re-sourcing

# Electronic Equipment Sector

*Industry*

## Roadmap for Responsible Sourcing of Raw Materials until 2050

**Alejandro González, Irene Schipper, Miles Litvinoff,**
**Centre for Research on Multinational Corporations (SOMO)**

August 2023

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №

# Disclaimer

This publication is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869276.



# Imprint

Date: August 2023 | Alejandro González, Irene Schipper, Miles Litvinoff, Centre for Research on Multinational Corporations (SOMO)

Work package: WP4 | D4.6 Electronic Equipment Sector Roadmap for Responsible Sourcing of Raw Materials | Status/version (Final DRAFT) | Dissemination level (external)

http://re-sourcing.eu

# Acknowledgements

The authors would like to express their gratitude to the members of the project consortium, the project's Platform Steering Committee and Advisory Board for their support in developing this report. We also want to thank the participants of the consultation processes for their continuous feedback that provided the foundation for the roadmap.

Special thanks for their valuable input and support go to:

Johannes Betz, Öko-Institut e.V.
Rebecca Burton, Initiative for Responsible Mining Assurance (IRMA)
Masuma Farooki, MineHutte
Gudrun Franken, Federal Institute for Geosciences and Natural Resources
Cristina Ganapini, Right to Repair
Audrey Gaughran, SOMO
Alexander Graf, Vienna University of Economics and Business
Deepak Gulliya, WWF India
Tobias Kind-Rieper, WWF Deutschland
Diego Francesco Marin, European Environmental Bureau
Jakob Neumaier, Öko-Institut e.V.
Michael Reckordt, PowerShift
Michael Tost, Montanuniversität Leoben

Any errors in this roadmap remain those of the authors.

# Contents

# Figures



# Abbreviations and Acronyms

| | |
|---|---|
| 3TG | Tin, tungsten, tantalum and gold |
| ASM | Artisanal and small-scale mining |
| CRMA | Critical Raw Materials Act |
| CSOs | Civil society organisations |
| EC | European Commission |
| ETOs | Extraterritorial obligations |
| EU | European Union |
| FPIC | Free, prior and informed consent |
| ICMM | International Council on Mining and Metals |
| ICT | Information and communications technology |
| IFC | International Finance Corporation |
| ILO | International Labour Organization |
| IRMA | Initiative for Responsible Mining Assurance |
| MIPS | Material input per service |
| OECD | Organisation for Economic Co-operation and Development |
| OHCHR | Office of the UN High Commissioner for Human Right |
| OEF | Organisation environmental footprint |
| PEF | Product environmental footprint |
| RS | Responsible sourcing |
| SDGs | Sustainable Development Goals |
| UN | United Nations |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNGPs | UN Guiding Principles on Business and Human Rights |

# Executive Summary

**This publication is an excerpt from the Electronic Equipment Sector Roadmap for Responsible Sourcing of Raw Materials with a focus on recommendations for industry**. The full publication, with recommendations for policy makers, for industry, and for civil society, academia and research institutions, can be found here.

Transformation of the electrical and electronic equipment sector is essential to meet the Paris Agreement's goals, to ensure a just energy transition and to meet the Sustainable Development Goals (SDGs), including fulfilment of their critical human rights dimension.[1] Electronics is one of the world's largest and fastest growing industries, employing millions of workers. The sector is defined by innovation and evolution of components and end-use products, and largely a business model that consequently relies heavily on obsolescence and consumers purchasing new versions of products and technologies every few years.

While some efforts have been made to recycle or reuse some raw materials that go into electronics production, the growth of the sector means that it is currently evolving away from sustainability goals as its demand for virgin materials continues to increase, accompanied by many negative impacts. The global consumer electronics market is forecast to grow at a compound annual rate of 5.1% to 2030 (Precedence Research 2022).

To ensure a just transition and to achieve the SDGs, the implementation of high social and environmental standards in production and sourcing along the entire supply chain is crucial.

Following the State of Play and Roadmap Concepts for the Electronics Sector – a stock-taking report of the current sustainability challenges in the electronics sector – this report by the RE-SOURCING project focuses on the road towards achieving a sustainable electronics transition by 2050. The RE-SOURCING project's Vision 2050 for the electronics sector describes the ultimate goal to be achieved with the roadmap.

This roadmap addresses 3TG minerals (tin, tungsten, tantalum and gold) and mica, and three supply chain stages: mining, manufacturing, and end of life/recycling. It provides milestones and recommendations for EU policy makers, international industry and civil society organisations (together with academia and research institutions), which have been developed to achieve the identified three main targets needed for a sustainable electronics sector:

- Respect for Human Rights
- Circular Economy and Decreased Resource Consumption
- Responsible Production

For the development of the sectoral roadmaps, the RE-SOURCING project relies primarily on bringing together existing knowledge from key stakeholder groups and regions. A series of three webinars between September 2022 and March 2023, supplemented by additional expert consultations, were used to elaborate the recommendations presented in this report.

Each target has milestones for short- (2025), medium- (2030) and long-term (2050) timeframes, as well as recommendations for the three stakeholder groups addressed. It is clear that we need to act without further delay to bring about the changes needed in mining, production, repair/reuse and end-

[1] "Human rights are essential to achieving sustainable development that leaves no one behind and are central to all its three dimensions – social, environmental, and economic" – OHCHR, no date.

of-life recycling/disposal. Therefore, there are a large number of milestones and recommendations for 2025 and 2030 as the basis for achieving the milestones for 2050.

The numbering of the three targets does not imply any priority. All are interlinked and should be pursued simultaneously to achieve the vision for the electronic equipment sector. Key issues for all three targets are transparency and good communication between stakeholder groups along the entire value chain. In addition, the rethinking of electronics in general and the end of materials and production from the very start (e.g. design for repair, reuse and recycling) is essential for a sustainable electronics sector.

**Target 1 Respect for Human Rights** focuses on filling major identified gaps in human rights protection in relation to current EU legislation and voluntary industry initiatives for the electronics sector. These gaps involve inadequate due diligence, limitations of scope including which raw materials are currently covered by existing standards, non-coverage of imported goods, loopholes and low thresholds, insufficient sanctions, a lack of consistent implementation, inadequate rights holders' avenues for protection and remedy, and poor-quality and non-transparent implementation of due diligence processes.

**Target 2 Circular Economy and Decreased Resource Consumption** is concerned with the need for changes in production, product design and efficiency, public expectations and consumer behaviour, the business model and incentives, and the economic system to achieve universal wellbeing and stay within planetary boundaries. A transition to an electronics sector without direct $CO_2$ emissions will be impossible without major improvements in energy efficiency, comprehensive use of renewable energy and substantially decreased demand; other environmental impacts such as on biodiversity will also need to be addressed. Additionally, an accessible, affordable and effective right to repair is crucial, and end-of-life electronic equipment and materials need to be seen as a source of raw materials, with improved collection and recycling. Current social and environmental standards in mining and electronics manufacturing do not sufficiently address increasing demand for raw materials or focus on reducing overall demand. Policy makers need to ensure the economic viability of repair and recycling and support the creation of a market for secondary raw materials.

**Target 3 Responsible Production** focuses on a significant reduction of inequality and a fair share of costs and benefits among value chain actors. The protection of workers is central here, as is the improvement of working conditions. Considerations include securing enabling rights, such as freedom of association and the right to know. Supply chain transparency, unitary taxation, and responsible public and private procurement are crucial elements in this pillar.

## Keywords

electronics sector, 3TG minerals, mica, human rights, due diligence, labour rights, circular economy, responsible sourcing, transparency.

# 1 Introduction

## 1.1 The Electronics Sector

Work on the electronics sector started with the State of Play and Roadmap Concepts for the Electronics Sector, published in December 2021. The aim of this report was to investigate the current state of the electronics sector with attention to three segments of the supply chain – mining, manufacturing (both contract and component manufacturing and production of branded electronics goods) and end of life/recycling – with a material focus on 3TG minerals (tin, tungsten, tantalum and gold) and mica.

The following provides a brief overview of the main findings of the State of Play report.

The electronics sector, which covers consumer electronics and electronic components such as semiconductors and circuit boards, is one of the world's largest and fastest growing industries, employing millions of workers. Consumer electronics are part of our daily life and have spurred economic growth across the globe. Electronics are increasingly intertwined with many technologies and economic sectors such as automotive, health, internet of things, defence and security, and are key for ambitious global goals such as digitalisation and the energy transition.

The global electronics industry is, however, associated with serious social, human rights and environmental harms, risks and challenges for responsible sourcing along its supply chain.[2] From mining to recycling, workers in the electronics supply chain may face poor working conditions including excessive working hours, health and safety hazards such as exposure to chemicals, low wages, violation of freedom of association and collective rights, flexibilisation of labour and in some cases gross rights violations such as child labour and forced labour. Civil society, trade unions and academics have documented many such abuses in electronics manufacturing.

Mining for key minerals to produce electronics can also affect the livelihoods and health of nearby communities, and erode and damage ecosystems, while mining and processing of minerals and electronics recycling potentially result in pollution of water, soil and air.[3]

Artisanal and small-scale mining (ASM) plays a significant role in global production and supports the livelihoods of millions of people in Africa, Asia and Latin America. It is often undertaken by impoverished and indebted miners who accept extremely low wages and poor working conditions in order to survive. ASM is deemed informal or even illegal in some jurisdictions. Artisanal and small-scale gold mining (ASGM) is the leading global cause of anthropogenic mercury emissions.

Gold mining is linked to organised crime and deforestation.[4]

The EU Conflict Minerals Regulation aims to regulate the import of 3TG minerals into the EU and to prevent global and EU smelters and refiners from using 3TG minerals produced by armed groups, often using forced labour and sold to finance weapons purchases or otherwise fund their activities. The regulation also aims to support the development of local communities. In force since 1 January 2021, the regulation requires EU companies to import 3TG minerals from responsible sources only. Gap analysis (see section 2 below) has found the regulation has shortcomings including limited material

[2] See State of Play report, endnote 2.
[3] See State of Play report, endnote 4.
[4] See State of Play report, endnote 23.

scope (limitation to specific minerals and geographical regions), exclusion of manufactured goods, a threshold that allows loopholes, insufficient sanctions, different implementation per Member State and lack of transparency.

Contract manufacturers are large multinationals employing millions of workers to make components and products that they sell to their brand clients. Operating on low margins and extremely dependent on their clients, contract manufacturers are forced by this power imbalance to accept terms imposed by buyers, often detrimentally to their employees' working conditions. Civil society, trade unions and academics have documented serious human rights violations in electronics contract manufacturing.[5] These include manufacturing hotspots such as China, India, Indonesia, Mexico, Vietnam, Malaysia and the Philippines (where basic labour rights are often not respected): forced labour; excessive working hours; breaches of social security obligations; health and safety hazards; unlawful termination of employment contracts; violation of freedom of association and collective bargaining rights; child labour; payment below living wage; union busting; harassment and gender discrimination; exposure to chemicals and noise; and multiple health issues.[6] Public information and analysis are scarce about the practices of contract manufacturers.

Environmentally, semiconductor manufacture uses vast amounts of energy and water and generates hazardous waste and carbon emissions.

Most publicly known electronics brands, which are among the largest companies in the world in terms of sales and market value, outsource manufacturing to contract manufacturers. For many years, CSOs, trade unions and academics have documented cases and allegations of electronics brands causing, contributing to or being directly linked to serious social and environmental impacts along the supply chain, such as those mentioned above. At the root of many such abuses are lack of transparency, brands' purchasing practices and the use of toxic substances throughout the electronics lifecycle. Brands' buying practices such as pricing, lead times and technical specifications directly impact working conditions and sourcing practices along the supply chain. Brands have enormous leverage over the chain due to their purchasing and economic power.

End-of-life e-waste has become "the world's fastest-growing domestic waste stream, fueled mainly by higher consumption rates of electric and electronic equipment, short life cycles, and few options for repair".[7]

Voluntary due diligence schemes have gaps with regard to their ability to provide rights holders with effective opportunities for protection, such as lack of transparency on implementation, limited scope and limited credibility of, and overreliance on, audits.[8] Although the growth of voluntary due diligence schemes has played an important part in raising awareness, creating leverage and setting new and higher standards in the electronics sector, they do not ensure implementation of human rights due diligence. Nor can authorities transfer their responsibility to regulate companies to voluntary schemes. Therefore, to protect human rights, international mandatory due diligence regulation with individual corporate accountability is crucial.

This is already the case with in the Conflict Minerals Regulation, which states that "Union importers

[5] See State of Play report, endnote 83.
[6] Ibid.
[7] See State of Play report, endnote 5.
[8] Rights holders are "individuals or social groups that have particular entitlements in relation to duty-bearers. Duty-bearers are state or non-state actors that have the obligation to respect, protect, promote, and fulfil human rights of rights-holders" – European Network of National Human Rights Institutions (no date).

retain individual responsibility to comply with the due diligence obligations set out in this Regulation." At the same time, the regulation suggests that due diligence schemes can contribute to achieving its aims. A complicating fact is that electronics companies may have thousands of suppliers, and for each company to fully assess its supply chain may be impossible. Therefore, the Organisation for Economic Co-operation and Development's Guidelines for Multinational Enterprises (OECD 2011) and the UN Guiding Principles on Business and Human Rights (UNGPs; UN 2011) embrace a risk-based approach. This enables flexibility by requiring companies to focus their attention where it is most needed (OECD Watch et al. 2022).

