



Risk-assessments for products within five categories: Furniture

A report for Direktoratet for forvaltning og IKT (DIFI) by
Swedwatch

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Introduction

Swedwatch has carried out risk-assessments on thirty-four products within five product categories on behalf of Direktoratet for forvaltning og IKT (DIFI). The risk-assessment reports aim to provide information on potential adverse impacts on labour rights and human rights in the supply chains of the selected products. The reports will guide contracting authorities on the importance of social considerations in their purchasing practices and when such criteria should be applied. The risk-assessments will also improve the readers' understanding of what to look for when monitoring supplier compliance.

It is important to note that the risk-assessments do not aim to scrutinise or describe the supply chain of any particular brand or supplier. The purpose is to give a general understanding of the potential risks linked to the product in general.

Each product is described based on components and materials used in the product. The general supply chain is presented in a table, along with a narrative explanatory paragraph. The supply chain table is divided into three sections; assembly, component and raw material, and provides an overview of most relevant countries.

General risks are outlined and those which are categorised as most adverse risks for each step of the supply chain are summarised in an introductory table in order to provide an overview. The grading at the bottom of the risk-matrix indicates a combination of the *severity* and *likelihood* of the risk and aims to provide guidance on where main risks are located in the supply chain. For example, when a product is assembled in both a high-risk and a low-risk context to more or less the same extent, the risk will be graded lower than if the product had been predominantly assembled in a high-risk environment. This also means that even if a number of potential severe risks are listed in the column, the risk may still be considered low if it is likely that the production mostly takes place under safe and sound processes in a low-risk environment.

The grading includes the following steps:

Very low risk	Low risk	Medium-high risk	High risk	Very high risk
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Method and data

The data used for the risk-assessments comes mainly from reports, articles, films and academic research. Suppliers, and to a smaller, degree industry organisations/initiatives, have also been interviewed to provide input to the understanding of the supply chains. Trading data has been used for the mapping of the supply chains, as transparency and traceability is often limited. Therefore, the supply chain data, especially on a component and raw material level, partly presents the likelihood of a certain producing country being included in the supply chain. The supply chain data can therefore not be viewed as exact for every single product procured by Norwegian contracting authorities, but as a general estimate.

The report was written October to December 2017.

Furniture

Product	Assembly	Component	Raw material
Furniture	Low risk	Medium-high risk	High risk
Height-adjustable desks	Low risk	Medium-high risk	High risk
Meeting tables	Low risk	Medium-high risk	High risk
Office chairs	Low risk	Medium-high risk	High risk
Shelves and cabinets	Low risk	Medium-high risk	High risk
Student chairs	Low risk	Medium-high risk	High risk
Light-sources	High risk	High risk	Very high risk

The furniture industry includes a wide range of products, materials and manufacturing processes. Furniture can be made of everything from plastics and wood to metal or glass,¹ and consequently value-chains and working conditions vary greatly depending on the specific product. In many cases the furniture industry is labor-intensive, demanding a lot of manual work.² There are many countries involved in the furniture industry on a general level. Still, products included in this category are to a large extent designed and manufactured in Scandinavian countries. Components are also to a high degree sourced from European countries and to some extent from Asian countries. If components are sourced from Asian countries, the risks of labour rights abuse and poor working conditions increase. On a raw material level, traceability is limited. Ore, oil and other substances can come from all over the world, although also to a large extent sourced from Europe. Consequently, risks tend to increase further down the supply chain, in developing countries with weak legal institutions and limited rule of law. It is therefore important to keep in mind that risks may vary substantially depending on where components and raw materials are produced.

Health and safety risks linked to the production of furniture and furniture-components are linked to repetitive movement, heavy lifting, and exposure to dust and chemicals. Risks of labour rights violations, hazardous working conditions, and environmental pollution are more prominent in the extraction of raw materials and in component production in regions like East Asia, the Arab Gulf and Africa. As several of the products covered have similar supply chains and materials, the risks are also more or less the same, with the exception of light sources.

This risk-assessment includes the following products:

- Height-adjustable desks
- Meeting tables
- Office chairs
- Shelves and cabinets
- Student chairs

¹ Hoovers – [Furniture Manufacturing Industry Overview](#)

² Nejad, N. H. et. Al. (2013), '[Musculoskeletal Risk Assessment in Small Furniture Manufacturing Workshops](#)', International Journal of Occupational Safety and Ergonomics (JOSE), Vol19, No2, pp275-284

- Light sources

Industry and Sector Initiatives

Möbelfakta

Möbelfakta is a Swedish furniture certification used by several Scandinavian producers for specific products. It started as a quality certification in 1972 and is today run by the Swedish business association TMF. Möbelfakta includes environmental considerations (wood sourcing, chemicals etc.) and, since 2010, also social considerations. Since 2015, Möbelfakta has used an independent auditor to verify that the supply chain descriptions, risk-assessments and action plans provided by the company are accurate.

In an impartial evaluation³, Möbelfakta was rated as the only European furniture certification scheme attempting to ensure respect for labour rights in the supply chain.

EPD - Environmental Product Declarations

EPD's provide independently certified estimates of the life-cycle environmental impact of approximately 120 Norwegian furniture products.⁴

Furniture Industry Research Association

The Furniture Industry Research Association (FIRA) is a UK-based, non-profit industry association promoting and regulating the furniture industry through controlling their members (i.e. furniture companies). It provides expert help within all sectors of the industry and also in supply chain management. It also provides support in the form of training, events, seminars and the like.⁵

Wood Recyclers' Association

The Wood Recyclers' Association works with promoting the wood recycling industry both in the UK but also abroad. It does this through providing advice and guidelines, acting as a mediator between their members and supporting its members to maximize business opportunities.⁶

Responsible Business Alliance (RBA)

Responsible Business Alliance is a global industry association for over 100 companies within the electronics sector. They have developed a code of conduct and provide member companies with tools and guidance to enhance sustainable supply chains.⁷

Certifications

EU Ecolabel

In 2016, the EU Ecolabel adopted far-reaching criteria for making furniture economy circular, affecting product design, production, use and recycling.⁸

Forest Stewardship Council (FSC)

³ [EU furniture sector report](#), Centre for European Policy Studies, 2014. Page 133, "Conformity to fair labour conditions".

⁴ [epd-norge.no](#)

⁵ [Furniture Industry Research Association](#) (FIRA)

⁶ [Wood Recyclers' Association](#)

⁷ [Responsible Business Alliance](#)

⁸ [Circular economy: Commission expands Ecolabel criteria...](#), European Commission, 2016-08-17

Forest Stewardship Council is an international member organisation, working for sustainable forestry and providing certification for timber, paper and wood products.⁹

⁹ [Forest Stewardship Council](#)

Height adjustable desks

Summary of the most severe risks

Assembly	Components	Raw materials
Repetitive movements Toxic exposure and emissions Minority discrimination and abuse	Wood derivatives, metal, plastics, fabric, electronics Forced labour Child labour Low wages Excessive overtime Minority discrimination/abuse Lack of union rights Exploitation of migrant workers Poor health and safety Toxic exposure and emissions Fire and explosion Environmental pollution	Oil, gas, bauxite, urea, coal, phenols, wood Forced Labour Child labour Poor working conditions Poor health and safety Environmental pollution Violations of indigenous peoples' rights Conflict and impacts with local communities Illegal logging Support of armed conflict Sexual abuse
Low risk	Medium-high risk	High risk

The product

The desks consist of a frame, feet, a desktop, a height adjusting system and other possible features such as cable channels and front/side panels.

The desktop is mostly made of a board of various compositions, often with a lightweight base of wood chips of different sizes and glue. The chips are typically made by a mixture of wood species, most commonly spruce, fir and beech, in some cases also birch, aspen and poplar, and also contains sawdust and parts of recycled wood (old furniture, pallets etc.).¹⁰ The board is covered with one or several layers of veneer or laminate.

These laminates can be made of melamine-resin impregnated decor paper and one or more layers of kraft paper, impregnated with phenolic resins, laminated under high pressure and heat.¹¹ Melamine resin is a plastic that contains melamine and formaldehyde. The veneer can be of for example oak, beech, birch and ash.

Desk height is regulated through an electronic device, with electric lifting columns, a power supply unit, controlling devices and sensors.

Panels may be in plastic or metal but clad in wool or polyester. Various chemicals and metals may be used in the treatment.

Other components include plastics (often polypropylene (PP), polyamide (PA) and polyoxymethylene (POM) but also polyvinyl chloride (PVC)), all made of oil, rubber (natural and synthetic (butyl) rubber

¹⁰ Email from Johanna Ljunggren, Kinnarps, 2017-11-17

¹¹ [Environmental product declaration](#), Egger laminate, issued 2014-07-31

and metal. Steel is made from iron ore, scrap metal, hard coal, and elements like chromium, nickel and molybdenum. Aluminum is often recycled but otherwise made of bauxite clay, caustic soda, lime and carbon.¹²

Surface treatments, including chrome plating, powder coating and painting, lacquering etc., involve complex use of binders, solvents, pigments and possibly additives. The raw materials for these are mainly oil and gas, fatty acids from animals and plants and cellulose.¹³

The supply chain

The height adjustable desk market is characterised by an unusually high degree of Scandinavian designers, often assembling and partly manufacturing the desks in their home country and in Northern Europe. Several - and for certain components all - of their suppliers are also based in those or other highly developed countries.

Chipboard production is ubiquitous, occurring in Western as well as in Eastern Europe.¹⁴ Roundwood, sawdust and chips are usually sourced inside a 100-kilometer radius from the factory.¹⁵

In Scandinavian-assembled products, much metal predominantly originates in Sweden or Finland, with iron ore also sourced locally.¹⁶ Scrap metal makes up part of the supply, with production in Germany and Italy.¹⁷ In large scale, aluminum used is recycled.¹⁸

Regarding plastics, additive industries are geographically widespread. Plastics are also recycled regionally.¹⁹ Among Scandinavian producers, powder coating is often done in-house while chrome plating is subcontracted.²⁰

The global petrochemical industry, as well as the extraction of oil, gas, hard coal, bauxite, urea, lime and other furniture raw materials, is characterised by near-zero traceability.²¹

¹² [Aluminum - how it's made](#), Norsk Hydro, retrieved 2017-11-28

¹³ Telephone conversation, Ingvar Lindh, Sherwin, 2017-11-27

¹⁴ Email from Ljunggren, Kinnarps, 2017-11-17

¹⁵ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

¹⁶ Telephone conversation, Andreas Alm, Tibnor, 2017-11-24

¹⁷ Telephone conversation, large Scandinavian metal supplier, 2017-11-27

¹⁸ Email from Tor Egil Skulstad, Hydro, 2017-12-06

¹⁹ Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

²⁰ Telephone conversation, Stefan Järnberg, Rol Ergo, 2017-11-24

²¹ [Transparency international on oil companies and corruption...](#), The Guardian, 2011-03-01; [The global hard coal market](#), Vattenfall, July 2017.

Assembly	Components	Raw Material
Sweden, Norway, Denmark ²² , Germany, Hungary, and possibly Japan, Brazil and the USA ²³	<p>Upholstery: EU, Japan, China, South Korea, Norway²⁴</p> <p>Veneer and boards: Mainly Northern and Eastern Europe, but also Russia and the USA²⁵</p> <p>Laminate surfaces: Germany, Austria, UK, France, Romania²⁶</p> <p>Plastics: Sweden, Norway, other EU, China, Taiwan, Malaysia²⁷</p> <p>Metal parts: Sweden, Norway, other EU, China, Taiwan, Malaysia, South Korea²⁸</p> <p>Height adjustment electronics: Denmark, Lithuania, China, Sweden²⁹</p> <p>Standardised parts³⁰: Sweden, Germany, China, Netherlands³¹</p>	<p>Wood: EU, USA, Ukraine, Russia (some plywood)³², scrap. (Often: Ash, oak, beech from Croatia, beech from Slovakia and Hungary and birch from Finland and the Baltics.³³)</p> <p>Iron ore: Sweden. World market; main producing countries are Australia, Brazil and China³⁴</p> <p>Plastic resins: World market (e.g. Saudi Arabia, Europe, Brazil, the USA and China³⁵)</p> <p>Oil: Some of the main producing countries are Saudi Arabia, Russia, United Arab Emirates, Canada, Nigeria³⁶</p> <p>Urea: World market, often North Africa, Gulf states, China³⁷</p> <p>Phenol: World market, often North Asia, USA³⁸</p>

²² Telephone conversations, Jone Stangeland, Senab Eikeland, 2017-12-08 and Kristina Pettersson, Kinnarps, 2017-11-06.

²³ [Website](#), Vitra, retrieved 2017-12-08

²⁴ Email from Ljunggren, Kinnarps, 2017-11-14. Telephone conversations, Marie-Louise Fagervall Sliti, Ludvig Svensson, Jan Skrefsrud, Gudbrandsdalens uldvarefabrik, 2013-11-27 and Kurt Nedergaard, Gabriel, 2017-11-30.

²⁵ Emailed data from Kristina Pettersson and Ljunggren, Kinnarps, 2017-11-17 and 2017-11-28 and Pierre Lennartsson, Lekolar, 2017-11-22

²⁶ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

²⁷ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

²⁸ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

²⁹ Telephone conversations, Tom Bernhard Larsen, Linak Norway, 2017-11-24; Stefan Järnberg, ROL.

³⁰ Screws, nuts, bolts, spacers, fittings etc., plastic or metal

³¹ Emailed data from Kristina Pettersson, Kinnarps, 2017-11-28

³² Email from Pierre Lennartsson, Lekolar, 2017-11-22

³³ Emailed data from Kristina Pettersson, Kinnarps, 2017-11-28

³⁴ United States Geological Survey, [Mineral Commodity Summaries 2017](#), Iron Ore, Retrieved 2017-11-30

³⁵ Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

³⁶ Råvarumarknaden.se, [USA passerade Saudiarabien som världens största oljeproducent](#), Retrieved 2017-10-27

³⁷ [Website](#), Independent chemical information service, retrieved 2017-12-04

³⁸ [Website](#), IHS Markit, retrieved 2017-12-04

		<p>Bauxite/aluminium: Brazil.³⁹ Main producing countries are also Australia, China, Guinea, Jamaica, India.⁴⁰</p> <p>Copper, tin, lead, etc: World market.</p> <p>Wool: New Zealand, EU, South America, Iceland.⁴¹</p> <p>Cotton: World market (China, India, USA, Pakistan, Uzbekistan)⁴²</p>
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Risks

With several tiers of the supply chains located in the EU and often Scandinavia, risks are relatively low, socially as well as environmentally. Still, in furniture assembly and wood processing, repetitive motions and cutting machinery cause musculoskeletal disorders. Maiming is a risk even in highly developed economies.⁴³

On a component level, risks increase. In Southern and Eastern Europe, migration raises general risks for abuse of undocumented workers and discrimination of minorities.⁴⁴ Anti-union activities along with “yellow unions”⁴⁵, low wages, unpaid over-time and insecure employment is reported from East-European countries.⁴⁶

Components, including fabrics, manufactured in countries such as China, continue to pose a heightened risk of human rights abuses including child labour⁴⁷ and forced labour.⁴⁸ Health and safety conditions in Chinese factories are often poor.⁴⁹ There is a risk that people are paid very low

³⁹ Telephone conversation, Tor Egil Skulstad, Hydro Extrusions, 2017-12-05

⁴⁰ U.S. Geological Survey, [Bauxite and alumina](#), 2017

⁴¹ Email from Ljunggren, Kinnarps, 2017-11-14. Telephone conversation Kurt Nedergaard, Gabriel, 2017-11-30

⁴² [UN Comtrade](#), cotton exports 2016, retrieved 2017-12-10; [In Uzbekistan, the practise of forced labour lives on during the cotton harvest](#), New York Times, 2013-12-17

⁴³ Email from Hjerpbakk, Nordic Comfort Products, 2017-11-27 [Arbetskadorn i träindustrin](#), IVL Svenska miljöinstitutet, issued in May 2008

⁴⁴ [Abuse of migrant workers is now a top priority for businesses](#), The Guardian, 2016-02-16; [Country ranking](#), ILGA-Europe, retrieved on 2017-12-05

⁴⁵ Yellow unions are associations that are established by the employer themselves and are therefore not free. The purpose is to control workers and prevent strikes. They can also be controlled or influenced by the state.

