



re-sourcing

Electronic Equipment Sector

**Roadmap for Responsible Sourcing of
Raw Materials until 2050**

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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

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 the 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-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

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.

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 CO₂ 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 RE-SOURCING Project

Responsible sourcing (RS) is increasingly becoming an imperative for policy makers, businesses and civil society. Some stakeholders are striving to keep pace with rapidly evolving recognition of ecological and social needs, government regulations, company practices and initiatives spearheaded by civil society.² Others have shown a relative lack of ambition.

In response to the growing challenge of responsible sourcing, **the RE-SOURCING Global Stakeholder Platform was started in 2020.**

RE-SOURCING, funded under the European Union's (EU) Horizon 2020 programme, is a four-year project coordinated by the Institute for Managing Sustainability at the Vienna University of Economics and Business. The project's consortium consists of 12 international partners in and outside the EU working together to create the RE-SOURCING Platform. The project's vision is to **advance and establish RS as a minimum requirement among EU and international stakeholders.** The project will foster the development of a globally accepted definition of RS, facilitate the implementation of RS practices through direct knowledge exchange within its network and beyond, and advocate for RS in international political forums.

To guarantee a thorough and comprehensive RS framework, RE-SOURCING takes a holistic approach by integrating companies and industries (upstream and downstream) across the mineral value chains of three sectors: Renewable Energy, Mobility and Electronics. All these sectors play a decisive role in the EU Green Deal and the clean energy transition. As such, RE-SOURCING's approach gives equal consideration to traditional minerals, conflict minerals and green tech minerals. The main target groups of the project are EU and international industry stakeholders, EU policy makers and civil society.

The RE-SOURCING project actions will:

- facilitate the development of a globally accepted definition of RS;
- develop ideas for incentives facilitating responsible business conduct in the EU to support RS initiatives;
- enable exchange between stakeholders for information and promotion of RS;
- foster the emergence of RS in international political fora; and
- support the European Innovation Partnership on Raw Materials.

RE-SOURCING will deliver:

- For EU and international business stakeholders:
 - increased capacity of decision-makers for implementing responsible business conduct;
 - better understanding and awareness of RS in the three sectors of renewable energy, mobility, and electric and electronic equipment; and
 - facilitated implementation of lasting and stable sectoral framework conditions for RS.
- For EU policy makers:
 - increased capacity for RS policy design and implementation;

² For more details see the [State-of-Play Report on the International Responsible Sourcing Agenda](#) (Farooki et al. 2020).

- innovative ideas on policy recommendations for stimulating RS in the private sector; and
- better understanding and awareness of RS in the three sectors of renewable energy, mobility, and electric and electronic equipment.
- For civil society:
 - integration of sustainable development and an environmental agenda into the RS discourse;
 - an established global level playing field of RS in international political fora and business agendas; and
 - better understanding and awareness of RS in the three sectors of renewable energy, mobility and electronics.

1.2 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.³ 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.⁴

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.

³ See [State of Play report](#), endnote 2.

⁴ See [State of Play report](#), endnote 4.

Gold mining is linked to organised crime and deforestation.⁵

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 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.⁶ 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.⁷ 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".⁸

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

⁵ See [State of Play report](#), endnote 23.

⁶ See [State of Play report](#), endnote 83.

⁷ Ibid.

⁸ See [State of Play report](#), endnote 5.

and limited credibility of, and overreliance on, audits.⁹ 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 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.

1.3 Methodology: The Roadmap Process

The roadmap approach and process are well suited for the RE-SOURCING project to develop a vision for responsible sourcing in the project’s three sectors: renewable energy, mobility and electronics.¹⁰ It allows for engagement with all the relevant stakeholders, i.e. European and international policy makers, businesses along raw materials value chains, civil society and academia. The process lends itself well to developing recommendations for action and collectively defining an agreed vision. To achieve the vision, recommendations for action were developed involving all relevant stakeholders. For details of this approach, see an earlier publication by the RE-SOURCING project, [The RE-SOURCING](#)

⁹ 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).

¹⁰ The methodology for the roadmap development was defined at the beginning of the RE-SOURCING project and is the same for all three sectors. This section is therefore based on the preceding roadmaps for the [Renewable Energy](#) and [Mobility](#) sectors.

Common Approach (Degreif et al. 2020):

“The initial development of the technology roadmapping [sic] approach in the late 1970s by Motorola (Willyard and McClees 1987) was to support the linkage of strategic product and technology plans. Having since evolved, the tool offers a key benefit, as it organises and clearly communicates the current achievements and challenges, and the future vision, juxtaposed with the means to realising said goal (Phaal et al. 2007). Roadmapping [sic] has become one of the most widely used approaches for driving innovation and strategy planning, both at firm and sector levels” (Degreif et al. 2020, p. 28).

The roadmap for the electronics sector, as well as for the other two sectors, is developed according to a predefined process (see Figure 1), which aims to involve as many stakeholders of this sector as possible, in order to obtain different views on all the relevant aspects of the supply chain. The aim is to achieve a result that is widely accepted and adopted by all the parties involved. The RE-SOURCING project is characterised by offering a multi-stakeholder platform that is open to all groups involved, in order to generate the largest possible pool of knowledge resources.

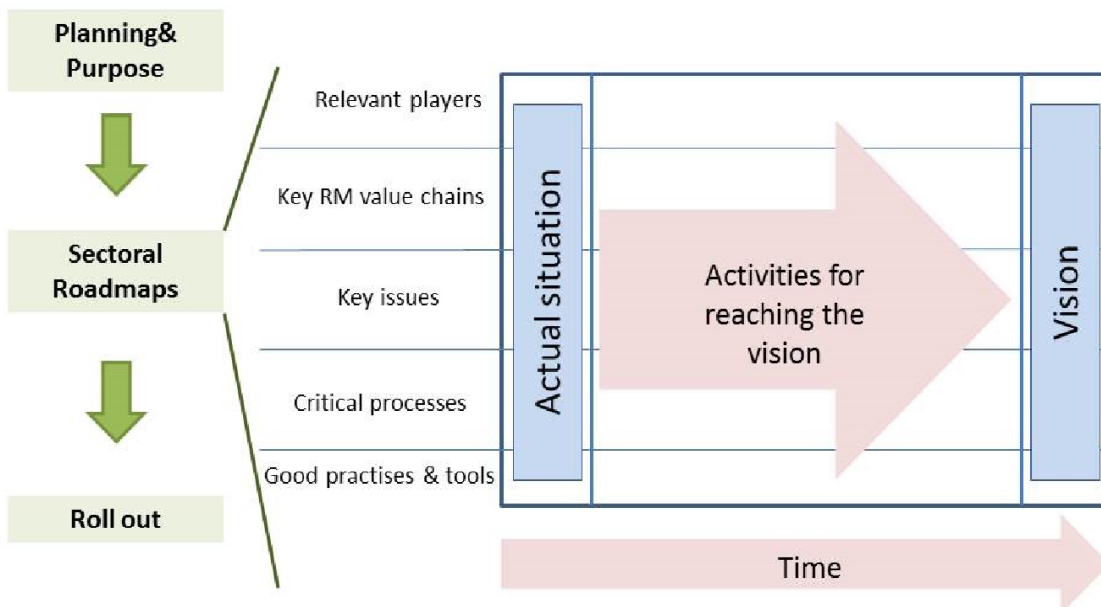


Figure 1: Roadmap process for the RE-SOURCING project

An important aspect is the open approach to problems in the supply chain. Only through open communication can problems be uncovered and solved through a joint effort. The RE-SOURCING project supports a risk-based approach. This means “activities associated with higher risks will require more intensive due diligence and monitoring activities” (OECD 2021).¹¹ Stakeholders should not be excluded because of prevailing issues, but rather supported in solving them. These issues and the current situation, including sustainability challenges, actors and initiatives along electronics supply chains, are described in detail in the [State of Play and Roadmap Concepts for the Electronics Sector](#) (see subsection 1.2 above for a short summary of the results).

