shortages (Sagris and Abbott 2015; Hossain and Khan 2020).

Cotton farming:

→ (WWF 2020; Stamm et al. 2019). Water consumption differs depending on the growing region, and can be significantly reduced through the use of drip irrigation (e. g. in Uzbekistan from 18 % to 42 %; cf. Ibragimov et al. 2007).

Soil and (ground) water pollution

- The high use of pesticides (up to 25 % of all insecticides and 10 % of all pesticides) is associated with major risks for the environment, such as contamination of soils, water bodies and groundwater (Stamm et al. 2019; UBA 2019).

Air pollution and emissions

- The cultivation of cotton emits around 86 million tonnes of CO_2e[47] annually, in particular through the use of chemicals (see Ellen MacArthur Foundation 2017).

Biodiversity and deforestation

- Conventional cotton cultivation has a very high degree of land consumption. Cultivation in monocultures without crop rotations (of partly genetically modified cotton) in combination with the excessive use of pesticides and fertilizers (to increase yields) can negatively affect soil fertility and biodiversity and lead to soil salinization and erosion (Stamm et al. 2019).

47 The CO2e figure aggregates not only CO2 emissions but also other greenhouse gas emissions. CO2e allows the comparison of different greenhouse gases with different global warming potentials and half-lives.

Further processing (spinning, weaving, dyeing, finishing, assembling):

Soil and (ground) water pollution

- Textile production and finishing (e. g. dyeing, washing, printing and finishing) involves the use of around 7,500 different chemicals (including some that are classified as carcinogenic, mutagenic and toxic to reproduction) and around 4,000 dyes (Umweltinstitut München e. V. 2016). For one tonne of end product produced, between 200 and 350 m^3 of wastewater is generated, which is often discharged into rivers and other bodies of water inadequately treated or not treated at all (Stamm et al. 2019). The consequences are contaminated soils and (ground) water, which also has negative implications for the health of the residents.[48]

Air pollution and emissions

- Textile production consumes very large amounts of energy. This energy mostly comes from non-renewable sources, which has negative consequences for the climate. For example, around 173 million tonnes of CO_2e are emitted annually in global textile processing (cf. Ellen MacArthur Foundation 2017). In particular, yarn and surface production as well as wet processing are energy-intensive (ILO 2021). Wet processing often uses coal or gas for water heating and steam generation, resulting in particularly high greenhouse gas emissions (ILO 2021).

48 With prolonged exposure, the consequences are cancer or other life-shortening diseases (Stamm et al. 2019; Global Fashion Agenda and Boston Consulting Group 2017). The example of China most clearly illustrates water contamination. China is the largest textile producer in the world. Investigations of water discharges from two major Chinese textile producers detected a range of hazardous and persistent pollutants, including alkylphenols, which are banned in the EU, and perfluorinated chemicals (PFC), which despite modern sewage treatment plants unhindered the water passed (Greenpeace 2018). According to the European Parliament, textile dyeing and finishing are responsible for around 20 percent of global water pollution (European Parliament 2020).

Further processing (spinning, weaving, dyeing, finishing, assembling):

Environment and waste

- In addition to wastewater contaminated with chemicals, sewage sludge is also a waste problem in textile production, which is a mixture of fibres and chemicals and is produced in wastewater treatment plants. The disposal of this highly toxic sewage sludge is a challenge in many places and can have a strong impact on the environment if, for example, sewage sludge is improperly disposed of in open landfills or incinerated. In particular, the pollution of soils, surface water and/or groundwater is a serious problem in this context (Anwar et al. 2018; Delelegn 2018).

Linking human rights and environmental conccerns

Cotton farming:

The use of plant protection products in conventional cotton cultivation entails both human rights and environmental risks. Due to insufficient occupational safety and the improper handling of toxic substances, the use of plant protection products can have a negative impact on the health of workers on the one hand, and lead to considerable environmental damage on the other, such as the contamination of water and soil. Such environmental damage can in turn give rise to new human rights risks – for example if local residents are denied access to clean water (Scherf et al. 2019). Genetically modified Bt cotton, which is currently used in over 90 % of conventional cotton production in India, can lead to a reduction in the use of pesticides[49] but at the same time ensures that farmers are economically dependent on seed suppliers (Van Dycke and Van Overwalle 2017; Hubbard 2019).

49 Recent studies have questioned the usefulness of Bt cotton as a means to reduce the use of pesticides. See: Ogliore 2020, "Long-term analysis shows GM cotton no match for insects in India."

Further processing:

There are also important links between human rights and environmental risks in the processing of cotton. For example, the use of chemicals in dyeing can have a negative impact on water and soil quality, which in turn can have consequences for food security or water access for local residents (Scherf et al. 2019). Here, sustainable occupational health and safety and environmental management (especially chemical and water management as well as wastewater) at production sites can have positive consequences for the health of local residents (Scherf et al. 2019).

Cotton farming:

In this respect, organic cotton cultivation, in which the use of plant protection products is dispensed with, offers an opportunity to reduce both human rights and environmental risks in cotton production. At the same time, there may be new risks, as organic cotton cultivation, although less water-intensive, requires about 20 % more land than conventional production (Messner in Reichert 2019). With regard to land use, conflicting goals can arise in particular if cotton production ("cash crop") has a negative impact on food security on the one hand by competing with food crop production ("food crop"), but creates economic opportunities for local residents on the other (Scherf et al. 2019).

Recommendations for action

Find out where the cotton comes from:

As with all raw materials, attention should also be paid to the origin of cotton. As this fact sheet shows, human rights and environmental risks in cotton production vary considerably depending on the country or region where the cotton is grown. To capture these country- and region-specific risks, it is essential to trace textile production back to the cotton fields.

Source certified cotton[50]:

To ensure this traceability, it is particularly suitable to work with certificates. Worth mentioning is, among others, the sustainability standard Cotton made in Africa (CmiA), which promotes sustainable, smallholder cotton cultivation in sub-Saharan Africa. In addition to the "normal" CmiA seal, which guarantees sustainability standards for non-organic cotton cultivation, there is also the CmiA organic seal, which explicitly certifies organic cotton. Other notable standards and initiatives include the Better Cotton Initiative (BCI), which primarily aims to train farmers in sustainable cotton cultivation and to certify them if they successfully implement it. BCI supports farmers in Pakistan, India, China, Tajikistan, Brazil and Turkey, among other countries. One particularly demanding seal in terms of social and ecological standards in textile production is, for example, the IVN Best Seal from the International Association of Natural Textiles.

Pay attention to standards at factories:

In order to consider the risks in further processing, the factories responsible for spinning, weaving, designing, finishing and finally making up end products must also be taken into account. Criteria on the basis of which factories can be assessed are, for example, standards in occupational health and safety or in chemicals management. Such standards can also be demanded and promoted through codes of conduct or training.

50 The demand for cotton is linked to consumer behaviour (keyword "fast fashion"). More sustainable handling and purchasing reduce demand, but on the other hand can lead to a loss of income for workers at the cultivation and processing level. Such factors must be taken into account when initiatives and projects are launched to ensure that companies, consumers and workers benefit equally.

Make consumers aware of their responsibilities:

Consumers also have the opportunity to support fair clothing (fair fashion) through their purchasing decisions and in this way influence the industry. On the one hand, consumers influence human rights and environmental standards in cotton and textile production through their purchasing decisions; on the other hand, the use of clothing by consumers themselves causes a high ecological footprint: in the form of water, energy and chemicals used in washing, drying and ironing, as well as in the form of microplastics that enter the water. Better washing and drying instructions in the form of care labels can reduce the environmental impact of clothing (Sajn 2019).

Future prospects

Circular economy solutions in the textile industry:

The short-lived nature of many textiles[51] and the low level of recycling in the industry means that 73 % of clothing ends up in landfills or incinerators after use (Ellen MacArthur Foundation 2017). Most clothing is also mechanically recycled, meaning it is cut up and shredded, which means the fibres are shorter and of lower quality, losing 75 % of their value. Downcycling takes place, in which the fibres are made into insulation material, wiping cloths or mattress fillings, rather than new clothing (Sajn 2019). According to data from the European Parliament, only about one percent of the world's clothing is recycled and made into new garments. One reason for this is the insufficient availability of appropriate technologies (European Parliament 2020). These developments underline the need for circular economy solutions for the textile sector. In this context, issues such as recycling[52], upcycling, biodegradability or durability of products as well as sustainable consumption and use should be addressed.

Selection of certificates and initiatives

- Better Cotton Initiative
- Sustainable Apparel Coalition (SAC)
- Global Organic Textile Standard (GOTS)
- Organic Content Standard (OCS) – for organically grown cotton
- GoldWeave Seal
- Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)
- EU Ecolabel
- Fair Wear Foundation
- Fairtrade Certified Cotton
- Soil Association Organic Standard
- Oeko-Tex 100 and Made in Green von Oeko-Tex
- Cotton Made in Africa
- Textile Exchange – OE Standard 100 requires textile mills to use 100 % certified organic fibres (except sewing thread)
- Internationale Verband der Naturtextilwirtschaft – IVN Best Seal

51 Between 2000 and 2015, the average useful life of clothing reduced by 36 % globally and 70 % in China (Ellen MacArthur Foundation 2017).
52 There are fundamental limits to the recycling of cotton fibres: as fibre lengths shorten during recycling, the fibres cannot be spun into yarn over and over again. For a discussion of new technological approaches and other recovery options that go beyond the traditional recycling, see: Piribauer and Bartl 2019, "Textile recycling processes, state of the art and current developments: a mini review."

Sources

Anwar, Touhid Bin; Behrose, Bushra and Shoeb Ahmed 2018: Utilization of textile sludge and public health risks assessment in Bangladesh. In: Sustainable Environment Research 28 (5): 228–233. *https://doi.org/10.1016/j.serj.2018.04.003* (last accessed 10.03.2021).

Bundesministerium für Arbeit und Soziales (BMAS) 2020: Die Achtung von Menschenrechten entlang globaler Wertschöpfungsketten. Risiken und Chancen für Branchen der deutschen Wirtschaft (Berlin: BMAS). *https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschenrechten-entlang-globaler wertschoepfungsketten.pdf;jsessionid=97105B9111F-CE1F1F90D5A407FA04ACA.delivery1-replication?__blob=publicationFile&v=1* (last accessed 10.03.2021).

Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ) 2019: Baumwollanbau – auf dem Weg zu mehr Nachhaltigkeit (Berlin: BMZ). *https://www.bmz.de/de/zentrales_downloadarchiv/themen_und_schwerpunkte/agrar/191210_FS_Baumwollanbau_web.pdf* (last accessed 10.03.2021).

Business and Human Rights Resource Centre 2014. Report calls for greater transparency from garment brands on tackling bonded labour in South India suppliers (online 27.06.2014: Business and Human Rights Resource Centre). *https://www.business-humanrights.org/en/latest-news/report-calls-for-greater-transparency-from-garment-brands-on-tackling-bonded-labour-in-south-india-suppliers/* (last accessed 19.05.2021)

Cotula, Lorenzo and Liliane Mouan 2021: Labour Rights in Special Economic Zones: Between Unilateralism and Transnational Law Diffusion. In: Journal of International Economic Law 24 (2): 341–360. *https://doi.org/10.1093/jiel/jgab012* (last accessed 10.03.2021)

Delelegn, G.M. 2018: Assessment of Physical and Chemical Contents of Textile Sludge and Associated Risks on Public Health: In Case of Common Effluent Treatment Plant (CETP). (Ehtiopia: Environmentalist at Industry Parks Development Corporation – IPDC). *https://www.rroij.com/open-access/assessment-of-physical-and-chemical-contents-of-textile-sludge-and-associatedrisks-on-public-health-in-case-of-common-effluent-tre.pdf* (last accessed 10.03.2021)

Ellen MacArthur Foundation 2017: A new Textiles Economy: Redesigning Fashion's Future (Cowes: Ellen MacArthur Foundation). *https://www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report_Updated_1-12-17.pdf* (last accessed 10.03.2021).