As to protecting the environment, fundamental systemic change is required, including revising the business model based on the externalisation of costs and maximisation of shareholder value and profit. An overall reduction of resource consumption is key, which will require profound changes in consumption and production patterns. Regulation is needed that requires electronics products to be designed for longer use, reuse, reparability and recyclability.

In addition, a fair distribution of costs and benefits along the supply chain is important to address current levels of global and in-country economic inequality and poverty. Miners and workers deserve fair wages that capture a significant share of the value created. Initiatives that improve conditions on the ground, including human-rights-respecting formalisation of the ASM sector and ensuring improvements in the livelihoods of workers and their communities, require further development and scaling up, in cooperation with local actors such as artisanal miners, worker-led cooperatives and local businesses.

For further details of the project findings, see the State of Play report.

## 1.2 Vision

The horizon considered for the roadmap of the RE-SOURCING project is 2050. The vision for the electronics sector was developed based on the underlying concepts of the Paris Agreement,[9] planetary boundaries,[10] strong sustainability[11] and effective human rights due diligence[12] and will be incorporated in the definition of responsible sourcing that is developed towards the end of the project. Further information on the RE-SOURCING project's vision for the electronics sector can be found in the State of Play report for the electronics sector.

The remainder of this report outlines three key target areas for achieving the RE-SOURCING Vision 2050 (Electronics Sector):

- Respect for Human Rights
- Circular Economy and Decreased Resource Consumption
- Responsible Production

The discussion of each target area considers key milestones for 2025, 2030 and 2050, followed (in the full report) by specific recommendations for three key stakeholder groups: policy makers, industry

[9] For further information on the Paris Agreement, see the UNFCCC and the legislation.
[10] On planetary boundaries, see Rockström et al. 2009, Steffen et al. 2015 and Raworth 2017.
[11] An explanation of the strong sustainability concept is provided by Ekins et al. 2003 and Dedeurwaerdere 2014.
[12] On human rights due diligence standards, see UNGPs, ILO Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy and OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.

and civil society. This shorter document includes only recommendations for industry (for recommendations for policy makers, see here, and for the full roadmap document, here).[13]

[13] The authors consider the recommendations for civil society, academia and research institutions to be too general to merit a separate document.

# 2 Pathway

The three overarching targets of respect for human rights, circular economy and decreased resource consumption, and responsible production are, as stated above, based on the concepts of the Paris Agreement, planetary boundaries, strong sustainability and effective human rights due diligence. Several approaches to reach these targets overlap each other, and there are therefore cross-references between the three target sections below.

The following paragraphs explain the roadmap's scope, assumptions and limitations, and structure. To have a uniform project structure, these explanations are similar in the three sectors of the RE-SOURCING project. Before detailed presentation of Targets 1, 2 and 3 begins, we include discussion of the gap analysis undertaken in the State of Play report.

### Scope

The RE-SOURCING project provides a roadmap encompassing recommendations for action for policy makers, industry and civil society. It does not propose new standards or guidelines, nor does it attempt to "reinvent the wheel". For many areas, appropriate standards have already been developed and the first and most important step is to successfully implement these.[14]

The State of Play report serves as a basis and baseline for the development of concrete recommendations for policy makers, industry and civil society for moving ahead to the RE-SOURCING project's vision for 2050. The recommended actions for policy makers focus mainly on the EU, whereas recommendations for industry and civil society can be considered at a broader international level. The RE-SOURCING project recognises the important role of investors, insurance, logistics providers and other business service providers. However, they are out of scope for this roadmap, although they are relevant for all three sectors (renewable energy, mobility and electric and electronic equipment) included in the RE-SOURCING project. Recommendations for these businesses will therefore be provided in a separate briefing document at a later stage in the project.

As with the State of Play report, this electronics sector roadmap focuses on the raw materials 3TG (tin, tungsten, tantalum and gold) and mica, and on the supply chain stages of mining, manufacturing (both contract and component manufacturing and production of branded goods) and end of life/recycling. This scope was defined as part of the consultation process for the State of Play report. There are, of course, other minerals and metals that are essential for the electronics sector, and many of the recommendations included here can also be applied to other raw materials.

### Assumptions and limitations

The RE-SOURCING project roadmap for the electronics sector assumes technological advances but does not specifically address this issue, apart from the continuation of these advances and the necessary support from the public and private sectors. The conclusions from the consultation process indicate the difficulty in setting specific targets for the use of secondary raw materials, the circular economy, etc., as the necessary research has not yet been fully carried out. Nevertheless, this report attempts ambitious but realistic assumptions indicating the pathway to achieve the targets.

[14] For further information on existing standards and initiatives, refer to the State of Play report for the electronics sector.

### Structure

The roadmap differentiates between targets and milestones. **Targets** define the desired end points and are kept at a high and aggregated level. They can be short term (2025), medium term (2030) or long term (2050). Targets were developed during a consultation process with the project's consortium partners, the Platform Steering Committee and Advisory Board, as well as the Roadmap Workshop with participants from various stakeholder groups of the electronics supply chain. The targets consider all three pillars of sustainability: social, economic and environmental (Figure 1).

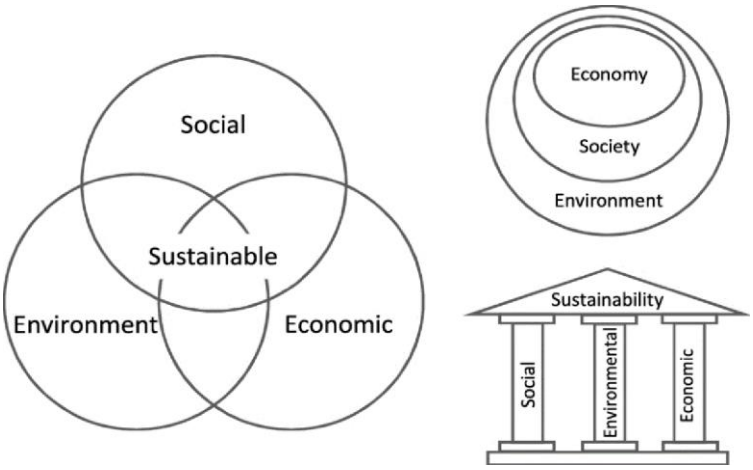


*Figure 1: Depictions of the three sustainability pillars: social, environmental and economic (Purvis et al. 2019)*[15]

**Milestones** are points along the desired trajectory from baseline to target and intended to help track progress. They can be short (2025), medium (2030) or long term (2050). While 2025 milestones may appear as short-term considerations, they refer to the achievement of commitments already made or set the direction for future goals. Wherever possible, milestones are specified according to desired quantity, quality and/or time (Capacity4dev 2016). Milestones also include existing and agreed goals, such as the UN Sustainable Development Goals (SDGs) and the Paris Agreement.

However, this roadmap focuses only on targets and milestones that are most relevant for the electronics sector. Targets and milestones not mentioned here are not considered irrelevant but are beyond the scope of this roadmap. Nevertheless, there are milestones that can be transferred to other sectors.

The classification of milestones and recommendations into categories is based on the authors' deliberations and should not be regarded as absolute. The time frame for the achievement of milestones and targets shows the latest deadline. However, earlier completion is strongly encouraged.

The term **responsible sourcing** is not considered as a simple supplier-manufacturer business transaction in the RE-SOURCING roadmap for the electronics sector. In this project, the term represents the idea that responsible sourcing engages all stages of the supply chain and should be understood as a joint effort to make each stage sustainable. The milestones and recommendations therefore focus not only on procurement but on all stages of the supply chain and touch upon sector-specific issues.

[15] For more information on sustainability and responsible sourcing approaches, see the State-of-Play Report on the International Responsible Sourcing Agenda (Farooki et al. 2020)

**Recommendations** were developed by the report team and discussed and further revised during the consultation process. The authors' aim is to set recommendations for policy makers, industry and civil society that are ambitious but also realistic, in order to achieve the milestones and targets. Recommendations for policy makers and industry are provided under milestones for 2025, 2030 and 2050. Recommendations for civil society (together with academia and research institutions) are provided under milestones for 2025 and apply equally to the 2030 and 2050 milestones. As noted above, this shorter document includes only recommendations for industry (for recommendations for policy makers, see here, and for the full roadmap document, here).

## Gap analysis

The State of Play report included a gap analysis comparing current standards and initiatives for responsible sourcing with the Vision, and we have drawn on this gap analysis in our work towards this roadmap for responsible sourcing of minerals in the electronics sector. Main gaps identified in the State of Play report incorporated and built on gaps identified in the State of Play reports on the renewable energy and mobility sectors.[16] These included that:

- Many current standards on mineral supply chains to a large part overlap; many cover only certain stages of the minerals supply chain; and none cover all issues.
- An overarching international framework is missing, and harmonisation and/or mutual recognition of standards is needed.

However, for the electronics sector, the State of Play analysis paid particular attention to gaps related to the EU Conflict Minerals Regulation and to voluntary due diligence schemes. The following main gaps were identified in relation to the regulation:

- The focus on 3TG minerals is too limited.
- The regulation does not apply to the import of manufactured goods.
- The set threshold allows loopholes.
- There are insufficient sanctions.
- There is different implementation per Member State.
- Lack of transparency.[17]

As to voluntary due diligence schemes, the following gaps were noted:

- The schemes do not provide rights holders with effective opportunities for protection and access to remedy.
- Lack of transparency regarding implementation.
- Lack of credibility of audits.
- Scope of due diligence too limited.
- Implementation shows the biggest gap according to studies.

Much of the roadmap that follows seeks to address these gaps.

[16] See Kügerl and Tost 2021a and Betz et al. 2021 respectively.
[17] See European NGO Coalition on Conflict Minerals et al. 2021.

## 2.1 Target 1: Respect for Human Rights

The Vision for the electronics sector towards 2050, developed with work on the State of Play report for the electronics sector, incorporates the three pillars of social, environmental and economic sustainability. The sector roadmap now presents one overall target for each of these three pillars, starting with human rights and access to remedy, broadly corresponding to the social sustainability pillar.

The State of Play report defines Respect for Human Rights as "full respect for and protection of human rights across all entire value chain operations including effective mechanisms for accountability and access to remedy for affected rights holders".

Under the human rights pillar we acknowledge the need for a level playing field has also been identified as a gap in the State of Play reports on the renewable energy (Kügerl and Tost 2021a) and mobility (Betz et al. 2021) sectors. For the successful implementation and enforcement of human rights, we consider due diligence laws as a way to achieve a level playing field and have built the milestones on this. The human rights milestones also focus on filling the identified gaps in human rights protection in relation to current EU legislation and voluntary industry initiatives for the electronics sector.

The following milestones and recommendations will form the basis for reaching the target of Respect for Human Rights in the electronics sector (Figure 2).

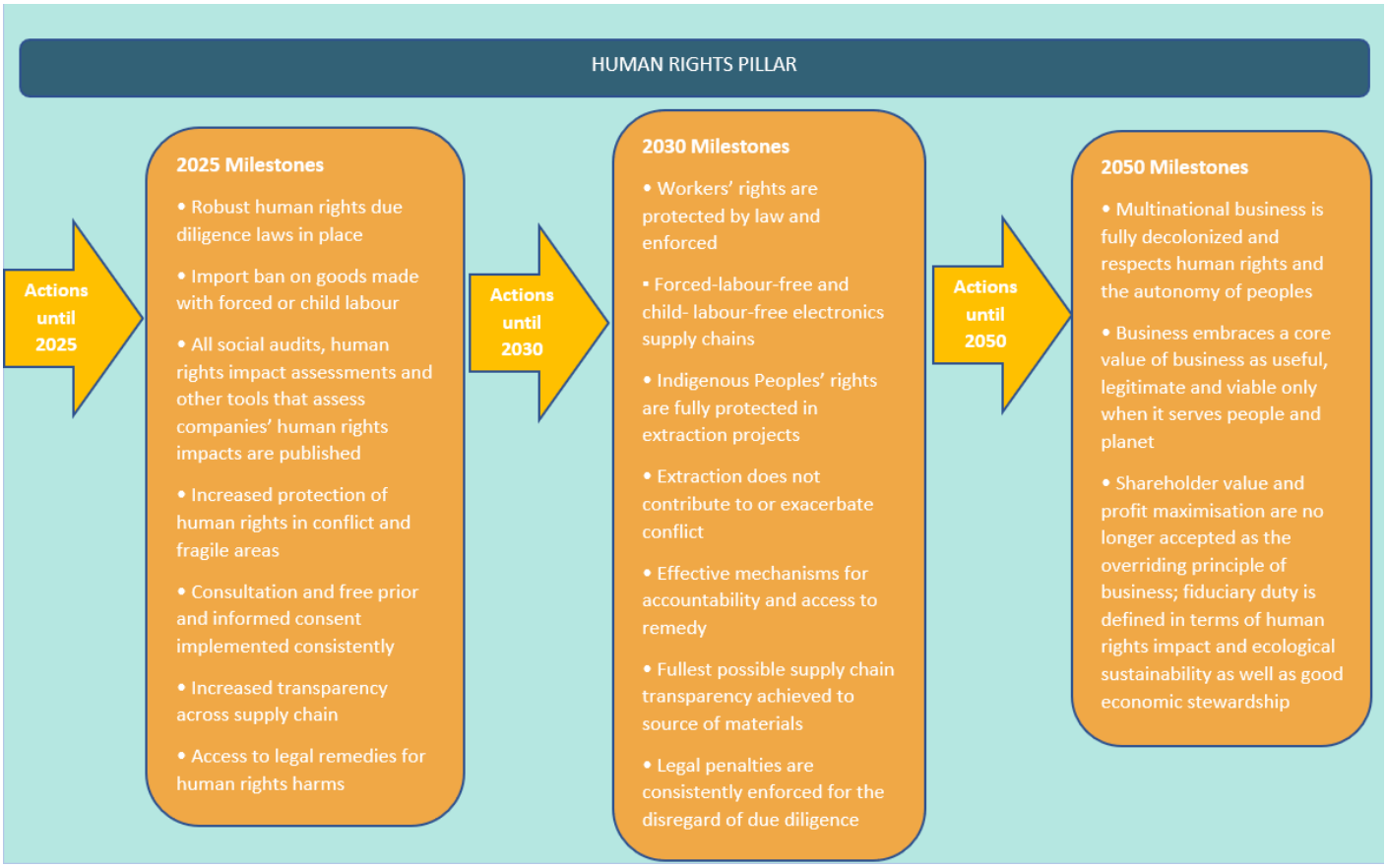


*Figure 2: Milestones towards respect for human rights in the electronics sector by 2050*