The State of Play report was developed with input from the Platform Steering Committee and Advisory Board Members during online consultation meetings and further written feedback. A Roadmap Workshop, involving key stakeholder groups from the electronics sector, was held in September 2022,

¹¹ For more information on a risk-based due diligence process, see the OECD’s five-step framework (OECD 2016).

to identify and prioritise issues and challenges and frameworks to address these.

The next step was the detailed development of the roadmap, including providing recommendations for policy makers, industry and civil society to achieve the RE-SOURCING project's vision by 2050. For the roadmap development, two consultations took place via online webinars. The first consultation took place in January 2023, when the pillars and milestones were presented to the consortium members for their validation. A second consultation was held at the end of March 2023, with consortium partners, the Platform Steering Committee and the Advisory Board. Further interviews and information requests were conducted in parallel to broaden the feedback. A final general consultation with the project team, Advisory Board and Platform Steering Committee was organised in April/May 2023 to receive feedback on the written document.

A secondary contribution to the development of the roadmap for the electronics sector was the preparation of Good Practice Guidelines for policy makers and industry based on three case studies from the sector: (i) Supporting Responsible Workplace Practices – featuring the Responsible Mica Initiative; (ii) Empowering the Workforce – featuring Electronics Watch; (iii) Resource Efficiency & Product Longevity – featuring Fairphone (Farooki et al. 2023). The Good Practice Guidelines and the case studies are available in a single document on the project's website.¹²

The European Green Deal

In December 2019, the European Commission presented the [European Green Deal](#) with the aim of making “Europe the first climate-neutral continent by 2050” (European Commission 2019a). While the RE-SOURCING project's roadmap for the electronics sector supports the goals of the Green Deal, the authors also believe that more ambitious targets are required. This roadmap integrates many aspects of the Green Deal, especially from the strategies on clean energy (European Commission 2019b), sustainable industry (European Commission 2019c) and circular economy (European Commission 2020a). However, many of these aspects are included with a shorter timeframe.

1.4 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,¹³ planetary boundaries,¹⁴ strong sustainability¹⁵ and effective human rights due diligence¹⁶ 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

¹² <http://re-sourcing.eu/project-outputs/>.

¹³ For further information on the Paris Agreement, see the [UNFCCC](#) and the [legislation](#).

¹⁴ On planetary boundaries, see Rockström et al. 2009, Steffen et al. 2015 and Raworth 2017.

¹⁵ An explanation of the strong sustainability concept is provided by Ekins et al. 2003 and Dedeurwaerdere 2014.

¹⁶ 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](#).

- Circular Economy and Decreased Resource Consumption
- Responsible Production

The discussion of each target area considers key milestones for 2025, 2030 and 2050, followed by specific recommendations for three key stakeholder groups: policy makers, industry and civil society.

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.¹⁷

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.

¹⁷ 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 2).

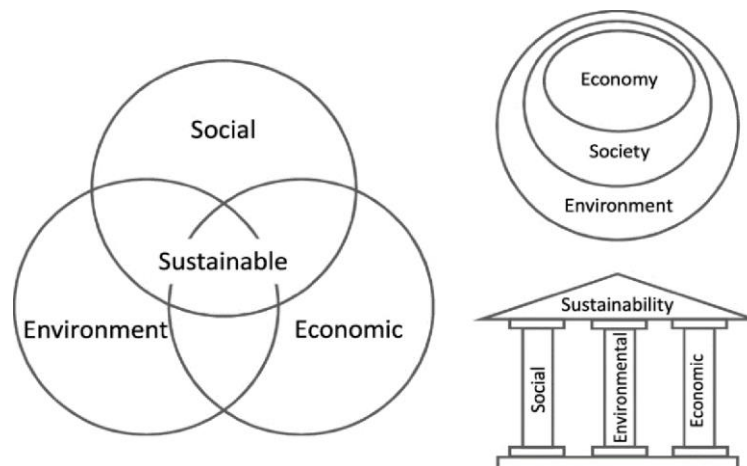


Figure 2: Depictions of the three sustainability pillars: social, environmental and economic (Purvis et al. 2019)¹⁸

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.

¹⁸ 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.

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.¹⁹ 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.²⁰

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.

¹⁹ See Kügerl and Tost 2021a and Betz et al. 2021 respectively.

²⁰ 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 3).

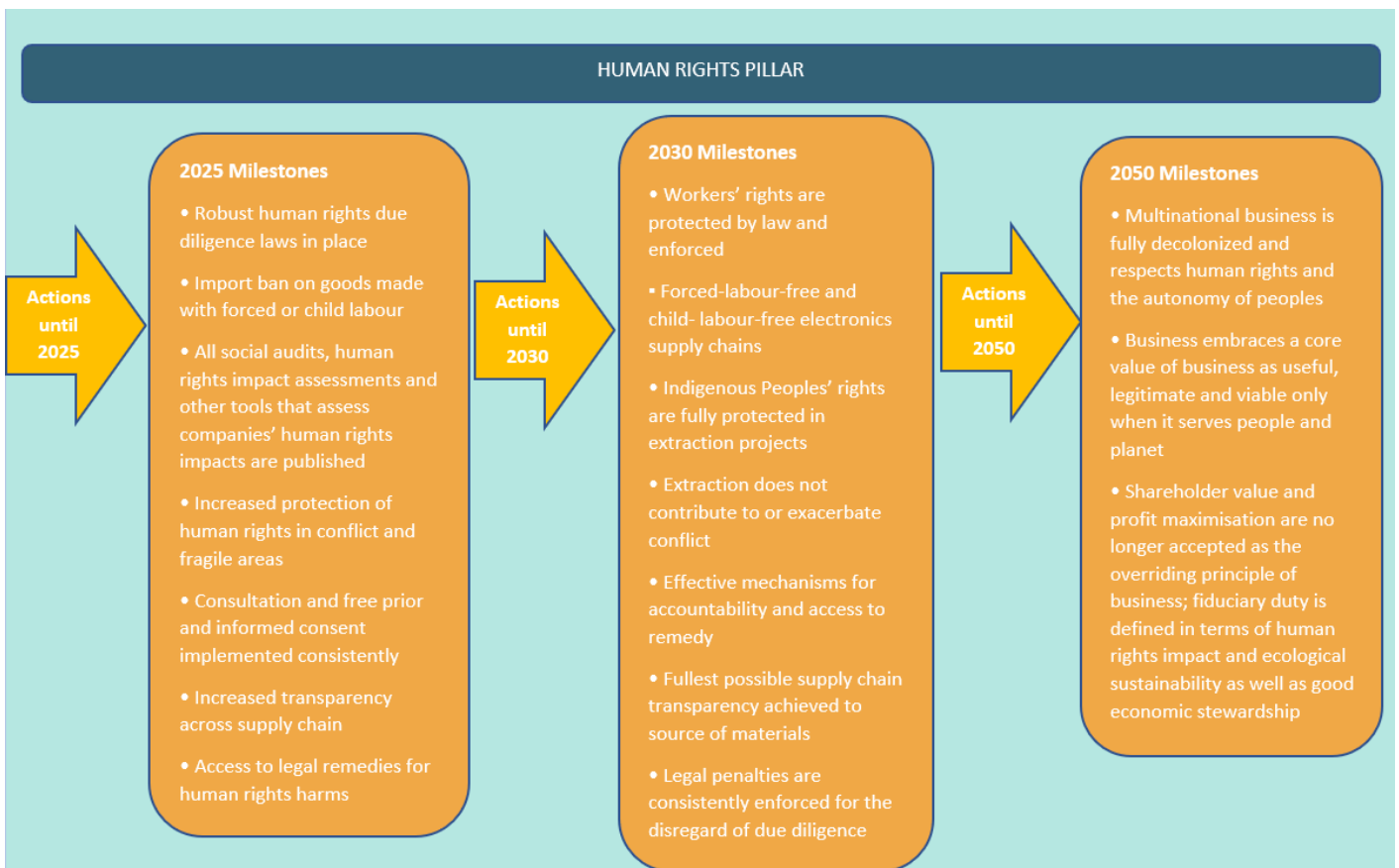


Figure 3: Milestones towards respect for human rights in the electronics sector by 2050

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 States²¹ and the responsibilities of businesses²² 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.

