United Nations ECE/TRADE/C/CEFACT/2023/17

Economic and Social Council

Distr.: General
8 November 2023

English only

Economic Commission for Europe

Executive Committee

Centre for Trade Facilitation and Electronic Business

Twenty-ninth session
Geneva, 9 and 10 November 2023
Item 6 (c) (ii) of the provisional agenda
Recommendations, standards and deliverables supporting implementation:
Deliverables in support of implementation:
Deliverables in support of the outcomes of the seventieth Commission session

ECE Policy Paper on Accelerating the Transition Towards a Circular Economy in the ECE Region: Improving the Traceability of Products along International Value Chains

Submitted by the secretariat

Summary

This policy paper provides recommendations to governments on how to design, develop and implement a policy framework on traceability and transparency of sustainable and circular value chains in the region of the Economic Commission for Europe (ECE). It contributes to the themes of the sixty-ninth and the seventieth Commission sessions, on promoting the circular economy and sustainable use of natural resources, and the digital and green transformations for sustainable development in the ECE region and beyond. This policy paper is launched under Circular STEP, the ECE platform that facilitates sharing of good practices and the engagement of stakeholders in the circular economy transition.

Document ECE/TRADE/C/CEFACT/2023/17 is submitted to the twenty-ninth session for information

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I. Executive summary

1. Faced with climate change, environmental pollution and biodiversity loss, there is an urgent need to decouple economic growth from its negative impact on the environment. The circular economy is a concept that aims to circulate products and materials, extend their life cycles, minimize waste and pollution in consumption and production, and enable the regeneration of natural resources.

2. At the 69th and 70th Sessions of the ECE, member States made important decisions regarding the circular economy, the sustainable use of natural resources and the green and digital transitions. They emphasized the need to further strengthen the Economic Commission's work and requested that its relevant sectoral committees and bodies scale up their efforts to promote such approaches across the ECE region, within the Commission's existing mandate as appropriate, and subject to available resources.

3. A critical element for the circular economy is the ability to trace, in a transparent and trustworthy manner, how materials and products move along and across value chains: traceability and transparency help to identify obstacles that prevent repairability, reusability and recyclability and provide consumers, investors, procuring agencies and regulators with the confidence that the goods and services they bought are sustainable.

4. Governments can support traceability and transparency for the circular economy, in line with their sustainability objectives, in multiple ways. The main policy recommendations outlined in this paper include the following:

- **Look at the market drivers and the sector, which involves assessing the economic scenario to understand what drives value for consumers, investors and civil society in the country.**
- Tailor the policy, which involves considering the specific characteristics of the sector while establishing strategies and roadmaps.
- **Engage industry stakeholders, which involves** setting up a multistakeholder dialogue platform to assess the sustainability risks and identify the requirements for circular business models, sharing the vision and getting commitment from the industry.
- **I**dentify and analyse international best practices, which involves raising awareness among organizations, including businesses, of best practices for traceability and circularity from around the world and their key success factors. Governments need to share these practices to help them develop them at home. This paper argues that the regulation and policy work being established by the European Union (EU) is a good source of guidance on traceability and the circular economy for ECE programme countries and beyond.
- **Define national strategies and roadmaps, which involves developing** an action plan to guide organizations in the transition to a circular economy based on traceability and transparency approaches, including the development of engagement plans with other governments and civil society and establishing checkpoints to assess progress.
- Create an effective and efficient system of incentives, which involves including special financing instruments for business to have preferable rates for loans related to supply chain improvements or other forms of financial support, such as tax credits or subsidies.
- **Promote research and development, which involves introducing** tax exemptions and incentives to lessen the short-term costs of investing in development of environmental technologies and green practices. Organizations must start developing the technologies to operate in a clean and safe environment and research and development needs to be promoted.
- Provide information and support to MSMEs, which involves tailored guidance to comply with environmental, social and governance (ESG) standards and

implement traceability systems. Also banks could offer loans at favourable rates for MSMEs investing in the use of such approaches and systems.

- Increase consumers awareness and education, which involves making information on the sustainability performance of products available so that consumers can make conscious choices when purchasing, while using, and at the end of the product's life. Sustainable consumption patterns depend on the level of information provided to consumers.
- Support national, globally connected, trading platforms, which involves a dynamic and commercially functioning marketplace for resources with traceability underpinning the provenance and processing of the materials. This is essential for circularity.
- Develop common standards, which involves providing benchmarks for organizations and governments to assess performance. These could be used to create robust policies, strategies and a wide range of tools to achieve traceability and circularity, and to introduce mechanisms to reward organizations that achieve these standards.
- Use accepted frameworks, which involves using widely accepted traceability and circularity frameworks such as those developed by United Nations agencies. When organizations incorporate relevant, common standards into their strategic planning, they send a clear message to customers, investors and other stakeholders that they take ESG risks seriously.