### 2.1.1 Milestones 2025

- Robust human rights due diligence laws in place.
- Import ban on goods made using forced or child labour.
- All social audits, human rights impact assessments and other tools that assess companies' human rights impacts are published.
- Increased protection of human rights in conflict and fragile areas.
- Consultation and free, prior and informed consent implemented consistently.
- Increased transparency across the supply chain.
- Access to legal remedies for human rights harms supported in home states.

**Overall considerations to 2025**

Protecting human rights across the electronics industry is an essential condition of responsible sourcing. Substantial efforts have been made in the realm of business and human rights to ensure that the rights of individuals and communities are respected, protected and fulfilled in the context of business operations in the sector. The UNGPs (UN 2011) and the OECD Guidelines for Multinational Enterprises (OECD 2011) have clarified the legal obligations of States[18] and the responsibilities of businesses[19] for human rights. Elements of these accepted international standards are now increasingly reflected in laws including the EU Batteries Directive and the upcoming EU due diligence law and Critical Raw Materials Regulation.

However, despite this progress, human rights continue to be abused across the extractive sector and throughout the electronics supply chain. To achieve the responsible sourcing milestones on human rights, decisive action is needed, building on established standards as well as closing critical gaps in implementation and enforcement. Rights holders are central to the milestones on human rights, and consultation is therefore critical, as is the ability for people to achieve meaningful remedy. Supply chain transparency is crucial to enable implementation and monitoring of due diligence commitments.

#### RECOMMENDATIONS FOR INDUSTRY TO 2025

Business has a responsibility to respect human rights. As the UNGPs state: "The responsibility to respect human rights is a global standard of expected conduct for all business enterprises wherever they operate. It exists independently of States' abilities and/or willingness to fulfil their own human rights obligations, and does not diminish those obligations. And it exists over and above compliance with national laws and regulations protecting human rights."

The UNGPs also make clear that "Business enterprises may be involved with adverse human rights impacts either through their own activities or as a result of their business relationships with other parties."

These now well-established standards are underpinned with guidance – see e.g. the UN Guiding

[18] "States' international human rights law obligations require that they respect, protect and fulfil the human rights of individuals within their territory and/or jurisdiction. This includes the duty to protect against human rights abuse by third parties, including business enterprises" – UNGPs.
[19] Businesses are "required to comply with all applicable laws and to respect human rights" – UNGPs.

Principles Reporting Framework (Shift and Mazars, no date) – and increasingly elements of these standards are being translated into legal requirements. The UNGPs require businesses to conduct corporate human rights due diligence across operations and supply chains. Achieving the 2025 milestones requires electronics companies not only to embrace the UNGPs but to quickly address current gaps in their implementation and adherence to these standards. Despite much attention being given to the extraction of minerals, serious human rights concerns continue to arise in the mining sector. Additionally, electronics companies should pay far more attention to human rights issues at stages other than extraction within the supply chain, including the rights of workers in processing phases such as smelting, refining, manufacture, waste processing and recycling.

To make meaningful progress, industry should map the human rights issues in its supply chain and develop specific plans of action. This work should not sit within corporate "compliance" or "stakeholder engagement" portfolios but be elevated to high priority involving company leadership and joined-up action. Moreover, industry should learn from civil society and take an investigative approach to identifying human rights issues in the supply chain. Social auditing is not sufficient, as audits frequently miss major issues and are conducted without due regard for the fundamentals of human rights investigation.

The approach to auditing of IRMA (the Initiative for Responsible Mining Assurance) has some important strengths for assessing specific mines. IRMA involves the participation of civil society and trade unions in the governance of its audit process. IRMA also actively seeks input from diverse stakeholders in advance of an audit, and during audits civil society and workers provide input on mine site performance. Further, IRMA publishes the full audit reports (see IRMA, no date, and State of Play report). Audits and certifications should however not be treated as a proxy for human rights due diligence and should not provide a safe harbour for companies' individual responsibility to respect human rights and operate sustainably.

Industry initiatives and multistakeholder schemes may provide spaces to develop new thinking. However, both industry and civil society find the large array of such initiatives and schemes confusing and more likely to lead to inertia than to action. Business actors can choose which initiatives and schemes provide them with spaces to learn or dialogue, but no such voluntary approaches should be used to prevent or delay legislative and regulatory action.

**RECOMMENDATIONS**

- Map and increase transparency of the electronics supply chain.
- Increase credibility of social audits through multi-stakeholder involvement; publish full audit reports; acknowledge that positive audit results do not equate to human rights due diligence.
- Strengthen human rights assessments of the supply chain using investigative approaches that fully respect the health and safety of workers, communities and human rights defenders.
- Secure the expertise of relevant CSOs and individuals in human rights, intersectional identity and justice who are independent and can "speak truth to power".
- Strengthen company human rights management systems, with continual participatory auditing, reassessment and improvement, actively involving trade unions and CSOs, regular publication of audit results, and worker-led monitoring.
- Integrate in company policies and implement the UN Guiding Principles on Business and Human Rights.
- Implement the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from

Conflict-Affected and High-Risk Areas.

➢ Seek and follow authoritative country-specific guidance on human rights and business (e.g. from the Danish Institute for Human Rights).

### 2.1.2 Milestones 2030

- Workers' rights are protected by law and enforced.
- Forced-labour-free and child-labour-free electronics supply chains.
- Indigenous Peoples' rights are fully protected in mineral extraction projects.
- Extraction does not contribute to or exacerbate conflict.
- Effective mechanisms for accountability and access to remedy.
- Fullest possible supply chain transparency achieved.
- Legal penalties are consistently enforced in home states for the disregard of due diligence obligations.

**Overall considerations to 2030**

To fundamentally address the impact of multinational business operations on human rights, a paradigm shift is needed (Amnesty International 2014). Rights must be protected by law; and when multinational businesses operate across borders, the legal protection of human rights must do so also.

The Maastricht Principles on Extraterritorial Obligations of States (2011) note: "Despite the universality of human rights, many States still interpret their human rights obligations as being applicable only within their own borders. This attempt to limit accountability territorially has led to gaps in human rights protections, especially in human rights regulation and accountability of transnational corporations and international financial institutions. Extraterritorial obligations (ETOs) are a missing link in the universal human rights protection system. ETOs allow human rights to assume their proper role as the legal basis for regulating globalization and ensuring universal protection of all people and groups. ETOs are a tool needed to ultimately stop violations of human rights, destruction of ecosystems, and climate change."

Policy makers should take their lead from the broad group of human rights advocates and scholars who drafted the Maastricht Principles and seek reforms of the law that allow states to meet their human rights ETOs obligations fully. Much of the difficult legal thinking and problem solving has been done, and what remains is political willingness to act.

As we state under other targets in this roadmap, the changes needed to protect and respect human rights in the electronics sector require industry to change its business model. The current model is predicated on shareholder value, short-term profit maximisation and minimising direct costs to business (whatever the wider and often longer-term costs to society including to sustainable livelihoods, affected communities and the natural environment). Human rights, environmental degradation and climate change are, to a large extent, still seen as "externalities". This business model is the core of the challenge, and there is no route to genuinely responsible sourcing if the model remains unchanged. (For more discussion, see under recommendations for industry to 2050.)

### RECOMMENDATIONS FOR INDUSTRY TO 2030

Industry should publish and consult on a blueprint for a change in the business model, which aims to balance adequate, moderate profitability with responsible sourcing and with comprehensively effective commitments to human rights and to respecting planetary boundaries (see Target 2).

In making human rights central to business operations, industry can take a range of steps to ensure workers' rights and remedy.

**RECOMMENDATIONS**

- Publish and consult on a blueprint for a change in the business model to balance adequate, moderate profitability with responsible sourcing and commitments to human rights and to respect for planetary boundaries.
- Take comprehensive measures to ensure workers' rights and remedy for abuses.

## 2.1.3 Milestones 2050

- Multinational business is fully decolonised and respects human rights and the autonomy of peoples.
- Business embraces a core value of business as useful, legitimate and viable only when it serves people and planet.
- Shareholder value and profit maximisation are no longer accepted as the overriding principles of business; fiduciary duty is defined in terms of human rights impact and ecological sustainability as well as good economic stewardship.

### Overall considerations to 2050

Responsible production, including in the electronics sector and particularly in the extractive sector that feeds electronics, is undermined by the dominant economic and business model, reform of which is critical to sustainability. For more than 50 years, a specific and narrow view of the purpose and role of the business company has prevailed. Commonly associated with the work of the US economist Milton Friedman, it holds that the main purpose of a corporation is to maximise value – make money – for its shareholders and that it is the fiduciary duty of the directors to make sure this happens. Institutional shareholders such as hedge funds and asset managers have strongly promoted this view (HEC Paris 2021). This growth-at-all-costs ideology drives both the behaviour of multinational companies and government policy globally. Yet it is antithetical to sustainability and leads inexorably towards deeper inequality within and between countries.

The single-minded pursuit of short-term shareholder value and profit has prompted questionable strategies on the part of companies aimed at attracting investors, from share buybacks and excessive dividend payments, often funded by debt, to aggressive tax planning (Barton et al. 2016; Clarke 2022). In parallel, government prioritisation of economic growth above all else, encouraged by corporate lobbying, has led to self-interested trade policies and highly unequal international tax and investment agreements that harm the economies of less powerful countries and have enforcement mechanisms that are almost completely absent in international agreements on human rights, the environment and climate change (Oxfam 2002; Korten 2015). Today, more enlightened company managements increasingly pursue a wider set of more responsible goals (Fitzgerald 2019; B Team, no date).

In pursuit of economic growth, governments promote rapid extraction of resources and high levels of consumerism. Because this growth model is fundamentally competitive, and leverages the power of some countries over others, it has exploited pre-existing inequalities and reinforced economic advantages gained by colonialism. Hence we use the term "decolonised" in the 2050 milestones. Decolonisation refers to efforts "to reverse the legacy of inequality and racism left by colonialism and [to] redress the unequal power relations it produced and perpetuated" (Rodriguez 2020). Because European colonialism created today's world using "economic violence" that "materially enrich[ed] some people at the expense of others" (Koram 2021, pp. 230, 233), power holders in government and industry should recognise and work to remove the structural legacy whereby large-scale businesses unjustly and excessively extract wealth from the societies in which they operate.

### RECOMMENDATIONS FOR INDUSTRY TO 2050

To achieve the 2050 milestones, industry should actively embrace the imperative of respecting workers' rights throughout the supply chain and respecting human rights comprehensively across society.

Industry should make a more proactive and comprehensive commitment to full human rights accountability upstream and downstream, and to genuinely participatory and transparent approaches to human rights due diligence, assessment, planning, monitoring and reporting. As part of this, industry should consider more seriously models for cooperatively owned business and social enterprises that combine business and public interest goals. Such models and goals are more likely to result in outcomes that "leave no one behind".[20]

Moving towards 2050, industry should progress away from the current emphasis on short-term shareholder value and profit maximisation. The pathway to socially responsible businesses that are fully accountable to wider stakeholders who are not conflicted by financial interests will require substantial planning, supported by legislative change.

**RECOMMENDATIONS**

- Fully embrace the imperative of comprehensive human rights accountability.
- Complete reform of the business model away from profit led to social purpose led (social equity and ecological sustainability).

## 2.2 Target 2: Circular Economy and Decreased Resource Consumption

The State of Play report for the electronics sector defines the Circular Economy and Decreased Resource Consumption as "the imperative of protecting the environment, including remaining within planetary boundaries, preventing global warming of more than 1.5°C above preindustrial levels, and preventing further biodiversity loss". This target broadly corresponds to the environmental sustainability pillar.