2.1.1.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2025

Policy makers have the opportunity to ensure that due diligence legislation in the EU is robust, comprehensive, world leading and effective. The authors believe that passing effective due diligence legislation is central to the wider goals of the RE-SOURCING project, and this is therefore both a 2025 milestone and a recommendation to policy makers.

Industry's implementation of due diligence is currently often limited to the first tier of suppliers; most electronics companies do not go further than the refiners. This is too limited. Supply chain due diligence must cover the full supply chain up to extraction and supply of raw materials.

²¹ "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.

²² Businesses are "required to comply with all applicable laws and to respect human rights" – UNGPs.

RECOMMENDATIONS

- Enact effective corporate human rights due diligence legislation.
- Require corporate human rights due diligence to extend downstream and upstream (to the mining of raw materials).
- Require human rights due diligence and transparency from mineral importers.
- Reform of EU Conflict Minerals Regulation to cover more minerals and close loopholes.
- Enact effective legislation to ban goods made using forced and child labour, including provisions for remediation and disclosure requirements on all levels of suppliers.
- Protect human rights defenders.
- Support CSOs in their human rights monitoring and reporting and involve them in development of policies and auditing.
- Include human rights supply chain due diligence requirements in all trade agreements.

Due diligence²³

Regarding human rights due diligence legislation, EU policy makers should, first, acknowledge that the decades-long approach of corporate self-regulation via industry schemes, multi-stakeholder initiatives and third-party auditing has proven insufficient in identifying risks and preventing and mitigating harm. EU policy makers have responded to the inherent limitations of self-regulation by recognising the need for effective human rights due diligence legislation. Such legislation should not rely on the same insufficient industry schemes and third-party auditing (Quijano and Wilde-Ramsing 2022).

EU corporate human rights due diligence legislation and its implementation should include, at a minimum:

- Making companies individually responsible for human rights due diligence across their supply chain, whether they are members of an industry scheme or other initiative or not.
- A stipulation that membership in industry schemes or other initiatives, including certification arrangements, or achievement of a positive audit result, will not be treated as substitutes for, equivalent to or indicators of human rights due diligence, and will not shield companies from liability, trigger a lighter monitoring or enforcement regime, or serve as a basis for establishing a presumption of compliance.
- Companies should not assume that business partners are in compliance with human rights due diligence requirements and expectations simply because they are members of an industry scheme or other initiative (even where judged to meet certain fitness criteria), hold certification from them or have achieved a positive audit result.
- Encouragement and expectation that companies will use the full range of available tools and mechanisms, and develop new ones where necessary, to better enable, assist, monitor and verify compliance with human rights due diligence requirements in their supply chain.
- Authorities responsible for monitoring and enforcing the EU's human rights due diligence regime should focus on all measures taken, whether within or outside the context of an industry scheme or other initiative, when considering if corporate human rights due diligence is adequate.
- In examination of specific complaints or claims, Member State regulators, enforcement

²³ While the focus under Target 1 of this roadmap is on human rights due diligence, many of the same standards and principles apply to environmental due diligence, discussed under Target 2.

authorities and courts should be required to focus on the company's actual and potential impacts on human rights, and the extent to which its human rights due diligence measures are effective and genuinely capable in practice of addressing the relevant risks and impacts.

- Regulators, enforcement authorities and courts should not rely on industry schemes or other initiatives (even where judged to meet certain fitness criteria), holding certification from them or achieving a positive audit result in assessing compliance and liability.²⁴

Recent commentary from the [UN Special Rapporteur on Human Rights Defenders](#) has criticised current EU corporate sustainability due diligence proposals. Mary Lawlor, the UN Special Rapporteur, argues that the EU should oblige businesses to meaningfully consult affected and potentially affected communities and groups, including human rights defenders, throughout the process; address risks of retaliation against people who speak out against negative impacts of business activities; and empower affected people to seek remedy and accountability (UN Special Rapporteur 2023).

CSOs [Amnesty International](#) and [Shift](#) have also commented on the EU proposals. The former states that the proposals “fail to live up to international human rights standards”, leaving “gaps ... for the victims of corporate harm” (Amnesty International 2023); while the latter urges that the forthcoming directive must “incentivize the right kinds of approaches by companies that are more likely to deliver better outcomes in practice” (Shift 2023).

Human rights due diligence legislation should make clear that the risk-based approach to due diligence applies to the full value chain, including upstream and downstream business relationships. This is clearly indicated in the texts of the UNGPs, the OECD Guidelines and the [OECD Due Diligence Guidance for Responsible Business Conduct](#). It is equally clarified in authoritative commentary by the Office of the UN High Commissioner for Human Rights (OHCHR), International Labour Organization (ILO) and OECD, and in rulings by OECD National Contact Points (OECD Watch et al. 2022).²⁵

While due diligence legislation has broad application, it is widely recognised that enhanced due diligence and other measures are needed when mineral extraction takes place in conflict-affected areas (European Commission 2018; OECD 2016). As the State of Play report observes, the EU Conflict Minerals Regulation has significant gaps and limitations. In the context of electronics and in particular communications technology goods, new minerals beyond 3TG that are now the focus of global attention were not prominent when the regulation was developed. Critically too, the regulation does not apply to the import of manufactured goods. Additionally, there are insufficient sanctions, different implementation per Member State and a lack of transparency.

Labour rights, supply chain mapping, transparency

Due diligence legislation alone is not sufficient to tackle specific human rights problems in the electronics sector. In particular policy makers should do more to promote the rights of workers along the supply chain, from mining to processing, and from manufacture to recycling. Requiring companies to map their supply chain and workers' rights issues in the chain is critical. Where companies cannot provide this information, the information gap should be reported transparently. Without such public information it is impossible for trade unions, workers' advocates, CSOs and workers themselves to respond to risks and harms. Opacity in supply chains has long been at the core of the disempowerment of workers and is a major obstacle to achieving the protection of human rights and responsible sourcing.

²⁴ See Quijano and Wilde-Ramsing 2022.

²⁵ See also Clean Clothes Campaign et al. 2022a.

Supply chain transparency is possible. Civil society has demonstrated this, and some companies have gone far further than others. Policy makers should require full supply chain transparency and information on workers' rights in the chain. Policy makers should also make clear the expectation that companies act with due diligence to know about workers' rights and take remedial action where needed. Such action should not involve ending contractual relationships, unless this is required by law, but rather involve engaging to remedy the situation. While accepting that this is not straightforward and that leverage differs by context, significantly more can be done than at present, starting with transparency.

Transparency is also important in relation to the tools on which companies rely to assess their human rights impacts. In this regard social audits have long been an area of concern because their tools, underlying process and outcomes are often not disclosed. As these tools are currently a significant feature of the industry, policy makers should make clear requirements for transparency about tools, processes and outcomes.

Policy makers can also give support at the international level to help establish fair and living wages and protection of livelihoods in the electronics supply chain, and ensure this is done in ways that are beneficial to third countries.