⁴⁶ World Economy, Ecology and Development, Working Conditions and Economic Development in ICT Production in Central and Eastern Europe 2010

⁴⁷ China Labor Watch, [reports on toy factories in China](#), Retrieved 2017-11-02; International Labor Rights Forum, [Six cents an hour](#), 1996

⁴⁸ Topical research digest: Human rights and contemporary slavery, [The dark side of labour in China](#), Retrieved 2017-11-02

⁴⁹ International Journal of Occupational and Environmental Health, [Occupational Health and Safety in China](#), Oct/Dec 2003; Labor Watch Pakistan, [Safety at workplace](#), 2015-08-24

wages and are required to work excessively long hours.⁵⁰ Migrant workers constitute a particularly vulnerable group, at risk of being exploited and discriminated against in both China and Malaysia (including confiscation of passports and high recruitment fees) and to some extent South Korea. In these countries trade union rights are limited or not respected.⁵¹

For plastic components manufactured in high risk countries such as China, Malaysia and Taiwan, there is a high risk of severe health impacts on people working in the plastics industry as a result of poor safety management and lack of ventilation and safety equipment.⁵² There is risk of fires and explosions in factories producing plastics, as well as the risk of air pollution and contamination of soil and water from waste water.⁵³

The vast array of chemicals used in plastics, in glue and in surface and textile treatments, as well as their components and raw materials, is difficult to trace. Many are produced in the EU. Bulk chemicals and replicas are produced outside of the EU, with considerably less controls.⁵⁴

In wood processing, wood dust can inflict workers with diseases like asthma and cancer unless ventilation and/or breathing protection is properly employed.⁵⁵

The PVC (Polyvinyl Chloride) plastic often emits phthalates which can harm the human hormone balance and reduce fertility⁵⁶, and some producers avoid it, at least in some components.⁵⁷ Several flame retardants, biocides and stain- and water-repellants can be harmful to the environment and/or humans.⁵⁸ Apart from such chemicals, electronic components' heavy metals are associated with several health risks and easily accumulate in the body and food chain.⁵⁹

Melamine is poisonous⁶⁰ and formaldehyde is carcinogenic and mutagenic⁶¹ and its use in consumer products is questioned by authorities.⁶² Risks apply to workers, users and the environment throughout the life-cycle of products⁶³, unless proper precautions are taken.

⁵⁰ South China Morning Post, [‘Low pay, long hours’: life inside factory that supplied Ivanka Trump brand in China](#), 2017-06-28; The Guardian, [The grim truth of Chinese factories producing the west’s Christmas toys](#), 2016-12-04; China Labor Watch, [Minimum wage standards in China](#), 2016.

⁵¹ ITUC, Survey of violations of trade union rights in [China](#), 2016-2017.

⁵² Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#), 2015-04-09

⁵³ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#),

⁵⁴ Telephone conversation, Ingvar Lindh, Sherwin Williams, 2017-11-27; [Chemical mixtures and the ‘cocktail’ effect](#), European chemicals agency, retrieved 2017-12-10

⁵⁵ [Wood dust](#), Health and Safety Executive, UK, retrieved on 2017-12-05

⁵⁶ [Forskare: Rätt av förskolor att rensa ut gamla plastleksaker](#), Dagens Nyheter, 2017-12-02

⁵⁷ Linak website, retrieved 2017-11-14

⁵⁸ [Bromerade flamskyddsmedel](#), Kemiinspektionen, retrieved 2017-12-06; [Regler för biocidbehandlade varor](#), Kemiinspektionen, April 2016; Högfluorerade ämnen - PFAS, Kemiinspektionen, retrieved 2017-12-06;

⁵⁹ [Toxicity, mechanism and health effects of some heavy metals](#), Interdisciplinary toxicology, June 2014

⁶⁰ [Poisoned milk substitute took lives](#), Swedish Radio, 2009-01-22

⁶¹ See e.g. [EU Commission Regulation 605/2014](#)

⁶² Sveriges Natur, September 6, 2017, [“EU bans formaldehyde in cosmetics”](#).

⁶³ [Electronic waste](#), World health organisation, retrieved 2017-12-08

Electronics is in general a high-risk segment, with complex and obscure supply chains of its own. Production is frequently located in China, with several components sourced from there. Risks surround both the manufacturing of electronics and components but also the extraction of a vast amount of different minerals used.⁶⁴ The extraction of minerals and heavy metals (such as copper, tin and lead) for electronics risks has been connected to conflict profiteering, human rights violations, child labour and/or pollution.⁶⁵

Several risks are connected to the raw materials. Because of widespread illegal logging⁶⁶, including inside the EU⁶⁷, some furniture makers trace wood back to the logging location and use mainstream certifications, like that which is provided by the Forest Stewardship Council, to do so. However, certification schemes have also been the subject of criticism. For example, FSC has been accused of inconsistencies and of providing certification despite clear-cutting of old growth forests and degradation of biological diversity.⁶⁸ If wood from Russia is used, there is risk of illegal logging, corruption and poor working conditions, including abuse of migrant workers.⁶⁹

If steel or aluminium from high-risk countries is used, there is a risk of harsh conditions, with extreme temperatures, heavy lifting, large machinery, and employees exposed to harmful fumes and dust. Metal processing and iron-ore mining also involve a range of chemicals that are harmful to humans and ecosystems.⁷⁰ Aluminum smelters involve risk of air pollution.⁷¹ Scrap metal handling may be associated with risks of fires, pollution, physical accidents, illicit trade as well as labour issues.⁷²

Social and environmental impacts is connected to iron and bauxite mining (for aluminium) in countries such as Brazil, India, China and other high-risk countries. Mining is one of the most high-risk sectors in the world and in most countries, mining remains the most hazardous occupation when the number of people exposed to risk is taken into account.⁷³ Bauxite is extracted from open mine pits, which can cause leaching of toxic substances, dust and water pollution, soil erosion, water

⁶⁴ Please review the [Difi high-risk product category Elektronikk og IKT](#) for more information.

⁶⁵ [Blood minerals are electronics industry's dirty secret](#), New Scientist, 2014-06-11; [For Apple and others, tin supply chain has links to rebel-held Myanmar mine](#), Reuters, 2016-11-28

⁶⁶ [Europe failing to clamp down...](#), The Guardian, 2015-10-22

⁶⁷ [Major Austrian timber firm accused of illegal logging in Romania](#), The Guardian, 2015-10-22

⁶⁸ [70 företag kräver ett mer hållbart svenskt jordbruk](#), Expressen, 2017-11-30; [Tracking timber: could new technology help clean up the supply chain?](#), The Guardian, 2013-08-14

⁶⁹ Environmental Protection Agency, [Liquidating the Forests: Hardwood Flooring, Organized Crime, and the World's Last Siberian Tigers](#), 2013; ILO, [Decent work in forestry](#), 2015; [Transparency international: Russia one of the most corrupt countries](#), The Moscow times, 2016-11-16

⁷⁰ Enact Sustainable Strategies, Riskanalys: Instrument, 2017; International Labour Organisation, [Code of practice on safety and health in the iron and steel industry](#), 2005; The Aluminium Association, Safety, retrieved 2017-11-24

⁷¹ Reuters, [China Hongqiao shuts down aluminium smelting pots for winter](#), 2017-11-15; Metal Miner, [Beijing Proposes Massive Idling of Chinese Smelters to Combat Pollution](#), 2017-02-08, Financial Times, [China's environmental clean-up to have big impact on industry](#), 2017-05-22

⁷² [The hazards of scrap metal recycling - and implications for insurers](#), Gen re, February 2013; [Scrap metal scams - a hazard for international freight forwarders](#), Logistiq insurance solutions, 2013-04-11; [Immigrants squeak out living as Athens scrap metal mongers](#), AFP, 2012-04-29

⁷³ ILO, [Mining: A Hazardous work](#), Retrieved 2017-11-28

shortage and negative impacts on biodiversity.⁷⁴ Other risks associated with the countries involved are: lack of union rights and harassment of unionised workers, in some cases conflicts connected to local communities and indigenous peoples' land rights, low wages, poor working conditions and sometimes child labour and forced labour.⁷⁵ Chinese mine sites have been found to rely on large numbers of migrant workers, who receive less pay and often work without personal protection equipment.⁷⁶

Coal mining in top exporting nations such as Indonesia, Russia, South Africa and Mongolia is often associated with deforestation, marginalisation of minorities and large-scale corruption.⁷⁷

Oil extraction is linked to environmental and social risks in Saudi Arabia, Russia, United Arab Emirates and Nigeria, including lack of union rights, poor working conditions and forced labour as well as oil spills that cause health impacts and contamination of soil and water for surrounding communities.⁷⁸ Oil extraction, and mining, in high-risk environments has also been linked to sexual exploitation and abuse of women in surrounding areas.⁷⁹

Urea plants in countries like Tanzania, Nigeria, India and Saudi Arabia carry varying, albeit significant, risks in terms of workers' rights violations, discrimination and harmful emissions.⁸⁰

Wool treatment may involve acid baths ("carbonising"), the use of biocides and heavy metals, which poses risk to workers and the environment unless proper procedures are in place. Sheep may be subjected to cruelty during castration, tail docking and shearing.⁸¹

⁷⁴ The Wilderness Society, [Bauxite mining threatens Wild Rivers](#) 2015-07-31; Naturskyddsföreningen, [Bra Miljöval – Kriterier 2013:4](#) 2013

⁷⁵ Swedwatch, Riskanalys av material och leverantörsled i Kungsbrohuset 2011; SVT, [Brasilien: Indianer ockuperar gruva](#), 2006-10-19, Business & Human Rights Resource Center, [Business and Human Rights in Guinea](#) Retrieved 2017-10-27

⁷⁶ Enact Sustainable Strategies, Riskanalys: instrument, 2017

⁷⁷ [Indonesian coal mining boom is leaving trail of destruction](#), Yale environment 360, 2015-12-17; [The cost of coal](#), Ecodefense, 2015; [Fighting corruption in mining poses tough challenges](#), Deutsche Welle, 2017-12-04.

⁷⁸ Utrikesdepartementet, [Mänskliga rättigheter i Saudiarabien 2011](#), Retrieved 2017-10-27; ILO, Working Paper No. 267, [Working conditions of contract workers in the oil and gas industries](#), 2010; The Degradation of Work, Oil and Casualization of Labor in the Niger Delta, 2010; Oil price.com, [Nigerian Oil Workers Go On Strike, Stop Production At Several Flow Stations](#), 2017; The Guardian, [Shell Nigeria oil spill '60 times bigger than claimed'](#), 2012-04-23.

⁷⁹ Wday, [The Bakken's dirty secret: sex trafficking has growing precense in oil patch experts say](#) 2014-05-06, Al Jazeera, [The Dark side of the oil boom: Human trafficking in the Heartland, 2014-04-28](#), Columbia law school, Righting wrongs? [Barrick Gold's remedy mechanism for sexual violence in Papua New Guinea](#) November 2015

⁸⁰ [Tanzania's anti-corruption crusaders cracks down on opponents, CNN, 2017-11-07](#); [Corruption perceptions index 2016 - Nigeria](#), Transparency international; [Some 400 children rescued...](#), Daily mail, 2015-02-05

⁸¹ [PETA: There is no such thing as humane wool](#), NBC News, 2014-07-08; [Move to end lamb 'cruelty' as castration is condemned by government experts](#), Daily mail, 2008-07-02.

Cotton from India and China may be farmed using child or bonded labour,⁸² particularly genetically-engineered cotton, and in Uzbekistan, forced labour is widespread.⁸³ In general, cotton farming uses substantial amounts of pesticides and water.⁸⁴

Meeting tables

Summary of the most severe risks

Assembly	Components	Raw materials
Repetitive movements Toxic exposure/ emissions Minority discrimination/ abuse	Wood derivatives, plastic components, metal components, electronics Low wages Excessive overtime Forced labour Child labour Minority discrimination/abuse Lack of union rights Poor health and safety Toxic exposure and emissions Fire and explosion Environmental pollution Exploitation of migrant workers	Oil, gas, bauxite, urea, coal, phenols, wood, sand, conflict minerals: Poor working conditions Low wages Child labour Forced labour Illegal logging Poor health and safety Environmental pollution Land erosion Impacts on local communities' and indigenous peoples' rights Conflict with local communities Exploitation of migrant workers Support of armed conflict Sexual abuse
Low risk	Medium-high risk	High risk

The product

Tabletops are made of wood derivatives, solid wood, glass or metal. The support structure, including legs/base, is often in metal.⁸⁵

⁸² CSR Academy, [Combating child labor in the supply chain in India](#), 2013; Maplecroft, Risk calculators and dashboards, [Climate change will push more children into work](#), 2010.

⁸³ [India's farmer suicides: are deaths linked to GM cotton?](#), The Guardian, 2014-05-05; [Uzbekistan is forcing 'volunteers' to toil its cotton fields](#), Vice news, 2015-09-16; [Will EU agreement leverage forced labour out of Uzbek cotton?](#), Innovation forum UK, 2017-01-06

⁸⁴ International Journal of Applied Research, [Bt cotton in India, pesticide use and environmental impact in India](#), 2016; International Journal of Occupational and Environmental Health, [Acute pesticide poisoning among female and male cotton growers in India](#), 2005; Journal of Developmental Economics, [Risk preferences and pesticide use by cotton farmers in China](#), 2013; [Cotton: A water wasting crop](#), WWF, Retrieved 2017-12-10

⁸⁵ See e.g. [Edsbyn's Centro](#), [Kinnarps' Multicom](#) or [Wilkhahn's Travis](#). Retrieved in November 2017

Wooden table tops often have a board base covered with veneer or laminate. Chipboard and MDF are usually made by a mixture of wood species, most commonly spruce, fir, beech, birch, aspen and poplar, and also contain sawdust and parts of recycled wood (old furniture, pallets etc.) as well as urea-formaldehyde resin glue and dispersion glue.⁸⁶

Surfaces are in veneer, from for example oak, beech, birch and ash, or laminate. The latter consists of decorative paper impregnated with melamine-resin and one or more layers of kraft paper, impregnated with phenolic resins, laminated under high pressure and heat. More than 40 percent of the laminate can consist of resins, which in turn contain formaldehyde.⁸⁷

Apart from the above-mentioned wood species, alder is sometimes used for painted solid wood.⁸⁸

Table edge profiles typically come in ABS plastic or solid wood. The frame is often powder-coated steel - made with iron ore, scrap metal, hard coal, and elements like chromium, nickel and molybdenum - or aluminum, often recycled⁸⁹ but otherwise made of bauxite clay, caustic soda, lime and carbon.⁹⁰

Optional features include height-adjusting systems and cable channels, in plastics or aluminium, and feet in natural or synthetic rubber. Plastic details come from granules made up of basic resins and additives such as antioxidants, colourants, foaming agents, plasticizers, lubricants and flame retardants.⁹¹

Surface treatments, including chrome plating, powder coating and painting, lacquering etc. involve complex use of binders, solvents, pigments and possibly additives. The raw materials for these are mainly oil and gas, fatty acids from animals and plants and cellulose.⁹²

The supply chain

The meeting table market is characterised by an unusually high degree of Scandinavian designers, often assembling and partly manufacturing the chairs in their home country and in Northern Europe. Several - and for certain components all - of their suppliers are also based in those or other highly developed countries.

Chipboard production is ubiquitous, and takes place in Western as well as in Eastern Europe.⁹³ Roundwood, sawdust and chips are usually sourced inside a 100-kilometer radius from the factory.⁹⁴

In Scandinavian-assembled products, much metal predominantly originates in Sweden or Finland, with iron ore also sourced locally.⁹⁵ Major Swedish steelworks claim that hard coal is sourced from Australia and the USA. However, Indonesia, Russia, South Africa and Mongolia are also global top

⁸⁶ Email from Johanna Ljunggren, Kinnarps, 2017-11-17

⁸⁷ [Environmental product declaration](#), Egger laminate, issued 2014-07-31

⁸⁸ Telephone conversation with Martin Stejdahl, Karl Andersson & Sons, 2017-11-14

⁸⁹ Email from Tor Egil Skulstad, Hydro, 2017-12-06.

⁹⁰ [Aluminum - how it's made](#), Norsk Hydro, retrieved 2017-11-28.