Europäisches Parlament 2020: Umweltauswirkungen von Textilproduktion und -abfällen (Infografik) (online 29.12.2020: Europäisches Parlament). *https://www.europarl.europa.eu/news/de/headlines/society/20201208STO93327/umweltauswirkungen-von-textilproduktion-und-abfallen-infografik* (last accessed 08.04.2021).

European Agency for Safety and Health at Work 2008: E-fact 30 – Occupational safety and health in the textiles sector (Bilbao: European Agency for Safety and Health at Work). *https://osha.europa.eu/en/search/site?search_block_form=Occupational+safety+and+health++in+the+textiles+sector&op=Search* (last accessed 18.05.2021).

Fair Labour Association (FLA) and Development Workshop Cooperative 2017: Child Labour in Cotton Supply Chains. Action-based Collabourative Project to Address Human Rights Issues in Turkey (Washington: FLA). *https://www.unicef.nl/files/child_labor_in_cotton_supply_chains_june_2017.pdf* (last accessed 17.04.2021).

Fair Wear Foundation 2019: India country study 2019 (Amsterdam: Fair Wear Foundation). *https://api.fairwear.org/wp-content/uploads/2019/06/CS-INDIA-2019.pdf* (last accessed 27.05.2021).

Ferenschild, Sabine 2019: Machbarkeitsstudie zur nachhaltigen Beschaffung von Textilien in der Diakonie (Bonn: Südwind Institut, Gesellschaft für internationale Zusammenarbeit). *https://www.moewe-westfalen.de/wp-content/uploads/2020/06/28-01-20-Machbarkeitsstudie_Final.pdf* (last accessed 19.05.2021).

Global Fashion Agenda (GFA) and The Boston Consulting Group 2017: Pulse of the Fashion Industry 2017 (Boston, Copenhagen: GFA, The Boston Consulting Group). *https://www.globalfashionagenda.com/publications-and-policy/pulse-of-the-industry/* (last accessed 08.04.2021).

Greenpeace 2015: Pestizide und unsere Gesundheit – die Sorge wächst (Vancouver: Greenpeace). *https://www.weltagrarbericht.de/fileadmin/files/weltagrarbericht/Weltagrarbericht/03Gesundheit/2015Greenpeace-Pestizide.pdf* (last accessed 18.05.2021).

Greenpeace International 2018: Destination Zero: Sieben Jahre Entgiftung der Textilindustrie (Vancouver: Greenpeace International). *https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/s02231_es_gp_detox_report_dt_07_18_fin.pdf* (last accessed 08.04.2021).

Hossain, Laila and Mohidus Samad Khan 2020: Water Footprint Management for Sustainable Growth in the Bangladesh Apparel Sector. In: Water 12(10), 2760. *https://doi.org/10.3390/w12102760* (last accessed 10.03.2021).

Hubbard 2019: The Sobering Details Behind the Latest Seed Monopoly Chart (online 11.01.2019: Civil Eats). *https://civileats.com/2019/01/11/the-sobering-details-behind-the-latest-seed-monopoly-chart/* (last accessed 19.05.2021).

Ibragimov, Nazirbay; Evett, Steven R.; Esanbekov, Yusupbek; Kamilov, Bakhtiyor S.; Mirzaev, Lutfollo and John P.A. Lamers 2007: Water use efficiency of irrigated cotton in Uzbekistan under drip and furrow irrigation. In: Agricultural Water Management 90 (1–2): 112–120. *https://doi.org/10.1016/j.agwat.2007.01.016* (last accessed 10.03.2021).

International Labour Organization (ILO) 2021: Reducing the footprint? How to assess carbon emissions in the garment sector in Asia. ILO Asia-Pacific report. (Genf: ILO). *https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/publication/wcms_781938.pdf* (last accessed 01.06.2021).

International Labour Organization (ILO) o. J.: Eliminating child labour and forced labour in the cotton, textile and garment value chains: an integrated approach (Genf: ILO). *https://www.ilo.org/islamabad/whatwedo/projects/WCMS_648369/lang--en/index.htm%20und%20https://www.globalslaveryindex.org/2018/findings/importing-risk/g20-countries/* (last accessed 07.04.2021).

International Labour Organization (ILO) and FUNDAMENTALS 2016: Child labour in cotton: a briefing (Genf: ILO). *https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj80cqAxaDvAhXSGewKHazADCYQFjAAegQIARAD&url=https%3A%2F%2Fwww.ilo.org%2Fipecinfo%2Fproduct%2Fdownload.do%3Ftype%3Ddocument%26id%3D29655&usg=AOvVaw2A4pz8n9U0xx97sv3p6yt4* (last accessed 08.03.2021).

International Trade Centre (ITC) 2011: Women in cotton: Results of a Global Survey (Genf: International Trade Centre). *https://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Sectors/Food_and_agri_business/Cotton/AssetPDF/Women%20in%20cotton%20-%209%2011%2011%20FINAL.pdf* (last accessed 19.05.2021).

International Union for Conservation of Nature (IUCN) 2016: Biodiversity Risks and Opportunities in the Apparel Sector (Gland: IUCN). *https://portals.iucn.org/library/sites/library/files/documents/Rep-2016-001.pdf* (last accessed 10.03.2021).

Kerkow, Uwe and Jens Martens 2010: Sonderwirtschaftszonen Entwicklungsmotoren oder teure Auslaufmodelle der Globalisierung? (Düsseldorf/Bonn/Osnabrück: DGB Bildungsnetzwerk BUND, Global Policy Forum Europe, terre des hommes). *https://www.dgb-bildungswerk.de/sites/default/files/media/product/files/Arbeitspapier_Sonderwirtschaftszonen.pdf* (last accessed 27.05.2021).

Messner, Monika in Reichert, Inka 2019: So macht unsere Kleidung die Umwelt kaputt (online 06.12.2019: Quarks) *https://www.quarks.de/umwelt/kleidung-so-macht-sie-unsere-umwelt-kaputt/* (last accessed 19.05.2021).

Naturtextil 2018: Bio-Baumwolle – die ökologische Alternative überzeugt (online: Naturtextil). *https://naturtextil.de/themen/bio-baumwolle/* (last accessed 07.04.2021).

Niebank, Jan-Christian 2018: Bringing human rights into fashion: issues, challenges and underused potentials in the transnational garment industry (Berlin: Deutsches Institut für Menschenrechte). *https://www.ssoar.info/ssoar/bitstream/handle/document/61194/ssoar-2018-niebank-Bringing_human_rights_into_fashion.pdf?sequence=1&isAllowed=y&lnkname=ssoar-2018-niebank-Bringing_human_rights_into_fashion.pdf* (last accessed 10.03.2021).

OECD and FAO 2021: OECD-FAO Agricultural Outlook 2021–2030 (Paris, Rom: OECD, FAO). *https://www.oecd-ilibrary.org/docserver/19428846-en.pdf?expires=1626347360&id=id&accname=guest&checksum=23241FBB865BAF6F817AB7260980DDB3* (last accessed 15.07.2021).

Ogliore, Talia 2020: Long-term analysis shows GM cotton no match for insects in India (online 13.03.2020: Washington University in St. Louis). *https://source.wustl.edu/2020/03/long-term-analysis-shows-gm-cotton-no-match-for-insects-in-india/* (last accessed 19.05.2021).

Oxford Economics 2021: Status Deutscher Mode 2021. Bericht für das Fashion Council Germany. (Oxford: Oxford Economics). *https://www.bmwi.de/Redaktion/DE/Downloads/Studien/status-deutscher-mode-2021.pdf?__blob=publicationFile* (last accessed 01.06.2021).

Paulitsch, Katharina 2004: Am Beispiel Baumwolle: Flächennutzungskonkurrenz durch exportorientierte Landwirtschaft (Wuppertal: Wuppertal Institut für Klima, Umwelt und Energie). *https://www.econstor.eu/bitstream/10419/21835/3/WP148.pdf* (last accessed 19.05.2021).

Piribauer, Benjamin and Andreas Bartl 2019. Textile recycling processes, state of the art and current developments: A mini review. In: Waste Management & Research 37(2): 112–119. *https://doi.org/10.1177/0734242X18819277*

Richardson, Benjamin and James Harrison: Labour rights in Export Processing Zones with a focus on GSP+ beneficiary countries. (Brussels: European Parliament). *https://www.europarl.europa.eu/RegData/etudes/STUD/2017/603839/EXPO_STU(2017)603839_EN.pdf* (last accessed 10.03.2021).

Sagris, Thomas and Justin Abbott 2015: An analysis of industrial water use in Bangladesh with a focus on the textile and leather industries (Washington: 2030 Water Resources Group) *https://www.2030wrg.org/wp-content/uploads/2016/02/WRG-Bangladesh-Report.pdf* (last accessed 18.05.2021).

Sajn, Nikolina 2019: Environmental impact of the textile and clothing industry. What consumers need to know (Wiertz: European Parliamentary Research Service). *ttps://www.europarl.europa.eu/RegData/etudes/BRIE/2019/633143/EPRS_BRI(2019)633143_EN.pdf* (last accessed 08.04.2021).

Scherf, Cara-Sophie; Gailhofer, Peter; Hilbert, Inga; Kampffmeyer, Nele and Tobias Schleicher 2019: Umweltbezogene und menschenrechtliche Sorgfaltspflichten als Ansatz zur Stärkung einer nachhaltigen Unternehmensführung (Dessau-Roßlau: Umweltbundesamt). *https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2019-09-03_texte_102-2019_ap_1-unternehmerische-sorgfaltspflichten.pdf* (last accessed 10.03.2021).

Stamm, Andreas; Altenburg, Tilman; Müngersdorff, Maximilian; Stoffel, Tim and Kaspar Vrolijk 2019: Soziale und ökologische Herausforderungen der globalen Textilwirtschaft. Lösungsbeiträge der deutschen Entwicklungszusammenarbeit (Bonn: Deutsches Institut für Entwicklungspolitik). *https://www.die-gdi.de/uploads/media/DIE_Publikation_Textilwirtschaft_2019.pdf* (last accessed 07.04.2021).

Statistisches Bundesamt (Destatis), GENESIS-Online Datenbank, *https://www-genesis.destatis.de/genesis/online* (last accessed 30.06.2021)

Südwind Institut für Ökonomie und Ökumene 2013. Flächenkonkurrenz – das Beispiel Baumwolle (Siegburg: Südwind e. V. – Institut für Ökonomie und Ökumene). *https://suedwind-institut.de/files/Suedwind/Publikationen/2013/2013-11%20FS%20Flaechenkonkurrenz%20-%20das%20Beispiel%20Baumwolle.pdf* (last accessed 19.05.2021).

Textile Exchange 2020: Organic Cotton Market Report 2020 (New York: Textile Exchange). *https://textileexchange.org/wp-content/uploads/2020/08/Textile-Exchange_Organic-Cotton-Market-Report_2020-20200810.pdf* (last accessed 15.07.2021).

The Freedom Fund 2014: Addressing Modern Slavery in Tamil Nadu Textile Industry – Feasibility Study Report (London: The Freedom Fund). *https://freedomfund.org/wp-content/uploads/Addressing-modern-slavery-in-Tamil-Nadu-Textile-Industry-26Feb15.pdf* (last accessed 19.05.2021).

Theuws, Martje and Pauline Overeem 2014: Löchrige Kleider: Der Missbrauch von Mädchen und jungen Frauen in der Textilindustrie Südindiens (Amsterdam: SOMO, ICN). *https://femnet.de/images/downloads/publikationen/Loechrige-Kleider.pdf* (last accessed 25.05.2021).

Umweltbundesamt (UBA) 2019: Die Textilindustrie in Deutschland (Dessau-Roßlau: UBA). *https://www.umweltbundesamt.de/themen/wirtschaft-konsum/industriebranchen/textilindustrie* (last accessed 18.05.2021).

Umweltinstitut München e. V. 2016: Fragen und Antworten. Anbau von Baumwolle. (online August 2016: Umweltinstitut München e. V.). *http://www.umweltinstitut.org/fragen-und-antworten/bekleidung/anbau-von-baumwolle.html* (last accessed 10.03.2021).