5. Following these recommendations will allow traceability and transparency to be implemented at scale and effectively contribute to the transition to the circular economy. These need to be reflected in capacity-building and technical assistance programs, targeting programme countries in the ECE region.

II. Introduction

6. The Sustainable Development Goals (SDGs) were adopted by the United Nations Member States in 2015 as a call to action for people around the world to address five key areas by 2030: people, planet, prosperity, peace and partnership. However, there is a challenge in the 17 SDGs: how to reconcile economic growth and industrial development with the need to address the triple planetary crisis of climate change, environmental pollution and biodiversity loss. One of the most promising solutions to this dilemma is the circular economy. The circular economy is a concept that proposes the recirculation of products and materials to extend their life cycle, minimize waste and pollution in consumption and production, and enable the regeneration of natural resources.[1]

7. The circular economy can result in a competitive economy that creates green and decent jobs, improves security of raw materials, reduces the dependency on raw material imports and can keep resource consumption within planetary limits. However, this transformation from a linear to circular economy is a broad one that requires substantial changes in the way we think, and in the organization of supply chains and business models.

8. The traceability and transparency of value chains is a necessary condition for the transition to an effective circular economy. To reduce the environmental impact of products and keep them in circulation for longer, internal and external stakeholders need information about the origin, composition and history of products, as well as the names, certifications and accreditations of upstream and downstream actors in the value chain. This information enables stakeholders across the value chain to expand circular and regenerative approaches such as sharing, reusing, repairing, remanufacturing, recycling and recovering. The information gathered and shared with stakeholders is also key to

[1] Ellen MacArthur Foundation, "What is the circular economy?", available at https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

developing new circular business models such as industrial symbiosis, where current waste streams from industrial production are diverted and transformed into resources for other processes. This is only possible if information is collected along product value chains and shared efficiently using modern technologies.

9. This policy paper reviews the state of play of traceability and transparency approaches in three economic sectors critical to the circular transition in the ECE region: the agrifood, garment and footwear, and minerals sectors. Moreover, it provides an overview of the challenges and opportunities for advancing the circular economy and highlights successful practices from the whole region. Lastly, it provides policy recommendations to leverage traceability and transparency for the circular economy.

10. The paper has been developed within the United Nations Development Account (UNDA) project "Accelerating the transition towards a circular economy and sustainable use of natural resources in the ECE region" (2021-2024), implemented by ECE in partnership with United Nations Environment Programme (UNEP). The project aims to accelerate the transition to a circular economy in the region, while supporting efforts to "build back better" after the COVID-19 pandemic. It supports the design and implementation of national policies, programmes and strategies on waste management, public procurement, innovation, trade and traceability of value chains, in line with member States recommendations emerging from the 69th and 70th sessions of ECE.

11. The policy paper was prepared based on the findings of a large consultation process conducted by ECE and its consultancy team. It builds on the work of the UN/CEFACT Team of Specialists on ESG Traceability of Sustainable Value Chains in the Circular Economy, and its Sustainability Pledge initiative. It is the result of an in-depth analysis of existing policies, regulations and guidelines from governments and organizations worldwide, and international best practices on traceability and transparency in targeted sectors, as well as field research engaging national focal points from the ECE Circular STEP initiative.