⁹¹ [How plastics are made](#), American chemistry council, retrieved 2017-11-28.

⁹² Telephone conversation, Ingvar Lindh, Sherwin, 2017-11-27

⁹³ Email from Ljunggren, Kinnarps, 2017-11-17

⁹⁴ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

⁹⁵ Telephone conversation, Andreas Alm, Tibnor, 2017-11-24

exporters and supply chains are non-transparent.⁹⁶ Scrap metal makes up part of the supply, with producers in Germany and Italy.⁹⁷ Plastic granulate is sourced on the world market, but plastics are also recycled regionally.⁹⁸

Glass details can be finished in Sweden with raw glass produced in Germany using sand often from Western Europe. China, for example the Qingdao area, is a competitor. Other ingredients, as well as additional elements such as laminate sheets made of polyvinyl butyral, have low traceability.⁹⁹

Assembly	Main components	Raw Material
Sweden, Norway, Denmark, ¹⁰⁰ Germany, Hungary, and possibly Japan, Brazil and the USA. ¹⁰¹	<p>Veneer and boards: Mainly Northern and Eastern Europe, but also Russia and the USA¹⁰²</p> <p>Laminate surfaces: Germany, Austria, UK, France, Romania¹⁰³</p> <p>Plastics: Sweden, Norway, other EU countries, China, Taiwan, Malaysia¹⁰⁴</p> <p>Metal parts: Sweden, Norway, other EU, China, Taiwan, Malaysia, South Korea¹⁰⁵</p> <p>Height adjustment electronics: Denmark, Lithuania, China, Sweden¹⁰⁶</p>	<p>Wood: EU, USA, Ukraine, Russia¹⁰⁹, scrap. (Often: Ash, oak, beech from Croatia, beech from Slovakia and Hungary and birch from Finland and the Baltics.¹¹⁰)</p> <p>Iron ore: Sweden, world market; main producing countries are Australia, Brazil and China.¹¹¹</p> <p>Plastic resins: World market, e.g. Saudi Arabia, Europe, Brazil, the USA and China¹¹²</p> <p>Oil: Some of the main producing countries are Saudi Arabia, Russia, United Arab Emirates, Canada, Nigeria¹¹³</p> <p>Urea: World market, often North Africa, Gulf states, China¹¹⁴</p>

⁹⁶ [Website](#), SSAB, retrieved 2017-11-28. [Coal information overview 2017](#), IEA

⁹⁷ Telephone conversation, large Scandinavian metal supplier, 2017-11-27

⁹⁸ Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

⁹⁹ Telephone conversation, Michael Johansson, Värnamo glas, 2017-11-15

¹⁰⁰ Telephone conversations, Jone Stangeland, Senab Eikeland, 2017-12-08 and Kristina Pettersson, Kinnarps, 2017-11-06

¹⁰¹ [Website](#), Vitra, retrieved 2017-12-08

¹⁰² Emailed data from Kristina Pettersson and Ljunggren, Kinnarps, 2017-11-17 and 2017-11-28 and Pierre Lennartsson, Lekolar, 2017-11-22

¹⁰³ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

¹⁰⁴ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

¹⁰⁵ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

¹⁰⁶ Telephone conversation, Tom Bernhard Larsen, Linak Norway, 2017-11-24

¹⁰⁹ Email from Pierre Lennartsson, Lekolar, 2017-11-22

¹¹⁰ Emailed data from Kristina Pettersson, Kinnarps, 2017-11-28

¹¹¹ United States Geological Survey, [Mineral Commodity Summaries 2017](#), Iron Ore, Retrieved 2017-11-30

¹¹² Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

¹¹³ Råvarumarknaden.se, [USA passerade Saudiarabien som världens största oljeproducent](#), Retrieved 2017-10-27

¹¹⁴ [Website](#), Independent chemical information service, retrieved 2017-12-04

	<p>Standardised parts¹⁰⁷: Sweden, Germany, the Netherlands.¹⁰⁸</p>	<p>Phenol: World market, often North Asia, USA¹¹⁵</p> <p>Sand: Netherlands, Belgium, other EU-countries¹¹⁶</p> <p>Bauxite/aluminium: Brazil¹¹⁷, world market; Main producing countries are Australia, Brazil, China, Guinea, Jamaica, India.¹¹⁸</p> <p>Copper, tin, lead, etc: World market.</p>
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Risks

With several tiers of the supply chains located in the EU and often in Scandinavia, risks are relatively low, socially as well as environmentally. However, repetitive motions, cutting machinery causing musculoskeletal disorders and maimings are risks in furniture assembly and wood processing even in highly developed economies.¹¹⁹

On the component level, the risk-level increases. In Southern and Eastern Europe, migration raises general risks for abuse of undocumented workers and discrimination of minorities.¹²⁰ Anti-union activities along with “yellow unions”¹²¹, low wages, unpaid over-time and insecure employment is reported from East-European countries.¹²²

Components manufactured in some Asian countries, particularly China, continue to pose a heightened risk of human rights abuses including child labour¹²³ and forced labour.¹²⁴ Health and safety conditions in Chinese factories are often poor.¹²⁵ There is a risk that people are paid very low

¹⁰⁷ Screws, nuts, bolts, spacers, fittings etc., plastic or metal.

¹⁰⁸ Emailed data from Kristina Pettersson, Kinnarps, 2017-11-28, apart from that - unknown.

¹¹⁵ [Website](#), IHS Markit, retrieved 2017-12-0

¹¹⁶ Telephone conversation, Michael Johansson, Värnamo glas, 2017-11-15

¹¹⁷ Telephone conversation, Tor Egil Skulstad, Hydro Extrusions, 2017-12-05

¹¹⁸ U.S. Geological Survey, [Bauxite and alumina](#), 2017

¹¹⁹ Email from Hjerpbakk, Nordic Comfort Products, 2017-11-27. [Arbetskadorna i träindustrin](#), IVL Svenska miljöinstitutet, issued in May 2008

¹²⁰ [Abuse of migrant workers is now a top priority for businesses](#), The Guardian, 2016-02-16; [Country ranking](#), ILGA-Europe, retrieved on 2017-12-05

¹²¹ Yellow unions are associations that are established by the employer themselves and are therefore not free. The purpose is to control workers and prevent strikes. They can also be controlled or influenced by the state.

¹²² World Economy, Ecology and Development, Working Conditions and Economic Development in ICT Production in Central and Eastern Europe 2010

¹²³ China Labor Watch, [reports on toy factories in China](#), Retrieved 2017-11-02; International Labor Rights Forum, [Six cents an hour](#), 1996

¹²⁴ Topical research digest: Human rights and contemporary slavery, [The dark side of labour in China](#), Retrieved 2017-11-02

¹²⁵ International Journal of Occupational and Environmental Health, [Occupational Health and Safety in China](#), Oct/Dec 2003; Labor Watch Pakistan, [Safety at workplace](#), 2015-08-24

wages and are required to work excessively long hours.¹²⁶ Migrant workers constitute a particularly vulnerable group and are at risk of being exploited and discriminated against in China, Taiwan and Malaysia, including confiscation of passports and high recruitment fees. Union rights are limited or not respected.¹²⁷

During processing, wood dust can inflict workers with diseases like asthma and cancer unless ventilation and/or breathing protection is properly employed.¹²⁸

For plastic components manufactured in high risk countries such as China, Malaysia and Taiwan, there is a high risk of severe health impacts on people working in the plastics industry as a result of poor management and lack of ventilation and safety equipment.¹²⁹ There is a risk of fires and explosions in factories producing plastics, as well as the risk of air pollution and contamination of soil and water from waste water.¹³⁰ The PVC plastic often emits phthalates which can harm the human hormone balance and reduce fertility¹³¹, and some producers avoid it, at least in some components.¹³²

The vast array of chemicals used in plastics, in glue and in surface and textile treatments, as well as their components and raw materials, is difficult to trace. Many are produced in the EU. Bulk chemicals and replicas are produced outside of the EU, with considerably less controls.¹³³

Melamine is poisonous¹³⁴ and formaldehyde is carcinogenic and mutagenic¹³⁵ and its use in consumer products is questioned by authorities.¹³⁶ These risks apply to workers, users and environment throughout the life-cycle of products¹³⁷, unless proper precautions are taken.

Several flame retardants have been classified as harmful to the environment and/or humans, or their potential toxicity have yet to be fully examined.¹³⁸ Apart from such chemicals, electronic

¹²⁶ South China Morning Post, [‘Low pay, long hours’: life inside factory that supplied Ivanka Trump brand in China](#), 2017-06-28; The Guardian, [The grim truth of Chinese factories producing the west’s Christmas toys](#), 2016-12-04; China Labor Watch, [Minimum wage standards in China](#), 2016

¹²⁷ ITUC, Survey of violations of trade union rights in [China](#), 2016-2017

¹²⁸ [Wood dust](#), Health and Safety Executive, UK, retrieved on 2017-12-05

¹²⁹ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#), 2015-04-09

¹³⁰ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#),

¹³¹ [Forskare: Rätt av förskolor att rensa ut gamla plastleksaker](#), Dagens Nyheter, 2017-12-02

¹³² Linak website, retrieved 2017-11-14

¹³³ Telephone conversation, Ingvar Lindh, Sherwin Williams, 2017-11-27; [Chemical mixtures and the ‘cocktail’ effect](#), European chemicals agency, retrieved 2017-12-10

¹³⁴ [Poisoned milk substitute took lives](#), Swedish Radio, 2009-01-22

¹³⁵ See e.g. [EU Commission Regulation 605/2014](#)

¹³⁶ Sveriges Natur, September 6, 2017, [“EU bans formaldehyde in cosmetics”](#).

¹³⁷ [Electronic waste](#), World health organisation, retrieved 2017-12-08

¹³⁸ [Bromerade flamskyddsmedel](#), Kemiinspektionen, retrieved 2017-12-06; [Regler för biocidbehandlade varor](#), Kemiinspektionen, April 2016; [Högfluorerade ämnen - PFAS](#), Kemiinspektionen, retrieved 2017-12-06;

components' heavy metals are associated with several health risks and easily accumulate in the body and food chain.¹³⁹

Electronics is in general a high-risk segment, with complex and obscure supply chains of its own and production frequently located in China or several components sourced from there. Risks surround both the manufacturing of electronics and components but also the extraction of a vast amount of different minerals used.¹⁴⁰ The extraction of minerals and heavy metals (such as copper, tin and lead) for electronics risks being connected with conflict profiteering, human rights violations, child labour and/or pollution.¹⁴¹

Several risks are connected to the raw materials. Because of widespread illegal logging¹⁴², including inside the EU¹⁴³, some furniture makers trace wood back to the logging location and use mainstream certifications, like that which is provided by the Forest Stewardship Council (FSC), to do so. However, certification schemes have also been the subject of criticism. For example, FSC has been accused of inconsistencies and of providing certification despite clear-cutting of old growth forests and degradation of biological diversity.¹⁴⁴ If wood from Russia is used, there is risk of illegal logging, corruption and poor working conditions, including abuse of migrant workers.¹⁴⁵

Urea plants in countries like Tanzania, Nigeria, India and Saudi Arabia carry varying, albeit significant, risks in terms of workers' rights violations, discrimination and harmful emissions.¹⁴⁶

If steel and aluminum from high-risk countries is used, there is a risk of serious health and security risks for employees. The production can take place under harsh conditions, with extreme temperatures, heavy lifting, large machinery, and can expose employees to harmful fumes and dust. Metal processing and iron ore mining also involve a range of chemicals that are harmful to humans and ecosystems.¹⁴⁷ Aluminum smelters involve risk of air pollution.¹⁴⁸

Mining is one of the most hazardous occupations of all when the number of people exposed to risk is taken into account.¹⁴⁹ There are social and environmental impacts linked to iron and bauxite mining

¹³⁹ [Toxicity, mechanism and health effects of some heavy metals](#), Interdisciplinary toxicology, June 2014.

¹⁴⁰ Please review the [Difi high-risk product category Elektronikk og IKT](#) for more information.

¹⁴¹ [Blood minerals are electronics industry's dirty secret](#), New Scientist, 2014-06-11; [For Apple and others, tin supply chain has links to rebel-held Myanmar mine](#), Reuters, 2016-11-28.

¹⁴² [Europe failing to clamp down...](#), The Guardian, 2015-10-22

¹⁴³ [Major Austrian timber firm accused of illegal logging in Romania](#), The Guardian, 2015-10-22

¹⁴⁴ [70 företag kräver ett mer hållbart svenskt jordbruk](#), Expressen, 2017-11-30; [Tracking timber: could new technology help clean up the supply chain?](#), The Guardian, 2013-08-14

¹⁴⁵ Environmental Protection Agency, [Liquidating the Forests: Hardwood Flooring, Organized Crime, and the World's Last Siberian Tigers](#), 2013; ILO, [Decent work in forestry](#), 2015; [Transparency international: Russia one of the most corrupt countries](#), The Moscow times, 2016-11-16

¹⁴⁶ [Tanzania's anti-corruption crusaders cracks down on opponents](#), CNN, 2017-11-07; [Corruption perceptions index 2016 - Nigeria](#), Transparency international; [Some 400 children rescued...](#), Daily mail, 2015-02-05.

¹⁴⁷ Enact Sustainable Strategies, Riskanalys: Instrument, 2017; International Labour Organisation, [Code of practice on safety and health in the iron and steel industry](#), 2005; The Aluminium Association, Safety, retrieved 2017-11-24.

¹⁴⁸ Reuters, [China Hongqiao shuts down aluminium smelting pots for winter](#), 2017-11-15; Metal Miner, [Beijing Proposes Massive Idling of Chinese Smelters to Combat Pollution](#), 2017-02-08, Financial Times, [China's environmental clean-up to have big impact on industry](#), 2017-05-22

¹⁴⁹ ILO, [Mining: A Hazardous work](#), Retrieved 2017-11-28

(for aluminium) in countries such as Brazil, India, China and other high-risk countries. Bauxite is extracted from open mine pits, which can cause leaching of toxic substances, dust and water pollution, soil erosion, water shortage and negative impacts on biodiversity.¹⁵⁰ Other risks associated with the countries involved are lack of union rights and harassments of unionised workers, in some cases conflicts connected to local communities and indigenous peoples' land rights, low wages, poor working conditions and sometimes child labour and forced labour.¹⁵¹ Chinese mine sites have been found to rely on large numbers of migrant workers, who receive less pay and work without personal protection equipment.¹⁵²

Coal mining in top exporters like Indonesia, Russia, South Africa and Mongolia is often associated with deforestation, marginalisation of minorities and large-scale corruption.¹⁵³

Scrap metal handling may be associated with risks of fires, pollution, physical accidents, illicit trade as well as labour issues.¹⁵⁴

Sand mining can cause large-scale environmental impacts on water, soil, birds, fish and other wildlife. Reports from all over the world show incidents of land erosion and beaches disappearing, water changing course, collapse of infrastructure and pollution. As a result, local communities surrounding the areas of sand mines are at risk losing access to clean water, land and food, with impacts on their right to livelihood.¹⁵⁵

Oil extraction is connected to environmental and social risks in Saudi Arabia, Russia, United Arab Emirates and Nigeria, including lack of union rights, poor working conditions, and forced labour as well as oil spills leading to health impacts and contamination of soil and water for surrounding communities.¹⁵⁶ Oil extraction, and mining, in high-risk environments has also been linked to sexual exploitation and abuse of women in surrounding areas.¹⁵⁷

¹⁵⁰ The Wilderness Society, [Bauxite mining threatens Wild Rivers](#) 2015-07-31; Naturskyddsforeningen, [Bra Miljöval – Kriterier 2013:4](#) 2013

¹⁵¹ Swedwatch, Riskanalys av material och leverantörsled i Kungsbrohuset 2011; SVT, [Brasilien: Indianer ockuperar gruva](#), 2006-10-19, Business & Human Rights Resource Center, [Business and Human Rights in Guinea](#) Retrieved 2017-10-27

¹⁵² Enact Sustainable Strategies, Riskanalys: instrument, 2017

¹⁵³ [Indonesian coal mining boom is leaving trail of destruction](#), Yale environment 360, 2015-12-17; [The cost of coal](#), Ecodefense, 2015; [Fighting corruption in mining poses tough challenges](#), Deutsche Welle, 2017-12-04

¹⁵⁴ [The hazards of scrap metal recycling - and implications for insurers](#), Gen re, February 2013; [Scrap metal scams - a hazard for international freight forwarders](#), Logistiq insurance solutions, 2013-04-11; [Immigrants squeak out living as Athens scrap metal mongers](#), AFP, 2012-04-29

¹⁵⁵ The Guardian, [Sand mining: the global environmental crisis you've probably never heard of](#) 2017-02-27

¹⁵⁶ Utrikesdepartementet, [Mänskliga rättigheter i Saudiarabien 2011](#), Retrieved 2017-10-27; ILO, Working Paper No. 267, [Working conditions of contract workers in the oil and gas industries](#), 2010; The Degradation of Work, Oil and Casualization of Labor in the Niger Delta, 2010; Oil price.com, [Nigerian Oil Workers Go On Strike, Stop Production At Several Flow Stations](#), 2017; The Guardian, [Shell Nigeria oil spill '60 times bigger than claimed'](#), 2012-04-23

¹⁵⁷ Wday, [The Bakken's dirty secret: sex trafficking has growing precense in oil patch experts say](#) 2014-05-06, Al Jazeera, [The Dark side of the oil boom: Human trafficking in the Heartland](#), 2014-04-28, Columbia law school, Righting wrongs? [Barrick Gold's remedy mechanism for sexual violence in Papua New Guinea](#) November 2015

Office chairs

Summary of the most severe risks

Assembly	Components	Raw materials
Repetitive movements Minority discrimination/abuse	Plastic and metal components, fabrics Forced labour Child labour Low wages Lack of union rights Poor health and safety Repetitive movements Minority discrimination/abuse Toxic exposure and emissions Fire and explosion Environmental pollution Exploitation of migrant workers	Oil, gas, bauxite, coal, wool, cotton Poor working conditions Low wages Excessive overtime Lack of union rights Child labour Forced labour Poor health and safety Toxic exposure Environmental pollution Land erosion Lack of clean water Illegal logging Impacts on local communities' rights Conflict with local communities Sexual abuse
Low	Medium-high risk	High risk

The product

Modern office chairs are complex and sometimes advanced systems. Components include the seat, back, optional headrest and arms, their support frames, several paddings, the cylinder/gas lift, footbase (in metal or plastic), wheels/castors and motion mechanisms, as well as standardised parts like straps, screws and spacers.