The rights of workers in artisanal and small-scale mining (ASM) require special attention. Policy makers should ensure that prohibitions against forced and child labour in supply chains are enforced, and that they support remedy for those affected as far as possible. Action to address such serious labour rights issues should not lead to further abuse of rights, and companies involved should work collaboratively to remedy the situation and not simply to exit the problem context without remediation (Responsible Mica Initiative, no date; SOMO 2016).

See also under milestones for 2030.

Forced labour

In September 2022, the European Commission presented a proposal for a [Regulation on Prohibiting Products Made with Forced Labour](#), including child labour, on the internal market of the EU (European Commission 2022a; European Parliament 2023b). The proposal covers all products, made in the EU or imported, end products or components, regardless of the sector.

The ILO estimates the global number of people in a situation of forced labour at around 27.6 million, including 3.3 million children (ILO 2022). The European Parliament has played an important initiating role, as it has called for a ban on products made with forced labour in several resolutions. The Parliament has also adopted resolutions on specific issues related to forced labour, such as its 2020 resolution on child labour in mica mines in Madagascar (European Parliament 2020b).²⁶

While there is already ample EU legislation that prohibits forced labour, and human rights due diligence legislation in the making also addresses forced and child labour, no current or pending legislation includes an explicit prohibition on placing and selling products on the EU market made using forced labour. The proposal would therefore complement existing and upcoming legislation and contribute to the eradication of forced labour. It does not introduce extra due diligence requirements for companies.

CSOs in principle welcome the EU's 2022 forced labour proposal. However, improvements are needed.

²⁶ This followed media attention resulting from SOMO and Terre des Hommes's [research report](#) on child labour in Malagasy mica mining (SOMO and Terre des Hommes 2019).

Workers' rights should be taken more into account, and there should be provisions to ensure affected workers receive remediation. In addition, disclosure requirements are currently too weak: companies should be required to publicly disclose their suppliers, sub-suppliers and business partners throughout their value chain to enable effective implementation of the regulation (Clean Clothes Campaign 2022b).

2.1.1.2 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 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 in 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](#)).

2.1.1.3 RECOMMENDATIONS FOR CIVIL SOCIETY, ACADEMIA AND RESEARCH INSTITUTIONS

Civil society, academia and research institutions have a critical role in promoting and contributing to the intersecting values, targets and milestones of human rights (social sustainability: Target 1), a circular economy and decreased resource consumption (environmental sustainability: Target 2) and responsible production (economic sustainability: Target 3). Rather than allocating milestones, sequencing dates and recommendations in the same way as for policy makers and industry, we see the following as civil society, academia and research institutions’ key ongoing contributions to the achievement of Target 1 for the entire period.

RECOMMENDATIONS

- Promote robust interpretation of due diligence in the electronics sector.
- Expose, through robust research, companies that fail to meet due diligence, social and environmental sustainability, and human rights commitments.
- Support human-rights-respecting formalisation of ASM.
- Set out clear research and proposals for an alternative business model.
- Promote industry adoption and implementation of lifecycle business strategy with end-of-life logistics, collection and recycling, and integrated sustainability, climate and environmental impact assessments, accounting, reporting and auditing.
- Research implications of the circular economy for low-income resource-dependent countries.
- Advance campaigns, advocacy and strategic litigation to hold companies to account for failing to meet human rights, environmental and responsible business due diligence.

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.)

2.1.2.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2030

By 2030 policy makers should embrace and create significant legal protections for human rights in the context of multinational business operations. Building on the existing jurisprudence and on the conversion of corporate human rights due diligence into law in the EU, policy makers should place parent companies under an express legal duty of care towards individuals and communities whose

human rights are or may be affected by their operations – and those of their subsidiaries, consortium partners and suppliers – in every country (Amnesty International 2014).

To ensure that rights are protected, EU policy makers should also use their leverage in international policy spaces to advance cooperation among States to protect rights globally in the context of multinational corporate operations.

Policy makers should also pay attention to reducing the undue influence of companies on policy making and make legitimate engagement transparent. It is challenging to make fundamental reforms when powerful and wealthy business actors have opaque influence on the policy-making process.

In the period to 2030, careful attention should be paid to the role of enforcement bodies, including regulators and courts, to ensure they are sufficiently resourced to carry out their functions in respect of protecting human rights.

RECOMMENDATIONS

- Make parent/controlling companies legally responsible for human rights abuses resulting from their global operations.
- Ensure regulatory enforcement of due diligence, transparency and other legislation is adequately resourced and protected from corporate influence.
- Develop guidance for judges and prosecutors, preferably in a multilateral forum, with respect to international cooperation and assistance to ensure effective remedy in cases concerning multinational companies' operational-related human rights abuses.
- Require companies to produce plans to significantly shift their business model to meet the requirements of sustainable, responsible, human-rights-respecting materials sourcing.
- Appoint a responsible government agency in each EU Member State for supply chain human rights due diligence.
- Impose penalties for the disregard of due diligence obligations and for non- or incomplete submission of due diligence plans.
- Make companies legally liable for human rights violations caused by failure to comply with due diligence obligations throughout the supply chain.

2.1.2.2 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.

2.1.3.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2050

Achieving the 2050 milestones requires sustained action, building on the recommendations and milestones for 2030. After 2030, action should merge towards a wholly sustainable model.

RECOMMENDATIONS

Policy makers should continue to:

- Adapt the legal and policy framework to support a different kind of business model.
- Encourage third countries' actions to ensure multinational business is held accountable.
- Expand legal and effective non-legal options to challenge corporate behaviour.
- Set human rights, climate mitigation and biodiversity safeguarding requirements for all business actors.
- Develop and implement robust pension reforms to decouple pension provision from short-term shareholder-dominated and profit-maximising corporate behaviour.²⁷

2.1.3.2 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".²⁸

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).

²⁷ For proposals that would decouple personal pensions from dependency on stock markets and instead link pensions to investment in essential public services and local priorities, see Simpson et al. 2003. On pension reform, see also subsection 2.3.3.1.

²⁸ UN Sustainable Development Group, no date.

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:

- 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 4).