III. Geographical and sectoral overview

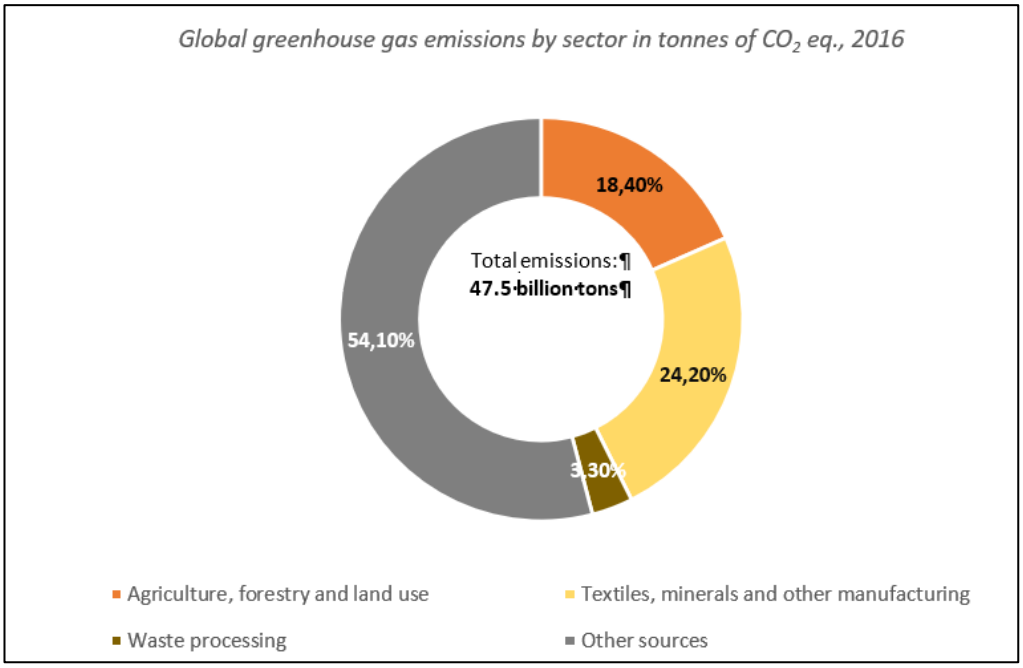
12. This policy paper addresses traceability and transparency approaches and practices in countries of the ECE region, with a particular focus on the European Union and programme countries in the region. The ECE region consists of 56 member States that include the countries of Europe, including South-Eastern Europe and Eastern Europe, the Russian Federation, but also countries in North America, the Caucasus, Central Asia and Western Asia (Israel).

13. The conditions for effective traceability and transparency in value chains are very diverse across the ECE region: The region includes some of the richest and most developed countries in the world, but also countries with a relatively low level of development. As such, the economies of some member States are strongly oriented towards extraction of natural resources at the source of value chains, while other member States are mainly involved in value creation at the end of the value chain and extract few natural resources domestically. There is also a notable digital divide, as some member States already have strong digital infrastructure, regulation and high levels of digital literacy, while others are not yet as advanced. This diversity in the levels of development represents a challenge to ECE, as it must respond to the expectations and capacities of its different member States. However, it is also an advantage, as it encourages the sharing of experience and knowledge, and guarantees financial and technical aid to countries in need.

14. The focus of this paper is on three economic sectors: agrifood, garment and footwear, and minerals. The three sectors are of high economic importance in the ECE region, as they contribute significantly to economic growth and employment. However, they are also major sources of environmental pollution and global greenhouse gases (see Figure 1). ECE has identified that these three sectors have great potential to benefit from transparency and traceability practices to increase their efficiency and improve their resilience. At the same time, the adoption of circular economy practices in these three

sectors promises to significantly reduce the burden on people and the environment, contributing to the achievement of SDGs.

Figure 1
Global greenhouse gas emissions of the agrifood, garment, minerals and waste processing sectors



Source: ECE, based on Our World in Data, 2020

A. The agrifood sector

15. The agrifood sector is the world's largest employer and the most important source of food and raw materials for various sectors of the global economy. The Food and Agriculture Organization of the United Nations (FAO) estimates that around 4 billion people are directly or indirectly employed in it. The agrifood sector is critical for development, especially in developing countries, as it contributes to a large share of employment and GDP. Strengthening the capacity of the agrifood sector is critical to achieving the SDGs because growth in the agrifood sector helps reduce poverty (SDG 1), fight hunger (SDG 2), and creates employment and economic growth (SDG 8).[2] However, current agrifood systems[3] frequently suffer from inefficient resource use and have significant environmental impacts. Agrifood systems release large amounts of CO_2 and methane emissions (Figure 1), which contribute to climate change and global warming. Data shows that agrifood systems are the second largest greenhouse gas emitting sector after the energy sector, and in 2020 it accounted for 18.4 per cent of global greenhouse gas emissions. Moreover, agrifood practices also have severe impacts on land and water resources, especially in middle- and low-income countries where water is scarce. Worldwide, 72 per cent of all water withdrawals are for

[2] OECD-FAO Agricultural Outlook 2022-2031, (OECD Publishing, Paris, 2022). Available at https://doi.org/10.1787/f1b0b29c-en