All main parts are made of aluminium, steel or different types of plastic, while upholstery is in wool or synthetic (polyester) fibre. Cotton also occurs but leather is uncommon. Various chemicals and metals may be used in fabric treatment.¹⁵⁸ Zinc and nylon is also used.¹⁵⁹

Steel is made from iron ore, scrap metal, hard coal, and elements like chromium, nickel and molybdenum. Aluminum is often recycled but otherwise made with bauxite clay, caustic soda, lime and carbon.¹⁶⁰ Rubber can be natural and synthetic (butyl).

¹⁵⁸ [Environment Product Declaration](#), BMA Axia 2.5, Flokk, issued 2017-01-25

¹⁵⁹ Telephone conversations, Robin Ljungar, TMF, 2017-11-17 and Kurt Nedergaard, Gabriel, 2017-11-30, [Sustainability declaration](#), Capella, Kinnarps, retrieved 2017-11-15

¹⁶⁰ [Aluminum - how it's made](#), Norsk Hydro, retrieved 2017-11-28

Polyvinyl chloride (PVC) may also be used. All plastics come from granules made up of basic resins and additives such as antioxidants, colourants, foaming agents, plasticizers, lubricants and flame retardants.¹⁶¹

Surface treatments, including chrome plating, powder coating and painting, lacquering etc. involve complex use of binders, solvents, pigments and possibly additives. The raw materials for these are mainly oil and gas, fatty acids from animals and plants and cellulose.¹⁶²

Supply chain

The office chair market is characterised by an unusually high degree of Scandinavian designers, often assembling and partly manufacturing the chairs in their home country and in Northern Europe. Several - and for certain components all - of their suppliers are also based in those or other highly developed countries.¹⁶³

Two producers, which did not respond to repeated requests for details, list production in Hungary and the UK, but also outside the EU: USA, China, Japan, India and Brazil.¹⁶⁴ It is probable but not certain that their main production for the Scandinavian market occurs in European locations.

Some producers import key components from EU countries, North America and Asia. However, supply chains of components are highly complex, where a single mechanism can contain some 200 details, of which many are sourced from different subcontractors.¹⁶⁵

Scandinavian assembly means that much metal predominantly originates in Sweden or Finland, with iron ore also sourced locally.¹⁶⁶ Both aluminum and steel are frequently reproduced from scrap metal in Germany and Italy.¹⁶⁷ The major Swedish steelworks claims hard coal is sourced from Australia and the USA, but Indonesia, Russia, South Africa and Mongolia are also global top exporters and supply chains are non-transparent.¹⁶⁸

Plastics (shells, seat, foam, bellows, spacers) are typically injection molded by subcontractors in Scandinavia or Northern Europe. Saudi Arabia, Europe, Brazil, the United States or China are among the top producers of basic resins, while additive industries are even more widespread. Recycled plastics occur in details.¹⁶⁹

Standardised parts (screws, spacers, washers) may be produced by small or medium-sized firms in Scandinavia, while more complex components like the foot base, cylinder, and wheels/castors can be

¹⁶¹ [How plastics are made](#), American chemistry council, retrieved 2017-11-28

¹⁶² Telephone conversation, Ingvar Lindh, Sherwin, 2017-11-27

¹⁶³ Contacts with several Scandinavian office chair producers, November-December 2017

¹⁶⁴ [Website](#), Herman Miller; [website](#), Vitra, both retrieved 2017-12-04; email, Geir Hovland, Senab Eikeland, 2017-12-08

¹⁶⁵ Telephone conversation, large Scandinavian metal supplier A, 2017-11-27

¹⁶⁶ Telephone conversation, Andreas Alm, Tibnor, 2017-11-24

¹⁶⁷ Telephone conversation, large Scandinavian metal supplier A, 2017-11-27

¹⁶⁸ [Website](#), SSAB, retrieved 2017-11-28, [Coal information overview 2017](#), IEA

¹⁶⁹ Email, Johanna Ljunggren, Kinnarps, 2017-11-29; telephone conversation, Peter Arentz, Nordic polymers, 171127

made in Italy, Canada and Taiwan, but also China.¹⁷⁰ The German firm Stabilus dominates the gas spring market, with factories in Germany and Romania.¹⁷¹

Some textile is bought from Western Europe or Japan, whereas processing like weaving, colouring and spinning also takes place in Eastern Europe, including in Lithuania, the Czech Republic and Bulgaria, and South Korea or China. Synthetic fibres often originate from Germany and wool in New Zealand or Norway¹⁷² but also South America and elsewhere in Northern Europe.¹⁷³ Cotton is commonly spun and woven in the EU and sourced from the world market, dominated by US, Indian and Australian exports.¹⁷⁴

Surface treatments are often performed and mixed in the assembly country, and sourced from Germany or central Europe, with ingredients procured on the world market.

The global petrochemical industry, as well as the extraction of oil, gas, hard coal, bauxite, urea, lime and other furniture raw materials, are characterised by near-zero traceability.

Assembly	Components	Raw materials
Sweden, Norway, Denmark, Italy, Germany, UK. ¹⁷⁵ Possibly Hungary, China, Brazil, India, USA, Japan.	<p>Shell: Sweden, Norway, Denmark, Italy, Germany</p> <p>Base: EU, Taiwan, Canada, China¹⁷⁶</p> <p>Wheels/castors: Germany, North America, East Asia¹⁷⁷</p> <p>Upholstery: EU, Japan, China, South Korea, Norway¹⁷⁸</p> <p>Gas swivel: Germany, Romania¹⁷⁹, Sweden (components from Austria and Poland¹⁸⁰), China</p>	<p>Iron ore: Sweden, world market; main producing countries are Australia, Brazil and China.¹⁸⁴</p> <p>Plastic resins: Saudi Arabia, Europe, Brazil, the USA and China¹⁸⁵</p> <p>Oil: World market; some of the main producing countries are Saudi Arabia, Russia, United Arab Emirates, Canada, Nigeria, USA¹⁸⁶</p>

¹⁷⁰ Telephone conversation, Jone Stangeland, Senab Eikeland, 2017-12-08

¹⁷¹ Telephone conversation, Erik Malm, Malmstolen, 2017-11-07

¹⁷² Emailed data, Kinnarps, 2017-11-14

¹⁷³ Telephone conversation, Kurt Nedergaard, Gabriel, 2017-11-30

¹⁷⁴ [Monthly economic letter](#), Cotton incorporated, October 2017

¹⁷⁵ Telephone conversations, Jone Stangeland, Senab Eikeland, 2017-12-08 and Kristina Pettersson, Kinnarps, 2017-11-06

¹⁷⁶ Telephone conversation, Scandinavian furniture producer A, 2017-11-09

¹⁷⁷ Telephone conversation, Erik Malm, Malmstolen, 2017-11-07.

¹⁷⁸ Email from Ljunggren, Kinnarps, 2017-11-14. Telephone conversations, Marie-Louise Fagervall Sliti, Ludvig Svensson, Jan Skrefsrud, Gudbrandsdalens uldvarefabrik, 2013-11-27 and Kurt Nedergaard, Gabriel, 2017-11-30.

¹⁷⁹ Telephone conversation, Erik Malm, Malmstolen, 2017-11-07

¹⁸⁰ Email from Ljunggren, Kinnarps, 2017-11-28

¹⁸⁴ United States Geological Survey, [Mineral Commodity Summaries 2017](#), Iron Ore, Retrieved 2017-11-30

¹⁸⁵ Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

¹⁸⁶ Råvarumarknaden.se, [USA passerade Saudiarabien som världens största oljeproducent](#), Retrieved 2017-10-27

	<p>Paddings: Sweden, Germany¹⁸¹</p> <p>Standardised parts:¹⁸² Sweden, Germany, the Netherlands.¹⁸³</p>	<p>Bauxite/aluminium: Brazil¹⁸⁷, world market (Main producing countries are Australia, Brazil, China, Guinea, Jamaica, India.¹⁸⁸)</p> <p>Wool: New Zealand, EU, South America, Iceland.¹⁸⁹</p> <p>Cotton: World market (China, India, USA, Pakistan, Uzbekistan)¹⁹⁰</p>
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Risks

With several tiers of the supply chains located in the EU and often in Scandinavia, risks are relatively low, socially as well as environmentally. However, repetitive motions and cutting machinery causing musculoskeletal disorders and maimings constitute risks in furniture assembly and wood processing even in highly developed economies.¹⁹¹

On the component level, risks increase. In Southern and Eastern Europe, migration raises general risks for abuse of undocumented workers and discrimination of minorities.¹⁹² Anti-union activities along with “yellow unions”¹⁹³, low wages, unpaid over-time and insecure employment is reported from East-European countries.¹⁹⁴

Components, including fabrics, manufactured in Asian countries such as China, continue to pose a heightened risk of human rights abuses including child labour¹⁹⁵, forced labour and debt bondage.¹⁹⁶ Health and safety conditions in Chinese factories are often poor.¹⁹⁷ There is a risk that people are

¹⁸¹ Email from Ljunggren, Kinnarps, 2017-11-28

¹⁸² Screws, nuts, bolts, spacers, fittings etc., plastic or metal.

¹⁸³ Emailed data, Kinnarps, 2017-11-14

¹⁸⁷ Telephone conversation, Tor Egil Skulstad, Hydro Extrusions, 2017-12-05

¹⁸⁸ U.S. Geological Survey, [Bauxite and alumina](#), 2017

¹⁸⁹ Email from Ljunggren, Kinnarps, 2017-11-14, Telephone conversation Kurt Nedergaard, Gabriel, 2017-11-30

¹⁹⁰ [UN Comtrade](#), cotton exports 2016, retrieved 2017-12-10; [In Uzbekistan, the practise of forced labour lives on during the cotton harvest](#), New York Times, 2013-12-17.

¹⁹¹ Email from Hjerpbakk, Nordic Comfort Products, 2017-11-27. [Arbetskadorn i träindustrin](#), IVL Svenska miljöinstitutet, issued in May 2008

¹⁹² [Abuse of migrant workers is now a top priority for businesses](#), The Guardian, 2016-02-16; [Country ranking](#), ILGA-Europe, retrieved on 2017-12-05

¹⁹³ Yellow unions are associations that are established by the employer themselves and are therefore not free. The purpose is to control workers and prevent strikes. They can also be controlled or influenced by the state.

¹⁹⁴ World Economy, Ecology and Development, Working Conditions and Economic Development in ICT Production in Central and Eastern Europe 2010

¹⁹⁵ China Labor Watch, [reports on toy factories in China](#), Retrieved 2017-11-02; International Labor Rights Forum, [Six cents an hour](#), 1996

¹⁹⁶ Topical research digest: Human rights and contemporary slavery, [The dark side of labour in China](#), Retrieved 2017-11-02

¹⁹⁷ International Journal of Occupational and Environmental Health, [Occupational Health and Safety in China](#), Oct/Dec 2003; Labor Watch Pakistan, [Safety at workplace](#), 2015-08-24

paid very low wages and are required to work excessively long hours.¹⁹⁸ Migrant workers constitute a particularly vulnerable group at risk of being exploited in China and Taiwan (to some extent also South Korea), and union rights are limited or not respected.¹⁹⁹

For plastic components manufactured in high risk countries such as China and Taiwan, there is a high risk of severe health impacts among workers as a result of poor management and lack of ventilation and safety equipment.²⁰⁰ There is a risk of fires and explosions in factories producing plastics, as well as the risk of air pollution and contamination of soil and water from waste water.²⁰¹ PVC plastic often emits phthalates which can harm the human hormone balance and reduce fertility²⁰², and some producers avoid it, at least in some components.²⁰³

The vast array of chemicals used in plastics, in glue and in surface and textile treatments, as well as their components and raw materials, is difficult to trace. Many are produced in the EU. Bulk chemicals and replicas are produced outside of the EU, with considerably less control.²⁰⁴

Several flame retardants, biocides and stain- and water-repellants have been classified as harmful to the environment and/or humans.²⁰⁵ These risks apply to workers, users and environment throughout the life-cycle of products²⁰⁶, unless proper precautions are taken.