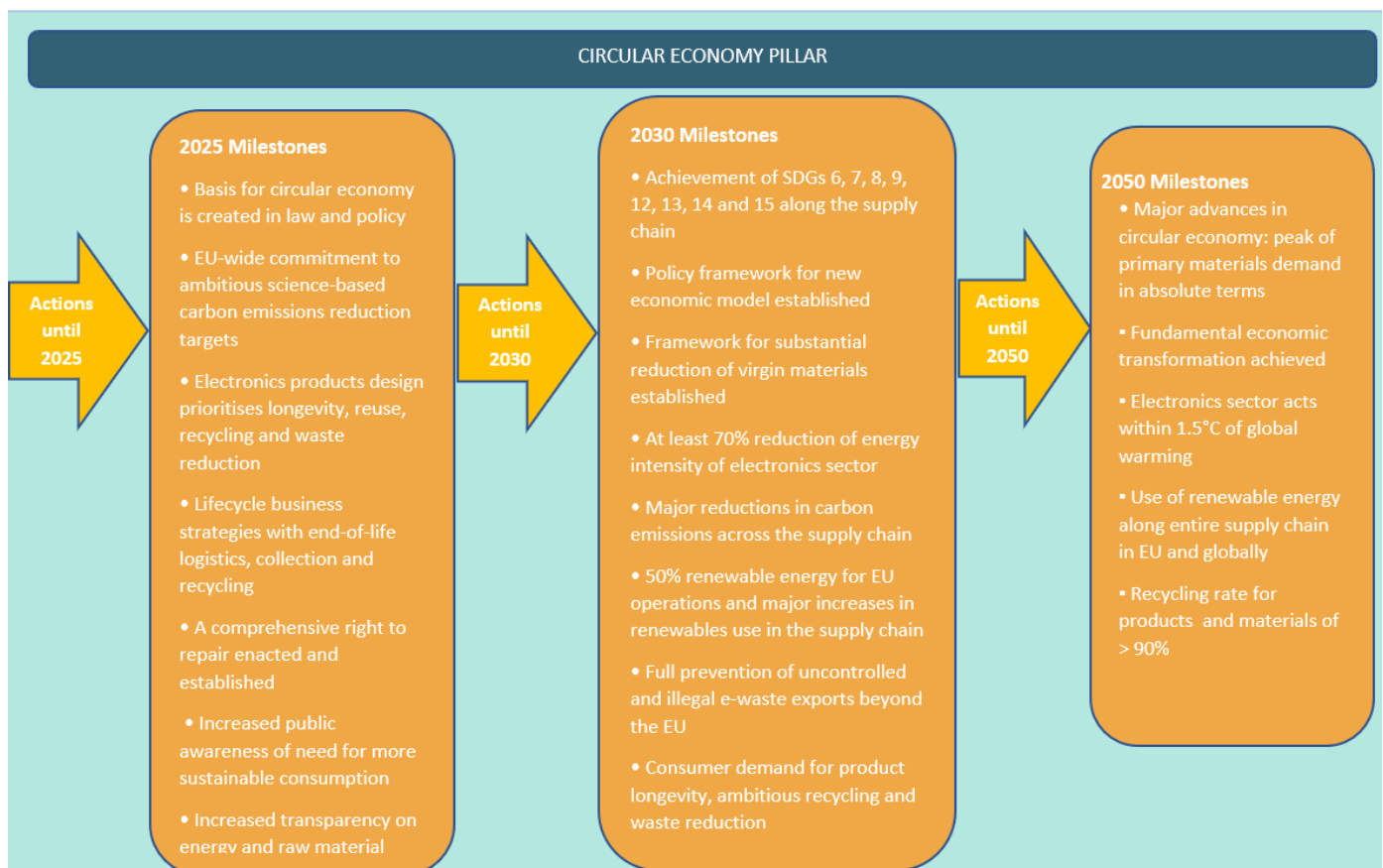


Figure 4: Milestones towards a circular economy and decreased resource consumption in the electronics sector by 2050

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.

2.2.1.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2025

To set clear legal foundations for a circular economy, it is imperative that the EU passes all planned relevant legislation with robust measures and with a focus on coherence with circular economy goals. Several key instruments will be debated and shaped in 2023-2024 that are directly relevant, including the [Critical Raw Materials Act](#) (CRMA), the [Right to repair](#) proposal and the plans for a [Circular](#)

[electronics initiative](#) (European Parliament 2023a).

Energy efficiency

In 2021 the European Commission put forward a [proposal for a recast directive on energy efficiency](#) as part of the [European Green Deal](#). Setting “energy efficiency first” as an overall principle of energy policy, the recast proposal would “raise[s] the level of ambition of the [EU energy efficiency target](#)” and require “EU countries to collectively ensure an additional reduction of energy consumption of 9% by 2030 compared to 2020” (European Commission, no date).

In 2023 the EU Council presidency and European Parliament negotiators [announced](#) a provisional new agreement with a target of reducing the EU’s final energy consumption from 2020 levels by 11.7% by 2030 (Council of the European Union 2023).²⁹ Member States would be required to contribute to meeting the overall target through “indicative national contributions and trajectories” in their integrated national energy and climate plans. However, the agreement fell short of the 14% reduction target that the Parliament had sought and the 13% target the Commission had argued for in 2022 to help end EU countries’ dependency on Russian fossil fuels after Russia invaded Ukraine (Reuters 2023).

An independent study published in late 2022 had recommended a 14.5% EU reduction target by 2030 that would have “environmental, economic and social benefits” including major energy and transportation costs savings, with reduced energy bills benefitting the poorest households; reduced costs of fossil fuel imports and thus greater energy security; an estimated 752,000 jobs created, particularly in energy efficiency sectors; and an increase in the EU’s GDP and wealth (FEDARENE (European Federation of Agencies and Regions for Energy and the Environment 2022).

A limitation is that the scope of the regulation is within the EU. It does not apply to energy use by EU entities in their supply chain operations in countries outside the EU. This means that, at present, energy efficiency in the supply chain (mining sites, smelting, and so on) depends on the actions of companies and third governments. We discuss this further below.

E-waste, longevity, repair and recycling

In the EU, it is estimated that less than 40% of e-waste is recycled. A public opinion survey conducted in the EU shows that almost 80% of respondents “believe that manufacturers should be required to make it easier to repair digital devices or replace their parts individually” (PubAffairs Bruxelles 2022).

The EU has made some progress on e-waste. The European Commission’s 2020 Circular Economy Action Plan included plans to promote longer product lifetimes, improve the collection and treatment of waste electrical and electronic equipment, and explore options for an EU-wide take-back scheme for older mobile phones, tablets and chargers (European Commission 2020a). This was positive, but faster progress is needed.

The Commission’s 2022 proposal of a new framework for eco-design requirements for sustainable products (European Commission 2022b) seeks to build on “the sustainability and circularity aspects listed in the Circular Economy Action Plan”. By making “materials last for longer, ensuring their value is retained for as long as possible and boosting the use of recycled content in products”, the proposal will “promote the decoupling of economic development from natural resource use and reduction of material dependencies”. It will include regulatory measures for electronics and ICT including mobile

²⁹ “Final” energy consumption represents energy consumed by end-users such as businesses and households, whereas “primary” energy consumption includes energy used to produce and supply energy.

phones, tablets and laptops, such as design for energy efficiency and durability, reparability, upgradability, maintenance, reuse and recycling (European Parliament 2022).

Well-targeted and well-judged government incentives can play a role in achieving circular economy goals in the electronics industry. As noted by [PACE](#) (Platform for Accelerating the Circular Economy): “About 80% of the total environmental impact of a product is determined in the design phase. Providing incentives and technical support to designing electronics for longevity (making them durable, easy-to-upgrade, or easy-to-repair), recyclability (easy-to-disassemble, with safe inputs), and with recycled content is key to achieving a circular economy” (PACE, no date).

Incentives to industry should come with clear commitments and goals. Enabling infrastructure such as more recycling options and waste collection, with effective monitoring, can advance circularity across the economy. Making take-back schemes mandatory can also push the sector forward in terms of recycling.

The Circular Economy initiative commits the EU to implement the right to repair, including a right to update obsolete software (European Commission 2020a). The EU will also “consider new horizontal material rights for consumers for instance as regards availability of spare parts or access to repair and, in the case of ICT and electronics, to upgrading services” (European Parliament 2020a). More recently, in March 2023 the Commission adopted a “[proposal on common rules promoting the repair of goods](#)”.

The Right to Repair civil society campaign has identified essential elements needed in any EU legislation on right to repair, including design requirements to ensure easy disassembly and replacement of key components, starting with mobile phones, laptops and other IT products, and the importance of consumers being well informed about reparability of the electronic goods they purchase. The campaign considers the Commission’s 2023 [right to repair proposal](#) insufficient to make repair accessible and affordable. It calls for provision for independent providers, universal access to affordable spare parts, repair manuals and diagnostic tools, meaningful financial incentives for repair, and bans on anti-repair practices such as software serialisation of parts. Right to Repair argues that promoting repair will lead to major environmental gains, reduced dependency on raw material and component imports, and creation of local green jobs ([Right to Repair 2023](#))³⁰ (see also Good practice box below).

Good practice recommendations for the right to repair³¹

- 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.

The Critical Raw Materials Act (CRMA) is also relevant to a circular economy. This legislation includes provisions for recycling and EU self-sufficiency, but a core premise is that the EU wants to seek access to critical minerals. This is linked to industrial needs in technology and electric vehicles. The legislation should ensure consistency with circular economy provisions. In particular, waste generated by mining for critical minerals is an issue. Reducing the demand for products that consume resources must form a stronger part of EU policy, alongside repair, reuse and recycling. Several provisions in the CRMA are

³⁰ See also Right to Repair 2021 and European Environmental Bureau 2019.