United States Department of Agriculture – Foreign Agriculturel Service 2021: Cotton: World Markets and Trade (online: USDA/FAS). *https://downloads.usda.library.cornell.edu/usda-esmis/files/kp78gg36g/js957857r/cr56nv141/cotton.pdf* (last accessed 30.07.2021)

Van Dycke, Lodewijk and Geertrui Van Overwalle 2017: Genetically Modified Crops and Intellectual Property Law: Interpreting Indian Patents on Bt Cotton in View of the Socio-Political Background. In: Jorunal of Intellectual Property, Information Technology and E-Commerce Law 8 (2): 151–165. *https://ssrn.com/abstract=3169958*

Word Wide Fund for Nature (WWF) 2020.: Durstige Pflanzen – Wasserschlucker – Landwirtschaft (online 11.06.2020: WWF). *https://www.wwf.de/themen-projekte/fluesse-seen/wasserverbrauch/wasser-verschwendung#:~:text=Zum%20Beispiel%20Baumwolle%20und%20Erdbeeren&text=Beispielsweise%20sind%20bis%20zu%2011.000,oder%20versickert%20aus%20undichten%20Kan%C3%A4len* (last accessed 10.03.2021).

3.2. Wood

Industries:

construction, furniture, wood products

Typical products:

floorboards, parquet, chairs, tables, chests of drawers, cabinets, trusses, siding, beams, firewood, veneers, chipboard, plywood, energy wood, toys, decoration, shutters, den, blinds, models, ships, barbecue coal

Wood

To the point

- Wood is extracted from forests and wood plantations; as the demand for wood increases worldwide, wood plantations play an increasingly important role in meeting the global demand for wood (McEwan et al. 2020).
- Wood is used in various industries and products, including construction and the furniture or paper industry; another typical product is barbecue charcoal.
- The international forestry sector is characterised by a high degree of informality.
- Illegal logging is a major problem in the forestry and timber industry, particularly in tropical regions (BMEL 2019), but also in European countries such as Russia, Romania and Bulgaria (WWF 2008).
- Significant human rights and environmental risks are increasingly found at the level of timber harvesting, particularly in the areas of land use and property rights, biodiversity and deforestation, forced labour and human trafficking, and conflicts and security.
- The World Bank has forecast a fourfold increase in global timber demand by 2050. The global challenge is to meet the increasing demand for wood products without damaging the world's forest resources (Adhikari & Ozarska 2018).
- Timber imports are regulated by the European Timber Trade Regulation (EUTR), implemented in Germany by the Timber Trade Assurance Act (HolzSiG).

Countries of origin

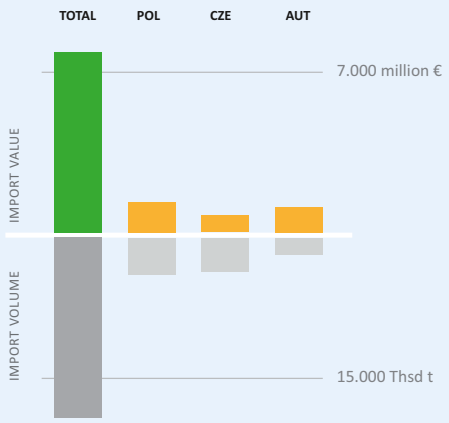
Imports of Wood to Germany

Total import volume and value

2 DIGIT CLASSIFICATION OF GOODS	DESCRIPTION	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
WA 44	Wood, wooden products, charcoal	19.219,75	7.878,83

Main trading partners (imports) for Wood to Germany

COUNTRY	IMPORT VOLUME (THSD t)	IMPORT VALUE (MILLION €)
Poland (POL)	3.885,86	1.321,92
Czech Republic (CZE)	3.611,17	735,34
Austria (AUT)	1.770,37	1.107,55



Source: Genesis – Destatis

Structural features

Approximately one-third of the world's land area is covered with forests (NABU n. d.) From these forests, the forestry industry obtains its most important raw material, wood. Forestry operations take care of the maintenance as well as the management of forests for the purpose of timber production. Whether ecological or economic aspects are more important in the use of the forest varies greatly from region to region. After the raw wood has been taken from the forest or from timber plantations[53], it is first processed in sawmills, planing mills or chipboard factories, where, among other things, sawn timber is produced. This timber is then processed in a further processing stage according to the intended end use, for example in joineries or in carpentry or timber construction, before it is sold.

According to official figures, 13.7 million people work in forestry worldwide (ILO n. d.). However, it can be assumed that this figure is very low, as it only includes the formal part of the timber industry. The forestry sector is, however, characterised by a high degree of informality, the large extent of which (especially in developing countries) is only vaguely estimated (ILO n. d.). The biggest problem that arises in this context is illegal logging, which occurs mainly in tropical regions (BMEL 2019). Here timber is taken from endangered and protected species (e. g. tropical timber) or from

53 In the wake of a fast-growing demand for timber worldwide, timber plantations are playing an increasingly important role in meeting global timber demand (McEwan et al. 2020). While timber plantations accounted for about 7 % of the world's forest area in 2015, they were responsible for 46 % of roundwood production in 2012 (Payn et al. 2015).

protected areas (e. g. nature parks) (WWF 2008). Illegal logging and trade in timber is a profitable business for all parties involved, providing them with revenues that are five to ten times higher than those from legal practices (Nellemann 2012). According to estimates by the Thünen Institute, 2–5 % of the timber imported into Germany is harvested illegally, although the proportion can be much higher depending on the country of origin (BMEL 2019). Illegal logging is also estimated at 15–30 % of global forest production (Nellemann 2012).

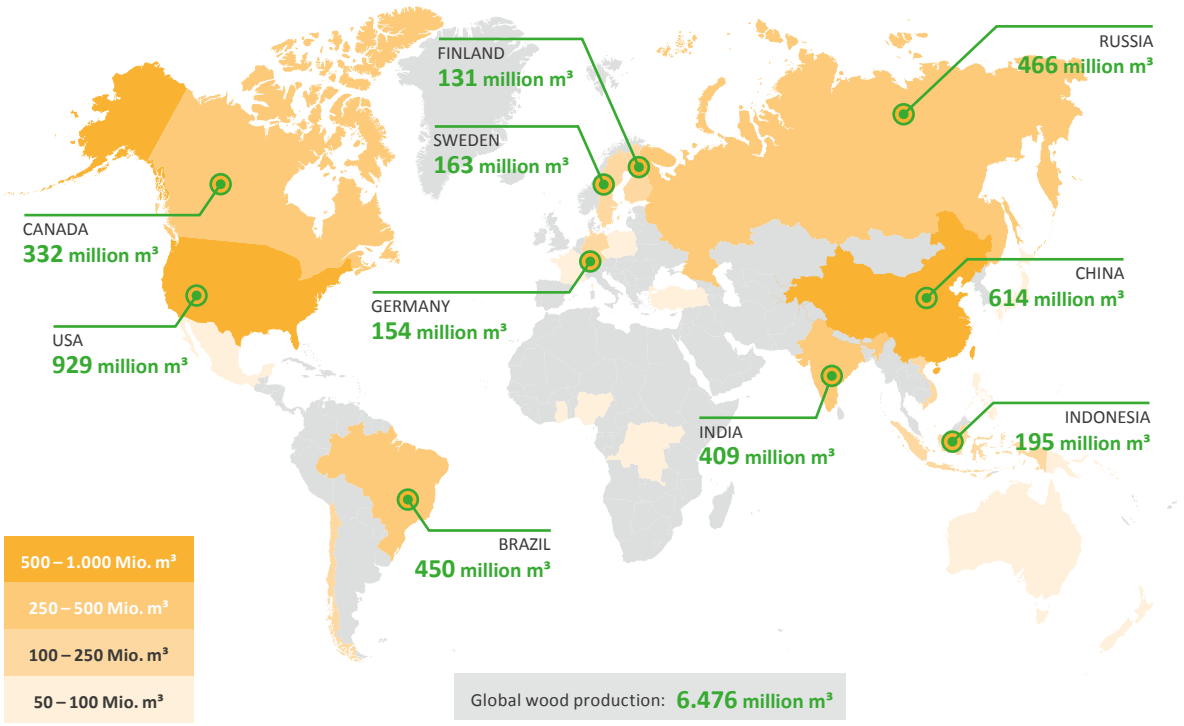
Illegal timber is harvested all over the world. Regions in West and Central Africa (including Cameroon, Democratic Republic of the Congo (DRC), Côte d'Ivoire and Nigeria) and Southeast Asia (including Indonesia, Myanmar, Malaysia), as well as China, where there are less sustainable forest management and certification systems, and in some cases high levels of poverty and weak governance structures (Verité 2017; WWF 2011; Interpol 2019). Illegal logging is also a serious problem in Brazil, Peru, as well as the Baltic States, the Balkans, Russia, Romania and Bulgaria (WWF 2008). For Peru, it is estimated that between 40 and 60 % of logging is illegal. For Brazilian state of Pará, in the Amazon region, this figure is estimated to be as high as 80 % (Interpol 2019). These countries are also the states with the last remaining large contiguous forest areas in the world (WWF 2011). China acts as an important transit country in the international timber trade, sourcing much of its raw material from the designated risk areas and further exporting it from there as wood and paper products (UNEP-WCMC 2018; WWF 2008).

Germany imports most of its wood, wood products and charcoal[54] from Poland, followed by the Czech Republic and, at some distance, Austria (see table above). The term wood products covers a wide range of processed wood, including chipboard, doors and door frames, breadboards and chopping boards as well as pallets and boxes (Genesis – Destatis). However, the category does not include furniture. For comparison, Germany also imported 421,764 tons of wooden furniture[55] from Poland, valued at €706.67 million in 2019, which also puts Poland in first place in this category, followed by China with 103,711 tons (€235.1 million) and then Italy with 70,909 tons (€151.22 million) (Genesis – Destatis). For paper imports (papers and paperboards[56]), Austria (263,809 tons at €224.42 million), Finland (253,296 tons at €182.46 million) and Sweden (251,962 tons at €190.1 million) are in the lead.

The World Bank has projected a fourfold increase in global demand for wood by 2050. The global challenge is to meet the increasing demand for wood products without damaging the world's forest resources (Adhikari & Ozarska 2018). While human rights and environmental risks exist in all stages of the value chain and in different sectors (e. g. sawmills, furniture industry or coal piles), the following risk localisation focuses on timber harvesting, as this stage of the value chain has to be considered particularly critically with regards to the central function of forests for the ecosystem as well as with regards to the remaining large problem of illegal logging.

54 Charcoal is still not covered by the European Timber Trade Regulation (EUTR) and can accordingly be placed on the market in Europe without controls (WWF 2020). According to WWF estimates, the EU imports around 1.6 to six million cubic metres of illegal wood in the form of barbecue charcoal every year (WWF 2020). Poland also dominates the European market in charcoal exports. Although Poland itself is the largest charcoal producer in the EU, charcoal exports exceed the country's own production by about one-third. While the products exported to Germany and other "sensitive countries" originate predominantly from Poland itself, imported products (mostly from the risky countries Belarus and Nigeria) are mainly sold on the domestic market (WWF 2020).
55 The category (tariff item number WA940360) includes wooden furniture other than office, kitchen, bedroom and seating furniture.
56 Customs tariff number WA4802.

Production countries



Wood production* in million cubic meters (million m³) per year (2019)
* Industrial logs and lumber

Source: FAOSTAT – Forestry Production and Trade 2019

Significant human rights risks

Child labour

- The risk of child labour in the timber sector exists mainly in rural and remote regions (ILO n. d.). For example, in Chiapas (Mexico), children are involved in accident-prone tree felling (sometimes without personal protective equipment) and in sawmills, where they are exposed to sawdust inhalation and accidents caused by machinery (Wagner et al. 2020). There are also reports of child labour in the timber sector in Cambodia and Vietnam (USDOL 2018).

Forced labour and human trafficking

- The presence of labour brokers and middlemen in the production and export of timber has great potential and risks for abuse (Verité 2017). One cycle of abuse and indebtedness is the debt bondage typical of the industry, in which middlemen deny local communities the pre-determined price for the timber by claiming that the market price for the wood had fallen, forcing the municipalities into debt (Verité 2017). Another form

of bonded labour occurs in Peru, for example, when loggers pay excessive prices for materials to brokers (*habilitadores*) to do their work (Verité 2017). There are also reports of forced labour in Brazil, North Korea and Russia (USDOL 2018).