The production of steel and aluminum is, in high-risk countries that lack enforcement of proper labour laws, intimately linked to serious health and safety risks for employees. The production commonly takes place under harsh conditions, with extreme temperatures, heavy lifting, large machinery, and can expose employees to harmful fumes and dust. Metal processing and iron ore mining also involve a range of chemicals that are harmful to humans and ecosystems.²⁰⁷ Aluminum smelters involve risk of air pollution.²⁰⁸

¹⁹⁸ South China Morning Post, [‘Low pay, long hours’: life inside factory that supplied Ivanka Trump brand in China](#), 2017-06-28; The Guardian, [The grim truth of Chinese factories producing the west’s Christmas toys](#), 2016-12-04; China Labor Watch, [Minimum wage standards in China](#), 2016

¹⁹⁹ ITUC, Survey of violations of trade union rights in [China](#), 2016-2017

²⁰⁰ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#), 2015-04-09

²⁰¹ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#),

²⁰² [Forskare: Rätt av förskolor att rensa ut gamla plastleksaker](#), Dagens Nyheter, 2017-12-02

²⁰³ Linak website, retrieved 2017-11-14

²⁰⁴ Telephone conversation, Ingvar Lindh, Sherwin Williams, 2017-11-27; [Chemical mixtures and the ‘cocktail’ effect](#), European chemicals agency, retrieved 2017-12-10

²⁰⁵ [Bromerade flamskyddsmedel](#), Kemiinspektionen, retrieved 2017-12-06; [Regler för biocidbehandlade varor](#), Kemiinspektionen, April 2016; Högfluorerade ämnen - PFAS, Kemiinspektionen, retrieved 2017-12-06;

²⁰⁶ [Electronic waste](#), World health organisation, retrieved 2017-12-08

²⁰⁷ Enact Sustainable Strategies, Riskanalys: Instrument, 2017; International Labour Organisation, [Code of practice on safety and health in the iron and steel industry](#), 2005; The Aluminium Association, Safety, retrieved 2017-11-24

²⁰⁸ Reuters, [China Hongqiao shuts down aluminium smelting pots for winter](#), 2017-11-15; Metal Miner, [Beijing Proposes Massive Idling of Chinese Smelters to Combat Pollution](#), 2017-02-08, Financial Times, [China’s environmental clean-up to have big impact on industry](#), 2017-05-22

Social and environmental impacts are linked to iron and bauxite mining (for aluminium) in countries such as Brazil, India, China and other high-risk countries. Mining is one of the most high-risk sectors in the world and in most countries, mining remains the most hazardous occupation when the number of people exposed to risk is taken into account.²⁰⁹ Bauxite is extracted from open mine pits, which can cause leaching of toxic substances, dust and water pollution, soil erosion, water shortage and negative impacts on biodiversity.²¹⁰ Other risks associated with the countries involved are lack of union rights and harassment of unionized workers, in some cases conflicts connected to local communities and indigenous peoples' land rights, low wages, poor working conditions and sometimes child labour and forced labour.²¹¹ Chinese mine sites have been found to rely on large numbers of migrant workers, who receive less pay and often work without personal protection equipment.²¹²

Bauxite mined particularly in authoritarian countries like China and Malaysia (which in turn exports to China²¹³, from which aluminium parts may be sourced for furniture) involves risks of water pollution due to poor waste management facilities and illegal mining.²¹⁴ Coal mining in top exporters like Indonesia, Russia, South Africa and Mongolia is often associated with deforestation, marginalisation of minorities and large-scale corruption.²¹⁵

Scrap metal handling may be associated with risks of fires, pollution, physical accidents, illicit trade as well as labour issues.²¹⁶

Wool treatment may involve acid baths ("carbonising"), the use of biocides and heavy metals, which poses risk to workers and environment unless proper procedures are in place. Sheep may be subjected to cruelty during castration, tail docking and shearing.²¹⁷

²⁰⁹ ILO, [Mining: A Hazardous work](#), Retrieved 2017-11-28

²¹⁰ The Wilderness Society, [Bauxite mining threatens Wild Rivers](#) 2015-07-31; Naturskyddsföreningen, [Bra Miljöval – Kriterier 2013:4](#) 2013

²¹¹ Swedwatch, Riskanalys av material och leverantörsled i Kungsbrohuset 2011; SVT, [Brasilien: Indianer ockuperar gruva](#), 2006-10-19; Business & Human Rights Resource Center, [Business and Human Rights in Guinea](#), retrieved 2017-10-27

²¹² Enact Sustainable Strategies, Riskanalys: instrument, 2017

²¹³ [Malaysia's bauxite exports rise despite mining ban](#), Reuters, 2017-07-06

²¹⁴ Business and human rights centre, [Malaysia bans bauxite mining for 3 months to curb environmental & health impacts; tighter rules sought](#), 2016-01-12; Asian correspondent, [China's demand for aluminium is poisoning Southeast Asia](#), 2015-09-14; Reuters, [Malaysia's bauxite exports rise despite mining ban](#), 2017-07-06; BBC, [Bauxite in Malaysia: The environmental cost of mining](#), 2016-01-19; Malaysia is the biggest supplier of bauxite to China. Business and human rights centre, [Malaysia bans bauxite mining for 3 months to curb environmental & health impacts; tighter rules sought](#), 2016-01-12

²¹⁵ [Indonesian coal mining boom is leaving trail of destruction](#), Yale environment 360, 2015-12-17; [The cost of coal](#), Ecodefense, 2015; [Fighting corruption in mining poses tough challenges](#), Deutsche Welle, 2017-12-04.

²¹⁶ [The hazards of scrap metal recycling - and implications for insurers](#), Gen re, February 2013; [Scrap metal scams - a hazard for international freight forwarders](#), Logistiq insurance solutions, 2013-04-11; [Immigrants squeak out living as Athens scrap metal mongers](#), AFP, 2012-04-29

²¹⁷ [PETA: There is no such thing as humane wool](#), NBC News, 2014-07-08; [Move to end lamb 'cruelty' as castration is condemned by government experts](#), Daily mail, 2008-07-02

Cotton from India and China may be farmed using child or bonded labour,²¹⁸ particularly genetically-engineered cotton, and in Uzbekistan, forced labour is widespread.²¹⁹ In general, cotton farming uses substantial amounts of pesticides and water.²²⁰

Oil extraction is connected to environmental and social risks in Saudi Arabia, Russia, United Arab Emirates and Nigeria, including lack of union rights, poor working conditions, and forced labour as well as oil spills leading to health impacts and contamination of soil and water for surrounding communities.²²¹

²¹⁸ CSR Academy, [Combating child labor in the supply chain in India](#), 2013; Maplecroft, Risk calculators and dashboards, [Climate change will push more children into work](#), 2010

²¹⁹ [India's farmer suicides: are deaths linked to GM cotton?](#), The Guardian, 2014-05-05; [Uzbekistan is forcing 'volunteers' to toil its cotton fields](#), Vice news, 2015-09-16; [Will EU agreement leverage forced labour out of Uzbek cotton?](#), Innovation forum UK, 2017-01-06

²²⁰ International Journal of Applied Research, [Bt cotton in India, pesticide use and environmental impact in India](#), 2016; International Journal of Occupational and Environmental Health, [Acute pesticide poisoning among female and male cotton growers in India](#), 2005; Journal of Developmental Economics, [Risk preferences and pesticide use by cotton farmers in China](#), 2013; [Cotton: A water wasting crop](#), WWF, retrieved 2017-12-10.

²²¹ Utrikesdepartementet, [Mänskliga rättigheter i Saudiarabien 2011](#), Retrieved 2017-10-27; ILO, Working Paper No. 267, [Working conditions of contract workers in the oil and gas industries](#), 2010; The Degradation of Work, Oil and Casualization of Labor in the Niger Delta, 2010; Oil price.com, [Nigerian Oil Workers Go On Strike, Stop Production At Several Flow Stations](#), 2017; The Guardian, [Shell Nigeria oil spill '60 times bigger than claimed'](#), 2012-04-23

Shelves and cabinets (storage solutions)

Summary of the most severe risks

Assembly	Components	Raw materials
Repetitive movements Minority discrimination/abuse Toxic exposure/emissions	Plastic and metal components, wood derivatives Forced labour Child labour Low wages Excessive overtime Lack of union rights Poor health and safety Repetitive movements Cutting accidents, toxic exposure and emissions Minority discrimination/abuse Exploitation of migrant workers	Oil, gas, bauxite, urea, coal, phenols, wood Poor working conditions Low wages Excessive overtime Child labour Forced labour Illegal logging Poor health and safety Environmental pollution Land erosion Lack of clean water Impacts on local communities' rights Conflict with local communities Exploitation of migrant workers Sexual abuse
Low	Medium-high risk	High risk

The product

Shelves and cabinets consist largely of wood boards, although solid wood is also used. Details, wheels, handles etc., are often in plastic or metal. Glass may be used in doors.

A cabinet with drawers and doors might consist to 90 per cent of wood, 3 percent steel, some melamine, PVC and other materials.²²² Similarly, in another cabinets, the main material is laminated chipboard and sheet metal.²²³

The laminated parts typically have a base of wood derivatives such as chipboard and MDF. Such boards are usually made by a mixture of wood species, most commonly spruce, fir, beech, birch, aspen and poplar, and also contain sawdust and parts of recycled wood (old furniture, pallets etc.) as well as urea-formaldehyde resin glue and dispersion glue.²²⁴

Surfaces are in veneer, from for example oak, beech, birch and ash, or laminate. The latter consists of decorative paper impregnated with melamine-resin and one or more layers of kraft paper,

²²² [Environmental product declaration](#), Svenheim Kontormøbler, issued 2015-05-11

²²³ [Product description](#), Kinnarps, Trixagon storage, retrieved on 2017-11-15

²²⁴ Email from Johanna Ljunggren, Kinnarps, 2017-11-17

impregnated with phenolic resins, laminated under high pressure and heat. More than 40 per cent of the laminate can consist of resins, which in turn contain formaldehyde.²²⁵

Apart from the above-mentioned wood species, alder is sometimes used for painted solid wood.²²⁶

The glass is made mainly from silica sand, soda, limestone and dolomite.²²⁷ Aluminum is often recycled but otherwise made with bauxite clay, caustic soda, lime and carbon.²²⁸ Rubber can be natural and synthetic (butyl).

Surface treatments, including chrome plating, powder coating and painting, lacquering etc., involve complex use of binders, solvents, pigments and possibly additives. The raw materials for these are mainly oil and gas, fatty acids from animals and plants and cellulose.²²⁹

The supply chain

The public sector and office-gear shelves and cabinets' market is characterised by a high degree of Scandinavian designers. Often, assembling and some manufacturing takes place in their home country and in Northern Europe. Several - and for certain components all - of their suppliers are also based in those or other highly developed countries.

Chipboard production is ubiquitous, and takes place in Western Europe as well as in Eastern Europe.²³⁰ Roundwood, sawdust and chips are usually sourced inside a 100-kilometer radius from the factory.²³¹

In Scandinavian-assembled products, much metal predominantly originates in Sweden or Finland, with iron ore also sourced locally.²³² The major Swedish steelworks claims hard coal is sourced from Australia and the USA, but Indonesia, Russia, South Africa and Mongolia are also global top exporters and supply chains are non-transparent.²³³ Metal and aluminum are also recycled.²³⁴

Glass details can be finished in Sweden with raw glass produced in Germany using sand often from Western Europe. China, for example the Qingdao area, is a competitor. Other ingredients, as well as additional elements such as laminate sheets made of polyvinyl butyral, have low traceability.²³⁵

Plastic components are, for Europe-assembled furniture, injection molded in Sweden, Norway, or elsewhere in Europe.²³⁶ They could also be sourced from Asia. Additive industries are widespread. Recycled plastics occur in small components.

²²⁵ [Environmental product declaration](#), Egger laminate, issued 2014-07-31

²²⁶ Telephone conversation with Martin Stejdahl, Karl Andersson & Sons, 2017-11-14

²²⁷ [Raw materials](#), Pilkington, retrieved on 2017-12-06.

²²⁸ [Aluminum - how it's made](#), Norsk Hydro, retrieved 2017-11-28

²²⁹ Telephone conversation, Ingvar Lindh, Sherwin, 2017-11-27

²³⁰ Email from Ljunggren, Kinnarps, 2017-11-17

²³¹ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

²³² Telephone conversation, Andreas Alm, Tibnor, 2017-11-24

²³³ [Website](#), SSAB, retrieved 2017-11-28. [Coal information overview 2017](#), IEA

²³⁴ Email from Tor Egil Skulstad, Hydro, 2017-12-06

²³⁵ Telephone conversation, Michael Johansson, Värnamo glas, 2017-11-15

²³⁶ Email from Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-27

Assembly	Main components	Raw Material
<p>Sweden, Denmark, Norway, Switzerland, Germany, Estonia, Latvia.²³⁷ Also Hungary, and possibly Japan, Brazil and the USA²³⁸.</p>	<p>Veneer and boards: Sweden, Eastern Europe, Finland, Germany, USA, Russia. Bosnia, Serbia, Croatia, Poland, Finland, Germany.²³⁹</p> <p>Laminate surfaces: Germany, Austria, UK, France, Romania.²⁴⁰</p> <p>Plastics: Sweden, Norway, other EU, China, Taiwan, Malaysia.²⁴¹</p> <p>Metal parts: Sweden, Norway, other EU, China, Taiwan, Malaysia, South Korea.²⁴²</p> <p>Standardised parts²⁴³: Sweden, Germany, the Netherlands.²⁴⁴</p>	<p>Wood: EU, USA, Ukraine, Russia²⁴⁵, scrap. (Often: Ash, oak, beech from Croatia, beech from Slovakia and Hungary and birch from Finland and the Baltics.²⁴⁶)</p> <p>Iron ore: Sweden, world market; main producing countries are Australia, Brazil and China.²⁴⁷</p> <p>Plastic resins: Saudi Arabia, Europe, Brazil, the USA and China.²⁴⁸</p> <p>Oil: World market; some of the main producing countries are Saudi Arabia, Russia, United Arab Emirates, Canada, Nigeria²⁴⁹</p> <p>Sand: Netherlands, Belgium, EU.</p> <p>Urea: World market, often North Africa, Gulf states, China.²⁵⁰</p> <p>Phenol: World market, often North Asia, USA²⁵¹</p> <p>Bauxite/aluminium: Brazil²⁵², world market; main producing countries are</p>

²³⁷ Telephone conversation, Johanna Ljunggren, Kinnarps, 2017-11-07; email from Pierre Lennartsson, Lekolar, 2017-11-22; telephone conversation, Jone Stangeland, Senab Eikeland, 2017-12-08

²³⁸ [Website](#), Vitra, retrieved 2017-12-08

²³⁹ Emailed data from Kristina Pettersson and Ljunggren, Kinnarps, 2017-11-17 and 2017-11-28 and Pierre Lennartsson, Lekolar, 2017-11-22

²⁴⁰ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

²⁴¹ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

²⁴² Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

²⁴³ Screws, nuts, bolts, spacers, fittings etc., plastic or metal.

²⁴⁴ Emailed data from Kristina Pettersson, Kinnarps, 2017-11-28; telephone conversation, Martin Stejdahl, Karl Anderson & söner, November 2017

²⁴⁵ Email from Pierre Lennartsson, Lekolar, 2017-11-22

²⁴⁶ Emailed data from Kristina Pettersson, Kinnarps, 2017-11-28

²⁴⁷ United States Geological Survey, [Mineral Commodity Summaries 2017](#), Iron Ore, Retrieved 2017-11-30

²⁴⁸ Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

²⁴⁹ Råvarumarknaden.se, [USA passerade Saudiarabien som världens största oljeproducent](#), Retrieved 2017-10-27

²⁵⁰ [Website](#), Independent chemical information service, retrieved 2017-12-04

²⁵¹ [Website](#), IHS Markit, retrieved 2017-12-04

²⁵² Telephone conversation, Tor Egil Skulstad, Hydro Extrusions, 2017-12-05.

		Australia, Brazil, China, Guinea, Jamaica, India. ²⁵³
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Risks

Several tiers of the supply chains are located in the EU and often in Scandinavia, with elaborate regulations, labour rights traditions, highly developed infrastructure and societal functions in general. This means that risks are relatively low, socially as well as environmentally. Still, even in highly developed economies, repetitive motions, cutting machinery causing musculoskeletal disorders and maimings are identified risks in furniture assembly and wood processing.²⁵⁴ Anti-union activities have been reported from the Baltics, where unions can be considered weak.²⁵⁵

On the component level, risks increase. In Southern and Eastern Europe, migration raises general risks for abuse of undocumented workers and discrimination minorities.²⁵⁶ Anti-union activities along with “yellow unions”²⁵⁷, low wages, unpaid over-time and insecure employment is reported from East-European countries.²⁵⁸

Components manufactured in some Asian countries, particularly China, continue to pose a heightened risk of human rights abuses including child labour²⁵⁹ and forced labour.²⁶⁰ Health and safety conditions in Chinese factories are often poor.²⁶¹ There is a risk that people are paid very low wages and are required to work excessively long hours.²⁶² Migrant workers constitute a particularly vulnerable group at risk of being exploited and discriminated against in China, Taiwan and Malaysia (including confiscation of passports and high recruitment fees) and union rights are limited or not respected.²⁶³

There are health and safety risks connected to the manufacturing of components. Wood dust can inflict workers with diseases like asthma and cancer unless ventilation and/or breathing protection is properly employed.

²⁵³ U.S. Geological Survey, [Bauxite and alumina](#), 2017

²⁵⁴ Email from Hjerpbakk, Nordic Comfort Products, 2017-11-27. [Arbetskador i träindustrin](#), IVL Svenska miljöinstitutet, issued in May 2008

²⁵⁵

²⁵⁶ [Abuse of migrant workers is now a top priority for businesses](#), The Guardian, 2016-02-16; [Country ranking](#), ILGA-Europe, Retrieved on 2017-12-05

²⁵⁷ Yellow unions are associations that are established by the employer themselves and are therefore not free. The purpose is to control workers and prevent strikes. They can also be controlled or influenced by the state.