Key principles required for a Circular Economy and Decreased Resource Consumption include:

[20] UN Sustainable Development Group, no date.

- Elimination of waste and pollution and keeping products and materials longer in use.
- Remaining within planetary boundaries.
- Preventing global warming of more than 1.5°C above preindustrial levels.
- Preventing further biodiversity loss, restoring biodiversity and regenerating natural systems.

For further discussion of contextual issues surrounding, and requirements for meeting the environmental sustainability target, see the Renewable Energy Sector Roadmap (Kügerl and Tost 2021, sections 2.1 and 2.2) and the Mobility Sector Roadmap (Degreif and Betz 2022, section 2.1).

The electronics sector is defined by innovation and evolution of components and end-use products, and its business model relies heavily on obsolescence and consumers recurrently purchasing new versions of products and technologies. While some efforts have been made to recycle or reuse some raw materials that go into electronics production, the sector as a whole is not moving decisively towards circular economy and decreased consumption targets.

For the sector to make a meaningful contribution to this target, it will require major changes to the business model and incentives, as well as substantial efforts at education of consumers.

The key points on the supply chain are:

- Extraction of raw materials, in particular key minerals, which drives a range of social and environmental damage and geopolitical competition for access to limited resources.
- Processing and refining of minerals, with impacts on water and generating harmful waste.
- Manufacturing of components and/or finished goods.
- End-user companies' sales to, and interface with, consumers.

Several stages of production are energy intensive, while extraction and processing generate considerable waste material, including hazardous waste in some contexts. Manufacturing also generates waste material that can be harmful to health and the environment. The marketing and sale of many electronics promote a culture of intense consumer demand for new and innovative goods, leading to major increases in use of raw materials and generation of electronics waste.

As noted in the State of Play report, there are gaps in the current social and environmental standards in mining and electronics manufacturing. Current standards do not sufficiently address the increasing demand for raw materials, and more attention is needed for environmental sustainability and resource efficiency. Most current standards focus on reducing negative externalities, but not on reducing overall demand for and extraction of raw materials. Indeed, some current standards are based on reducing externalities because they assume and implicitly support increased demand for raw materials and end products.

Core issues to ensure that the manufacture of electronic goods takes place in consistency with a circular economy and decreased consumption are:

- Reduced need for minerals through repair, reuse and recycling: this concerns EU policy and innovation by industry.
- Reduced overall demand for new goods, which requires reducing consumer demand through education to support a fundamental shift in the public consciousness.
- Technological innovation directed to extend product lifetimes and reduce the need to change hardware regularly.
- Ending aggressive marketing based on novelty value.
- An EU requirement to include warning labels with the sale of all short-lifespan goods (mobile

phones, etc.).

- Dramatically reduced waste generation in the sector, from mining to end of life.

Within the electronics sector, the technology revolution is driving innovation and increased consumer demand for new and "up-to-date" goods. It is now commonplace in the developed North to consider personal computers, mobile phones and household goods such as televisions as requiring replacement within three to five years. This must change.

The following milestones and recommendations will form the basis for reaching the target of Circular Economy and Decreased Resource Consumption in the electronics sector (Figure 3).

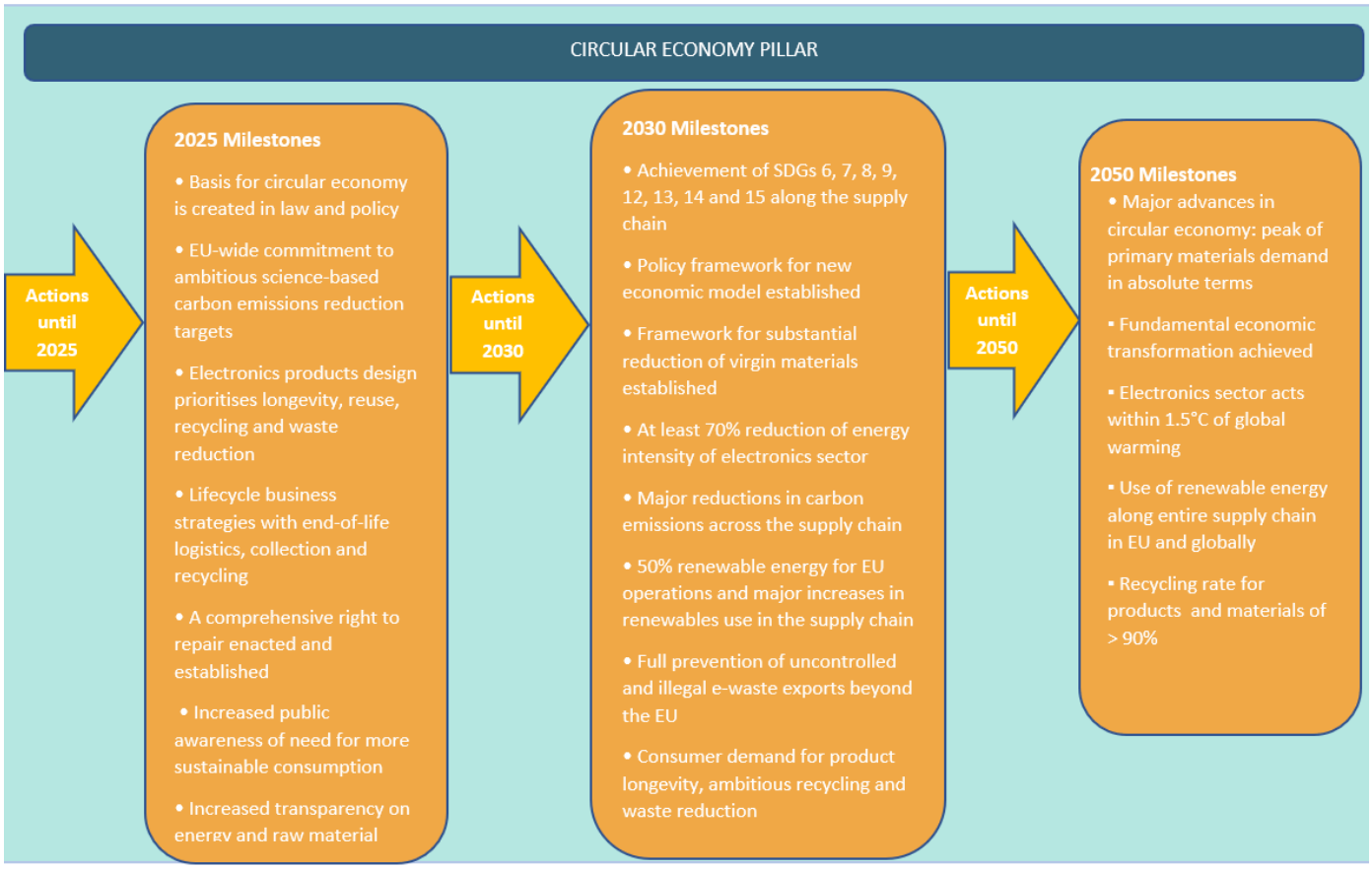


*Figure 3: Milestones towards a circular economy and decreased resource consumption in the electronics sector by 2050*

### 2.2.1 Milestones 2025

- Basis for circular economy is created in law and policy.
- EU-wide commitment to science-based carbon emissions reduction targets.
- Electronics products design prioritises longevity, reuse, recycling and waste reduction.
- Lifecycle business strategies with end-of-life logistics, collection and recycling.
- A comprehensive right to repair enacted and established.
- Increased public awareness of need for more sustainable consumption.
- Increased transparency on energy and raw material consumption in electronic goods.

### Overall considerations to 2025

The 2025 milestones lock in a strong foundation to achieve the Circular Economy and Decreased Resource Consumption target. Building on the legal basis that already exists within the EU – and looking at incremental but ambitious increases in targets around energy consumption, waste and recycling – all players in the electronics industry should be clear on the parameters and direction of travel.

The EU has a policy and legislative framework relevant to the Circular Economy and Reduced Resource Consumption, including as part of the EU's Green Deal (European Commission 2019a). However, greater policy coherence is needed, including industrial, environmental, trade and development policies.

The EU's Green Deal is still fundamentally based on growth and consumption. Statements about decoupling growth from resource consumption are not yet underpinned by realistic proposals. Much growth, including in the electronics sector, relies on the EU consuming significant amounts of metals and minerals, only a portion of which are currently collected, recovered and recycled. Current efforts to rebalance economic growth with sustainable consumption messages are important but insufficient. More must be done to confront the limits of long-established economic prescriptions about growth and to chart a new course. This includes an open debate and attempting new approaches.

A genuinely circular economy cannot be based on increasing consumption and the primacy of short-term shareholder value and profit. Circularity challenges the basis on which many industry leaders have built businesses. Meaningful embracing of circular economy goals will significantly disrupt the electronics sector and in particular manufacturers of personal technology goods. Efforts that follow rather than lead the market will be insufficient. And business leaders will not be able to convince shareholders of the need to change without a strong legislative framework that offers a level playing field so that no competing company is disadvantaged by taking positive action. That said, some actors in the electronics industry are showing leadership and should do more to push laggards and to identify and name the challenges along the supply chain.

**Good practice recommendations for the right to repair**[21]

- From the design stage, ensure that devices are resilient and lend themselves to repair and upgrades and not to disposal.
- Ensure the ecosystem supports repair and upgrade choices and is not cost prohibitive relative to replacing the device.
- Provide for end-of-life support services to ensure recycling and/or reuse of device.
- Provide software support such that devices continue to be compatible with software updates.

## RECOMMENDATIONS FOR INDUSTRY TO 2025

The electronics industry can reach 2025 milestones through a combination of public commitments on key circular economy issues, public reporting across the supply chain and supporting the legislative framework. Industry leadership, combined with increased transparency, is important to meet ambitious circular economy targets. Leadership exists within the industry, and leaders need to push laggards and drive sector-wide awareness and standards higher.

For example, several industry actors have made public commitments to 100% renewable energy (see

[21] See Farooki et al. 2023, section 4.

RE100). Few such commitments if any relate to the full supply chain. While industry actors cannot ensure renewable energy across the full chain, they can foster conditions and provide incentives for suppliers and others to act. Transparency around such moves is important.

Industry commitments in relation to other elements of a circular economy are less clear. Actions by the electronics sector to reduce use of virgin raw materials should be made more transparent. Clear and measurable commitments on energy, repair, reuse, recycling, waste and, more challenging, demand reduction are critical to drive progress towards the environmental sustainability target.

**RECOMMENDATIONS**

- Publish clear plans and targets for overall energy reduction, renewable energy use, reuse, repair, recycling, and waste and demand reduction across the supply chain.
- Adopt ambitious plans for lifecycle business strategies and publish annual progress.

### Product design: brands

To contribute to a circular economy and decreased consumption, major electronics brands need to make a commitment to direct their design and innovation towards longevity, repair and reuse and to enable evolution of technology to happen without constant new hardware being required. This goes beyond recycling old products, which is happening to a certain extent, and requires deliberate design for longevity, repair, reuse and recycling in a way that still allows technology to advance.

Extraction and processing of raw material inputs are, to a degree, driven by design and demand. Alongside design for longevity, repair, reuse, recycling and waste minimisation, a decisive shift away from built-in obsolescence and novelty-fixated electronics marketing is critical. Major brands can have a critical influence on the supply chain, from what they commission to what they reward. Actors across the chain need to engage in deeper discussions on how each element affects others. Designers must know more about extraction and processing, while mining and processing companies need to understand where the industry is going. The end products affect the process phases, but the process phases (mining, smelting, refining, component manufacture) can also take steps independently.

When developing new products, eco-design considerations need to be included from the outset. By prioritising resource efficiency from the start of product development, significant efficiency gains can be achieved. A possible method for the assessment and subsequent reduction of resource use over the lifetime of a product is a combination of the MIPS (material input per service) concept with general resource efficiency parameters.

### Mining

The electronics industry needs to reduce the impact of extraction and to avoid critical biodiversity areas. The World Bank's Climate-Smart Mining Initiative and efforts of the International Council on Mining and Metals (ICMM) show some steps in the right direction.

The Climate-Smart Mining Initiative is intended to "help resource-rich developing countries benefit from the increasing demand for minerals and metals, while ensuring the mining sector is managed in a way that minimizes the environmental and climate footprint" (World Bank, no date). The approach includes the idea of circular economy, reduced energy consumption in mining, and recycling. It seeks to link to the SDGs to "ensure the decarbonization of the mining and energy sectors also benefits resource-rich countries that host these strategic minerals and the communities directly impacted by their extraction" (ibid.).

However, many CSOs have expressed concern about the Climate-Smart Mining Initiative for seeking to promote new mining without prioritising recycling, efficiency and circular economy or rethinking how societies (particularly wealthy ones) consume energy and products. CSOs argue that more meaningful guarantees are needed that new mining will meet credible environmental, social and human rights safeguards. And they signal alarm that the Bank, as a public financial institution, may be "putting mining company agendas and interests before protections to safeguard and benefit workers, communities and the environment", hence failing in its public responsibilities (Earthworks et al. 2019).

Turning to the ICMM, its members "collaborate to maximise the effective use, recovery and disposal of metals and minerals to keep products and materials in use for longer, while not compromising on health, safety or the environment" (ICMM, no date (a)). Advancing this aim further is critical, as is pushing laggards. The ICMM notes that "recovery and reuse of metals from products is on the increase for some metals … although concerted collaborative action is required to increase recycling rates" (ICMM, no date (b)).