[3] "Food systems embrace the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal (loss or waste) of food products that originate from agriculture (incl. livestock), forestry, fisheries, and food industries, and the broader economic, societal, and natural environments in which they are embedded", according to the definition of the Scientific Group for the UN Food Systems Summit (5. March 2021). Available at: https://knowledge4policy.ec.europa.eu/publication/food-systems-definition-concept-application-un-food-systems-summit-paper-scientific_en. (Accessed 1 November 2023.)

agricultural use.[4] The agrifood sector is also a major consumer of materials that cause environmental pollution and degradation of ecosystems, such as packaging and single-use plastic products. In 2019, agricultural value chains used 12.5 million tons of plastic products in plant and animal production and 37.3 million tons in food packaging.[5] Agrifood items such as fishing gear, food containers, plastic bags, cutlery, straws and plastic cups were found to be among the ten most common items of marine litter in the EU.[6]

16. The agrifood sector is not only a major contributor to climate change and environmental pollution, but at the same time it is also one of the sectors most exposed to environmental risks: more frequent and more extreme droughts, landslides, heavy rainfalls, premature frost and rising sea levels threaten the livelihoods of millions, especially in the world's poorest and most vulnerable countries. Reforming the agrifood sector towards more sustainable and circular practices that reduce environmental impacts therefore has very positive implications for people and the planet.

17. In 2022, Europe, Central Asia and North America contributed around 25 per cent of the global value of agricultural and fish production.[7] Major agricultural producers in the region include Canada, the EU, Kazakhstan, the Russian Federation, Türkiye, Ukraine and the United States. However, there are large regional disparities in the economic importance of the agrifood sector; while agriculture accounts for more than a half of total employment and a quarter of Tajikistan's GDP[8], in the USA, agriculture, food, and related industries contributes 5.4 per cent to the country's GDP and provides 10.4 per cent of the U.S. employment.[9] This is largely due to the different levels of development and industrialization.

18. Consequently, there is no one-size-fits-all solution for implementing circular practices in the agrifood sector. The aim of this paper is to present a set of regulatory and business best practices that can be adapted to regional circumstances.

B. The garment and footwear sector

19. The garment and footwear sector is also an important driver of employment and economic growth. The revenue of the global apparel market is projected to amount to 1.5 trillion USD in 2022[10] and is estimated to reach approximately 2 trillion USD by 2027.[11] This will increase opportunities for employment worldwide, especially for women and persons who may have previously had difficulty accessing formal employment. Growth and improvements in labour rights in the garment and footwear sector are having an impact on economic growth (SDG 8) in general, and represent an opportunity to advance the fight against poverty (SDG 1) and women's economic independence and empowerment (SDG 5) in particular.

[4] UN-Water, *Summary Progress Update 2021: SDG 6 — water and sanitation for all*, (Geneva, Switzerland, July 2021). Available at: https://www.unwater.org/app/uploads/2021/12/SDG-6-Summary-Progress-Update-2021_Version-July-2021a.pdf

[5] FAO, *Assessment of Agricultural Plastics and Their Sustainability: A Call for Action,* (Rome, 2021). Available at https://www.fao.org/3/cb7856en/cb7856en.pdf.

[6] European Commission, "Single-use plastics", topic webpage outlining the EU approach to single-use plastics. Available at: https://environment.ec.europa.eu/topics/plastics/single-use-plastics_en.

[7] *OECD-FAO Agricultural Outlook 2022-2031.*

[8] IFAD, Tajikistan. Available at https://www.ifad.org/en/web/operations/w/country/tajikistan

[9] U.S. Department of Agriculture, Agriculture and Food Sectors and the Economy. Available at: https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy/?topicId=b7a1aba0-7059-4feb-a84c-b2fd1f0db6a3

[10] Statista (2023), Global apparel market - statistics & facts, August 2023. Available at: https://www.statista.com/topics/5091/apparel-market-worldwide/#topicOverview

[11] Statista (2023), Revenue of the apparel market worldwide from 2014 to 2027, 15 September 2023. Available at: https://www.statista.com/forecasts/821415/value-of-the-global-apparel-market

20. The leading exporters of apparel and footwear in the ECE region by value are Italy, Germany, the Netherlands, Türkiye, France and Spain, which together accounted for more than 22 per cent of global exports in 2020.[12] While East Asia dwarfs the ECE-region's exports of garment and footwear, the ECE region plays a much larger role as an importer. In 2021, EU and U.S. apparel imports alone amounted to USD 203 billion. If intra-EU trade is included, the value of combined EU and U.S. imports increases to almost USD 301 billion, or 65.8 per cent of global apparel imports.[13] In addition, nine of the world's top ten apparel manufacturers and retailers were located in ECE member States in 2021.[14] In sum, the ECE region is one of the most important markets for apparel and footwear, and the sector creates jobs and wealth in ECE member States.