²⁵⁸ World Economy, Ecology and Development, Working Conditions and Economic Development in ICT Production in Central and Eastern Europe 2010

²⁵⁹ China Labor Watch, [reports on toy factories in China](#), Retrieved 2017-11-02; International Labor Rights Forum, [Six cents an hour](#), 1996

²⁶⁰ Topical research digest: Human rights and contemporary slavery, [The dark side of labour in China](#), Retrieved 2017-11-02

²⁶¹ International Journal of Occupational and Environmental Health, [Occupational Health and Safety in China](#), Oct/Dec 2003; Labor Watch Pakistan, [Safety at workplace](#), 2015-08-24

²⁶² South China Morning Post, [‘Low pay, long hours’: life inside factory that supplied Ivanka Trump brand in China](#), 2017-06-28; The Guardian, [The grim truth of Chinese factories producing the west’s Christmas toys](#), 2016-12-04; China Labor Watch, [Minimum wage standards in China](#), 2016

²⁶³ ITUC, Survey of violations of trade union rights in [China](#), 2016-2017

For plastic components manufactured in high risk countries such as China, Malaysia and Taiwan, there is a high risk of severe health impacts among people working in the plastics industry as a result of poor safety management and lack of ventilation and safety equipment.²⁶⁴ There is a risk of fires and explosions in factories producing plastics, as well as the risk of air pollution and contamination of soil and water from waste water.²⁶⁵ PVC plastic often emits phthalates which can harm the human hormone balance and reduce fertility²⁶⁶, and some producers avoid it, at least in some components.²⁶⁷

Several flame retardants, biocides and stain- and water-repellants have been classified as harmful to the environment and/or humans.²⁶⁸ These risks apply to workers, users and environment throughout the life-cycle of products²⁶⁹, unless proper precautions are taken.

The vast array of chemicals used in plastics, in glue and in surface and textile treatments, as well as their components and raw materials, is difficult to trace. Many are produced in the EU. Bulk chemicals and replicas are produced outside of the EU, with considerably less controls.²⁷⁰ Formaldehyde is carcinogenic and mutagenic²⁷¹ and its use in consumer products is questioned by authorities.²⁷²

Several risks are connected to the raw materials. Because of widespread illegal logging²⁷³, including inside the EU²⁷⁴, some furniture makers trace wood back to the logging location and use mainstream certifications, like that which is provided by the Forest Stewardship Council, to do so. However, certification schemes have also been the subject of criticism. For example, FSC has been accused of inconsistencies and of providing certification despite clear-cutting of old growth forests and degradation of biological diversity.²⁷⁵ If wood from Russia is used, there is risk of illegal logging, corruption and poor working conditions, including abuse of migrant workers.²⁷⁶

The production of steel and aluminum is in high-risk countries that lack enforcement of proper labour laws intimately linked to serious health and security risks for employees. Production

²⁶⁴ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#), 2015-04-09

²⁶⁵ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#),

²⁶⁶ [Forskare: Rätt av förskolor att rensa ut gamla plastleksaker](#), Dagens Nyheter, 2017-12-02

²⁶⁷ Linak website, retrieved 2017-11-14

²⁶⁸ [Bromerade flamskyddsmedel](#), Kemiinspektionen, retrieved 2017-12-06; [Regler för biocidbehandlade varor](#), Kemiinspektionen, April 2016; [Högfluorerade ämnen - PFAS](#), Kemiinspektionen, retrieved 2017-12-06;

²⁶⁹ [Electronic waste](#), World health organisation, retrieved 2017-12-08

²⁷⁰ Telephone conversation, Ingvar Lindh, Sherwin Williams, 2017-11-27; [Chemical mixtures and the 'cocktail' effect](#), European chemicals agency, retrieved 2017-12-10

²⁷¹ See e.g. [EU Commission Regulation 605/2014](#).

²⁷² Sveriges Natur, September 6, 2017, ["EU bans formaldehyde in cosmetics"](#).

²⁷³ [Europe failing to clamp down...](#), The Guardian, 2015-10-22

²⁷⁴ [Major Austrian timber firm accused of illegal logging in Romania](#), The Guardian, 2015-10-22

²⁷⁵ [70 företag kräver ett mer hållbart svenskt jordbruk](#), Expressen, 2017-11-30; [Tracking timber: could new technology help clean up the supply chain?](#), The Guardian, 2013-08-14

²⁷⁶ Environmental Protection Agency, [Liquidating the Forests: Hardwood Flooring, Organized Crime, and the World's Last Siberian Tigers](#), 2013; ILO, [Decent work in forestry](#), 2015; [Transparency international: Russia one of the most corrupt countries](#), The Moscow times, 2016-11-16

commonly takes place under harsh conditions, with extreme temperatures, heavy lifting, large machinery, and can expose employees to harmful fumes and dust. Metal processing and iron ore mining also involve a range of chemicals that are harmful to humans and ecosystems.²⁷⁷ Aluminum smelters involve risk of air pollution.²⁷⁸

Scrap metal handling may be associated with risks of fires, pollution, physical accidents, illicit trade as well as labour issues.²⁷⁹

Social and environmental impacts are linked to iron and bauxite mining (for aluminium) in countries such as Brazil, India, China and other high-risk countries. Mining is one of the most high-risk sectors in the world and in most countries, mining remains the most hazardous occupation when the number of people exposed to risk is taken into account.²⁸⁰ Bauxite is extracted from open mine pits, which can cause leaching of toxic substances, dust and water pollution, soil erosion, water shortage and negative impacts on biodiversity.²⁸¹ Other risks associated with the countries involved are lack of union rights and harassments of unionised workers, in some cases conflicts connected to local communities and indigenous peoples' land rights, low wages, poor working conditions and sometimes child labour and forced labour.²⁸² Chinese mine sites have been found to rely on large numbers of migrant workers, who receive less pay and work without personal protection equipment.²⁸³

Coal mining in top exporters like Indonesia, Russia, South Africa and Mongolia is often associated with deforestation, marginalisation of minorities and large-scale corruption.²⁸⁴

Sand mining (for glass) can have large scale environmental impacts on water, soil, birds, fish and other wildlife. Reports from all over the world show incidents of land erosion and beaches disappearing, water changing course, collapse of infrastructure and pollution. As a result, local communities surrounding the areas of sand mines are at risk losing access to clean water, land and food, with impacts on their right to livelihood.²⁸⁵

²⁷⁷ Enact Sustainable Strategies, Riskanalys: Instrument, 2017; International Labour Organisation, [Code of practice on safety and health in the iron and steel industry](#), 2005; The Aluminium Association, Safety, retrieved 2017-11-24

²⁷⁸ Reuters, [China Hongqiao shuts down aluminium smelting pots for winter](#), 2017-11-15; Metal Miner, [Beijing Proposes Massive Idling of Chinese Smelters to Combat Pollution](#), 2017-02-08, Financial Times, [China's environmental clean-up to have big impact on industry](#), 2017-05-22

²⁷⁹ [The hazards of scrap metal recycling - and implications for insurers](#), Gen re, February 2013; [Scrap metal scams - a hazard for international freight forwarders](#), Logistiq insurance solutions, 2013-04-11; [Immigrants squeak out living as Athens scrap metal mongers](#), AFP, 2012-04-29

²⁸⁰ ILO, [Mining: A Hazardous work](#), Retrieved 2017-11-28

²⁸¹ The Wilderness Society, [Bauxite mining threatens Wild Rivers](#) 2015-07-31; Naturskyddsforeningen, [Bra Miljöval – Kriterier 2013:4](#) 2013

²⁸² Swedwatch, Riskanalys av material och leverantörsled i Kungsbrohuset 2011; SVT, [Brasilien: Indianer ockuperar gruva](#), 2006-10-19, Business & Human Rights Resource Center, [Business and Human Rights in Guinea](#) Retrieved 2017-10-27

²⁸³ Enact Sustainable Strategies, Riskanalys: instrument, 2017

²⁸⁴ [Indonesian coal mining boom is leaving trail of destruction](#), Yale environment 360, 2015-12-17; [The cost of coal](#), Ecodefense, 2015; [Fighting corruption in mining poses tough challenges](#), Deutsche Welle, 2017-12-04.

²⁸⁵ The Guardian, [Sand mining: the global environmental crisis you've probably never heard of](#) 2017-02-27

Urea plants in countries like Tanzania, Nigeria, India and Saudi Arabia involve varying, albeit significant, risks in terms of workers’ rights violation, discrimination and harmful emissions.²⁸⁶

Oil extraction is linked to environmental and social risks in Saudi Arabia, Russia, United Arab Emirates and Nigeria, including lack of union rights, poor working conditions and forced labour, as well as oil spill leading to health impacts and contamination of soil and water for surrounding communities.²⁸⁷

Oil extraction, and mining, in high-risk environments has also been linked to sexual exploitation and abuse of women in surrounding areas.²⁸⁸

Student chairs

Summary of the most severe risks

Assembly	Components	Raw materials
Repetitive movements Minority discrimination/abuse	Wood, plastic and metal components, fabrics Minority discrimination/abuse Lack of union rights Poor health and safety Toxic exposure and emissions Fire and explosion Environmental pollution	Oil, gas, bauxite, urea, coal, phenols, wood, wool, cotton: Low wages Child labour forced labour Lack of union rights Illegal logging Poor health and safety Violations of indigenous peoples’ rights Conflict with and impacts on local communities Environmental pollution High water use Sexual abuse
Low risk	Medium-high risk	High risk

The product

The seat and backrest of a student chair can be made both of plastic and wood composites. Metal is typical for the legs and frame, although plastics and solid wood are also used. Upholstery, in natural or synthetic textile, padding and armrests, as well as a cylinder/gas lift, may be optional. Smaller details may be in plastic, metal or rubber (natural or synthetic).

²⁸⁶ [Tanzania’s anti-corruption crusaders cracks down on opponents](#), CNN, 2017-11-07; [Corruption perceptions index 2016 - Nigeria](#), Transparency international; [Some 400 children rescued...](#), Daily mail, 2015-02-05.

²⁸⁷ Utrikesdepartementet, [Mänskliga rättigheter i Saudiarabien 2011](#), Retrieved 2017-10-27; ILO, Working Paper No. 267, [Working conditions of contract workers in the oil and gas industries](#), 2010; The Degradation of Work, Oil and Casualization of Labor in the Niger Delta, 2010; Oil price.com, [Nigerian Oil Workers Go On Strike, Stop Production At Several Flow Stations](#), 2017; The Guardian, [Shell Nigeria oil spill '60 times bigger than claimed'](#), 2012-04-23

²⁸⁸ Wday, [The Bakken’s dirty secret: sex trafficking has growing precense in oil patch experts say](#) 2014-05-06, Al Jazeera, [The Dark side of the oil boom: Human trafficking in the Heartland, 2014-04-28](#), Columbia law school, Righting wrongs? [Barrick Gold's remedy mechanism for sexual violence in Papua New Guinea](#) November 2015

Polypropylene, polyamide and polyethylene are the main plastics used.²⁸⁹ They come from granules made up of basic resins and additives such as antioxidants, colourants, foaming agents, plasticizers, lubricants and flame retardants.²⁹⁰

Steel is made from iron ore, scrap metal, hard coal, and elements like chromium, nickel and molybdenum. Aluminum is often recycled but otherwise made with bauxite clay, caustic soda, lime and carbon.²⁹¹

Molded veneer for student chairs often comes in the wood species birch, oak or beech, ash, walnut or poplar and also contains glue.²⁹² Laminates are made of decorative paper impregnated with melamine-resin and one or more layers of kraft paper, impregnated with phenolic resins, all laminated under high pressure and heat. More than 40 percent of the laminate may consist of the resins, which in turn contains formaldehyde.²⁹³ The glues are mixed from urea and phenol, whose production in turn involves petrochemicals ammonia, benzene and propylene.

Surface treatments, including powder coating and chrome plating, involve complex use of binders, solvents, pigments and possibly additives. The raw materials for these are mainly oil and gas, fatty acids from animals and plants and cellulose.²⁹⁴

Supply chain

As with other furniture products, many producers of student chairs are located in Scandinavia, with design and assembly taking place locally. This typically means most components are also sourced, at least in the first few levels of the supply chain, in Europe.

Metal is, for Scandinavian assembly, frequently sourced from Sweden, which has its own steel production but also imports. Steel recycled from scrap is common, with Germany and Italy among producers.²⁹⁵ Poland and other Eastern European countries also have metal supply chains, which may go back to smelters in for example Poland and the Czech Republic, often based on scrap iron. Specific metal parts are also sourced from East Asia, for example chair legs from South Korea. Much aluminium is also recycled.²⁹⁶

Plastic components are, for Europe-assembled furniture, injection-molded mainly in Sweden, Norway, or elsewhere in Europe,²⁹⁷ but this is also done in Asia (China, Taiwan, Malaysia). Basic resins and additives have low traceability. Recycled plastics are sometimes used in non-load bearing details.

²⁸⁹ [Environmental product declaration](#), Nordic Comfort Products, issued 2017-05-15.

²⁹⁰ [How plastics are made](#), American chemistry council, retrieved 2017-11-28.

²⁹¹ [Aluminum - how it's made](#), Norsk Hydro, retrieved 2017-11-28.

²⁹² Email from Johanna Ljunggren, Kinnarps, 2017-11-17.

²⁹³ [Environmental product declaration](#), Egger laminate, issued 2014-07-31

²⁹⁴ Telephone conversation, Ingvar Lindh, Sherwin, 2017-11-27

²⁹⁵ Telephone conversations. Large Scandinavian metal supplier, 2017-11-27. Andreas Alm, Tibnor, 2017-11-24.

²⁹⁶ Email from Tor Egil Skulstad, Hydro, 2017-12-06

²⁹⁷ Email and telephone conversations with Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-27 and 2017-12-05

Roundwood, sawdust and chips are usually sourced inside a 100-kilometer radius from the factory.²⁹⁸

Textile is bought by manufacturers from Western Europe or Japan, whereas processing like weaving, colouring and spinning also takes place in Eastern Europe (like Lithuania, the Czech Republic and Bulgaria), South Korea or China. Synthetic fibres often originate in Germany or China.²⁹⁹

The global petrochemical industry, as well as extraction of oil, gas, hard coal, bauxite, urea, lime and other furniture raw materials, are characterised by near-zero traceability.

Assembly	Components	Raw material
<p>Norway, Sweden, Denmark, Germany, Italy, Bosnia, Poland.³⁰⁰ Also Hungary, and possibly Japan, Brazil and the USA³⁰¹.</p>	<p>Veneer and boards: Mainly Northern and Eastern Europe, but also Russia and the USA.³⁰²</p> <p>Laminate surfaces: Germany, Austria, UK, France, Romania.³⁰³</p> <p>Plastics: Sweden, Norway, other EU, China, Taiwan, Malaysia.³⁰⁴</p> <p>Metal parts: Sweden, Norway, other EU, China, Taiwan, Malaysia, South Korea.³⁰⁵</p> <p>Standardised parts³⁰⁶: Sweden, Germany, the Netherlands and unknown countries.³⁰⁷</p>	<p>Wood: EU, USA, Ukraine, Russia, scrap. (Often: Ash, oak, beech from Croatia, beech from Slovakia and Hungary and birch from Finland and the Baltics)</p> <p>Iron ore: Sweden, world market; main producing countries are Australia, Brazil and China.³¹¹</p> <p>Plastic resins: Saudi Arabia, Europe, Brazil, the USA and China.³¹²</p> <p>Oil: Some of the main producing countries are Saudi Arabia, Russia, United Arab Emirates, Canada, Nigeria³¹³</p>

²⁹⁸ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

²⁹⁹ Email from Ljunggren, Kinnarps, 2017-11-14. Telephone conversations, Marie-Louise Fagervall Sliti, Ludvig Svensson, Jan Skrefsrud, Gudbrandsdalens uldvarefabrik, 2013-11-27 and Kurt Nedergaard, Gabriel, 2017-11-30

³⁰⁰ Telephone conversation, Johanna Ljunggren, Kinnarps, 2017-11-07; email from Pierre Lennartsson, Lekolar, 2017-11-22; telephone conversation, Jone Stangeland, Senab Eikeland, 2017-12-08; [website](#), Andersen furniture, 2017-12-08

³⁰¹ [Website](#), Vitra, retrieved 2017-12-08

³⁰² Emailed data from Kristina Pettersson and Ljunggren, Kinnarps, 2017-11-17 and 2017-11-28 and Pierre Lennartsson, Lekolar, 2017-11-22

³⁰³ Telephone conversation, Ingemar Wiktorsson, Egger, 2017-12-04

³⁰⁴ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

³⁰⁵ Emailed data, Kinnarps, 2017-11-28; email, Svein-Erik Hjerpbakk, Nordic Comfort Products, 2017-11-24

³⁰⁶ Screws, nuts, bolts, spacers, fittings etc., plastic or metal.