³¹ See Farooki et al. 2023, section 4.

of concern, including proposals to fast-track mining permits in the EU, a move that can undermine environmental protection. Elements of the CRMA also echo policies that view resource-rich third countries primarily as mere suppliers of raw materials for EU consumption.

Recycling must advance significantly in relation to the electronics sector, and here both policy makers and industry have a role to play. Investment in research is required for the EU to become a global leader and innovator in recycling. This should be accompanied by more effective prevention of uncontrolled and illegal e-waste exports beyond the EU to third countries where informal urban e-waste mining results in toxins harming the health of informal workers – often including children and migrants – on dump sites, their communities and the wider environment (IPIS 2022).

Current Basel Convention restrictions on transboundary movements of hazardous e-waste outside the EU and OECD contain loopholes. One proposal is to extend electronic equipment producers' responsibility to the transboundary movement of e-waste, with financial responsibility to the end of a product's life, including recycling or landfilling (IPIS 2022). This would be consistent with the EU Commission's [corporate sustainability due diligence](#) proposals (European Commission no date).

Since recycling alone cannot provide sufficient amounts of raw materials for the electronics sector, it is important to avoid and reduce resource consumption wherever possible, as well as to address the high levels of currently uncollected waste.

RECOMMENDATIONS

Policy makers should ensure all forthcoming directives and revisions on raw materials, e-waste, batteries, and so on, promote lifecycle business strategies in the electronics sector.

- Adopt a revised Energy Efficiency Directive with ambitious targets (at least 14% from 2020 levels by 2030) for lowering energy consumption.
- Enact a Critical Raw Materials Act that reflects robust circular economy measures to reduce mineral consumption.
- Set strong reuse, recovery and recycling targets.
- Enact the right to repair with meaningful standards of accessibility and affordability.
- Set up mandatory take-back schemes allowing customers to return electronic goods at end of life.
- Improve and expand e-waste collection and require more action by industry.
- Strengthen the prevention of uncontrolled and illegal e-waste exports to third countries.

Public education and transparency

The achievement of a circular economy requires a significant shift in public awareness and perception. As noted in the Renewable Energy Sector Roadmap, policy makers should recognise that industry will struggle to achieve resource efficiency and energy reduction targets in the absence of significant changes in consumption. This will require public education as well as the use of technology that reduces the need for raw materials.

A public education drive should ensure that the full lifecycle of electronic equipment is made clear, and also the imperative of the EU not consuming disproportionately from other regions to satisfy demand. Efforts to decouple growth from environmental impact and the potential of technology to enable the manufacture of electronic goods with decreasing need for new raw materials should not lead to complacency about the more challenging issue of decreased overall electronics consumption.

Education efforts should include a focus on the right to repair and effective schemes to enable people to share, recycle and reuse electronics goods. Overall, for the achievement of a circular economy and decreased consumption, the EU should, as the Renewable Energy Sector Roadmap states, implement the 10-year framework of programmes on sustainable consumption and production (SDG 12): “Ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature (SDG 12).”

Transparency is fundamental if stakeholders are to know if policy, legislative acts and educational measures are working. Requiring companies to report on key circular economy parameters across the supply chain should be aligned with current reporting requirements for companies in electronics.

RECOMMENDATIONS

- An EU-wide public awareness campaign set up and running to 2030.
- Public education campaigns on repair, take-back and recycling options.
- Require reporting from industry on lifecycle business strategies, either as a new requirement or built into sustainability reporting.
- Initiate labelling of products to clearly show recycled content and durability.
- Require companies to substantiate their environmental claims using product environmental footprint (PEF) and organisation environmental footprint (OEF) methods.

2.2.1.2 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 [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.

2.2.1.3 RECOMMENDATIONS FOR CIVIL SOCIETY, ACADEMIA AND RESEARCH INSTITUTIONS

Civil society, academia and research institutions have a critical role in promoting and contributing to the intersecting values, targets and milestones of human rights (social sustainability: Target 1), a circular economy and decreased resource consumption (environmental sustainability: Target 2) and responsible production (economic sustainability: Target 3). Rather than allocating milestones, sequencing dates and recommendations in the same way as for policy makers and industry, we see the following as civil society, academia and research institutions' key ongoing contributions to the achievement of Target 2 for the entire period.

RECOMMENDATIONS

- Promote robust interpretation of due diligence in the electronics sector.
- Expose, through robust research, companies that fail to meet due diligence, human rights, and social and environmental sustainability commitments.
- Set out clear research and proposals for an alternative business model.
- Promote industry adoption and implementation of lifecycle business strategy with end-of-life logistics, collection and recycling, and integrated sustainability, climate and environmental impact assessments, accounting, reporting and auditing.
- Research implications of the circular economy for low-income resource-dependent countries.
- Advance campaigns, advocacy and strategic litigation to hold companies to account for failing to meet human rights, environmental and responsible business due diligence.

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.

2.2.2.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2030

The milestones for 2030 and achieving the SDGs require that the EU amends and advances the legal framework, building on the circular economy and European Green Deal measures in place in 2025. A clear message that targets and levels of ambition will increase over time is important to ensure that 2050 milestones are achievable. By 2030 the EU should also make decisive changes in relation to electronic waste exports and public procurement of electronic goods. Signalling these ambitions from 2025 will allow industry to make the necessary changes.

RECOMMENDATIONS

- Revised EU circular economy targets to reflect substantially increased ambition.
- Revised Critical Raw Materials Act to include new and more ambitious targets.
- Increase EU waste collection, recycling and reuse targets through revision of relevant directives.
- Introduce legislation for mandatory design-for-repair and design-for-recycling, and on reuse and repurposing.
- EU public procurement rules amended to disallow purchase of electronic equipment that does not meet minimum standards for virgin materials use reduction, repair and recycling.
- Substantially increase EU energy efficiency targets.
- Notify mining companies in EU supply chains that after 2035 no extraction using fossil fuel energy will be accepted.
- Effectively enforce the EU ban on export of e-waste.
- Legislate a fiduciary duty to act with due diligence in relation to environmental impacts.

The enabling environment requires policy makers to combine revision of laws and targets with further efforts to move the narrative from one of economic growth and consumption to a focus on satisfying human needs, universal wellbeing, equality and staying within planetary boundaries (Raworth 2017; DEAL 2021). Relevant wellbeing tools and indicators include the [Human Development Index](#), the [Multidimensional Poverty Index](#) and Bhutan's [National Happiness Index](#). Achievement of the SDGs, including those related to energy (SDG 7), responsible consumption and production (SDG 12), climate action (SDG 13) and safeguarding and restoring biodiversity (SDG 15), requires this decisive shift.

Sustaining public awareness, support and momentum within the EU should be coupled with taking a leadership role internationally, including on shifting narratives in high-consumption countries and social strata away from economic growth to human wellbeing. This message should be part of core foreign policy and international trade messaging. Moves to replace the language and framing that have dominated global economic discourse are crucial to embed a different relationship between human society and planetary boundaries, moving away from seeing people as consumers and nature as a resource to be consumed.

Additionally, measures in the EU in relation to industry standards along supply chains should be robustly assessed in terms of potential negative impacts on low-income countries in the chain. Negative impacts should be mitigated so that progress is swift but fair.

RECOMMENDATIONS

- Support countries outside the EU in creating a circular economy.
- Focus more on wellbeing than on economic growth.

2.2.2.2 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 (subsection 2.2.2.1), civil society plays a crucial role here (subsection 2.2.1.3). 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%.