Health and safety at work

- Forests and forest products production sites are potentially hazardous working environments. This factor is reinforced by the high degree of informality in the sector (Verité 2017). Working with chainsaws or at high altitudes repeatedly leads to serious accidents. Loggers working in illegal logging areas have a higher risk of accidents due to a lack of regulation and the presence of organised crime (Verité 2017).

- Loggers or forest workers working in heavily overgrown tropical forests are at higher risk of contracting malaria or dengue fever, which are transmitted by insects (Verité 2018).

Freedom of association and assembly

- Trade unions are not widespread in forestry, and the associations that often exist rarely function as workers' organisations, especially in developing countries (ILO 2011). In the UNECE region (Europe, North America and parts of West and Central Asia), the number of trade unions has also declined, partly because large companies that were once responsible for timber harvesting have increasingly handed over contracts to a fast-growing number of contractors with different labour and management structures (FAO and UNECE 2019).

Discrimination

- Women in forestry are heavily underrepresented in management and decision-making positions. In some cases, they receive 10–40 % lower wages and are exposed to higher health and safety risks (ILO 2011; Estruch and Rapone 2013).

- Women are often not involved in community management and the governance of forests, even though they use many forest resources and have great knowledge. As women only partially hold official forest use rights, but these are also not always put into practice, they are disadvantaged compared to men and are not included in decision-making processes (Arora-Jonsson et al. 2019).

- Migrant and guest workers in the forestry sector are to be understood as a vulnerable group, as they often have little work experience and no or insufficient social protection.[57] This can be the case, for example, in the USA, where isolation at the workplace, overwork and low wages with additional deductions (for food and visa costs) are reported to be the general practices (Verité 2017).

- In some cases, the land tenure rights of local or indigenous groups are not recognised, or not recognised to the same extent as private property rights, and forest concessions over these areas are granted to forestry companies. Even in cases where land tenure is recognised, there may be distributional inequalities within the community in terms of gender and ethnicity (Sustainable Procurement of Forest Products n. d.).

57 For these reasons, migrant and guest workers are also more vulnerable to forced labour. This is especially true for undocumented migrant/immigrant workers, who are provided with work through informal social structures (Verité 2017).

Wages and working conditions

- The high number of informal/illegal workers in the forestry sector is associated with negative impacts on working conditions. Forests and forest product production sites are potentially hazardous working environments characterised by high levels of informality, illegality, low wages and dangerous working conditions (Verité 2017). Compared to similar sectors such as wood processing or pulp and paper, wages in forestry are often lower (ILO 2011).

- Employment is often temporary or seasonal, which means that workers have no job security or fixed income. Furthermore, there is an increase in outsourcing or subcontracting in the timber industry, which can have a negative impact on working conditions (Estruch and Rapone 2013).

Land use and property rights

- Deforestation, whether legal or illegal, often takes place in areas where indigenous groups live and where the forest is of great social and cultural importance (Verité 2017; WWF 2008). In some cases, the land tenure rights of local or indigenous groups are not recognised, or not recognised to the same extent as private property rights. This can lead to a situation where, although indigenous groups have long made claims to the land, governments grant forest concessions, displacing the indigenous groups (Verité 2017).

- The granting of forest concessions to forestry companies can lead to clashes between them and local and indigenous groups.[58] These disputes not infrequently threaten the livelihoods (e. g. access to clean water, right to an adequate standard of living, right to food, loss of their tribal territory due to forest destruction) and human rights of communities (Verité 2017).

- Reports from Brazil show that the land rights of indigenous groups are being violated by illegal logging. This is increasingly taking place on the territories of indigenous groups, as many valuable tree species can still be found there (Wallace 2019). Members of indigenous and other groups who have resisted illegal logging on their lands have reportedly been threatened and sometimes killed by the companies and individuals acting illegally (HRW 2019).

- In Congo, too, the livelihoods of indigenous groups are threatened by (illegal) logging, as they lose important food sources in the course of deforestation and their cultural traditions, which are closely linked to the rainforest, are endangered. When their habitat is threatened by logging, indigenous groups are displaced from their traditionally inhabited areas (Cultural Survival 2019).

58 For example, Indonesian authorities have violated the land rights of local and indigenous groups and granted concessions over these areas to forestry companies. As a result, these locally based populations have lost their livelihoods, which were based on the management of forest areas (HRW 2013).

Conflicts and security

- In some areas, illegal logging is carried out by criminal networks that threaten, attack or even kill people who try to oppose their activities. These can include officials of the relevant environmental authorities and police officers, but also smallholders or members of indigenous groups (HRW 2019).

- In some conflict and high-risk areas[59] (including Liberia, Sierra Leone, Central African Republic, Côte d'Ivoire, DRC), illegal logging serves to finance civil wars and arms purchases (WWF 2008). A well-known example of this is the so-called "blood timber" from the Central African Republic. Since a violent takeover by rebel groups in 2013, natural resources and also areas of forestry have been controlled by armed rebel groups such as the Seleka. Despite prevailing violence and chaos, foreign forestry companies have been able to continue exporting timber from the Central African Republic because they have had financial arrangements with the Seleka. As a result, European and Chinese companies in particular have reportedly helped finance the conflict and the numerous human rights violations that accompany it (Global Witness 2015).

- Another example is illegal logging in the DRC. Despite the 2002 moratorium, logging concessions are granted, encouraging illegal logging. Protests by local people against illegal activities by the companies CFBC, Trans-M, Safbois and Sodefor have led to conflict, as the authorities side with the companies and intimidate or arrest protesters (Greenpeace 2007). Furthermore, research found that the civil war was partly financed by the illegal logging and marketing of tropical timber (WWF 2008).

59 The term "conflict and high-risk areas" is understood in the sense of the OECD definition. See: *http://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-for-Responsible-Business-Conduct.pdf*.

Significant environmental risks

Water consumption and availability

- Forests lose their protective function as a result of deforestation (WWF 2008). Uncontrolled deforestation or degradation of forests can disrupt regional water cycles. Trees normally ensure that a balance is maintained between water on land and water in the atmosphere. If this balance is disturbed, water can no longer be stored in the forest system, which can lead to soil erosion and altered precipitation with negative impacts (such as landslides and floods) (WWF n. d.).

- Forest and timber plantations can lead to water scarcity when they replace natural vegetation such as grasslands and shrublands, as they consume more water in comparison (Mata'ese et al. 2010). For example, China has planted several billion trees as part of a national reforestation program to increase forest cover to 42 % by 2050. Non-native tree species consume more water than natural grasslands, thereby altering regional hydrological cycles, flow rates of rivers such as the Yellow River, and water availability. This creates regional water scarcity, which negatively impacts both nature and humans (Zhang 2020).

Air pollution and emissions

- The Amazon is the largest tropical rainforest in the world and plays a crucial role in combating climate change by absorbing and storing huge amounts of carbon dioxide. The tropical rainforest, like all other forests, can no longer fulfil its storage function as soon as it is cut down uncontrollably. Closely related to illegal logging in rainforest areas is the subsequent slash-and-burn clearing of the areas in order to prepare them for agricultural use. This also releases carbon dioxide stored in the soil and other plants into the atmosphere. It is estimated that tropical rainforest deforestation alone accounts for approximately 8 % of global greenhouse gas emissions (Gibbs, Harris, and Seymour 2018). Estimates of global greenhouse gas emissions from deforestation and degradation range from 13 % to 17 % (Nellemann 2012; Seymour and Gibbs 2019).

Biodiversity and deforestation

- It is estimated that illegally harvested timber accounts for approximately 15–30 % of globally traded timber (EIA o. J.; Interpol 2019). Illegally cleared timber contributes significantly to global deforestation, particularly in the Amazon, one of the world's most biodiverse ecosystems (World Bank 2019). In tropical countries, illegally logged timber can account for 50–90 % of traded timber. Interpol estimates that in Peru 40–60 % and in some regions of Brazil as much as 80 % of logging is illegal (Interpol 2019). Due to the destruction of their natural habitat through large-scale deforestation, many (animal) species are threatened with extinction. However, selective logging, which specifically targets valuable tree species such as Mahogany, threatens the biodiversity of the Amazon rainforest. For every valuable tree, approximately 27 other trees are damaged, which leads to the degradation of the rainforest and increases its susceptibility to fire (Hirschberger 2008).

- Over-exploitation of forests and large-scale clear-cutting are associated with the intensification of forest fires, which destroys further valuable habitats (of humans and animals) (WWF 2008). About 80 % of known terrestrial animals live in forests. When these animal species lose their forest home, they are often no longer able to survive in the small forest fragments left behind. They become more accessible to (illegal) hunters, their numbers begin to dwindle and some eventually become extinct. Even localized deforestation can lead to the extinction of unique species that occur in small isolated geographical areas of the world (WWF n. d.). Unregulated or excessive deforestation can in this way contribute to species extinction and biodiversity loss.

- Forests consisting of monocultures or non-native tree species are mainly planted and managed for commercial forestry. However, these planted forests are not sustainable from an ecological point of view, as they are more susceptible to pest infestation and do not provide a natural habitat for native animal and plant species (UBA 2020).

- Synthetic pesticides such as insecticides and herbicides that are dispersed through the air kill not only pests but also other organisms such as natural vegetation and fauna, negatively affecting biodiversity and functionality of ecosystems (UBA 2020).[60] They are often used after slash-and-burn clear-cutting for timber plantations as well as on growing timber plantations to ensure the rapid growth of planted trees (Stop Clearcutting California n. d.).

60 The amount of pesticides applied is low compared to agriculture. However, in the course of climate change, trees will become more susceptible, since, for example, heat-loving insects and pests can overwinter and multiply better in temperate zones. There is therefore a risk that the amount of pesticides and insecticides needed in forestry will increase in the future (Krieger and Neumeister 2015).

Environment and waste

- A lot of waste wood is produced during the processing of wood. It is estimated that for every 1 m³ of felled tree, about 50 % of the wood ends up in waste in the form of damaged residues. Other waste material includes stumps, tops and branches, log waste and abandoned logs. Wood waste contributes to a significant portion of the world's waste. They are often dried in steam boilers or dumped on sites (Adhikari & Ozarska 2018).

Linking human rights and environmental concerns

Human rights and environmental risks in logging are closely linked. For example, illegal logging in Congo is not only responsible for rapid deforestation and associated environmental impacts such as biodiversity loss and climate change, but also threatens the livelihoods of indigenous groups and creates conflict (Scherf et al. 2019). Synergies between human rights and environmental protection therefore arise in particular from the protection of land use rights of indigenous groups and local populations (cf. FAO and FILAC 2021) in order to prevent illegal deforestation by companies and criminals. However, as the local population sometimes also cuts down unregulated timber, an important source of income, environmental protection measures that completely prohibit deforestation can lead to conflicts with socio-economic goals. The socio-economic situation and traditional way of life of indigenous groups and local populations should accordingly be taken into account in environmental protection measures. Therefore, as currently provided for in the EU Timber Regulation, not only the legality of the timber procured should be taken into account, but also human rights and environmental aspects. Policy instruments that can also facilitate the implementation of due diligence include the creation and promotion of alternative (sufficiently lucrative) employment opportunities as well as the promotion of sustainable timber management on legal plantations (Scherf et al. 2019).

Recommendations for action

Find out where the wood comes from:

- This step is central to tackling illegal logging and ensuring that no timber is sourced illegally. Although the European Timber Trade Regulation (EUTR) – implemented in Germany by the Timber Trade Assurance Act (HolzSiG) – requires all timber-importing companies to provide evidence on the exclusion of illegal timber sources, the efficiency of the Timber Trade Regulation is highly controversial. The main issue here is the regulatory loopholes that have so far prevented charcoal, for example, from being covered by the regulation. However, investigations by environmental associations and consumer protection organisations have shown that charcoal products such as barbecue charcoal sold in Europe still contain wood from illegal logging or at least of questionable origin (Zahnen et al. 2020, Bundesrat 2019).