In terms of relevant international standards, mining companies in the electronics supply chain should implement policies for improving efficiency and resource use in their operations in line with the IFC Environmental and Social Performance Standards. Unlike many other standards for the extractive sector, the IFC standards include measures relevant for circular economy principles. As noted in the Mobility Sector Roadmap, these policies should include: (i) implementation of a management plan for sustainable use of the entire deposit; (ii) optimisation of the existing mining plan considering energy efficiency (including locational planning, scheduling, drilling and blasting); and (iii) energy optimisation and increased renewable energy use in processing.

Recent work on the recovery of minerals from mine tailings also shows promise and requires R&D investment (Sarker et al. 2022).

While these initiatives include circular economy concepts, current emphasis focused on making continued extraction less socially and environmentally harmful is insufficient and should be coupled with reducing overall demand.

### Smelting and refining

Smelting and refining of metals and minerals are energy intensive, high carbon emitting and often associated with waste. This phase of the process is still relatively under-researched. It is likely that most smelting and refining for electronics supply chains take place outside the EU, but EU policy can still be of influence. Indirectly, the EU Conflict Minerals Regulation applies to around 500 smelters and refiners globally, with EU importers legally required to identify all the smelters and refiners in their supply chains and to check whether these have the correct due diligence practices in place.

This can be expanded to include circular economy considerations, with support over time to improve energy usage and waste management. As noted under Target 1, EU conflict minerals legislation is too narrowly framed and should be expanded. However, it also gives a clear basis for brands to identify smelters and refiners and hence to engage with these suppliers on circular economy issues.

**RECOMMENDATIONS**

- Public commitments to shift product design to prioritise longevity, enable repair and facilitate reuse and recycling.
- Publish plans to move to 50% renewable energy by 2030 in the EU, with targets for all stages of

production (mining, smelting, transport of materials, manufacture).

- Commitments to reduce use of virgin raw materials and fully respect planetary boundaries across the supply chain.

**Reducing consumption**

A significant challenge for industry is to support a reduction in overall consumption of electronic goods. This constitutes a major disruption in the sector, but one that industry leaders should embrace and strategise for. Industry can also contribute to public awareness and reduction of consumption by providing key information for consumers.

**RECOMMENDATIONS**

- Provide more information on energy and raw materials used in products, including in packaging to reach consumers.
- Offer customers and clients repair, reuse and recycling options and services based on clear and realistic commitments backed up by funds that will remain available even if the company is no longer in operation.

### 2.2.2 Milestones 2030

- Achievement of SDGs 6, 7, 8, 9, 12, 13, 14 and 15 along the supply chain.
- Policy framework for new economic model established.
- Framework for substantial reduction of virgin materials established.
- At least 70% reduction of energy intensity of electronics sector.
- Major reduction in carbon emissions across the supply chain.
- 50% renewable energy for operations in the EU and major advancements elsewhere in the supply chain.
- Full prevention of uncontrolled and illegal e-waste exports beyond the EU.
- Consumer demand for product longevity, ambitious recycling and waste reduction.

**Overall considerations to 2030**

To reach the milestones for 2030, policy makers and industry need to embrace a significant shift in the economy. Industry should plan and expect significant disruption and see itself as the catalyst for change. Policy makers should ensure the clarity and decisiveness necessary for all industry players to move with the required speed and commitment. As the changes needed to achieve the 2030 milestones require action outside as well as within the EU, policy should be informed by dialogue with stakeholders in third countries.

#### RECOMMENDATIONS FOR INDUSTRY TO 2030

To achieve the milestones for 2030, industry should reshape its business model and engage in shifting the narrative on resources and consumers to one about nature (planetary boundaries) and people (wellbeing). Industry actors in the electronics sector should make it clear that their policies and

behaviours are consistent with global climate and biodiversity goals. This shift cannot be accomplished if the dominant model remains one of maximising growth, shareholder value and short-term profit. Nor can industry alone change the ingrained framing of growth and consumption as necessary for economic wellbeing. Besides key actions by policy makers, civil society plays a crucial role here. Industry thought leadership, however, is also essential.

A reduction of primary resource demand is crucial. By 2030, the electronics industry should achieve a substantial decrease of primary/virgin materials in products. This decrease will require longer-lasting goods, repair, reuse and recycling, with the average lifespan of key personal electronic equipment significantly extended by 2030. Primary resource consumption reductions will require combined design and technological advances, which industry and independent research should prioritise.

**RECOMMENDATIONS**

- Ensure business practice aligns with the SDGs.
- Set high minimum recycled content standards for critical minerals and other key components of batteries for electronics goods.
- Revise the business model to support substantial reductions in demand for finished goods.
- Engage with and support the supply chain to make needed changes, assigning a financial commitment to this.
- Refrain from lobbying against policies intended to address climate change, biodiversity loss and the SDGs.

An important action by the electronics industry will be to increase, incrementally but swiftly, the public information available on the relevant circular economy parameters. Industry leadership can change public attitudes and foster a different kind of relationship between business, society and nature. Further increases in transparency will help shift the electronics sector, influence public demand via better-informed consumer behaviour and increase trust in electronics goods manufacturers.

**RECOMMENDATIONS**

- Manufacturers and brands report annually on percentage use of virgin materials in all products.
- Expand, optimise and support repair, reuse, end-of-life logistics and recycling programmes for key electronics components.
- Industry publishes plans to reach > 90% recycling of critical minerals including e-waste collection by 2050.
- Implement major switch to renewable energy along the supply chain.
- Dramatically reduce e-waste and work with repairers and recyclers to maximise repair and recycling.

### 2.2.3 Milestones 2050

- Major advances in circular economy: peak of primary materials demand in absolute terms.
- Fundamental economic transformation achieved.
- Electronics sector acts within 1.5°C of global warming.

- Use of renewable energy along entire supply chain in EU and globally.
- Recycling rate for products and materials of > 90%.

### RECOMMENDATIONS FOR INDUSTRY TO 2050

As noted under Target 1, moving towards 2050, industry should progress away from the current emphasis on short-term shareholder value and profit maximisation. The pathway to socially responsible businesses that are fully accountable to wider stakeholders who are not conflicted by financial interests will require substantial planning, supported by legislative change.

**RECOMMENDATIONS**

- Complete reform of the business model away from profit led to social purpose led (social equity and ecological sustainability).
- Achieve 100% renewable energy use in the supply chain.

## 2.3 Target 3: Responsible Production

The State of Play report for the electronics sector defines Responsible Production as "global eradication of poverty and a significant reduction of inequality that includes a minimum social foundation and a fair share of costs and benefits among the value chain actors". This target broadly corresponds to the economic sustainability pillar.

Responsible production in the electronics sector encompasses responsibility in relation to the impact of production on the environment, climate and the rights of workers, affected people and communities, and on the economies and wellbeing of host countries. As stated in the State of Play report, due diligence is often perceived as risk to the company and not to the affected people. For this target, the milestones need to bridge the gap between the current due diligence efforts and legislation, on the one hand, and the rights holders who are still insufficiently protected, on the other.

Responsible production requires transparency about impacts and about the value chain. As major elements of human rights and environmental impacts are covered in some detail under Targets 1 and 2 in this roadmap, these issues will be addressed more briefly here.

The core factors that ensure that the manufacture of electronic goods takes place responsibly are:

- Ensuring that all stages of production, from mining to marketing, minimise and mitigate any negative impacts on human rights and the environment, including the climate.
- Following circular economy principles to minimise waste and the need for virgin raw materials.
- Ensuring the extraction of minerals does not cause, exacerbate or benefit from conflict or abuse.
- Ensuring the protection of workers' rights along the supply chain including fair pay for workers.
- Respecting and promoting the rights of affected people and communities.
- Significantly reducing inequalities in income and wealth across the value chain.

Within the electronics sector, the extraction of minerals – mining – has received most attention when it comes to responsible production. Extraction of minerals like cobalt has been linked to child labour, conflict and corruption. A spotlight on this phase of the electronics supply chain has led to some improvements (Mancini et al. 2021).

The refining and processing of minerals have received less attention from policy makers, industry, CSOs and researchers. However, this phase of the production process frequently sees workers exposed to health risks, discriminated against and subject to labour rights abuses. Payment to workers doing hazardous processing work is often poor.

The actions of major companies and brands have also received limited attention. However, examples of large companies and brands putting pressure on producers of components and their contract manufacturers in terms of costs, delivery and speed shows that these can drive labour rights violations. Failures of responsible production along the supply chain are frequently not isolated but respond to market pressures driven from elsewhere in the chain. A lack of transparency about the supply chain exacerbates failures of responsible production.

The following milestones and recommendations will form the basis for reaching the target of Responsible Production in the electronics sector (Figure 4).

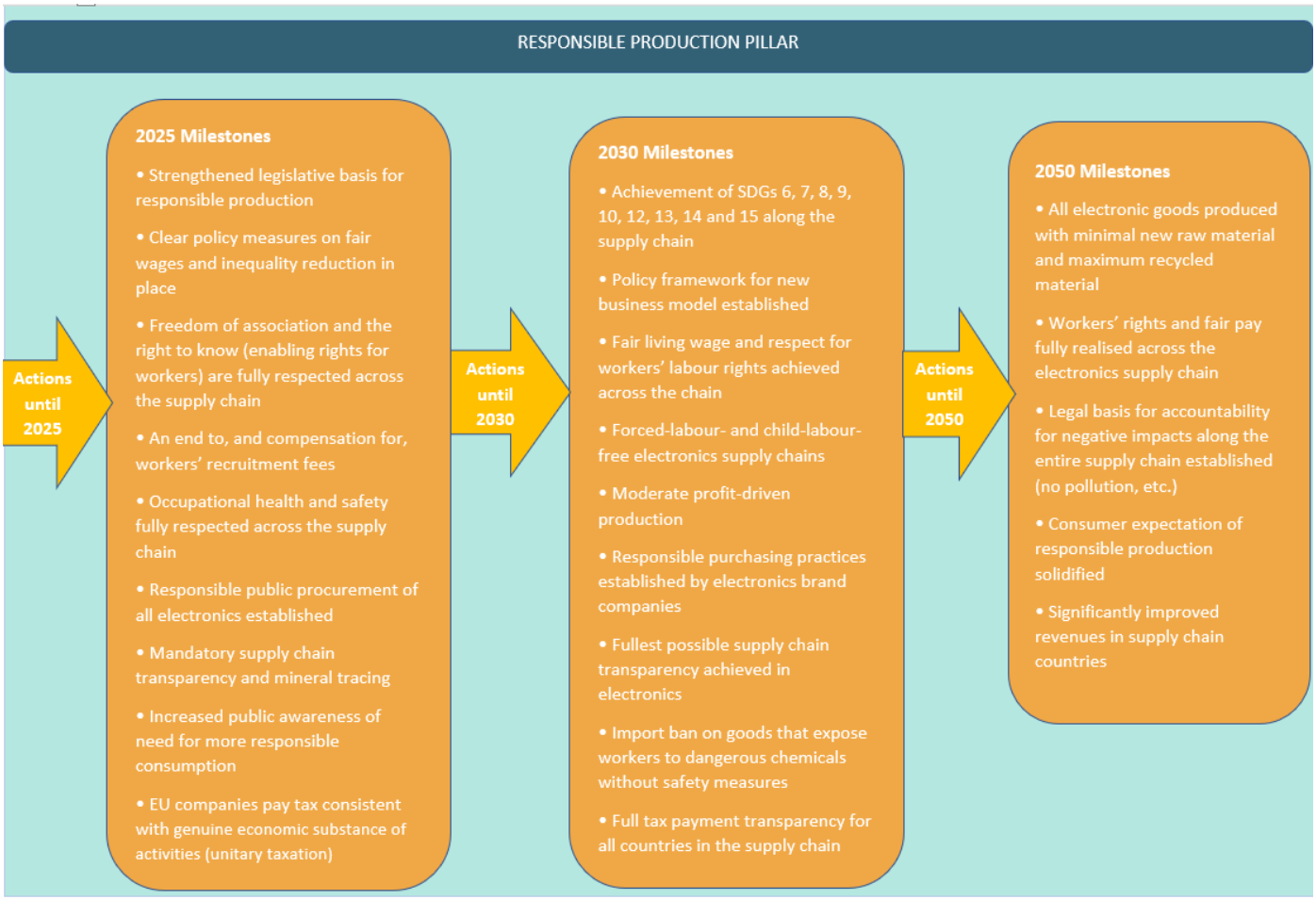


*Figure 4: Milestones towards responsible production in the electronics sector by 2050*

### 2.3.1 Milestones 2025

- Strengthened legislative basis for responsible production.
- Clear policy measures on fair wages and inequality reduction in place.
- Freedom of association and the right to know (enabling rights for workers) are fully respected across the supply chain.