2.2.3.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2050

Achieving the 2050 milestones requires sustained action, building on the recommendations and milestones for 2030. From 2030, action should merge towards a wholly sustainable model.

RECOMMENDATIONS

Policy makers should continue to:

- Adapt the legal and policy framework to support a business model that fully respects planetary boundaries.
- Encourage third countries' actions to ensure multinational business is accountable.
- Expand legal and effective non-legal options to challenge corporate behaviour.
- Set human rights, climate change mitigation, and biodiversity safeguarding/restoring requirements for all business actors.
- Develop and implement robust pension reforms to decouple pension provision from short-term shareholder-dominated and profit-maximising corporate behaviour.³²

³² For proposals that would decouple personal pensions from dependency on stock markets and instead link pensions to investment in essential public services and local priorities, see Simpson et al. 2003. On pension reform, see also subsection 2.3.3.1.

2.2.3.2 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.

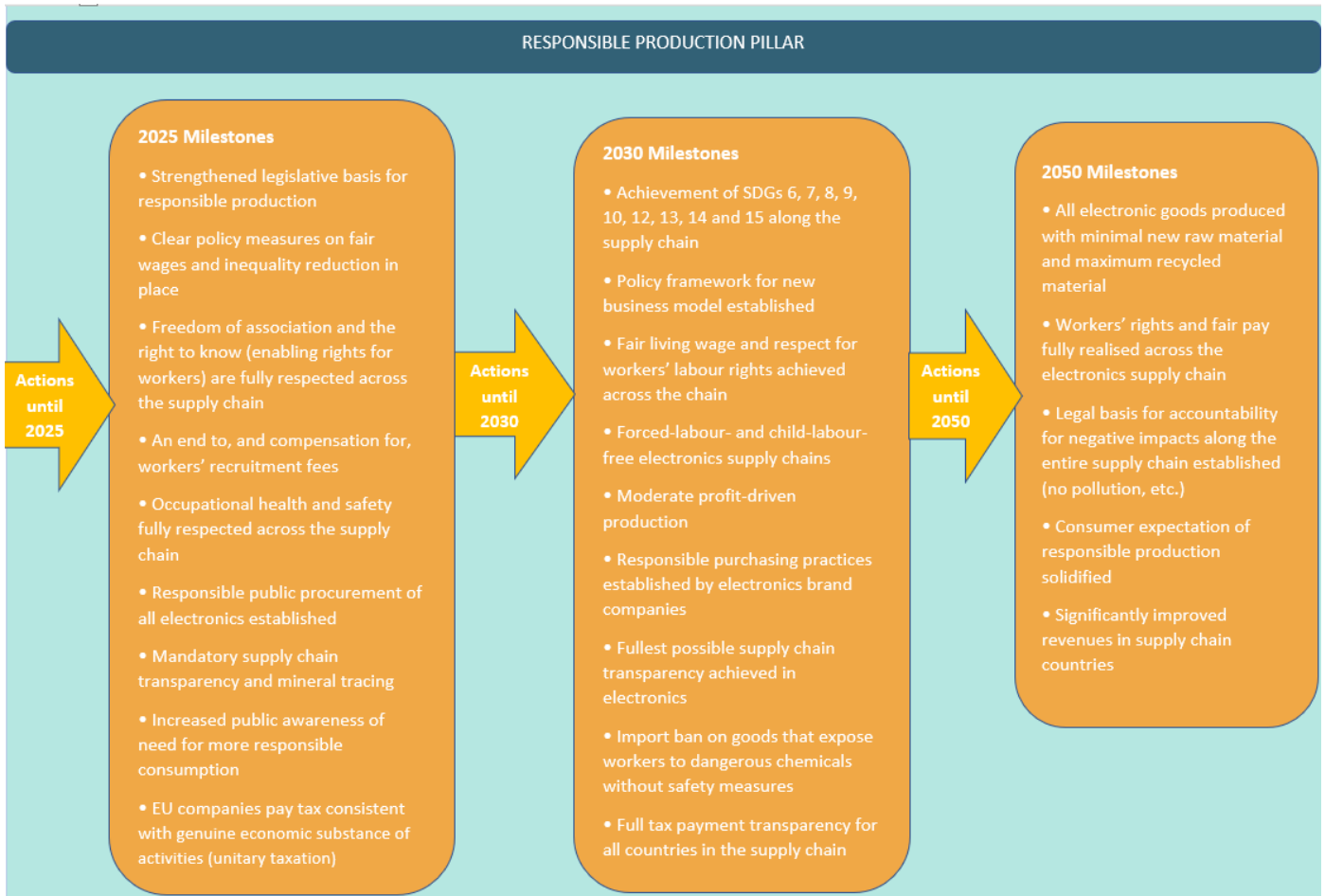
The core factors that ensure that the manufacture of electronic goods takes place responsibly are:

- 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 5).

Figure 5: 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).³³

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

³³ See Tax Justice Network, [Unitary tax explained](#) (2019) and Fair Tax Mark, [Standards and Guidance Notes](#) (no date).

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.

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).

2.3.1.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2025

EU policy makers should enact a suite of regulations and directives relevant to responsible production by 2025, including a ban on products made with [forced labour and child labour](#) (European Commission 2022a), the [Due Diligence Directive](#), the [Batteries Regulation](#) and the [Critical Raw Materials Act](#) (CRMA). These legal and policy instruments can provide a solid foundation for responsible production, but they must be coherent with responsible sourcing goals. This is not always the case.

For example, the CRMA, while making statements that appear in line with responsible production and sourcing, is underpinned by an economic and foreign policy logic that appears to run counter to these goals. Strategic raw materials projects are being developed in both the EU and third countries where a sense of urgency for access to raw materials for technology and the low-energy transition risks overriding responsible extraction (Business & Human Rights Resource Centre 2021; Chatham House 2023; SOMO 2023). Within the EU the CRMA establishes a maximum duration for permitting processes for projects involving extraction, processing and recycling. This is a concern because faster permitting can equal less time for environmental checks and consultations.

Current EU policy in relation to critical minerals needed for technology and electronics forms part of a geopolitical scramble for access to resources. This policy, involving competition with the US and China as other key actors, and leveraging diplomatic, trade and aid instruments, is not consistent with

promotion of responsible sourcing or responsible production. At minimum, responsible sourcing and responsible production should combine with efforts to reduce mineral sourcing and reduce production (see also Target 2).

As noted in the [State of Play](#) report, the electronics industry is a major consumer of tin, tantalum, tungsten and gold. Enforcement of the EU [Conflict Minerals Regulation](#), which covers these minerals, is critical for responsible production in the electronics sector. The regulation aims to ensure that EU importers of 3TG meet international responsible sourcing standards, set by the OECD, and has the potential to make a major impact on smelters and refiners of 3TG, as it requires that they can show that the four minerals are responsibly sourced.

EU legal frameworks should also bring greater clarity to expectations that workers will be paid a fair wage – at minimum, a living wage. While this can be legislated for within the EU, measures are needed to ensure companies act to align supply chains with living wage goals, including requirements for full supply chain transparency; require companies to identify contexts where a living wage is not paid; and oblige them to work collaboratively to remedy the situation (and not simply to exit a problem context without remediation). These measures are in line with the requirements of due diligence and will bear fruit more quickly if robust guidance is provided.

The efforts of the EU, US and China to secure access to critical minerals for electronics and technology include the provision of incentives and subsidies to industry actors. In view of lessons from the Covid-19 pandemic, responsible production should ensure that any public money used to enable industry actors to gain access to minerals should come with clear and robust safeguards and be fully transparent and accountable. Responsible production is not consistent with the conversion of public money into unjustified private profit.

Overall, policy makers should consider not only the enabling framework they can provide for responsible production, but also the risks of providing a contrary enabling framework, one that allows, or even encourages, poor practice. Policy coherence is essential.