Source certified wood:

- Sourcing certified wood is the safest way to avoid sourcing wood from illegal sources. The FSC (Forest Stewardship Council) is probably the best known and most demanding seal in forestry. The FSC aims to preserve forests worldwide and promotes responsible forest management. Criteria such as the conservation of biodiversity and water resources, soils as well as labour and land use rights are taken into account. However, the label is also subject to criticism. In particular, critics point out the influence of the timber industry on the label, which neglects ecological aspects (Müller 2021). Furthermore, certification bodies are not sufficiently audited (Conniff 2018). Nevertheless, the seal has the highest standards in the industry. An alternative is the PEFC seal (Programme for the Endorsement of Forest Certification Schemes), which at €0.18 per hectare per year for forest certification is significantly cheaper than the FSC seal (€1–2 per hectare/year for less than 1,000 hectares) (PEFC 2018). However, this is also criticized by environmental organisations (Pritzl 2020). In Germany, the Naturland forest certification system is still a stricter alternative (Pritzl 2020).

Procure recycled paper:

- For wood products, the FSC label is very useful and recommended. For paper products, however, it can be misleading, as it mostly refers to paper products made from virgin fibres. Especially with paper, however, recycled material should be used. This can be recognised by the Blue Angel, which also contains requirements for the production process of the paper, such as the avoidance of chemicals that are hazardous to health and/or the environment (UBA o. J.).

Work closely with suppliers:

- Some forest owners and sawmills, especially in the Global South, simply cannot afford FSC certification (FSC 2009; Bulkan 2020), which is why not all non-FSC-certified products originate from illegal logging or were obtained under inhumane conditions. In order to continue sourcing timber from these suppliers, it is important to audit and work with suppliers to ensure that they are meeting their due diligence obligations.

Future prospects

Circular economy solutions for the wood sector:

Wood is generally easy to recycle or reuse. To date, however, the recycling rate for waste wood in Germany is only 20 % (Wörrle 2021). Waste wood that is not painted or treated is usually shredded and processed into chipboard to be returned to the cycle. Most of the remaining waste wood is used for energy, either by being burned in waste wood power plants to generate heat or by being used itself by wood processing companies for heating or electricity generation (Wörrle 2021). In the course of the adaptation of the Waste Wood Ordinance (AltholzV), this is to change in the future and the recycling of waste wood is to be given priority over energy use (Wörrle 2021). This point of the cascade use of wood is also explicitly included in the Charter for Wood 2.0 of the Federal Ministry of Agriculture (BMEL), which is also part of the Federal Government's Climate Protection Plan 2015 (Wörrle 2021). In this context, issues such as the sorting of waste wood, which is sometimes still relatively cost-intensive and therefore represents a problem, are addressed. Accordingly, product design as a whole should be geared towards reuse and recycling, and innovative product ideas such as wood as a substitute for plastic or platform chemicals should be promoted (BMEL 2020). An overall circular system also envisages, for example, that even the ash left over from energy recovery is processed and recycled in other (high-quality) ways (BMEL 2020).

Selection of certificates and initiatives

- EU Forest Crime Initiative
- PEFC is the abbreviation for "Programme for the Endorsement of Forest Certification Schemes"
- FSC (Forest Stewardship Council)
- Interpol
- GTTN (Global Timber Tracking Network)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) – has now also listed 350 tree species
- International Tropical Timber Organization (ITTO)

Sources

Adhikari, Shankar and Barbara Ozarska 2018: Minimizing environmental impacts of timber products through the production process "From Sawmill to Final Products". In: Environmental Systems Research 7 (6). *https://doi.org/10.1186/s40068-018-0109-x* (last accessed 29.06.2021).

Arora-Jonsson, Seema; Ihalainen, Markus; Larson, Anne M.; Pierce Colfer, Carol J. and Dominique Lyons 2019: Moving forward on gender equality in forestry. Serious concern about addressing gender disparities in recent years (online 30.09.2019: Forests News). *https://forestsnews.cifor.org/62242/taking-sdg-5-gender-equality-and-womens-empowerment-seriously-in-the-forestry-sector?fnl=* (last accessed 29.06.2021).

Bulkan, Janette 2020: Smallholder Forestry in the FSC System: A Review. In: Governance Review 17 (2): 7–29. *https://doi.org/10.7202/1073109ar* (last accessed 29.06.2021).

Bundesministerium für Ernährung und Landwirtschaft (BMEL) 2019: Illegaler Holzeinschlag (Berlin/Bonn: Bundesministerium für Ernährung und Landwirtschaft). *https://www.bmel.de/DE/themen/wald/waelder-welt-weit/illegaler-holzeinschlag.html* (last accessed 15.06.2021).

Bundesministerium für Ernährung und Landwirtschaft (BMEL) 2020: Empfehlungen der Arbeitsgruppe Material- und Energieeffizienz zur Etablierung einer ressourceneffizienten Kreislaufwirtschaft bei der Nutzung von Holz (Berlin: BMEL). *https://www.charta-fuer-holz.de/fileadmin/charta-fuer-holz/dateien/aktivitaeten/20200920_Empfehlungen_der_AG_Effizienz_zur_Kreislaufwirtschaft_final.pdf* (last accessed 29.06.2021).

Bundesministerium für Ernährung und Landwirtschaft (BMEL) o. J. Charta Handlungsfelder (online: BMEL). *https://www.charta-fuer-holz.de/charta-handlungsfelder* (last accessed 29.06.2021).

Bundesrat 2019: Entschließung des Bundesrates „Handel mit Holzkohle aus illegalen Quellen eindämmen" (online 20.09.2019: Bundesrat). *https://www.bundesrat.de/SharedDocs/drucksachen/2019/0301-0400/377-19(B).pdf;jsessionid=1D788C6A3076C1908F0B261E5ADFC5AC.2_cid382?__blob=publicationFile&v=1* (last accessed 21.06.2021).

Conniff, Richard 2018: FSC – Ein Siegel, das den Wald kaum schützt (online 16.07.2018: Weltsichten). *https://www.welt-sichten.org/artikel/33600/fsc-ein-siegel-das-den-wald-kaum-schuetzt* (last accessed 29.06.2021).

Cultural Survival 2019: Observations on the State of Indigenous Human Rights in the Democratic Republic of Congo (Cambridge: Cultural Survival). *https://www.culturalsurvival.org/sites/default/files/UPR_DRC_2018.pdf* (last accessed 23.06.2021).

Environmental Investigation Agency (EIA) o. J.: Fighting deforestation and illegal logging (online: EIA) *https://eia-international.org/forests/fighting-deforestation/* (last accessed 21.06.2021).

Estruch, Elisenda and Cristina Rapone 2013: Promoting decent employment in forestry for improved nutrition and food security. Background paper for the International Conference on Forests for Food Security and Nutrition (Rome: Food and Agriculture Organization of the United Nations). *http://www.fao.org/forestry/37072-0fead0729740853a8e0e2410ffde85d8e.pdf* (last accessed 05.07.2021).

Food and Agriculture Organization of the United Nations (FAO), FAOSTAT-Online Datenbank *http://www.fao.org/faostat/en/#data/FO/visualize* (last accessed 15.07.2021).

Food and Agriculture Organization of the United Nations (FAO) and United Nations Economic Commission for Europe (UNECE) 2019: Forest sector workforce in the UNECE region. Overview of social and economic trends with impact on the forest sector (Genf, Rom: FAO, UNECE). *https://unece.org/fileadmin/DAM/timber/meetings/2019/20190327/Key-Findings-Forest-Sector-Workforce-Study-Draft.pdf* (last accessed 29.06.2021).

Food and Agriculture Organization of the United Nations (FAO) and Fund for the Development of the Indigenous Peoples of Latin America and the Caribbean (FILAC) 2021: Forest governance by indigenous and tribal peoples. An opportunity for climate action in Latin America and the Caribbean (Santiago: FAO). *http://www.fao.org/3/cb2953en/cb2953en.pdf#* (last accessed 29.06.2021).

Forest Stewardship Council (FSC) 2009: FSC user-friendly guide to FSC certification for smallholders (Bonn: FSC International Center). *https://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjUwovG1bzxAhXFgP0HHYmQDg8QFjAAegQIAhAD&url=https%3A%2F%2Fic.fsc.org%2Fdownload.fsc-user-friendly-guide-to-fsc-certification-for-smallholders.a-2220.pdf&usg=AOvVaw0WAzil2MvVZAIFfgCBiR2a* (last accessed 29.06.2021).

Gibbs, David; Harris, Nancy and Frances Seymour 2013: By the Numbers: The Value of Tropical Forests in the Climate Change Equation (Washington DC: World Resources Institute). *https://www.wri.org/insights/numbers-value-tropical-forests-climate-change-equation* (last accessed 22.06.2021).

Global Witness 2015: Blood timber. How Europe helped fund war in the Central African Republic (London: Global Witness Limited). *https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/blood-timber-global-witness-20150715.pdf* (last accessed 15.06.2021).

Greenpeace 2007: Carving up the Congo (Vancouver: Greenpeace). *https://www.greenpeace.org/usa/wp-content/uploads/legacy/Global/usa/planet3/PDFs/carving-up-the-congo-part-1.pdf* (last accessed 21.06.2021).

Hirschberger, Peter 2008: Illegaler Holzeinschlag und Deutschland Eine Analyse der Außenhandelsdaten (Frankfurt am Main: World Wildlife Fund). *https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF_Holzimporte_April2008.pdf* (last accessed 22.06.2021).

Hirschberger, Peter 2008: Illegaler Holzeinschlag und Deutschland Eine Analyse der Außenhandelsdaten (Frankfurt am Main: World Wildlife Fund). *https://www.hrw.org/report/2013/07/15/dark-side-green-growth/human-rights-impacts-weak-governance-indonesias-forestry* (last accessed 21.06.2021).

Human Rights Watch (HRW) 2019: Rainforest Mafias. How Violence and Impunity Fuel Deforestation in Brazil's Amazon (New York: Human Rights Watch). *https://www.hrw.org/report/2019/09/17/rainforest-mafias/how-violence-and-impunity-fuel-deforestation-brazils-amazon* (last accessed 15.06.2021).

Interpol 2019: Global Forestry Enforcement. Strengthening Law Enforcement Cooperation Against Forestry Crime (Lyon: Interpol). *https://www.interpol.int/content/download/5149/file/Global%20Forestry%20Enforcement%20Prospectus%202019-web.pdf* (last accessed 22.06.2021).

International Labour Organization (ILO) o. J.: Forestry, wood, pulp and paper sector (Genf: International Labour Organization). *https://www.ilo.org/global/industries-and-sectors/forestry-wood-pulp-and-paper/lang--en/index.htm* (last accessed 15.06.2021).

International Labour Organization (ILO) 2011: Productive and safe work in forestry. Rural Policy Briefs (Genf: ILO). *https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_158989.pdf* (last accessed 29.06.2021).

Krieger, Alfons-E. and Lars Neumeister 2015: Pflanzenschutzmittel in der Umwelt Erhebung zu Wirkstoffmengen von Pflanzenschutzmitteln im Land Brandenburg (Potsdam: Ministerium für Ländliche Entwicklung, Umwelt und Landwirtschaft des Landes Brandenburg). *https://lfu.brandenburg.de/sixcms/media.php/9/lfu_fb_151.pdf* (last accessed 29.06.2021).

Mata'ese, Elisara; Ersting, Almuth; Cardona, Diego Alejandro and Wally Menne 2010: Wood-based bioenergy: the green lie (Amsterdam: Global Forest Coalition). *https://globalforestcoalition.org/wp-content/uploads/2010/10/briefing-paper-bioenergy_final_11.pdf* (last accessed 29.06.2021).

McEwan, Andrew; Marchi, Enrico; Spinelli, Raffaele and Michael Brink 2020: Past, present and future of industrial plantation forestry and implication on future timber harvesting technology. In: Journal of Forestry Research 31: 339–351. *https://doi.org/10.1007/s11676-019-01019-3* (last accessed 17.06.2021).

Müller, Anneke 2021: FSC – Wie nachhaltig ist das Holz-Siegel? (online 09.04.2021: NDR). *https://www.ndr.de/ratgeber/verbraucher/FSC-Wie-nachhaltig-ist-das-Holz-Siegel,fscsiegel110.html* (last accessed 29.06.2021).