- An end to, and compensation for, workers' recruitment fees.
- Occupational health and safety fully respected across supply chain.
- Responsible public procurement of all electronics established.
- Mandatory supply chain transparency and mineral tracing.
- Increased public awareness of need for more responsible consumption.
- EU companies pay right tax in right place at right time consistent with genuine economic substance of activities (unitary taxation).[22]

### Overall considerations to 2025

Achieving the 2025 milestones for responsible production requires substantial action by industry based in, or selling into, the EU in relation to its supply chains through third countries where the majority of raw material extraction and processing takes place. EU regulations, such as the Conflict Minerals Regulation and the Batteries Regulation, provide the basis for action by industry actors. This can and should be augmented by ambitious responsible business practices. But, as we emphasise under Target 1, a legal framework is the only way to ensure a level playing field within the EU and to foster EU leadership on responsible sourcing.

Legal and policy provisions needed for the realisation of human rights (Target 1) and a circular economy (Target 2) are relevant to responsible production. The rights of workers, fair pay and efforts to combat inequality are also critical. Production is only responsible if the workers who produce goods are not exploited within a system where others capture an excessive and unjust proportion of the wealth created. As understanding of the widespread negative consequences of severe economic inequality and efforts to combat this gain prominence internationally, the inequality that characterises the global electronics supply chain requires action. Across the value chain, substantial wealth is extracted while the imposition of "externality" costs and poor pay and labour conditions characterise the chain itself.

### Enabling rights: freedom of association and the right to know

For workers in the electronics supply chain, freedom of association and the right to know are key enabling rights to realise decent working conditions. The right to know embraces the right to access all information that may impact or is necessary to realise workers' rights, including all information that affects their lives and livelihoods. The right to information is indivisible from the core labour rights to participation and association. The UN Special Rapporteur on toxics and human rights argues that the right to information, for instance in relation to toxic substances, is the foundation for the realisation of many other rights such as to health, to life, to refuse unsafe work and to a safe and healthy work environment (GoodElectronics Network et al. 2020).

Workers' right to information encompasses corporate information; business practices between buyers and suppliers; position of the company in the value chain; details of facilities and the workforce; due diligence policies and practices, including risks, findings and outcomes, and specifics of materials, components, processes and products.

[22] See Tax Justice Network, Unitary tax explained (2019) and Fair Tax Mark, Standards and Guidance Notes (no date).

Freedom of association is "a fundamental human right proclaimed in the Universal Declaration of Human Rights" (ILO 2016). Freedom of association and the right to collective bargaining are of fundamental importance. When workers are free to organise, join a trade union and negotiate working conditions, they have the ability to secure decent conditions in general. In practice, electronics workers are often denied these rights. Companies often undermine union organising and collective bargaining by hiring workers with temporary contracts whose position is already weak; and regular workers can face reprisals if they organise or join a union (GoodElectronics, no date).

### Recruitment fees

The practice of making workers pay recruitment fees is a major issue in the manufacturing sector in Asia, including in electronics. Workers pay the equivalent of three to four years' wages in their home country (e.g. Indonesia, Vietnam) to access jobs abroad at suppliers of major international brands. While paying off huge debts to their recruiters, they experience what can be called "debt bondage". They cannot afford to lose their job at the foreign employer for which they (or their family) paid so much. They are in a very precarious situation and vulnerable to exploitation.

Some company codes of conduct recognise this issue. The Apple code says: "Workers shall not be required to pay employers' or their agents' recruitment fees or other similar fees to obtain their employment. If such fees are found to have been paid by Workers, such fees shall be repaid to the worker" (Apple 2022). However, known cases of workers being compensated are very rare (Tagesschau 2023).

## RECOMMENDATIONS FOR INDUSTRY TO 2025

In addition to the recommendations under Targets 1 and 2, industry should look at the issue of workers' pay and at economic inequality across the value chain of electronics. Central to the idea of responsible production is that the workers who mine, smelt, refine, process, sell and recycle are paid fairly and have decent conditions of work.

### Mining

The electronics industry has made efforts to ensure responsible production, focusing mainly on reducing and mitigating negative impacts arising from mining. Doubling down on these efforts is critical. Companies must, in the words of the UNGPs, "know and show" when it comes to their impact on people and the environment at mine sites. Greater transparency is required.

### Processing

As noted elsewhere in this roadmap, the processing stages of the supply chain (refining, smelting, and so on) have generally received less attention from policy makers, industry, CSOs and researchers than mining. Responsible production, human rights and circular economy goals require substantially greater focus on key issues at processing facilities, including workers' exposure to waste, waste generation and treatment, and workers' rights including a fair wage.

### Components and finished goods

Many CSO reports over the years reflect how brands' buying practices such as pricing, lead times and technical specifications directly impact working conditions including labour rights violations at component and contract manufacturers. Brand companies have enormous leverage over the chain

due to their purchasing and economic power. Contract manufacturing is labour intensive, with some manufacturers employing hundreds of thousands of workers. These manufacturers often operate with small profit margins, and are extremely dependent on their main clients. The biggest client sometimes represents more than half of their total revenue. The power imbalance makes them accept the brand's terms, often at the expense of working conditions (see State of Play report).

Responsible production also links with the circular economy priority of not promoting obsolescence. Marketing and advertising should not encourage rampant consumerism but should provide people with clear information on how goods are responsibly produced. Industry schemes may be part of this, but social auditing and verification schemes too often involve "greenwashing".

Providing clear information about measures for responsible production will help change the narrative and combat levels of consumerism that drive unsustainable production of electronic and technical goods. Given that the business model both drives and is driven by increasing consumption, shifting the model to focus on meeting universal wellbeing needs while producing and consuming less requires a paradigm change that policy makers should support.

The goal of increasing and changing public awareness links closely to supply chain transparency. Companies and brands at the end of the supply chain should redouble efforts to ensure they know their supply chain fully. Responsible production is impossible if the source of inputs cannot be identified. Where full supply chain identification has proved challenging in the past, companies should invest in research and work openly with civil society, academia and research institutions. It is important to move these issues out of compliance boxes inside companies and into core corporate values. Milestones on social and environmental impacts and on payment of workers cannot be achieved without transparency on the chain. Only by identifying problems along the chain can there be clear plans to remedy and mitigate.

### Working conditions and traceability

As we discuss above, industry needs to fully respect the enabling workers' rights of freedom of association, the right to collective bargaining and the right to know across the supply chain. These rights enable workers to secure decent working conditions, including fair wages, and a safe and healthy working environment.

Companies should also publicly commit to ensuring that all workers have a living wage as a minimum standard, and that company supply chain reviews will identify where workers are not paid fairly.

There is a significant gap in the tracing of raw materials. Industry can take action to enable traceability. This is closely linked to due diligence in the supply chain, and industry should get ahead of legislation and develop traceability measures, working collaboratively.

**RECOMMENDATIONS**

- Make public commitments to embrace due diligence beyond tier 1 and strengthen supply chain transparency.
- Commit to reduction in use of virgin raw materials and full respect for human rights, including the right to fair pay and good working conditions, and environment in the supply chain.
- Publish due diligence action across the supply chain.
- Develop, implement and report on sustainability strategies.
- Enact sustainable buying practices.

### 2.3.2 Milestones 2030

- Achievement of SDGs 6, 7, 8, 9, 10, 12, 13, 14 and 15 along the supply chain.
- Policy framework for new business model established.
- Fair living wage and respect for workers' labour rights achieved across the chain.
- Forced-labour-free and child-labour-free electronics supply chains.
- Moderate profit-driven production.
- Responsible purchasing practices established by electronics brand companies.
- Fullest possible supply chain transparency achieved in electronics.
- Import ban on goods that expose workers to dangerous chemicals without safety measures.
- Full tax payment transparency for all countries in supply chain.

**Overall considerations to 2030**

Achieving the 2030 milestones on responsible production requires deeper economic shifts. The 2025 milestones set the trajectory for deeper change, and provide industry with sufficiently clear signals to ensure relevant transitions in the business model can be accomplished. By 2030, several core areas of responsible production should be achieved.

As 2030 is the deadline for achieving the SDGs, it is important to look at the intersection of SDGs and the electronics sector. Responsible production and achievement of several SDGs are interlinked.

Policy makers and industry should aim for continuous improvement through a combination of raising targets in all key areas (energy use, waste, recycling, transparency) and public education to reshape demand for electronics.

#### RECOMMENDATIONS FOR INDUSTRY TO 2030

Industry should continue to transition its business model away from shareholder-dominated profit maximisation to meeting human wellbeing needs within planetary boundaries.

Electronics companies should use their supply chain mapping to identify and publish plans and targets to move as much of their supply chain as possible to 100% renewable energy, ensure fair payment of workers and prevent harmful social and environmental impacts. Although not all of these issues are entirely within the power of multinational companies to achieve, transparent and good-faith efforts should be central to their core mission. Industry should avoid reliance on compliance approaches, and set out its own supply chain plans, indicating where progress is possible and where not. Such transparency is critical to enable policy makers, trade unions, workers' rights activists and CSOs to help unblock challenges.

As noted in the Renewable Energy Sector Roadmap, the practice of moving production to countries with lower environmental and social standards to save production costs has no place in responsible production. Nor should companies exit problem areas irresponsibly.

Responsible production requires more attention to artisanal and small-scale mining (ASM) and how the rights, safety and decent livelihoods of artisanal and small-scale miners can be protected. Industry should also not engage in actions that do not involve the affected people. Efforts to formalise the ASM

sector have too frequently been heavy-handed and resulted in lost livelihoods and human rights violations.

While reducing overall demand for minerals for electronics, industry should also ensure robust support for local content (local procurement). As the renewable energy roadmap notes, mining companies have significant spending power, which they should use to support not only local businesses but also local development. Ensuring proper payment of taxes in all countries of operation without artificial profit shifting is important in this regard.[23] Ending abusive transfer pricing practices and refraining from negotiating deals outside of national legislative frameworks are important reforms for industry.

Efforts to reduce overall use of energy in the electronics supply chain and action to make the supply chain close to 100% renewably powered require a combination of innovations in how extraction and processing are undertaken and a full mapping of the chain and high energy use points. For the latter, identification of the energy use of, for example, smelters is a prerequisite for action to support a transition directly or via interventions with policy makers.

**RECOMMENDATIONS**

- Continue to transition the business model from shareholder-dominated short-term profit maximisation to meeting universal wellbeing needs within planetary boundaries.
- Use supply chain mapping to identify and publish plans to move the supply chain to 100% renewable energy, ensure fair payment of workers (living wage) and prevent harmful social and environmental impacts.
- End the practice of moving production to countries with lower environmental and social standards to save costs; never exit problem areas irresponsibly.
- Support the human-rights-respecting formalisation of ASM.
- Refrain from actions or operations without the consent of affected people.
- While reducing overall demand for minerals for electronics, ensure robust support for local content (procurement).
- Refrain from lobbying against policies intended to address economic inequality.

### 2.3.3 Milestones 2050

- All electronic goods produced with minimal new raw material and maximum recycled material.
- Workers' rights and fair pay fully realised across the electronics supply chain.
- Legal basis for accountability for negative impacts along the entire supply chain established (no pollution, etc.).
- Consumer expectation of responsible production solidified.
- Significantly improved revenues in supply chain countries.

[23] See Tax Justice Network 2019 and the Fair Tax Mark's accreditation standards (Fair Tax Mark, no date).

## RECOMMENDATIONS FOR INDUSTRY TO 2050

As noted under Targets 1 and 2, moving towards 2050, industry should progress away from the current emphasis on short-term shareholder value and profit maximisation. The pathway to socially responsible businesses that are fully accountable to wider stakeholders who are not conflicted by financial interests will require substantial planning, supported by legislative change.

**RECOMMENDATIONS**

- Complete reform of the business model away from profit led to social purpose led (social equity and ecological sustainability).
- Fully embrace the imperative of comprehensive business social and environmental accountability.

# 3 Conclusion

This roadmap for responsible sourcing for the electronic equipment sector presents major and urgent challenges for all three stakeholder groups addressed – policy makers, industry and civil society – and for the general public. In this respect it is no different from the other two roadmaps in the RE-SOURCING project, on renewable energy and mobility. There is huge urgency in addressing these challenges with minimum delay to avert climate disaster and further destruction of biodiversity, human life chances and wellbeing. There can be no environmental responsibility without corresponding responsibility towards universal human rights, or vice versa. And human rights in this context very much include economic, social and cultural as well as civil and political rights.

Only fully transformative change, achieved strategically across all sectors of the economy and society will be enough. The prevailing linear, short-term, shareholder-dominated and profit-maximising business model must give way, as must the fixation on GDP and economic growth, in favour of the goal of achieving wellbeing within planetary boundaries for all people and communities, leaving no one behind – in the words of the central promise of the Sustainable Development Goals – wherever in the world people may happen to live.

The EU, its policy makers, industries, civil society and citizens can be standard bearers and trailblazers for the changes needed, but only by truly "walking the talk" of social, environmental and economic sustainability. All actors should work together to play their part. There is no time to waste.