³⁰⁷ Emailed data from Ljunggren, Kinnarps, 2017-11-28 and Pierre Lennartsson, Lekolar, 2017-11-22

(standardised parts' origin unknown as regards Polish and Bosnian production).

³¹¹ United States Geological Survey, [Mineral Commodity Summaries 2017](#), Iron Ore, Retrieved 2017-11-30

³¹² Telephone conversation, Peter Arentz, Nordic Polymers, 2017-11-28

³¹³ Råvarumarknaden.se, [USA passerade Saudiarabien som världens största oljeproducent](#), Retrieved 2017-10-27

	<p>Upholstery: EU, Japan, China, South Korea, Norway.³⁰⁸</p> <p>Gas swivel: Germany, Romania³⁰⁹, Sweden (components from Austria and Poland³¹⁰), China.</p>	<p>Wool: New Zealand, EU, South America, Iceland.³¹⁴</p> <p>Cotton: World market (China, India, USA, Pakistan, Uzbekistan)³¹⁵</p> <p>Urea: World market (often North Africa, Gulf states, China).³¹⁶</p> <p>Phenol: World market (often North Asia, USA)³¹⁷</p> <p>Bauxite/aluminium: Brazil³¹⁸, world market; Main producing countries are Australia, Brazil, China, Guinea, Jamaica, India.³¹⁹</p> <p>Hard coal: Australia, USA, world market.³²⁰</p>
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Risks

Several tiers of the supply chains are located in the EU and often in Scandinavia, lowering risks socially as well as environmentally. Still, repetitive motions, cutting machinery causing musculoskeletal disorders and maiming's are identified as risks in furniture assembly and wood processing even in highly developed economies.³²¹ Low wages, unpaid over-time and insecure employment is reported from East-European countries.³²² "Yellow unions" may also occur.³²³ In

³⁰⁸ Email from Ljunggren, Kinnarps, 2017-11-14. Telephone conversations, Marie-Louise Fagervall Sliti, Ludvig Svensson, Jan Skrefsrud, Gudbrandsdalens uldvarefabrik, 2013-11-27 and Kurt Nedergaard, Gabriel, 2017-11-30

³⁰⁹ Telephone conversation, Erik Malm, Malmstolen, 2017-11-07

³¹⁰ Email from Ljunggren, Kinnarps, 2017-11-28

³¹⁴ Email from Ljunggren, Kinnarps, 2017-11-14. Telephone conversation Kurt Nedergaard, Gabriel, 2017-11-30.

³¹⁵ [UN Comtrade](#), cotton exports 2016, retrieved 2017-12-10; [In Uzbekistan, the practise of forced labour lives on during the cotton harvest](#), New York Times, 2013-12-17.

³¹⁶ [Website](#), Independent chemical information service, retrieved 2017-12-04

³¹⁷ [Website](#), IHS Markit, retrieved 2017-12-04

³¹⁸ Telephone conversation, Tor Egil Skulstad, Hydro Extrusions, 2017-12-05

³¹⁹ U.S. Geological Survey, [Bauxite and alumina](#), 2017

³²⁰ [Website](#), SSAB, retrieved 2017-11-28. [Coal information overview 2017](#), IEA

³²¹ Email from Hjerpbakk, Nordic Comfort Products, 2017-11-27. [Arbetskadorn i träindustrin](#), IVL Svenska miljöinstitutet, issued in May 2008

³²² World Economy, Ecology and Development, Working Conditions and Economic Development in ICT Production in Central and Eastern Europe 2010

³²³ International Trade Union Confederation, [The ITUC Global Rights Index – Poland](#)

Southern and Eastern Europe, increasing migration raises risks for abuse of undocumented workers and discrimination of ethnic and sexual minorities.³²⁴

Components, including fabrics, manufactured in Asia, particularly China, continue to pose a heightened risk of human rights abuses including child labour³²⁵ and forced labour.³²⁶ Health and safety conditions in Chinese factories are often poor.³²⁷ There is a risk that people are paid very low wages and are required to work excessively long hours.³²⁸ Migrant workers constitute a particularly vulnerable group at risk of being exploited and discriminated against in China, Taiwan and Malaysia (including confiscation of passports and high recruitment fees) and union rights are limited or not respected.³²⁹

For plastic components manufactured in high risk countries such as China, Malaysia and Taiwan, there is a high risk of severe health impacts among people working in the plastics industry as a result of poor management and lack of ventilation and safety equipment.³³⁰ There is a risk of fires and explosions in factories producing plastics, as well as the risk of air pollution and contamination of soil and water from waste water. The production of polyester and its components in China has been associated with poor safety and environmental standards.³³¹

Formaldehyde is carcinogenic and mutagenic³³² and its use in consumer products is questioned by authorities.³³³ The compound cannot be recycled, and when burned the fumes are toxic and polluting unless well filtered. The PVC plastic often emits phthalates which can harm the human hormone balance and reduce fertility³³⁴, and some producers avoid it, at least in some components.³³⁵

³²⁴ [Abuse of migrant workers is now a top priority for businesses](#), The Guardian, 2016-02-16; [Country ranking](#), ILGA-Europe, retrieved on 2017-12-05

³²⁵ China Labor Watch, [reports on toy factories in China](#), Retrieved 2017-11-02; International Labor Rights Forum, [Six cents an hour](#), 1996

³²⁶ Topical research digest: Human rights and contemporary slavery, [The dark side of labour in China](#), Retrieved 2017-11-02

³²⁷ International Journal of Occupational and Environmental Health, [Occupational Health and Safety in China](#), Oct/Dec 2003; Labor Watch Pakistan, [Safety at workplace](#), 2015-08-24

³²⁸ South China Morning Post, [‘Low pay, long hours’: life inside factory that supplied Ivanka Trump brand in China](#), 2017-06-28; The Guardian, [The grim truth of Chinese factories producing the west’s Christmas toys](#), 2016-12-04; China Labor Watch, [Minimum wage standards in China](#), 2016

³²⁹ ITUC, Survey of violations of trade union rights in [China](#), 2016-2017

³³⁰ Upphandlingsmyndigheten, [Risker i upphandling av varor inom städ och kemikalier](#), 2016, Pulitzer Center, [India: The Toxic Price of Leather](#), 2017-10-03, ITUC, [Toxic work stop deadly exposure today](#), 2015-04-09

³³¹ [As opposition grows, China defends plans for petrochemical plants](#), Reuters, 2014-04-18.

³³² See e.g. [EU Commission Regulation 605/2014](#).

³³³ Sveriges Natur, [“EU bans formaldehyde in cosmetics”](#) 2017

³³⁴ [Forskare: Rätt av förskolor att rensa ut gamla plastleksaker](#), Dagens Nyheter, 2017-12-02

³³⁵ Linak website, retrieved 2017-11-14

Several flame retardants, biocides and stain- and water-repellants have been classified as harmful to the environment and/or humans.³³⁶ These risks apply to workers, users and environment throughout the life-cycle of products³³⁷, unless proper precautions are taken.

The vast array of chemicals used in plastics, in glue and in surface and textile treatments, as well as their components and raw materials, are difficult to trace. Many are produced in the EU. Bulk chemicals and replicas are produced outside of the EU, with considerably less controls.³³⁸

Other health and safety risks include wood dust that can inflict workers with diseases like asthma and cancer unless ventilation and/or breathing protection is properly employed.³³⁹

Several risks are connected to the raw materials. Because of widespread illegal logging³⁴⁰, including inside the EU³⁴¹, some furniture makers trace wood back to the logging location and use mainstream certifications, like that which is provided by the Forest Stewardship Council, to do so. However, certification schemes have also been the subject of criticism. For example, FSC has been accused of inconsistencies and of providing certification despite clear-cutting of old growth forests and degradation of biological diversity.³⁴² If wood from Russia is used, there is risk of illegal logging, corruption and poor working conditions, including abuse of migrant workers.³⁴³

The production of steel and aluminum is in high-risk countries that lack enforcement of proper labour laws, intimately linked to serious health and security risks for employees. The production can take place under harsh conditions, with extreme temperatures, heavy lifting, large machinery, and can expose employees to harmful fumes and dust. Metal processing and iron ore mining also involve a range of chemicals that are harmful to humans and ecosystems.³⁴⁴ Aluminum smelters involve risk of air pollution.³⁴⁵

Mining is one of the most hazardous occupations when the number of people exposed to risk is taken into account.³⁴⁶ Mine sites in many high-risk countries such as China, Brazil and India are tainted by harsh working conditions, lack of union rights and harassment of unionised workers. In

³³⁶ [Bromerade flamskyddsmedel](#), Kemiinspektionen, retrieved 2017-12-06; [Regler för biocidbehandlade varor](#), Kemiinspektionen, April 2016; [Högfluorerade ämnen - PFAS](#), Kemiinspektionen, retrieved 2017-12-06;

³³⁷ [Electronic waste](#), World health organisation, retrieved 2017-12-08

³³⁸ Telephone conversation, Ingvar Lindh, Sherwin Williams, 2017-11-27; [Chemical mixtures and the 'cocktail' effect](#), European chemicals agency, retrieved 2017-12-10

³³⁹ [Wood dust](#), Health and Safety Executive, UK, retrieved on 2017-12-05

³⁴⁰ [Europe failing to clamp down....](#), The Guardian, 2015-10-22

³⁴¹ [Major Austrian timber firm accused of illegal logging in Romania](#), The Guardian, 2015-10-22

³⁴² [70 företag kräver ett mer hållbart svenskt jordbruk](#), Expressen, 2017-11-30; [Tracking timber: could new technology help clean up the supply chain?](#), The Guardian, 2013-08-14

³⁴³ Environmental Protection Agency, [Liquidating the Forests: Hardwood Flooring, Organized Crime, and the World's Last Siberian Tigers](#), 2013; ILO, [Decent work in forestry](#), 2015; [Transparency international: Russia one of the most corrupt countries](#), The Moscow times, 2016-11-16

³⁴⁴ Enact Sustainable Strategies, Riskanalys: Instrument, 2017; International Labour Organisation, [Code of practice on safety and health in the iron and steel industry](#), 2005; The Aluminium Association, Safety, retrieved 2017-11-24.

³⁴⁵ Reuters, [China Hongqiao shuts down aluminium smelting pots for winter](#), 2017-11-15; Metal Miner, [Beijing Proposes Massive Idling of Chinese Smelters to Combat Pollution](#), 2017-02-08, Financial Times, [China's environmental clean-up to have big impact on industry](#), 2017-05-22

³⁴⁶ ILO, [Mining: A Hazardous work](#), Retrieved 2017-11-28

some cases, conflicts connected to local communities and indigenous peoples' land rights occur, as well as low wages, poor working conditions and sometimes child labour and forced labour.³⁴⁷ Chinese mine sites have been found to rely on large numbers of migrant workers, who receive less pay and work without personal protection equipment.³⁴⁸ Bauxite is extracted from open mine pits, which can cause leaching of toxic substances, dust and water pollution, soil erosion, water shortage and negative impacts on biodiversity.³⁴⁹ Scrap metal handling may be associated with risks of fires, pollution, physical accidents, illicit trade as well as labour issues.³⁵⁰

Coal mining in top exporting nations such as Indonesia, Russia, South Africa and Mongolia is often associated with deforestation, marginalisation of minorities and large-scale corruption.³⁵¹ Scrap metal handling may be associated with risks of fires, pollution, physical accidents, illicit trade as well as labour issues.³⁵²

Wool treatment may involve acid baths ("carbonising"), the use of biocides and heavy metals, which poses risk to workers and environment unless proper procedures are in place. Sheep may be subjected to cruelty during castration, tail docking and shearing.³⁵³

Cotton from India, China and Uzbekistan may be farmed using child, bonded or forced labour.³⁵⁴ In general, cotton farming uses substantial amounts of pesticides and water.³⁵⁵

Oil extraction is linked to environmental and social risks in Saudi Arabia, Russia, United Arab Emirates and Nigeria, including lack of union rights, poor working conditions and forced labour. Oil spills are also linked to health impacts and contamination of soil and water for surrounding communities.³⁵⁶

³⁴⁷ Swedwatch, Riskanalys av material och leverantörsled i Kungsbrohuset 2011; SVT, [Brasilien: Indianer ockuperar gruva](#), 2006-10-19,

³⁴⁸ Enact Sustainable Strategies, Riskanalys: instrument, 2017

³⁴⁹ The Wilderness Society, [Bauxite mining threatens Wild Rivers](#) 2015-07-31; Naturskyddsföreningen, [Bra Miljöval – Kriterier 2013:4](#) 2013

³⁵⁰ [The hazards of scrap metal recycling - and implications for insurers](#), Gen re, February 2013; [Scrap metal scams - a hazard for international freight forwarders](#), Logistiq insurance solutions, 2013-04-11; [Immigrants squeak out living as Athens scrap metal mongers](#), AFP, 2012-04-29.

³⁵¹ [Indonesian coal mining boom is leaving trail of destruction](#), Yale environment 360, 2015-12-17; [The cost of coal](#), Ecodefense, 2015; [Fighting corruption in mining poses tough challenges](#), Deutsche Welle, 2017-12-04.

³⁵² [The hazards of scrap metal recycling - and implications for insurers](#), Gen re, February 2013; [Scrap metal scams - a hazard for international freight forwarders](#), Logistiq insurance solutions, 2013-04-11; [Immigrants squeak out living as Athens scrap metal mongers](#), AFP, 2012-04-29

³⁵³ [PETA: There is no such thing as humane wool](#), NBC News, 2014-07-08; [Move to end lamb 'cruelty' as castration is condemned by government experts](#), Daily mail, 2008-07-02

³⁵⁴ CSR Academy, [Combating child labor in the supply chain in India](#), 2013; Maplecroft, Risk calculators and dashboards, [Climate change will push more children into work](#), 2010; [India's farmer suicides: are deaths linked to GM cotton?](#), The Guardian, 2014-05-05; [Uzbekistan is forcing 'volunteers' to toil its cotton fields](#), Vice news, 2015-09-16; [Will EU agreement leverage forced labour out of Uzbek cotton?](#), Innovation forum UK, 2017-01-06

³⁵⁵ International Journal of Applied Research, [Bt cotton in India, pesticide use and environmental impact in India](#), 2016; International Journal of Occupational and Environmental Health, [Acute pesticide poisoning among female and male cotton growers in India](#), 2005; Journal of Developmental Economics, [Risk preferences and pesticide use by cotton farmers in China](#), 2013; [Cotton: A water wasting crop](#), WWF, retrieved 2017-12-10

³⁵⁶ Utrikesdepartementet, [Mänskliga rättigheter i Saudiarabien 2011](#), Retrieved 2017-10-27; ILO, Working Paper No. 267, [Working conditions of contract workers in the oil and gas industries](#), 2010; The Degradation of Work, Oil and Casualization of Labor in the Niger Delta, 2010; Oil price.com, [Nigerian Oil Workers Go On Strike](#),

Oil extraction, and mining, in high-risk environments has also been linked to sexual exploitation and abuse of women in surrounding areas.³⁵⁷

Urea plants in countries like Tanzania, Nigeria, India and Saudi Arabia involve varying, albeit significant, risks in terms of curbed workers’ rights, discrimination and harmful emissions.³⁵⁸

Light sources

Summary of the most severe risks

Assembly	Components	Raw materials
Forced Labour Child labour Low wages Excessive overtime Lack of health and safety Lack of union rights Exploitation of migrant workers	Glass bulbs/tubes, semiconductor chips, printed circuit Boards, plastic and metal components Lack of health and safety Exposure to heat and toxic chemicals Lack of union rights Forced labour Child labour Low wages Excessive overtime Exploitation of migrant workers	Minerals, sand, oil Poor working conditions Toxic pollution to soil, water, air Lack of health and safety Lack of union rights Low wages Conflict with and impact on local communities impact on indigenous peoples’ rights Child labour Forced labour Support of armed conflict Land erosion Exploitation of migrant workers Sexual abuse
High risk	High risk	Very high risk

The product

Light sources mainly consist of glass, plastic, a metal end-cap of aluminium, zinc, tin and/or nickel, and a high number of different chemicals and minerals, including rare earth minerals. The glass is

[Stop Production At Several Flow Stations](#), 2017; The Guardian, [Shell Nigeria oil spill '60 times bigger than claimed'](#), 2012-04-23

³⁵⁷Wday, [The Bakken’s dirty secret: sex trafficking has growing precense in oil patch experts say](#) 2014-05-06, Al Jazeera, [The Dark side of the oil boom: Human trafficking in the Heartland](#), 2014-04-28, Columbia law school, [Righting wrongs? Barrick Gold's remedy mechanism for sexual violence in Papua New Guinea](#) November 2015

³⁵⁸ [Tanzania’s anti-corruption crusaders cracks down on opponents](#), CNN, 2017-11-07; [Corruption perceptions index 2016 - Nigeria](#), Transparency international; [Some 400 children rescued...](#), Daily mail, 2015-02-05

made from sand, soda and limestone, or from recycled glass.³⁵⁹ In compact fluorescent lamps (CFL), the glass tube has a phosphor white coating. Inside is argon gas with a little bit of mercury. Tungsten is used as electrode. The ballast includes circuit boards that typically contain a silicon wafer, copper and tantalum nitrate.³⁶⁰ A LED-lamp contains a semi-conductor chip of usually germanium, silicon, aluminium or zinc mixed with other minerals for different purposes, as well as copper wire, and an epoxy casing (plastic). The phosphor used in LED-lamps are a mix of magnesium, different rare earth minerals and barium or aluminium oxide.³⁶¹

The Supply chain

China is the largest producer and exporter of fluorescent light and LED-lights in the world.³⁶² Asian countries dominate the export at the component level. As China is a large producer of plastic, zinc and aluminium, it is likely that the components to a large extent are sourced from China and surrounding countries, but raw materials and minerals may come from multiple countries and regions.