Naturschutzbund Deutschland e. V. (NABU) o. J.: Zahlen und Fakten … zum Wald in Deutschland und weltweit (Berlin: Naturschutzbund Deutschland e. V.). *https://www.nabu.de/natur-und-landschaft/waelder/lebensraum-wald/13284.html#:~:text=In%20Deutschland%20gibt%20es%2011,0%2C6%20Hektar%20pro%20Erdenb%C3%BCrger* (last accessed 15.06.2021).

Nellemann, Christian (INTERPOL Environmental Crime Programme) 2012: Green Carbon, Black Trade: Illegal Logging, Tax Fraud and Laundering in the Worlds Tropical Forests. A Rapid Response Assessment. (Arendal: United Nations Environment Programme). *https://wedocs.unep.org/handle/20.500.11822/8030* (last accessed 22.06.2021).

Payn, Tim; Carnus, Jean-Michel; Freer-Smith, Peter; Kimberley, Mark; Kollert, Walter; Liu, Shirong; Orazio, Christophe; Rodriguez, Luiz; Neves Silva, Luis and Michael J. Wingf 2015: Changes in planted forests and future global implications. In: Forest Ecology and Management 352: 57–67. *https://doi.org/10.1016/j.foreco.2015.06.021*

Pritzl, Lena 2020: PEFC-Siegel (Programme for the Endorsement of Forest Certification Schemes) (online 09.06.2020: Utopia). *https://utopia.de/siegel/pefc/* (last accessed 05.07.2021).

Programme for the Endorsement of Forest Certification Schemes (PEFC) 2018: Synopse: Gemeinsamkeiten und Unterschiede zwischen PEFC und FSC (online Juli 2018: PEFC). *https://pefc.de/media/filer_public/db/c5/dbc52fce-5f18-4430-9d3a-67c9da176824/pefc-fsc_synopse_2018.pdf* (last accessed 01.07.2021).

Scherf, Sophie-Cara; Gailhofer, Peter; Hilbert, Inga; Kampffmeyer, Nele and Tobias Schleicher 2019: Umweltbezogene und menschenrechtliche Sorgfaltspflichten als Ansatz zur Stärkung einer nachhaltigen Unternehmensführung (Dessau-Roßlau: UBA). *https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2019-09-03_texte_102-2019_ap_1-unternehmerische-sorgfaltspflichten.pdf* (last accessed 23.06.2021).

Seymour, Frances and David Gibbs 2019: Forests in the IPCC Special Report on Land Use: 7 Things to Know (Washington DC: World Resources Institute). *https://www.wri.org/insights/forests-ipcc-special-report-land-use-7-things-know* (last accessed 22.06.2021).

Statistisches Bundesamt (Destatis), GENESIS-Online Datenbank, *https://www-genesis.destatis.de/genesis/online* (last accessed 30.06.2021)

Stop Clearcutting California o. J.: Toxic Chemicals: Clearcutting includes heavy, repeated use of herbicides and other toxic chemicals (online: Stop Clearcutting California). *https://www.stopclearcuttingca.org/resources/clearcutting-and-toxic-chemicals/* (last accessed 29.06.2021).

Sustainable Procurement of Forest Products (World Resources Institute, World Business Council for Sustainable Development) o. J.: Social impacts. Have the needs of local communities, indigenous peoples and workers been addressed? (online: Sustainable Procurement of Forest Products). *https://sustainableforestproducts.org/Social_Aspects* (last accessed 15.06.2021).

Umweltbundesamt (UBA) o. J.: FSC-Label (Holzprodukte) (online: UBA). *https://www.umweltbundesamt.de/umwelttipps-fuer-den-alltag/siegelkunde/fsc-label-holzprodukte#:~:text=%20Beim%20FSC-Siegel%20gelten%20unter%20anderem%20folgende%20Kriterien%3A,der%20Einhaltung%20der%20Standards%20durch%20unabh%C3%A4ngige...%20More%20* (last accessed 21.06.2021).

Umweltbundesamt (UBA) 2020: Forstwirtschaft (online 14.07.2020: UBA). *https://www.umweltbundesamt.de/daten/land-forstwirtschaft/forstwirtschaft#wirtschaftliche-bedeutung-des-waldes* (last accessed 29.06.2021).

United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC) 2018: People's Republic of China. Country Overview to Aid Implementation of the EUTR (Nairobi: UNEP-WMCMC). *https://ec.europa.eu/environment/forests/pdf/Country_overview_China__03_10_2018.pdf* (last accessed 29.06.2021).

United States Department of Labour (USDOL) 2018: List of Goods Produced by Child Labour or Forced Labour (Washington: United States Department of Labour). *https://www.dol.gov/sites/dolgov/files/ILAB/ListofGoods.pdf* (last accessed 08.06.2021).

Verité 2017: Strengthening Protections Against Trafficking in Persons in Federal and Corporate Supply Chains (Amherst: Verité). *https://www.verite.org/wp-content/uploads/2017/04/EO-and-Commodity-Reports-Combined-FINAL-2017.pdf* (last accessed 21.06.2021).

Verité 2018: Wood Products (Forestry). Trafficking Risk in Sub-Saharan African Supply Chains (Amherst: Verité). *https://www.verite.org/wp-content/uploads/2018/01/SSA-Verite-Commodity-Report-Forestry-Wood.pdf* (last accessed 29.06.2021).

Wagner, Livia; Siller, Diana and Rosalba Landa 2020. People and forests at risk. Organized crime, trafficking in persons and deforestation in Chihuahua, Mexico (Genf: Global Initiative Against Transnational Organized Crime). *https://globalinitiative.net/wp-content/uploads/2020/04/Mexican.Illegal.Logging.22.04.v1.final_.pdf* (last accessed 21.06.2021).

Wallace, Scott 2019: Inside the faltering fight against illegal Amazon logging (online 28.08.2019: National Geographic). *https://www.nationalgeographic.com/environment/article/brazil-logging* (last accessed 22.06.2021).

World Bank 2019: Why the Amazon's Biodiversity is Critical for the Globe: An Interview with Thomas Lovejoy (online 22.05.2019: World Bank). *https://www.worldbank.org/en/news/feature/2019/05/22/why-the-amazons-biodiversity-is-critical-for-the-globe* (last accessed 21.06.2021).

World Wildlife Fund (WWF) o. J.: Deforestation and Forest Degradation (online: World Wildlife Fund). *https://www.worldwildlife.org/threats/deforestation-and-forest-degradation* (last accessed 24.03.2021).

World Wildlife Fund (WWF) 2008: Illegaler Holzeinschlag und Deutschland. Eine Analyse der Außenhandelsdaten April 2008 (Frankfurt am Main: World Wildlife Fund). *https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF_Holzimporte_April2008.pdf* (last accessed 24.03.2021).

World Wildlife Fund (WWF) 2011: Die Wälder der Welt – Ein Zustandsbericht. Globale Waldzerstörung und ihre Auswirkungen auf Klima, Mensch und Natur (Berlin, Zürich: WWF). *https://www.wwf.de/fileadmin/user_upload/WWF_Waldzustandsbericht.pdf* (last accessed 24.03.2021).

Zahnen, Johannes; Hirschberger, Peter and Volker Haag 2020: Grillkohle 2020. Eine EU-Marktanalyse (Berlin: WWF). *https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-EU-Marktanalyse-Grillkohle-2020.pdf* (last accessed 15.07.2021)

Wörrle, Jana Tashina 2021: Altholz: Verbrannt statt weiter genutzt (online, 09.06.2021: Deutsche Handwerks Zeitung). (DHZ)). *https://www.deutsche-handwerks-zeitung.de/altholz-135618/* (last accessed 29.06.2021).

Zhang, Lulu 2020: Planting trees must be done with care – it can create more problems than it addresses (online, 30.01.2020: The Conversation). *https://theconversation.com/planting-trees-must-be-done-with-care-it-can-create-more-problems-than-it-addresses-128259* (last accessed 29.06.2021).

4. Cross-sectional topic: transport and logistics

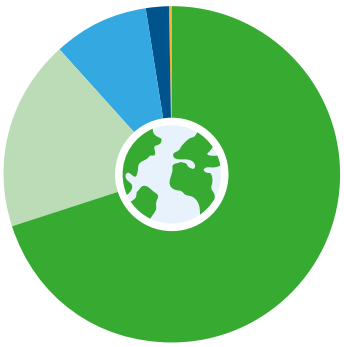
Size of logistics market worldwide (2018[61]):	€5.6 trillion (Transport Intelligence 2019)
Size of logistics market Germany (2019):	€285 billion (BVL 2021)
Employees transport and storage / economic section H (2019):	2,167,000 employees subject to social insurance (DESTATIS 2020a)

Freight transport worldwide by mode of transport in trillion ton-kilometres (2015[62])

- Sea: 75.7
- Road: 19.6
- Rail: 10.1
- Inland waters: 2.2
- Air: 0.2

Total: 107.8

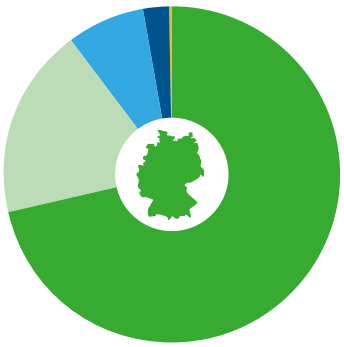
Source: ITF 2019



Freight transport in Germany[63] by mode of transport in billion tonne-kilometres (2019) (Destatis 2020b)

- Road: 498.6
- Rail: 129.2
- Inland waters: 50.9
- Crude oil pipelines: 17.6
- Air: 1.6

Source: Destatis 2020b



61 Unfortunately, more current data is not available at the moment.
62 Calculated by ITF Transport Outlook 2019. Unfortunately, more recent data is not currently available.
63 The category "sea" is not indicated here because, according to Destatis, it is not useful for calculating inland transport performance. This has to do with the fact that all arrivals and departures of ships in ports are recorded in the maritime transport statistics, provided that the voyage took place at least partly at sea. Since the ships come from all over the world and it is not known which sea route they choose and how many kilometres they cover, the transport performance cannot be calculated in tonne-kilometres (cf. Destatis 2020b).

To the point

- The logistics sector is one of the industries with the highest number of employees in Germany (Destatis 2020b).
- Logistics services are used by companies from all sectors, which is why risks in the logistics sector are to be understood as cross-sectional risks (Weiß et al. 2020)
- In terms of international freight transport, transport by container ship is clearly the dominant form of transport (IHRB 2019), while land transport is largely carried out by lorry (Destatis 2020b).
- In principle, risks in the logistics sector are closely linked to country risks, which is why careful consideration should always be given to where products are sourced from and via which routes. The form of transport is also pivotal for the risk potential.
- While corruption represents a risk in every sector, the risk of corruption in the logistics sector is comparatively high due to the high number of partners and authorities involved (cf. BSR o. J. and Lüscher 2016).

Structural features

With around 2.17 million employees subject to social insurance contributions, the logistics sector is one of the most heavily staffed sectors in Germany (Destatis 2020b). The sector is characterised by a wide range of different companies responsible for transporting goods and people by road, rail, water and air. The sector also includes all related activities such as warehousing, the operation of ports, airports, railway stations and car parks as well as postal, courier and express services.

Logistics services are used by companies in all sectors (Weiß et al. 2020). Especially for companies with global, complex value chains, cooperation with companies from the logistics sector is central. Accordingly, logistics is to be understood as a cross-cutting issue that should always be taken into account in the risk analysis and is of particular relevance for companies/products that are dependent on raw materials. One characteristic feature of cooperation with the logistics sector is that companies in the logistics sector act as logistics service providers to their customers, often offering a wide range of services from transport to warehousing and shipping. In turn, the logistics service providers themselves outsource subtasks to specialised subcontractors (Weiß et al. 2020).

In terms of international freight transport, transport by container ship is clearly the predominant form of transport (IHRB 2019), while land transports are largely carried out by lorry. Transport within Germany and within the EU is also primarily by lorry. The risks differ, sometimes significantly, depending on whether the company operates predominantly in Germany or internationally. In addition, there are country-specific risks, as well as those related to the raw material to be transported. This wide variety of specific risks cannot be addressed in the following. As with the commodity profiles, this profile is therefore no substitute for a risk analysis, but merely serves to provide an overview of the possible risks in the area of transport and logistics. In the following, a distinction is therefore only made between risks in Germany and Europe and risks in international logistics.