RECOMMENDATIONS

- Pass coherent, robust and mutually reinforcing directives on Li-ion batteries, due diligence and critical raw materials, forced labour, fair wages, and conflict minerals.
- Make transparency of supply chains mandatory in the EU.
- Put in place strong EU standards for tracing raw materials.
- Engage with third countries on workers' rights in the electronics supply chain.
- Put in place public procurement guidance on electronics that reflects responsible sourcing.
- Support public education on responsible production and reduced consumption to create demand for responsible production of electronics.
- Require companies to disclose their supply chains, including gaps in their knowledge.
- Develop plans to introduce a system of unitary taxation for multinational businesses.

With regard to focusing more on wellbeing than on GDP, as the [Mobility Sector Roadmap](#) puts it: “Our economic system is based on growth. Many people have to work more than 40 hours a week to be able to keep up with the ever-rising prices ... [T]he state’s debts and budget rely on the growth of the economy ... [T]he decoupling of economic growth and resource consumption is strongly debated. Instead of economic growth, policies should focus on wellbeing as an important indicator. As a result,

decreasing resource consumption requires a change in the economic system itself. Examples could be a tax on resources ... or a focus on lowering the working hours per week ... It is important that a future economy ensures higher wellbeing, while curbing the system of unlimited consumption.”³⁴

In this context, as mentioned under Target 2, wellbeing tools and indicators such as the [Human Development Index](#), the [Multidimensional Poverty Index](#) and Bhutan’s [National Happiness Index](#) merit greater attention.

In addition to law and policy, the EU can use its procurement leverage and its agenda-setting role to support responsible production. As the EU notes in relation to [Green Public Procurement](#): “Europe’s public authorities are major consumers. By using their purchasing power to choose environmentally friendly goods, services and works, they can make an important contribution to sustainable consumption and production.”

Green public procurement guidance is, however, a voluntary instrument. Responsible production in electronics will be substantially aided by producing technical specifications for public procurement with the aim to make responsible sourcing requirements mandatory.

Policy makers can also do more to raise public awareness and demonstrate to citizens that procurement is consistent with responsible production. Such action combines rewarding industry actors that show leadership and public education on the issues.

2.3.1.2 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

³⁴ As the mobility sector roadmap also notes, we recognise the need for developing countries to continue their growth to bring people out of poverty and increase wellbeing in line with SDG 8. In countries with low GDP, happiness or subjective wellbeing still increases significantly with only small increases in GDP (Jackson 2017).

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.

2.3.1.3 RECOMMENDATIONS FOR CIVIL SOCIETY, ACADEMIA AND RESEARCH INSTITUTIONS

Civil society, academia and research institutions have a critical role in promoting and contributing to the intersecting values, targets and milestones of human rights (social sustainability; Target 1), a circular economy and decreased resource consumption (environmental sustainability; Target 2) and responsible production (economic sustainability; Target 3). Rather than allocating milestones, sequencing dates and recommendations in the same way as for policy makers and industry, we present the following as civil society, academia and research institutions' key ongoing contributions to the achievement of Target 3 for the entire period.

RECOMMENDATIONS

- Promote robust interpretation of due diligence in the electronics sector.
- Expose, through robust research, companies that fail to meet due diligence, human rights, and social and environmental sustainability commitments.
- Support human-rights-respecting formalisation of ASM.
- Set out clear research and proposals for an alternative business model.
- Promote industry adoption and implementation of lifecycle business strategy with end-of-life logistics, collection and recycling, and integrated sustainability, climate and environmental impact assessments, accounting, reporting and auditing.
- Research implications of the circular economy for low-income resource-dependent countries.
- Advance campaigns, advocacy and strategic litigation to hold companies to account for failing to meet human rights, environmental and responsible business due diligence.

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.

2.3.2.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2030

Revision of the obligations of company directors is a cornerstone of enabling responsible production across supply chains. In the EU context, building on the provisions in due diligence law is important. This must go beyond the recommendations of the EU [Study on directors' duties and sustainable corporate governance](#) (European Commission 2020b), which focused on long-term sustainability of business, to encompass the impact of business on the sustainability of ecosystems, climate and biodiversity. A renewed effort is needed to clarify the language of sustainability and to avoid environmental sustainability being seen as synonymous with the sustainability of business operations. Directors' duties should include obligations to act to protect the environment and human rights across value chains. Reliance on social audits and voluntary schemes is demonstrably insufficient.

Policy makers should also establish incentives that discourage the payment of excessive dividends to shareholders, share buybacks and other measures that financialise the electronics and technology sectors. Such measures drive short-termism and deepen wealth inequalities. The abandonment, since the 1980s, of policies that curbed the excesses of short-term, shareholder-dominated and profit-maximising corporate operations should be reinstated, with necessary updates in the current context.

RECOMMENDATIONS

- Overhaul directors' duties and reporting responsibilities in the EU.
- Implement control mechanism for supply chain due diligence.

As noted under the 2025 milestones, transparency is essential for responsible production. EU policy makers should make corporate transparency and transparent supply chains a greater priority on the international agenda. This goes beyond, but can build on, initiatives like the [Extractive Industries Transparency Initiative](#). Transparency on financial aspects of extraction do not cover the supply chain. Processing and manufacturing are not covered, and issues such as fair payment of workers do not receive attention. The EU can work with third country partners to establish a presumption of transparency across supply chains (including but not limited to electronics), which can have multiple

benefits for addressing global inequalities and the SDGs.

As with transparency, efforts greatly increase the use of renewable energy along the entire supply chain require action outside the EU. Industry has a key role to play, as discussed below. However, policy makers should engage internationally on how to ensure that all countries can achieve renewable energy. This is essential for the wider goals of a just energy transition, as well as to ensure that electronic goods produced and/or sold in the EU are responsibly produced.

RECOMMENDATIONS

- Make supply chain transparency as a tool for responsible production of electronics an agenda item in international policy spaces.
- Address use of renewable energy in electronics production supply chains with other international policy makers.
- Align EU trade policy with responsible sourcing and human rights, and incorporate supply chain due diligence in all EU trade agreements.

The achievement of all milestones also requires more informed demand from citizens. Policy makers should see public engagement, persuasion and education on responsible production as a continuous process.

2.3.2.2 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.³⁵ 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.

2.3.3.1 RECOMMENDATIONS FOR POLICY MAKERS TO 2050

Achieving the 2050 milestones requires sustained action building on the recommendations and milestones for 2030. After 2030, action should merge towards a wholly sustainable and equitable model.

The changes needed cannot be limited to the electronics sector but require a shift in the economic paradigm. Between 2030 and 2050, policy makers should progressively amend the legal and policy frameworks that support the current economic model and predominant business model. Given the

³⁵ See Tax Justice Network 2019 and the Fair Tax Mark's [accreditation standards](#) (Fair Tax Mark, no date).

extent to which society has become reliant on this model, despite its harmful consequences, policy makers should put in place safety measures to enable the transition needed to a social-purpose-led economic and business model that prioritises ecological sustainability and social equity.

Policy makers should also look at the global context. Current trade and investment policy approaches, including those relevant to the electronics sector, treat third countries mainly as sources of raw materials. Moving towards 2050, it is imperative that the EU reviews and carries out a wholesale revision of its foreign economic policy with an express intention to decolonise its foreign policy, including trade and investment policy.

RECOMMENDATIONS

Policy makers should continue to:

- Adapt the legal and policy framework to support a social-purpose-led business model.
- Encourage third countries' actions to ensure multinational business is accountable.
- Expand legal and effective non-legal options to challenge corporate behaviour.
- Set human rights, climate change mitigation, and biodiversity safeguarding/restoration requirements for all business actors.

2.3.3.2 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 6: Roadmap for the electronics sector until 2050

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