21. Despite its contribution to economic development, many studies have shown that the apparel and footwear sector is also a resource-intensive sector associated with serious environmental and social risks. Around 93 billion cubic metres of water – enough to meet the needs of five million people – are used annually by the fashion industry, contributing significantly to water scarcity.[15] In addition, the garment and footwear industry alone produces 2.1 billion tons (4 per cent) of global greenhouse gas emissions, equivalent to the emissions of France, Germany and the UK combined.[16] Another problem associated with the garment and footwear sector is the waste generated by lack of recycling, poor quality of textiles and unsustainable fast-fashion practices. In total, around 92 million tons of waste are created annually, which end up burned, in landfills or in the oceans.[17] The Ellen Mac Arthur Foundation calculated that every year a half a million tons of plastic microfibers are dumped into the ocean, the equivalent of 50 billion plastic bottles.[18] The same document cites that around USD 500 billion in lost value[19] could be avoided by moving to a more circular economy. It is also well known that the sector is associated with poor working conditions, discrimination and abuses against women, forced and child labour and a range of occupational health risks.

22. Hence, there is an enormous potential to improve the sector's economic, social and environmental impacts by adopting some of the traceability and transparency practices described in this paper.

C. The minerals sector

23. Minerals[20], and the metals and materials created from them, form the backbone of the machinery, transportation and technology that make up our modern economies. And while developed and developing countries alike need minerals such as copper, iron, lithium or nickel to grow their economies and improve their people's standard of living, major mining operations tend to be clustered in several resource-rich countries. In the

[12] Calculations by ECE on the basis of ILO and the European Commission, "The state of the apparel and footwear industry: Employment, automation and their gender dimensions", January 2022. Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_835423.pdf

[13] WTO, *World Trade Statistical Review 2022*. Available at https://www.wto.org/english/res_e/booksp_e/wtsr_2022_e.pdf.

[14] Statista (2021), Sales of major apparel manufacturers and retailers worldwide in the fiscal year 2021. Available at https://www.statista.com/statistics/242114/sales-of-the-leading-10-apparel-retailers-worldwide/.

[15] UNCTAD, "Report maps manufacturing pollution in sub-Saharan Africa and South Asia", 24 September 2020. Available at https://unctad.org/news/report-maps-manufacturing-pollution-in-sub-saharan-africa-and-south-asia.

[16] McKinsey & Company and Global Fashion Agenda, *Fashion on Climate, How the Fashion Industry Can Urgently Act to Reduce Its Greenhouse Gas Emissions*, 2020. Available at https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/fashion%20on%20climate/fashion-on-climate-full-report.pdf.

[17] BBC, "Why clothes are so hard to recycle", 13 July 2020. Available at: https://www.bbc.com/future/article/20200710-why-clothes-are-so-hard-to-recycle.

[18] The World Bank, "How Much Do Our Wardrobes Cost to the Environment?", 23 September 2019. Available at: https://www.worldbank.org/en/news/feature/2019/09/23/costo-moda-medio-ambiente.

[19] Ibid.

[20] Mineral raw materials are mineral constituents of the earth's crust which are of economic value.

ECE region, the leading mining countries, based on minerals production value, are Canada, Finland, Kazakhstan, the Russian Federation, the United States, Ukraine and Uzbekistan.[21] However, some countries with comparatively few mineral resources, such as Switzerland and the UK, are also major players in the mining sector and are home to some of the world's largest mining companies. Mining has been and continues to be a major contributor to the economies of ECE member States, and notwithstanding major mining nations such as China, Australia, Chile, Indonesia and South Africa, 10 of the 20 largest mining companies are based in the ECE region.[22]

24. At the same time the mining sector faces numerous environmental and social challenges that are likely to intensify in the future due to the growing world population, the steady depletion of known mineral deposits and the increasing demand from the renewable energy transition.