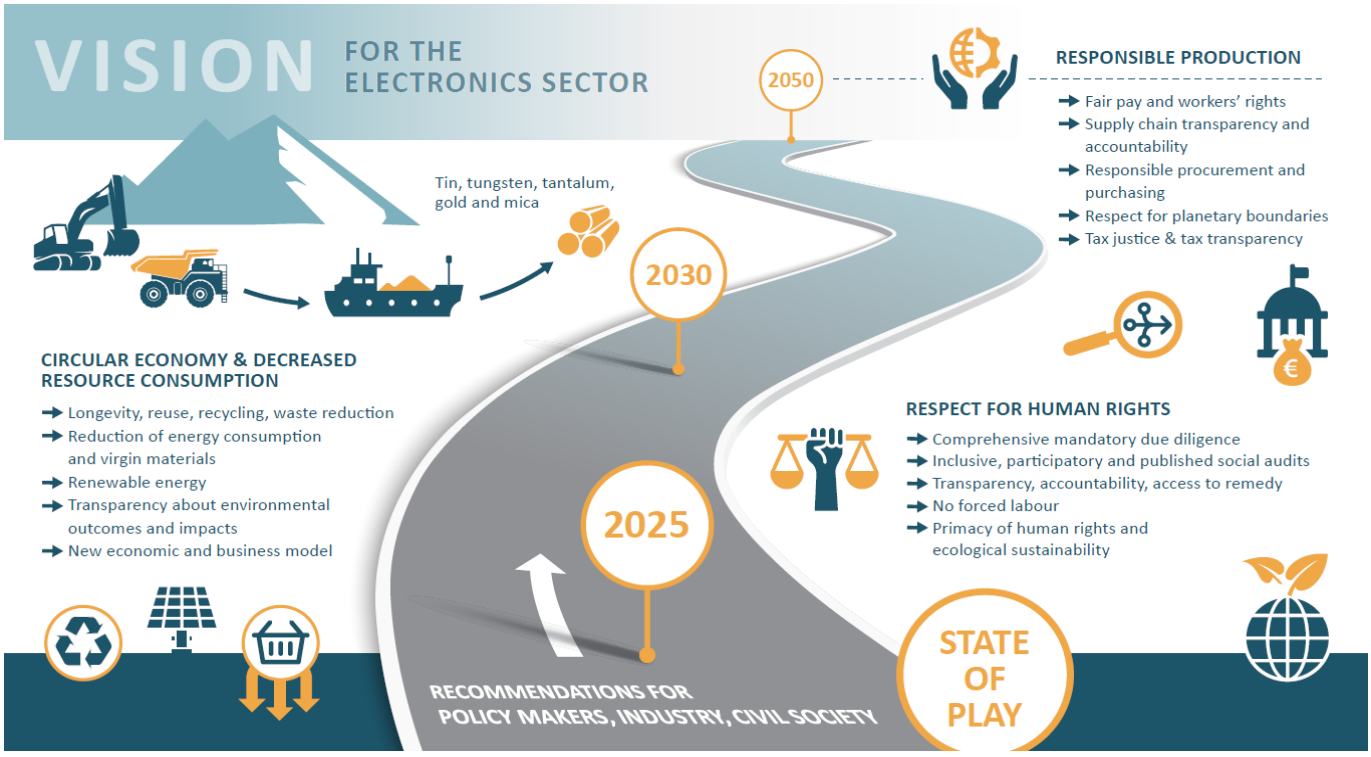


*Figure 5: Roadmap for the electronics sector until 2050*

# 4 Publication Bibliography

*Note: This shorter document for industry contains, unedited, the same bibliography as the full Electronic Equipment Sector Roadmap for Responsible Sourcing of Raw Materials, published here.*

Amnesty International (2014) Injustice incorporated: Corporate abuses and the human right to remedy. Amnesty Index Number: POL 30/001/2014, https://www.amnesty.org/en/documents/pol30/001/2014/en/, last accessed 24/04/2023.

Amnesty International (2023) EU: New business sustainability law must be strengthened to protect human rights, May 2023, https://www.amnesty.org/en/latest/news/2023/05/eu-new-business-sustainability-law-must-be-strengthened-to-protect-human-rights/, last accessed 17/05/2023.

Apple (2022) Apple Supplier Code of Conduct, https://www.apple.com/supplier-responsibility/pdf/FY23-Supplier-Code-of-Conduct-and-Supplier-Responsibility-Standards.pdf, last accessed 21/04/2023.

Barton, Dominic; Horváth, Dezsö; Kipping, Matthias (eds) (2016) Re-Imagining Capitalism. Oxford University Press.

Betz, Johannes; Degreif, Stefanie; Dolega, Peter (2021) State of Play and Roadmap Concept for the Mobility Sector. RE-SOURCING, April 2021, https://re-sourcing.eu/reports/sop-mobility-sector/, last accessed 10/05/2023.

B Team (no date) We advocate for economic systems change and new corporate norms — to protect our natural environment and secure a safe, sustainable and equitable future for all, https://bteam.org/.

Business & Human Rights Resource Centre (2021) Transition Minerals Tracker: Regional analysis of human rights policies and practices, https://tinyurl.com/4pnazzd8.

Capacity4dev (2016) Logical Framework Approach for Project and Programme Cycle Management. Session 10: Indicators (I) – Indicators, baselines, targets and milestones. Methodological Knowledge Sharing programme, August 2016, https://europa.eu/capacity4dev/rom/documents/session-10-indicators-i-indicators-baselines-targets-and-milestones-0, last accessed 09/03/2023.

Chatham House (2023) Europe's pursuit of securing critical raw materials for the green transition, https://www.chathamhouse.org/2023/04/europes-pursuit-securing-critical-raw-materials-green-transition-0.

Clarke, Clifton (2022) Protecting Shareholder Value: Unethical Corporate Leadership Threatens the American Dream. Journal of Intercultural Management and Ethics 5 (2), DOI:10.35478/jime.2022.2.02.

Clean Clothes Campaign; European Center for Constitutional and Human Rights; Public Eye; SOMO (2022a) Respecting Rights or Ticking Boxes? Legislating Human Rights Due Diligence, https://www.somo.nl/respecting-rights-or-ticking-boxes/?noredirect=en-GB, last accessed 30/03/2023.

Clean Clothes Campaign et al. (2020b) Civil Society Statement on the Proposed Regulation on Prohibiting Products Made with Forced Labour on the European Union Market, https://cleanclothes.org/news/2022/statement-on-proposed-eu-regulation-prohibiting-products-made-with-forced-labour, last accessed 30/03/2023.

Council of the European Union (2023) Council and Parliament strike deal on energy efficiency directive, press release, March 2023, https://www.consilium.europa.eu/en/press/press-releases/2023/03/10/council-and-parliament-strike-deal-on-energy-efficiency-directive/, last accessed 22/05/2023.

DEAL (Doughnut Economics Action Lab) (2021) About Doughnut Economics, https://doughnuteconomics.org/about-doughnut-economics, last accessed 15/03/2023.

Dedeurwaerdere, Tom (2014) Sustainability Science for Strong Sustainability. Edward Elgar Publishing, https://www.elgaronline.com/view/9781783474554.xml, last accessed 09/03/2023.

Degreif, Stefanie; Farooki, Masuma; Endl, Andreas; Barriere, Noé; Berger, Gerald; Schluep, Mathias; et al. (2020) The RE-SOURCING Common Approach. RE-SOURCING, March 2020, http://re-sourcing.eu/reports/d12-

in-rs-template-final/, last accessed 09/03/2023.

Degreif, Stefanie; Betz, Johannes (2022) Mobility Sector: Roadmap for Responsible Sourcing of Raw Materials until 2050. RE-SOURCING, July 2022, https://re-sourcing.eu/reports/re-sourcing-mobility-sector-roadmap/, last accessed 09/03/2023.

Earthworks et al. (2019) NGO letter to the World Bank re Mining & Renewables, https://earthworks.org/resources/ngo-letter-to-the-world-bank-re-mining-renewables, last accessed 09/05/2023.

Ekins, Paul; Simon, Sandrine; Deutsch, Lisa; Folke, Carl; Groot, Rudolf De (2003) A framework for the practical application of the concepts of critical natural capital and strong sustainability. Ecological Economics 44 (2–3), 165–185, DOI:10.1016/S0921-8009(02)00272-0.

European Commission (2018) Commission Recommendation (EU) 2018/1149 on non-binding guidelines for the identification of conflict-affected and high-risk areas and other supply chain risks under Regulation (EU) 2017/821 of the European Parliament and of the Council, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H1149&rid=1.

European Commission (2019a) The European Green Deal. Communication from the Commission, COM/2019/640 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588580774040&uri=CELEX%3A52019DC0640, last accessed 09/03/2023.

European Commission (2019b) Clean energy for all Europeans, https://data.europa.eu/doi/10.2833/9937, last accessed 09/03/2023.

European Commission (2019c) Sustainable industry, European Green Deal, https://ec.europa.eu/commission/presscorner/api/files/attachment/859442/Sustainable_industry_en.pdf, last accessed 09/03/2023.

European Commission (2020a) Circular Economy Action Plan, European Green Deal, https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en#:~:text=The%20EU's%20new%20circular%20action,new%20agenda%20for%20sustainable%20growth , last accessed 09/03/2023.

European Commission (2020b) Study on directors' duties and sustainable corporate governance: Final report, https://op.europa.eu/en/publication-detail/-/publication/e47928a2-d20b-11ea-adf7-01aa75ed71a1/language-en, last accessed 29/03/2023.

European Commission (2021a) Commission Staff Working Document Impact Assessment Report accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment, https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX:52021SC0245, last accessed 14/03/2023.

European Commission (2021b) Proposal for a Directive of the European Parliament and of the Council on energy efficiency (recast), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0558, last accessed 14/03/2023.

European Commission (2022a) Proposal for a regulation on prohibiting products made with forced labour on the Union market, COM(2022) 453, https://single-market-economy.ec.europa.eu/document/785da6ff-abe3-43f7-a693-1185c96e930e_en, last accessed 30/03/2023.

European Commission (2022b) Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC, COM(2022) 142, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022PC0142, last accessed 10/05/2023.

European Commission (2023a) Proposal for a Directive of the European Parliament and of the Council on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394, Directives (EU)

2019/771 and (EU) 2020/1828, COM(2023) 155 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0155, last accessed 10/05/2023.

European Commission (2023b) Proposal for a regulation of the European Parliament and of the Council establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/102, https://single-market-economy.ec.europa.eu/publications/european-critical-raw-materials-act_en, last accessed 20/03/2023.

European Commission (no date) Batteries, https://environment.ec.europa.eu/topics/waste-and-recycling/batteries_en#law, last accessed 20/03/2023.

European Commission (no date) Corporate sustainability due diligence, https://commission.europa.eu/business-economy-euro/doing-business-eu/corporate-sustainability-due-diligence_en, last accessed 20/03/2023.

European Commission (no date) Energy efficiency directive, https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en#:~:text=The%20recast%20proposal%20raises%20the,the%202020%20reference%20scenario%20projections, last accessed 14/03/2023.

European Commission (no date) Green Public Procurement, https://ec.europa.eu/environment/gpp/index_en.htm, last accessed 21/03/2023.

European Environmental Bureau (2019) Revealed: The climate cost of “disposable smartphones”, https://eeb.org/revealed-the-climate-cost-of-disposable-smartphones/, last accessed 30/03/2023.

European Environmental Bureau (no date) 100% renewables future, https://eeb.org/work-areas/climate-change/renewable-energy/, last accessed 23/05/2023.

European Network of National Human Rights Institutions (no date) Human Rights-Based Approach, https://ennhri.org/about-nhris/human-rights-based-approach/.

European NGO Coalition on Conflict Minerals; European Network for Central Africa; International Peace Information Service (IPIS); PAX; et al. (2021) The EU Conflict Minerals Regulation: Implementation at the EU Member State level, https://ipisresearch.be/wp-content/uploads/2021/06/Review-paper-on-EU-Conflict-Minerals-Regulation-1-1.pdf.

European Parliament (2020a) Answer given by Mr Reynders on behalf of the European Commission, 13 May 2020, https://www.europarl.europa.eu/doceo/document/E-9-2019-004171-ASW_EN.html,m last accessed 17/05/2023.

European Parliament (2020b) Resolution of 13 February 2020 on child labour in mines in Madagascar, https://www.europarl.europa.eu/doceo/document/TA-9-2020-0037_EN.html, last accessed 30/03/2023.

European Parliament (2022) Revision of the Ecodesign Directive, https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/699502/EPRS_BRI(2022)699502_EN.pdf, last accessed 31/03/2023.

European Parliament (2023a) Legislative Train Schedule: Circular electronics initiative, https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-circular-electronics, last accessed 24/04/2023.

European Parliament (2023b) Proposal for a ban on goods made using forced labour, https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/739356/EPRS_BRI(2023)739356_EN.pdf, last accessed 30/03/2023.

European Union (2006) Consolidated text: Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC [Batteries Regulation], https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006L0066-20180704, last accessed 20/03/2023.

European Union (2017) Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas [Conflict Minerals Regulation], http://data.europa.eu/eli/reg/2017/821/oj/eng, last accessed 20/03/2023.

Fair Tax Mark (no date) Standards and Guidance Notes, https://fairtaxmark.net/why-get-the-mark/criteria-and-standards/, last accessed 11/05/2023.

Farooki, Masuma; et al. (2020) The International Responsible Sourcing Agenda: State-of-Play. RE-SOURCING, April 2020, https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5e060a5ca&appId=PPGMS, last accessed 09/03/2023.