One risk that should also be understood as a cross-cutting risk (cf. Weiß et al. 2020) is corruption. While corruption is always a risk, the logistics sector is particularly susceptible to it (cf. BSR n. d. and Lüscher 2016). In the construction of roads, in the awarding of procurement contracts or in the international movement of goods at customs controls or in ports: there are corruption risks everywhere, which always represent human rights violations (BSR n. d.).

Significant human rights risks

Forced labour and human trafficking

- Container ships often employ migrant workers recruited through crewing agencies, which are not yet effectively controlled. Such occupation agencies usually charge the workers recruitment fees, which increases the risk of forced labour and debt bondage (IHRB 2019).

- The European road haulage sector employs many lorry drivers from Eastern Europe (especially Bulgaria, Romania and Ukraine) and partly from Asia (especially the Philippines), some of whom are subjected to undignified employment conditions that come close to systematic mass exploitation. In this context, there are cases of Eastern European drivers who work for low wages, live in their lorries, have no secure access to sanitary facilities and no holidays for months (ITF n. d.). In addition, there are cases of workers from the Philippines being recruited with promises of (comparatively) high wages and safe accommodation. In reality, however, they reportedly receive low wages, from which flight costs are deducted, while living in their driver's cab and working overtime without adequate (and mandated) rest periods. This targeted exploitation is a form of human trafficking. If drivers are deterred from leaving this model of exploitation by threats, there is also a risk of forced labour (ITF n. d.).

Health and safety at work

- Work in logistics warehouses is physically demanding, because even regular lifting of 10 kg results in fatigue and wear and tear on muscles and joints, which is why warehouse workers account for the highest proportion of people with musculoskeletal disorders (Schwandt 2016).[64] Furthermore, warehouse work is particularly prone to accidents, for example due to the falling of objects (goods) or when handling machinery (VNR 2019). In addition, noise, dust and draughts can represent additional stresses (Meier and Zimmerling 2003).

- Since 2019, all newly registered buses and lorries weighing more than 3.5 tonnes in Europe must be equipped with intelligent tachographs (EUR-Lex 2020). However, over the last few years, a trend has emerged to equip light commercial vehicles weighing less than 3.5 tonnes in trans-European road transport as no tachographs were legally required for this vehicle category, which led to a systematic undermining of driving and rest times.[65] With the EU Parliament's decision of July 2020, the regulations for tachographs will also be extended to vehicles in the 2.5–3.5 tonne weight category and will make the installation of tachographs obligatory from 1 July 2026 (EUR-Lex 2020). The tachographs serve as a control for compliance with the legally prescribed driving and rest times, which should contribute to more humane working conditions and safer transport.

64 In addition to the reduction of lifting loads through the use of machines, there are other technological developments that aim to relieve the body when lifting heavy weights, such as exoskeletons (DVZ 2020).

65 The study by Vitols and Voss (2019) examined working and social conditions in the transport sector in Belgium, Denmark, Germany, the Netherlands, Austria, Poland and the Czech Republic. The study found that there were examples of systematic circumvention of regulations through the use of light commercial vehicles under 3.5 tonnes in all countries studied.

Discrimination

- Migrant workers on the high seas can face discrimination as working conditions are difficult to monitor, which increases the risk of exploitation. Migrant workers also often have difficulty accessing information regarding their rights, health and safety due to language barriers. This is also problematic because the long period of isolation at sea can have negative effects on workers' health (IHRB 2019).

- The logistics industry remains male-dominated, which can lead to unfair hiring practices, unequal pay, harassment in the workplace, and the unfavourable treatment of minority groups in promotions and career advancement (BSR n. d.).

Freedom of associations and assembly

- Risks in the logistics sector are closely linked to country risks, which is why logistics companies may operate in countries where independent trade unions are illegal or attempts are made to prevent trade union formation (cf. ITUC 2020). This limits the ability of workers to exercise their collective rights and expose grievances (BSR n. d.). This is a particular problem in the context of complex subcontracting chains.

Wages and working conditions

- The working conditions in the road haulage sector are generally characterised by relatively low wages, atypical working hours coupled with long absences from home, little exercise and risks of road transport. As competition in the EU's internal market intensifies, labour and social regulations are reportedly being undermined. This is particularly the case for professional drivers from Eastern Europe or outside the EU (Vitols and Voss 2019).

- According to research, internationalisation and complex subcontracting chains in road transport can also contribute to a deterioration of working conditions for drivers. Large logistics management companies, some of which no longer even have their own fleet of vehicles, can benefit from the low labour costs in Eastern European countries (especially Romania) (Vitols and Voss 2019).

- Another problem in this context is the so-called (partly organised) cabotage fraud, the deliberate violation of the European regulation[66] on international road transport performed as cabotage (Vitols and Voss 2019). This poses a threat to fair working conditions and equitable wages, as illegal cabotage particularly benefits from wage differentials or lower wages in Eastern Europe. Organised illegal cabotage circumvents legal minimum wages in countries with higher wage levels by substituting foreign drivers for national freight transport (Vitols and Voss 2019).[67]

66 The EU regulation from 2010 stipulates that up to three cabotage transports are permitted within seven days of cross-border transport with complete unloading (EUR-Lex 2009).

67 With the new mobility package, new rules will apply from 21 February 2022 to counter organised illegal cabotage. Among other things, once the cabotage workload has been used up, the vehicle may not carry out any further cabotage transport operations in that member state for at least four days. This "cooling-off period" must be documented and evidenced, and tachographs must additionally record border crossings (analogue tachographs from 21 August 2020, digital from 21 February 2022) to ensure better controllability of cabotage (IHK Region Stuttgart 2020).

Significant environmental risks

Air pollution and emissions

- The logistics sector is one of the largest emitters of greenhouse gases in the world. In 2017, 27 % of the total greenhouse gas emissions of all EU countries came from the transport sector. Lorry emissions account for the largest share, but increasing emissions from sea and air freight are also problematic given the projected growth of the sector: compared to 1990, emissions from international shipping increased by 32 % and emissions from international aviation by 129 % (EEA 2020). The negative impact of the logistics sector on climate change is thus a major problem, as all savings and efficiency gains achieved so far (e. g. through better drive technologies) have been neutralised by the steady increase in traffic (UBA o. J.).

- In addition to greenhouse gas emissions, the logistics industry also emits many other pollutants in large quantities into the air atmosphere. Emissions of pollutants such as nitrogen oxides, particulate matter or soot from road, shipping and air traffic pose a health risk to all people living near busy roads, ports or airports. The same applies to noise emissions from all means of transport, which can also affect the health of residents. The main fuel used in the operation of ships is heavy fuel oil, which can lead to high emissions of sulphur oxides, nitrogen oxides, particulate matter and soot particles (Franzen 2017; Ebbing 2019).

Biodiversity and deforestation

- The land consumption of the logistics industry is also problematic. For the construction of infrastructure, e. g. in the form of roads, ports, airports, logistics centres or warehouses, large areas are taken up and massive interventions in ecosystems are made (e. g. in the construction of new motorways). In Germany, transport takes up about five percent of the total land area (UBA o. J.).

- Traffic generates high levels of noise pollution with corresponding negative consequences for the environment. The permanent underwater noise caused by large (container) ships poses a problem for marine life and primarily acoustically oriented marine animals such as whales and dolphins. It impairs their navigation under water, which in the worst case can lead to collisions with ships that are usually fatal for the animals (BfN o. J.a).

Environment and waste

- In addition to recurrent accidents with serious environmental consequences, shipping is also reported to contribute to chronic environmental pollution, for example by discharging oily waste, tank wash water, ship waste or faeces, often unfiltered, into the sea (BfN o. J.b).

- The majority of the world's decommissioned ships end up (often via detours) on shallow beaches in Asia, particularly in Bangladesh, for scrapping and recycling. There, they are dismantled directly on the beach by hand and without any suitable protective measures, neither for the environment nor for humans. The ships contain numerous hazardous and toxic substances (such as oil, asbestos and PCBs) that are built into the hull or contained in the machinery. As these substances are not disposed of properly, they are released unhindered into the environment and the sea, where they cause major environmental damage (Kampffmeyer et al. 2018).

Linking human rights and environmental concerns

Human rights and environmental risks overlap in various areas of the logistics industry, which is why risk mitigation measures could and should be designed holistically wherever possible. One example is the disposal of ships. In this context, higher environmental standards can also ensure the protection of human rights, namely the health of workers. Another example can be seen in the field of road transport and infrastructure. Roads that lead through forests or other animal habitats cut landscapes into several subspaces (UFZ 2015). When animals then want to move from one subspace to the other, they are exposed to danger. Accordingly, wildlife accidents pose a challenge for environmental protection. At the same time, it is not only a question of environmental protection, because human road users can also be affected and at risk of injury when animals (such as deer or wild boar) cross the road and cause accidents (UFZ 2015). Measures to avoid such incidents can therefore have a positive impact on humans and animals alike.

Future prospects

The logistics sector is facing a major transformation in the wake of digitalisation and automation. For example, at the Transport Logistic trade fair in Munich in 2020, Fraunhofer IML presented a “smart recyclables container” that is equipped with a sensor and can independently transmit the order for collection to a transport company (Michael Ten Hompel, interview, Verkehrsrundschau 2019). In this context, the topic of “smart contracting”, i. e. the automation of contracting, is also in the spotlight. While such technological advances will change the economy as a whole, the logistics industry is nevertheless one that is already highly automated and in principle completely “algorithmable” (Michael Ten Hompel, interview, Verkehrsrundschau 2019). These opportunities created by technological developments such as the Internet of Things (Industry 4.0) and/or blockchain technologies are particularly relevant for establishing and finding circular economy solutions for the industry. This is because the logistics sector has a special function in the course of the circular economy principle. Logistics service providers are strongly integrated into production, use and disposal processes (Clausen 2020), which is why logistics must also adapt if these processes are to change in the future and linear value chains are to become circular (Clausen 2020). In addition to the technological potential that is currently unfolding, however, a strategic rethink is also required. A circular economy that focuses less on production and more on recycling and reuse also requires, for example, logistics that are increasingly oriented towards service logistics instead of goods sales (Clausen 2020). In this context, it is also interesting to note that the increase in recycling processes can lead to more CO2 emissions, but the circular economy has the potential to reduce emissions, energy and resource consumption elsewhere. (Clausen 2020).

Outlook/Conclusion

Business customers have a crucial leverage effect when it comes to raising standards among logistics operators (IHRB 2019). When awarding contracts, attention should not only be paid to the lowest price, as this resulting cost pressure can be linked to low social standards and poor working conditions. A social condition should also be that workers can organize themselves into trade unions. Furthermore, when awarding contracts, it should be a contractual condition (for example in codes of conduct) that international standards on rest breaks, working hours and overtime pay are observed. The EU regulations on improving the working conditions of lorry drivers, which have been in force since 2020, must also be taken into account here. The new regulation stipulates that HGV drivers* in international logistics must return home regularly and must not spend compulsory breaks at the end of the week in the driver's cab (European Commission 2020). Finally, responsible shipping is an integral part of a sustainable supply and value chain (IHRB 2019).

Environmental guidelines should be regulated contractually. Shipping companies could, for example, be contractually obliged to use alternatives to heavy fuel oil or exhaust gas filters.

Certifications create more transparency and accountability about social and environmental standards in the logistics industry. Where possible, logistics service providers with certifications such as ISO 14001 or the Eco Management and Audit Scheme (EMAS) should be used. ISO 14001 or EMAS certified logistics service providers operate reliable environmental management systems and work to continuously improve their environmental performance. Furthermore, existing environmental management systems can be used and further developed in order to record and consider human rights risks or implement human rights due diligence processes.

Industry-wide challenges, such as the disposal of ships, should be addressed in multi-stakeholder initiatives. Appropriate initiatives to secure progress on environmental issues already exist in this regard, such as the Ship Recycling Transparency Initiative and Clean Cargo, and should be pursued (IHRB 2019).