Assembly	Component	Raw Material ³⁶³
China, USA, United Arab Emirates, South Korea, Malaysia, Poland, France, Hungary ³⁶⁴	<p>Semiconductor chips: Hong Kong, Singapore, China, South Korea, Malaysia³⁶⁵</p> <p>Printed Circuit Boards: Hong Kong, China, South Korea, Japan³⁶⁶</p> <p>Glass bulbs and tubes: China, United Arab Emirates, USA, India, Philippines, Hungary, Germany³⁶⁷</p> <p>Plastic: China, Germany, Italy, United States, Japan³⁶⁸</p>	<p>Aluminium/bauxite: Main exporters are Australia, Brazil, Guinea, India China³⁶⁹</p> <p>Magnesium: South Africa, Australia, China, Gabon, Brazil</p> <p>Zinc: Australia, China, Peru</p> <p>Copper: Chile, Peru, China, USA, DRC</p> <p>Lead: China, Australia</p> <p>Arsenic: China, Morocco, Namibia, Russia</p>

³⁵⁹ Minerals Education Coalition, [What's in a Compact Fluorescent Light Bulb?](#), Auralight, [Årsredovisning 2014](#)

³⁶⁰ The Edison Tech Center, Fluorescent lamps, Retrieved 2017-11-26,

³⁶¹ Allt on LED, Vad är LED? Retrieved 2017-11-26, Metal pages Report, [World Tungsten Report](#), November 2013, Tungsten Industry, [Conflict Mineral Council Framework](#) 2016

Minerals Education Coalition, [Mineral Products and Metals that make LED Light Bulbs](#), Retrieved 2017-11-26

³⁶² Osram, Sustainability – [Social Reporting](#), Riskanalyser av utvalda produkt- och tjänstekategorier under Kammarkollegiets ramavtal, 2015, The Observatory of Economic Complexity, [Flourescent Lamps, Hot Cathode Trade](#), Retrieved 2017-11-26, Europages, [Lighting exports](#), Retrieved 2017-11-27, The Observatory of Economic Complexity, [Semiconductor devices](#), Retrieved 2017-11-27

³⁶³ If nothing else is noted, U.S. Geological Survey, [Mineral commodity summaries](#), 2017

³⁶⁴ Riskanalyser av utvalda produkt- och tjänstekategorier under Kammarkollegiets ramavtal, 2015

³⁶⁵ The Observatory of Economic Complexity, [Intergraded circuits trade](#), 2017-11-26

³⁶⁶ The Observatory of Economic Complexity, Printed Circuit Boards, Retrieved 2017-11-26

³⁶⁷ The Observatory of Economic Complexity, [Glass envelopes \(bulbs & tubes\) for electric lightning trade, and Glass bulb Trade](#), Retrieved 2017-11-26

³⁶⁸ The Observatory of Economic Complexity, Propylene Polymers, Retrieved 2017-11-24, the Centre for the Promotion of Imports from developing countries, [Exporting plastic parts and components to Europe](#), retrieved 2017-11-24

³⁶⁹ Index Mundi, [Bauxite production by country](#) Retrieved 2017-11-02; Australian Government Geoscience Australia, [Bauxite](#) retrieved 2017-11-02

		<p>Boron: Chile, Kazakhstan, Argentina</p> <p>Selenium (byproduct from nickel and copper): Germany, Japan</p> <p>Nickel: Philippines, Russia, Canada, Australia</p> <p>Gallium (mostly extracted from bauxite): China, Germany, Japan, Ukraine, UK, USA³⁷⁰</p> <p>Rare earth minerals: China, India, Brazil</p> <p>Barite: China, Morocco, India</p> <p>Mercury: China, Kyrgyzstan, Peru³⁷¹</p> <p>Phosphate: China, USA, Morocco, Western Sahara, Russia³⁷²</p> <p>Tin and tungsten: China, Indonesia, Peru, Bolivia, Brazil, DRC, Vietnam, Rwanda³⁷³</p> <p>Soda, sand and limestone in glass: Main exporters are USA, China, Australia, Italy, Germany, France, Turkey, Belgium.³⁷⁴</p> <p>Oil: USA, Saudi Arabia, Russia, United Arab Emirates, Canada, Nigeria³⁷⁵</p>
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Risks

Light sources are high-risk products, both at manufacturing level and in the extraction of raw materials. Similar to the manufacturing sector in China in general, a 2008 report on the production of fluorescent lamps, shows excessive overtime, no paid overtime, lack of salary slips, work related

³⁷⁰ U.S. Geological Survey, [Gallium](#), January 2017

³⁷¹ Minerals Education Coalition, [Mineral Products and Metals that make LED Light Bulbs](#), Retrieved 2017-11-26

³⁷² Metal pages Report, [World Tungsten Report](#), November 2013, Tungsten Industry, [Conflict Mineral Council Framework 2016](#)

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³⁷³ Metal pages Report, [World Tungsten Report](#), November 2013, Tungsten Industry, [Conflict Mineral Council Framework 2016](#), Minerals Education Coalition, [What's in a Compact Fluorescent Light Bulb? 2010](#)

³⁷⁴ US Geological Survey, [Silica](#), Retrieved 2017-11-02

³⁷⁵ Råvarumarknaden.se, [USA passerade Saudiarabien som världens största oljeproducent](#), Retrieved 2017-10-

injuries due to poor working environment, and discrimination.³⁷⁶ Other risks include low wage and lack of union rights as the Chinese state only allows membership in the state-controlled unions.³⁷⁷ China has not ratified ILO core conventions of freedom of association, collective bargaining (87, 98) and forced labour (29, 105).³⁷⁸

Migrant workers are common in the manufacturing sector in United Arab Emirates (UAE), South Korea and Malaysia and China (internal migrants). There is an enhanced risk of migrant workers being exploited, getting their passports confiscated, and ending up in debt-bondage due to high recruitment fees. Living conditions in dorms are often poor and migrants are subject to discrimination and abuse.³⁷⁹ In UAE there is the Kafala system. This system demands that migrant workers have to have a “sponsor” in order to work, which in practice means a risk of forced labour.³⁸⁰ UAE is rated as one of the worst countries to work in, there are no free unions or collective bargaining and migrants are not covered by general labour law.³⁸¹ South Korea and Malaysia also have restrictions regarding union rights and there are reports on anti-union activities and repression within the electronics industry.³⁸² There are reports of suicide within the electronics sector in South Korea due to high pressure and work load.³⁸³ Anti-union activities are also reported for some East-European countries, as well as low wages, job-insecurity and poor occupational health and safety.³⁸⁴

Light sources are heavy in minerals and chemicals. A significant health and safety risk in the production of CFLs is the handling of mercury. If exposed to mercury, it can cause neurological damage to a person as well as damage to liver and kidneys. There are previous examples of hundreds of Chinese workers, producing CFLs, having increased levels of mercury in their bodies, broken lamps not being stored in a safe manner and lack of awareness and training amongst workers on how to

³⁷⁶ Policy Matters Ohio, Good bulbs, bad jobs - workers and conditions behind your new compact fluorescent

³⁷⁷ See till exempel Wall Street Journal, [China's Tech Factories Turn to Student Labor](#) 2014-09-24; Danwatch, [Servant of Servers - Rights violations and forced labour in the supply chain of ICT equipment in European universities](#) 2015; Global Research, [Interns or Workers? China's Student Labor Regime](#) 2015-09-07;

³⁷⁸ International Labour Organization, [Ratifications of fundamental Conventions and Protocols by country](#) Retrieved 2017-11-29

³⁷⁹ Amnesty International, [Trapped – The exploitation of migrant workers in Malaysia](#) 2010; The Guardian, [Modern-day slavery rife in Malaysia's electronics industry](#) 2014-09-17; Trippel Pundit, [EICC and Electronics Industry Promise to Fight Forced Labor in Malaysia](#) 2015-01-12

³⁸⁰ International Trade Union Confederation, [The 2015 ITUC Global Rights Index - The World's Worst Countries for workers](#) 2015; Swedwatch, [Shattered dreams - Migrant workers and rights violations](#) 2015; International Trade Union Confederation, [Internationally Recognised Core Labour Standards In The United Arab Emirates](#) 2012-03-29; International Trade Union Confederation, [Global Rights Index – United Arab Emirates](#)

³⁸¹ International Trade Union Confederation, [ITUC Global Rights Index](#), 2017, Human Rights Watch, [Building Towers, Cheating Workers](#)

³⁸² International Trade Union Confederation, [Internationally Recognised Core Labour Standards in Malaysia](#) 2015-01-29, International Trade Union Confederation, [Internationally Recognised Core Labour Standards In Korea](#) 2012-09-21; International Labour Organization, Labour Standards - [Ratifications of fundamental Conventions and Protocols by country](#) IndustriALL, [IndustriALL affiliates show solidarity for Samsung](#) 2014-06-26, Union to union, [Fack agerar för mänskliga rättigheter i Sydkorea](#) 2010-10-28

³⁸³ Danwatch, [Suicide and class struggle in South Korea](#) 2015-11-03, International Trade Union Confederation, [International Trade Unions Statement on Korea](#) 2014-01-20

³⁸⁴ The European Trade Union Institute, [China-isation of working conditions and workers' rights in Europe](#) 2016-10-06, World Economy, Ecology and Development, [Working Conditions and Economic Development in ICT Production in Central and Eastern Europe](#) 2010

handle the substance.³⁸⁵ The extraction of mercury is also linked to environmental and social risks. The high global demand for CFLs has led to Chinese mercury mines re-opening, previously known to contaminate soil and water and to cause local residents falling ill.³⁸⁶

On a component level, there are records of leakage of toxic chemicals in the production of semiconductors that have caused cancer.³⁸⁷ Semiconductors also contain tungsten and tin. These conflict minerals are at risk supporting armed conflict in and surrounding the Democratic Republic of Congo, and else-where.³⁸⁸

Phosphate is used in semiconductors and in phosphor - the compound that will light up and glow in a CFL light bulb. Phosphate is mined in the occupied territory of West Sahara. Phosphate extraction is also tied to environmental damage.³⁸⁹ There are also rare earth oxides in phosphor, for which China dominates the market with 97 per cent of the global production.³⁹⁰ Extraction located in Mongolia has caused hazardous pollution of chemicals and radiant substances, which has created a toxic lake and destroyed farmland and groundwater in the area. As a consequence, cancer, lung- and skin disease has reportedly appeared among local community members.³⁹¹

Other metals and minerals are present in light sources, such as aluminium, nickel, copper, barite, lead, arsenic, gallium, boron, selenium and magnesium. These are extracted and produced in a large number of countries, some of which are to be considered high-risk countries, such as China, Peru, Kyrgyzstan, Brazil, India, South Africa, Morocco and the DRC. Risks include hazardous working environment, low wages, environmental impacts and pollution of water, as well as land rights issues and conflicts with local communities and impacts on indigenous peoples' rights. In some cases, even forced labour and child labour occur (DRC, Peru).³⁹² Mining in high-risk environments has also been linked to sexual exploitation and abuse of women in surrounding areas.³⁹³

The production of glass bulbs and tubes include melting raw material in high temperatures, and shaping the glass into a desired execution before being covered in a chemical coating.³⁹⁴ In high risk

³⁸⁵ Policy Matters Ohio, Good jobs, bad jobs, [Workers and conditions behind your new compact fluorescent](#), The Australian, [Deadly cost of 'green' light bulbs](#) 2009-05-04

³⁸⁶ The Australian, [Deadly cost of 'green' light bulbs](#) 2009-05-04

³⁸⁷ Electronic Watch, [Wind of change 2014](#)

³⁸⁸ Minerals Education Coalition, [What's in a Compact Fluorescent Light Bulb? 2010](#)

³⁸⁹ Dagens arena, [Starka ekonomiska intressen bakom ockupationen av Västsahara](#) 2010-11-04; Svenskt vatten, [Frågan som världen glömde – En rapport om fosfor](#) 2015

³⁹⁰ Polinares – EU Policy on Natural Resources, [Fact Sheet: Rare Earths Oxides](#) 2012; Philips, [Phosphor – a critical component in fluorescent lamps](#)

³⁹¹ The Guardian, Rare earth mining in China: the bleak social and environmental costs, 2014-03-20, Daily Mail, [In China, the true cost of Britain's clean, green wind power experiment: Pollution on a disastrous scale](#) 2011-01-26, BBC, [The worst place on earth](#), 2015-04-02

³⁹² Swedwatch, [Rena guldgruvan? AP-fondernas investeringar har en smutsig baksida](#) 2011, Department of Labor, [List of Goods Produced by Child Labor or Forced Labor](#), Retrieved 2017-11-29, Mining Technology, [China's appalling mining death rate – dealing with 'disorderly' management](#) 2012-10-31, Swedwatch, [Allt är inte guld som glimmar](#), 2011, World Resource Institute, [Mine the Gap: Connecting Water Risks and Disclosure in the Mining Sector](#) 2010

³⁹³ Wday, [The Bakken's dirty secret: sex trafficking has growing precense in oil patch experts say](#) 2014-05-06, Al Jazeera, [The Dark side of the oil boom: Human trafficking in the Heartland, 2014-04-28](#), Columbia law school, [Righting wrongs? Barrick Gold's remedy mechanism for sexual violence in Papua New Guinea](#) November 2015

³⁹⁴ Youtube, [How a CFL is Made](#) Retrieved 2017-11-29

countries such as China, Philippines and India, there can be health and safety concerns as workers can be exposed to heat and chemicals if not trained properly or lacking sufficient personal protective equipment.³⁹⁵

Sand mining (for glass) may cause large scale environmental impacts on water, soil, birds, fish and other wildlife. Reports from all over the world show incidents of land erosion and beaches disappearing, water changing course, collapse of infrastructure and pollution. As a result, local communities surrounding the areas of sand mines are at risk losing access to clean water, land and food, impacting their right to livelihood.³⁹⁶

³⁹⁵ Electronic Watch, [Wind of change](#) 2014

³⁹⁶ The Guardian, [Sand mining: the global environmental crisis you've probably never heard of](#) 2017-02-27