Farooki, Masuma; González, Alejandro; Schipper, Irene (2023) Meeting the Milestones in the Responsible Sourcing Roadmap: Good Practice Guidelines for the Electronics Sector. RE-SOURCING, April 2023, https://re-sourcing.eu/reports/good-practice-guidelines-electronics-sector/.

FEDARENE (European Federation of Agencies and Regions for Energy and the Environment) (2022) New study on the benefits of a higher EU Energy Efficiency target, December 2022, https://fedarene.org/new-study-on-the-benefits-of-a-higher-eu-energy-efficiency-target/, last accessed 22/05/2023.

Fitzgerald, Maggie (2019) The CEOs of nearly 200 companies just said shareholder value is no longer their main objective. CNBC, August 2019, https://www.cnbc.com/2019/08/19/the-ceos-of-nearly-two-hundred-companies-say-shareholder-value-is-no-longer-their-main-objective.html.

González, Alejandro; Schipper, Irene (2021) State of Play and Roadmap Concepts for the Electronics Sector. RE-SOURCING, December 2021, http://re-sourcing.eu/reports/final-sop-eees/, last accessed 17/05/2023.

GoodElectronics Network (no date) Freedom of association, https://goodelectronics.org/topic/freedom-association/, last accessed 24/04/2023.

GoodElectronics Network; SOMO; Business, Human Rights and the Environment Research Group (2020) Beyond corporate transparency: The right to know in the electronics industry, https://goodelectronics.org/beyond-corporate-transparency/, last accessed 30/03/2023.

HEC Paris (2021) Activist Hedge Funds: Good for Some, Bad for Others? https://www.hec.edu/en/knowledge/articles/activist-hedge-funds-good-some-bad-others.

ICMM (International Council on Mining and Metals) (no date (a)) Responsible Production, https://www.icmm.com/en-gb/our-principles/mining-principles/principle-8, last accessed 15/03/2023.

ICMM (no date (b)) SDG 12: Responsible Consumption and Production, https://www.icmm.com/en-gb/our-work/supporting-the-sustainable-development-goals/responsible-consumption-and-production, last accessed 15/03/2023.

IFC (International Finance Corporation) (2012) Performance Standard 3: Resource Efficiency and Pollution Prevention, https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards/ps3, last accessed 15/03/2023.

ILO (2016) Freedom of Association and Collective Bargaining, https://www.ilo.org/global/topics/dw4sd/themes/freedom-of-association/lang--en/index.htm, last accessed 31/03/2023.

ILO (2022) Global Estimates of Modern Slavery: Forced Labour and Forced Marriage, https://www.ilo.org/global/topics/forced-labour/publications/WCMS_854733/lang--en/index.htm , last accessed 30/03/2023.

ILO (2023) Tripartite declaration of principles concerning multinational enterprises and social policy (MNE Declaration), https://www.ilo.org/empent/Publications/WCMS_094386/lang--en/index.htm, last accessed 30/03/2023.

IPIS (2022) Urban mining and e-waste exports: overview and recent initiatives, https://ipisresearch.be/weekly-briefing/urban-mining-and-e-waste-exports-overview-and-recent-initiatives/, last accessed 15/05/2023.

IRMA (no date) What we do, https://responsiblemining.net/what-we-do/, last accessed 15.05.2023.

Jackson, Tim (2017) Prosperity without Growth: Foundations for the Economy of Tomorrow. Routledge (Taylor & Francis Group).

Koram Kojo (2022) Uncommon wealth: Britain and the aftermath of empire. John Murray.

Korten, David (2015) When Corporations Rule the World. Berrett-Koehler Publishers.

Kügerl, Marie-Theres; Tost, Michael (2021a) State of Play and Roadmap Concepts for the Renewable Energy sector. RE-SOURCING, February 2021, https://re-sourcing.eu/reports/08022021-re-sourcing-wp4-d41-v2-res/, last accessed 10/05/2023.

Kügerl, Marie-Theres; Tost, Michael (2021b) Renewable Energy Sector: Roadmap for Responsible Sourcing of Raw Materials until 2050. RE-SOURCING, August 2021, https://re-sourcing.eu/static/7d58b046a89ea05c923f24fa3bbbf0bf/final_res_roadmap_2021.pdf, last accessed 28/07/2022.

Maastricht Principles on Extraterritorial Obligations of States in the area of Economic, Social and Cultural Rights (2011) https://www.ciel.org/project-update/extra-territorial-obligations-etos/, last accessed 20/03/2023.

Mancini, Lucia; Eslava, Nicolas A.; Traverso, Marzia; Mathieux, Fabrice (2021) Assessing impacts of responsible sourcing initiatives for cobalt: Insights from a case study, Resources Policy 71, 102015, DOI:10.1016/j.resourpol.2021.102015.

OECD (2011) Guidelines for Multinational Enterprises, http://mneguidelines.oecd.org/guidelines/, last accessed 20/03/2023.

OECD (2016) Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, https://www.oecd.org/daf/inv/mne/OECD-Due-Diligence-Guidance-Minerals-Edition3.pdf, last accessed 09/03/2023.

OECD (2018) Due Diligence Guidance for Responsible Business Conduct, https://www.oecd.org/investment/due-diligence-guidance-for-responsible-business-conduct.htm, last accessed 30/03/2023.

OECD (2021) Frequently Asked Questions: How to address bribery and corruption risks in mineral supply chains, https://mneguidelines.oecd.org/faq-how-to-address-bribery-and-corruption-risks-in-mineral-supply-chains.pdf, last accessed 30/03/2023.

OECD Watch; Swedwatch; European Coalition for Corporate Justice; European Center for Constitutional and Human Rights; SOMO (2022) Downstream due diligence: Setting the record straight, https://www.somo.nl/wp-content/uploads/2022/12/Downstream-due-diligence.pdf, last accessed 30/03/2023.

OHCHR (no date) About the 2030 Agenda for Sustainable Development and human rights, https://www.ohchr.org/en/sdgs, last accessed 30/03/2023.

Oxfam (2002) Rigged Rules and Double Standards: Trade, globalisation, and the fight against poverty, https://tinyurl.com/5n99dutw.

Oxford Brookes University (2022) Researchers agree: The world can reach a 100% renewable energy system by or before 2050, August 2022, https://www.brookes.ac.uk/About-Brookes/News/2022/08/Researchers-agree-The-world-can-reach-a-100-renewa, last accessed 23/05/2023,

PACE (Platform for Accelerating the Circular Economy) (no date) The Electronics Program, https://pacecircular.org/action-agenda/electronics, last accessed 15/03/2023.

PubAffairs Bruxelles (2022) Right to repair: MEPs want more durable and more easily repairable products, https://www.pubaffairsbruxelles.eu/eu-institution-news/right-to-repair-meps-want-more-durable-and-more-

easily-repairable-products/, last accessed 09/05/2023.

Purvis, Ben; Mao, Yong; Robinson, Darren (2019) Three pillars of sustainability: in search of conceptual origins. Sustainability Science 14 (3), 681–695, DOI:10.1007/s11625-018-0627-5.

Quijano, Gabriela; Wilde-Ramsing, Joseph (2022) A piece, not a proxy: The European Commission's dangerous overreliance on industry schemes, multi-stakeholder initiatives, and third-party auditing in the Corporate Sustainability Due Diligence Directive. SOMO, https://www.somo.nl/wp-content/uploads/2022/11/A-piece-not-a-proxy.pdf, last accessed 30/03/2023.

Raworth, Kate (2017) Doughnut economics: Seven ways to think like a 21st-century economist. Random House.

RE100 (no date) We are accelerating change towards zero carbon grids at scale, https://www.there100.org/, last accessed 12/05/2023.

Responsible Mica Initiative (no date) https://responsible-mica-initiative.com/.

Reuters (2023) EU strikes deal to curb energy use by 2030, March 2023, https://www.reuters.com/business/energy/eu-reaches-agreement-to-reduce-energy-consumption-eu-level-by-117-2030-2023-03-10/, last accessed 22/05/2023.

Right to Repair (2021) Part pairing: a major threat to independent repair, https://repair.eu/news/part-pairing-a-major-threat-to-independent-repair/, last accessed 30/03/2023.

Right to Repair (2023) Not yet accessible, affordable nor mainstream: campaigners tighten the screw on new EU Right to Repair proposal, https://repair.eu/news/not-yet-accessible-affordable-nor-mainstream-campaigners-tighten-the-screw-on-new-eu-right-to-repair-proposal/, last accessed 30/03/2023.

Ritthof, Michael; Rohn, Holger; Liedtke, Christa; Merten, Thomas (2002) Calculating MIPS: Resource productivity of products and services. Wuppertal Institut for Climate, Environment and Energy at the Science Centre North Rhine-Westphalia, https://epub.wupperinst.org/frontdoor/deliver/index/docId/1577/file/WS27e.pdf, last accessed 12/05/2023.

Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F. S., III; Lambin, E.; et al. (2009) Planetary Boundaries: Exploring the Safe Operating Space for Humanity. Ecology and Society 14(2), 32, http://www.ecologyandsociety.org/vol14/iss2/art32/, last accessed 09/03/2023.

Rodriguez, Jenny (2020) How to start decolonising your business. University of Manchester Alliance Manchester Business School, https://www.alliancembs.manchester.ac.uk/original-thinking-applied/original-thinkers/how-to-start-decolonising-your-business/#:~:text=Decolonising%20is%20an%20attempt%20to,that%20consider%20many%20diverse%20voices, last accessed 10/05/2023.

Rohn, Holger; Pastewski, Nico; Lettenmeier, Michael; Wiesen, Klaus; Bienge, Katrin (2014) Resource efficiency potential of selected technologies, products and strategies. Science of the Total Environment 473-474, 32–35, DOI: 10.1016/j.scitotenv.2013.11.024.

Sarker, Shuronjit Kumar; Haque, Nawshad; Bhuiyan, Muhammed; Bruckard, Warren; Pramanik, Biplob Kumar (2022) Recovery of strategically important critical minerals from mine tailings. Journal of Environmental Chemical Engineering 10(3), https://www.sciencedirect.com/science/article/abs/pii/S221334372200495X, last accessed 11/05/2023.

Shift (2023) From Policing to Partnership: Designing an EU Due Diligence Duty that Delivers Better Outcomes, May 2023, https://www.amnesty.org/en/latest/news/2023/05/eu-new-business-sustainability-law-must-be-strengthened-to-protect-human-rights/, last accessed 17/05/2023.

Shift and Mazars (no date) The UN Guiding Principles Reporting Framework, https://www.ungpreporting.org/, last accessed 31/03/2023.

Simpson, Alan; Hines, Colin; Murphy, Richard (2003) People's pensions: New thinking for the twenty-first century. New Economics Foundation, https://neweconomics.org/uploads/files/5ddea38e3ffca8bef3_com6y1pby.pdf, last accessed 17/05/2023.

SOMO (2016) Should I stay or should I go? Exploring the role of disengagement in human rights due diligence, https://www.somo.nl/should-i-stay-or-should-i-go/.

SOMO (2023) Ten reasons why the European Commission's proposed Critical Raw Materials Regulation is not sustainable – and how to fix it, https://www.somo.nl/somo-position-paper-on-critical-raw-materials-regulation/.

SOMO; Terre des Hommes (2019) Child Labour in Madagascar's Mica Sector, https://www.somo.nl/child-labour-in-madagascars-mica-sector/, last accessed 30/03/2023.

Steffen, Will; Richardson, Katherine; Rockström, Johan; Cornell, Sarah E.; Fetzer, Ingo; Bennett, Elena M.; et al. (2015) Planetary boundaries: guiding human development on a changing planet. Science 347 (6223), DOI:10.1126/science.1259855.

Tagesschau (2023) First compensations for migrant workers [trans.], https://www-tagesschau-de.translate.goog/investigativ/lieferkettengesetz-entschaedigungen-wanderarbeiter-101.html?_x_tr_sl=de&_x_tr_tl=en&_x_tr_hl=en-US&_x_tr_pto=wapp, last accessed 21/04/2023.

Tax Justice Network (2019) Unitary tax explained: infographic, https://taxjustice.net/2019/11/21/unitary-tax-explained-infographic/, last accessed 21/03/2023.

UNFCC (2015) The Paris Agreement, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement, last accessed 09/03/2023.

United Nations (2011) Guiding Principles on Business and Human Rights, https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf, last accessed 20/03/2023.

United Nations (2015) Paris Agreement, https://unfccc.int/sites/default/files/english_paris_agreement.pdf, last accessed 09/03/2023.

United Nations Special Rapporteur on Human Rights Defenders (2023) HRDs and the progress of the EU's Corporate Sustainability Due Diligence Directive, https://srdefenders.org/resource/hrds-and-the-progress-of-the-eu-corporate-sustainability-due-diligence-directive/, last accessed 17/05/2023.

United Nations Sustainable Development Group (no date) Universal Values Principle Two: Leave No One Behind, https://unsdg.un.org/2030-agenda/universal-values/leave-no-one-behind, last accessed 10/05/2023.

World Bank (no date) Climate-Smart Mining: Minerals for Climate Action, https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action, last accessed 15/03/2023.


Coordinated by:
Vienna University of Economics and Business, Institute for Managing Sustainability Welthandelsplatz 1A
1020 Vienna
phone: +43-1-31336-5452
email: info@re-sourcing.eu