The UN Guiding Principles require that companies identify human rights principles and provide affected persons/victims with access to effective remedies. This specifically includes the establishment of grievance mechanisms that enable workers and communities to raise awareness of abuses in companies. Effective corporate grievance mechanisms address human rights violations and provide redress for those affected (BSR n. d.).

Subcontracting practices of logistics service providers should be critically scrutinized, as they are more difficult for state controls to trace and thus create the basis for exploitation and systematic human rights violations.

Selection of certificates and initiatives

- DIN EN 16258
- GLEC Framework: Richtlinie des Global Logistics Emissions Council
- HPE-Zertifikat
- Ship Recycling Transparency Initiative
- Clean Cargo
- FairTruck (Codex and Seal)
- Lean and Green

Sources

Bundesamt für Naturschutz (BfN) o. J. a: Auswirkungen auf marine Arten (online: BfN). *https://www.bfn.de/themen/meeresnaturschutz/belastungen-im-meer/unterwasserschall/auswirkungen-auf-marine-arten.html* (last accessed 16.04.2021).

Bundesamt für Naturschutz (BfN) o. J. b: Schifffahrt (online: BfN). *https://www.bfn.de/themen/meeresnaturschutz/belastungen-im-meer/schifffahrt.html* (last accessed 16.04.2021).

Bundesvereinigung Logistik (BVL) 2021: Logistikumsatz und Beschäftigung. Bedeutung der Logistik für die deutsche Wirtschaft (online 15.02.2021: BVL) *https://www.bvl.de/service/zahlen-daten-fakten/umsatz-und-beschaeftigung* (last accessed 16.04.2021).

Business for Social Responsibility (BSR) o. J.: 10 Human Rights Priorities for the Transport and Logistics Sector (online: BSR) *https://www.bsr.org/en/our-insights/primers/10-human-rights-priorities-for-the-transport-and-logistics-sector* (last accessed 16.04.2021).

Clausen, Uwe 2020: Mit Logistik in die Circular Economy (online 18.12.2020: Verkehrsrundschau). *https://www.verkehrsrundschau.de/fm/3576/90020_2020_05_01%20I_presentation.pdf* (last accessed 30.06.2021).

Deutsche Verkehr-Zeitung (DVZ) 2020: Neues Exoskelett für Lagerarbeiter (online 10.03.2020: DVZ). *https://www.dvz.de/rubriken/logistik/detail/news/neues-exoskelett-fuer-lagerarbeiter.html* (last accessed 06.07.2021).

Ebbing, Sven 2019: Schwimmende Dreckschleudern: Containerschiffe müssen grüner werden (online 10.09.2019: Energieverbraucherportal). *https://www.energieverbraucherportal.de/energie-magazin/nachhaltigkeit/nachhaltigkeit-detail/schwimmende-dreckschleudern-containerschiffe-muessen-gruener-werden* (last accessed 30.06.2021).

EUR-Lex 2009: VERORDNUNG (EG) Nr. 1072/2009 DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 21. Oktober 2009 über gemeinsame Regeln für den Zugang zum Markt des grenzüberschreitenden Güterkraftverkehrs (online 14.11.2009: EUR-Lex). *https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:300:0072:0087:DE:PDF* (last accessed 06.07.2021).

EUR-Lex 2020: Lenkzeiten und Ruhezeiten im Straßenverkehrsgewerbe (online 26.11.2020: EUR-Lex). *https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=LEGISSUM%3Ac00018* (last accessed 05.07.2021).

Europäische Kommission 2020: Neue EU-Regeln für Lkw-Fahrer gelten ab heute (online 20.08.2020: European Commission). *https://ec.europa.eu/germany/news/20200820-eu-regeln-lkw-fahrer_de* (last accessed 05.07.2021).

European Environment Agency (EEA) 2020: Greenhous gas emissions from transport in Europe (status: 18 December 2020) (Kopenhagen: EEA). *https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-12* (last accessed 16.04.2021).

Franzen, Harald. Dreckige Dieselautos? Nichts im Vergleich zu Schiffen! (online 29.08.2017: Deutsche Welle). *https://www.dw.com/de/feinstaub-von-schiffen-gro%C3%9Fe-abgas-belastung/a-40279733* (last accessed 30.06.2021).

Helmoltz Zentrum für Umweltforschung (UFZ) 2015: Biodiversität und Verkehr (online 30.10.2015: UFZ). *https://www.ufz.de/index.php?de=36036* (last accessed 05.07.2021).

Industrie- und Handelskammer (IHK) Region Stuttgart 2020: Kabotagebeförderungen im Straßenverkehr (online: IHK Region Stuttgart). *https://www.stuttgart.ihk24.de/branchen/verkehrswirtschaft/gueterverkehr/kabotage-in-deutschland-672272* (last accessed 06.07.2021).

Institute for Human Rights and Business (IHRB) 2019: Human Rights in the Shipping Industry: from Shipyard to Scrapyard: 2019 Roundtable Meeting Report (London: IHRB – Institute for Human Rights and Business). *https://www.ihrb.org/uploads/meeting-reports/Shipping_Roundtable_Meeting_Report_May_2019.pdf* (last accessed 16.04.2021).

International Trade Union Confederation (ITUC) 2020: 2020 ITUC Global Rights Index. The world's Worst Countries for Workers (Brussels: ITUC). *https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf* (last accessed 06.07.2021).

International Transport Forum (ITF) 2019: ITF Transport Outlook 2019 (Paris: OECD Publishing). *https://doi.org/10.1787/transp_outlook-en-2019-en* (last accessed 06.07.2021).

Internationale Transportarbeiter-Föderation (ITF) o. J.: Im Blickpunkt: Systematische Ausbeutung im europäischen Straßengüterverkehr (online: ITF). *https://www.itfglobal.org/de/sector/road-transport/european-trucking-exploitation-of-workers* (last accessed 06.07.2021).

Kampffmeyer, Nele; Gailhofer, Peter; Scherf, Cara-Sophie; Schleicher, Tobias and Ida Westphal 2018: Umweltschutz wahrt Menschenrechte! Deutsche Unternehmen in der globalen Verantwortung: Working Paper 3/2018 (Freiburg: Öko-Institut e. V.) *https://www.oeko.de/fileadmin/oekodoc/WP-Umweltschutz-wahrt-Menschenrechte.pdf* (last accessed 16.04.2021).

Lüscher, Andi 2016: Logistik: «Im Zweifel zahlt man halt» (online 08.07.2016: SRF). *https://www.srf.ch/news/wirtschaft/logistik-im-zweifel-zahlt-man-halt* (last accessed 05.07.2021).

Meier, Christine and Regina Zimmerling 2003: Arbeit im Handel gesünder machen Tipps zum Arbeits- und Gesundheitsschutz für Beschäftigte und Betriebsräte im Einzel- und Großhandel (Berlin: Vereinte Dienstleistungsgewerkschaft (verdi) e. V.). *https://handel.verdi.de/++file++53832904aa698e42de0007e2/download/Broschuere_Arbeit_iH_gesuender_machen_Nov2003.pdf* (last accessed 06.07.2021).

Schwandt, Thomas 2016: Knochen schonen statt Schinderei (online 28.04.2016: DVZ). *https://www.dvz.de/rubriken/human-resources/fit-im-beruf/detail/news/knochen-schonen-statt-schinderei.html* (last accessed 06.07.2021).

Statistisches Bundesamt (Destatis) 2020a: Rechtliche Einheiten und abhängig Beschäftigte nach Beschäftigtengrößenklassen und Wirtschaftsabschnitten (Status: 7 December 2020). *https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Unternehmen/Unternehmensregister/Tabellen/unternehmen-beschaeftigtengroessenklassen-wz08.html* (last accessed 16.04.2021).

Statistisches Bundesamt (Destatis) 2020b: Beförderungsmenge und Beförderungsleistung nach Verkehrsträgern (Status: 11 November 2020). *https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Transport-Verkehr/Gueterverkehr/Tabellen/gueterbefoerderung-lr.html* (last accessed 16.04.2021).

Transport Intelligence 2019: Total Logistics 2019 (Bath: Transport Intelligence). *https://www.ti-insight.com/wp-content/uploads/2019/02/Total-Logistics-2019.pdf* (last accessed 16.04.2021).

Umweltbundesamt (UBA) o. J.: Verkehr/Lärm (online: UBA) *https://www.umweltbundesamt.de/themen/verkehr-laerm#strap1* (last accessed 16.04.2021).

Verkehrsrundschau 2019: Who is Who 2020 (online 20.12.2019: Verkehrsrundschau). *https://www.verkehrsrundschau.de/fm/3576/90020_2020_05_01%20I_presentation.pdf* (last accessed 30.06.2021).

Vitols, Katrin and Eckhard Voss 2019: Soziale Bedingungen in der Logistik in Europa: Schwerpunkt Güterkraftverkehr (Berlin: EVA – Europäische Akademie für umweltorientierten Verkehr gGmbH). *https://psl.verdi.de/++file++5d4ad4a8dda4fb6e7b1d5be3/download/Studie%20zum%20europ%C3%A4ischen%20Stra%C3%9Feng%C3%BCterverkehr%20-%20deutsche%20Fassung.pdf* (last accessed 16.04.2021).

VNR Verlag für Deutsche Wirtschaft AG (VNR) 2019: Arbeitsschutz im Lager – die Gefahren aus allen Himmelsrichtungen eindämmen (online 06.05.2019: Safety Xperts). *https://www.safetyxperts.de/arbeitsschutz/arbeitsschutz-im-lager/* (last accessed 06.07.2021).

Weiß, Daniel; Garcia, Bibiana; van Ackern, Pia; Rüttinger, Lukas; Albrecht, Patrick; Dech, Marlene and Jutta Knopf 2020: Die Achtung von Menschenrechten entlang globaler Wertschöpfungsketten Risiken und Chancen für Branchen der deutschen Wirtschaft (Berlin, Stuttgart, Eberswalde: adelphi, Ernst & Young, Hochschule für nachhaltige Entwicklung Eberswalde). *https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/Forschungsberichte/fb-543-achtung-von-menschenrechten-entlang-globaler-wertschoepfungsketten.pdf;jsessionid=D17573D5FC6ED7D90A64C8616B4B0E37.delivery1-replication?__blob=publicationFile&v=1* (last accessed 05.07.2021).

5. Conclusion and outlook

The fact sheets presented in this brochure were created with the aim of identifying and illustrating both human rights and environmental risks for various renewable and finite raw materials. All five fact sheets make clear that these risks are often closely linked, both for mineral and renewable raw materials. For example, the use of mercury in gold mining or the use of chemicals in cotton processing endangers both human health and the environment. Such links can also be found in the cross-cutting area of logistics, suggesting that more attention should be paid to the human-environment relationship in due diligence processes as a matter of principle.

The importance of considering these links between human rights and environmental risks at the risk analysis stage arises in particular with regard to the subsequent challenge of deriving measures for the identified risks. If the link between the identified human rights and environmental risks is taken into account, measures can be derived with desired synergy effects and without undesirable side effects. Through integrated management approaches, companies meet the increasing expectations of consumers to act responsibly and thus not only avoid reputational risks, but can also actively identify new opportunities for risk management and create a positive reputation. Furthermore, through integrative approaches, companies can also strategically prevent non-compliance costs that may arise from potential (unintentional) breaches of legal due diligence requirements along supply chains. In summary, an integrative management approach offers companies the opportunity to position themselves in a future-oriented way and to meet rising social and legal expectations with responsibility in the future.

The brochure also makes clear that raw material extraction in particular is associated with specific risks for human rights and the environment. Examining these risks as part of a risk analysis can be difficult, especially for SMEs, as they often do not have direct supplier relationships with raw material suppliers, but rather purchase from intermediaries. SMEs can hardly overcome these challenges on their own, which is why cooperation at sectoral level offers many opportunities, especially for SMEs. In addition, cross-sector initiatives that deal specifically with commodity risks offer companies the opportunity to deal with the issue more intensively and to deal with sustainability risks more easily within the framework of mergers and support networks. The individual profiles therefore mention selected initiatives and certification systems as examples that interested companies can turn to.