25. The sector is notoriously energy and resource-intensive and contributes significantly to climate change, environmental pollution and biodiversity loss.[23] The extraction of finite mineral resources is unsustainable by definition. Mining is estimated to account for up to 11 per cent of the world's total energy consumption[24] and 4 to 7 per cent of greenhouse gas emissions globally.[25] In addition, chemical emissions from mining can contaminate soil, groundwater and surface water, threatening health and causing biodiversity loss.[26] Mining also causes erosion, increases the risk of earthquakes and puts stress on available water resources. It does not help that 30 to 50 per cent of the world's production of copper, gold, iron ore and zinc is concentrated in areas experiencing significant water stress.[27]

26. In the context of the green energy transition and rapidly rising demand for clean energy technologies, the demand for metals and other minerals for batteries is expected to soar over the next decade, with the number of GWh required increasing from about 700 GWh in 2022 to around 4.7 TWh by 2030.[28] Similarly, demand for materials for use in renewable energy systems is projected to continue growing.[29] Circular economy approaches suggest we can mitigate the negative effects of this increasing demand for natural resources by circulating materials for longer, thereby increasing material productivity, eliminating waste and toxins in the environment and allowing nature to regenerate.

27. In summary, the agrifood, garment and footwear, and minerals sectors have two important things in common. First, they contribute significantly and positively to employment and economic development in the ECE region and abroad, due to the

[21] Statista, Leading mining countries worldwide in 2020, based on minerals production value (in billion U.S. dollars). Available at: https://www.statista.com/statistics/1114898/leading-mining-countries-worldwide-based-mineral-production-value/#:~:text=In%202018%2C%20China%20was%20by,production%20value%20the%20same%20year

[22] CompaniesMarketcap.com, "Largest mining companies by market cap". Available at https://companiesmarketcap.com/mining/largest-mining-companies-by-market-cap/.

[23] UNCTAD, Research Paper No. 84, "Growing the good and shrinking the bad: Output-emissions elasticities and green industrial policy in commodity-dependent developing countries" (May 2022) (UNCTAD/SER.RP/2022/4). Available at: https://unctad.org/system/files/official-document/ser-rp-2022d4_en.pdf

[24] K. Hund, et al, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition,* (Washington, DC, USA, World Bank Group, 11 May 2020). Available at https://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf.

[25] McKinsey, "Climate risk and decarbonization: What every mining CEO needs to know", 28 January 2020. Available at: https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-decarbonization-what-every-mining-ceo-needs-to-know

[26] U.S. Geological Survey Water Science School, "Mining and Water Quality", 8 June 2018. Available at: https://www.usgs.gov/special-topics/water-science-school/science/mining-and-water-quality.

[27] McKinsey, "Climate risk and decarbonization".

[28] McKinsey, "Battery 2030: Resilient, sustainable, and circular", 16 January 2023. Available at: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/battery-2030-resilient-sustainable-and-circular.

[29] K. Hund, et al, Minerals for Climate Action.

global value chains that converge in the ECE region. Second, current mainstream practices in the three sectors are unsustainable and contribute to climate change, environmental pollution, biodiversity loss and human health degradation. This calls for regulators, businesses and civil society to work together to positively transform the sectors to reconcile these two conflicting impacts and enable "green growth".

28. Given the prominence of the ECE region in these sectors, member States can effect significant change on a global scale if they adopt responsible environmental and social practices and circular approaches.

29. The next chapter explores how the circular economy can balance economic growth and employment with lower resource use and reduced environmental impacts.

III. Why traceability and transparency are needed for the circular economy

A. From linear to circular value chains

30. Currently, most economies and value chains follow the linear "take-make-waste" model, also known as the "cradle-to-grave" approach (see Figure 2). In this approach, virgin natural resources are extracted from the ecosystem and transformed, sold, consumed, and end up incinerated or in landfills. At the end of their life cycle, products are considered waste and have effectively lost their value. When disposed products enter the environment, hazardous chemicals, vapours or microparticles can contaminate soil and water and enter the food chain, causing health problems and harming the ecosystem. Existing mitigation strategies such as waste management and recycling are insufficient to alleviate the mounting challenge. For instance, of the 50 million tons of electronic waste produced globally, only 20 per cent are formally recycled.[30] In the ECE region, in parts of South-Eastern Europe, the Caucasus and Central Asia, waste collection only reaches 40 to 80 per cent of the population.[31]

Figure 2
The linear cradle-to-grave approach

Source: ECE, 2023and World Economic Forum,2019

31. Most agrifood, garment and footwear, and minerals value chains are no exception to this linear approach. As highlighted in the previous chapter, this leads to serious negative health and environmental impacts. The **circular economy** is a new and inclusive economic paradigm that aims to minimize pollution and waste, extend product life cycles and enable broad sharing of physical and natural assets. It strives for a competitive economy that creates green and decent jobs and keeps resource use within planetary boundaries.

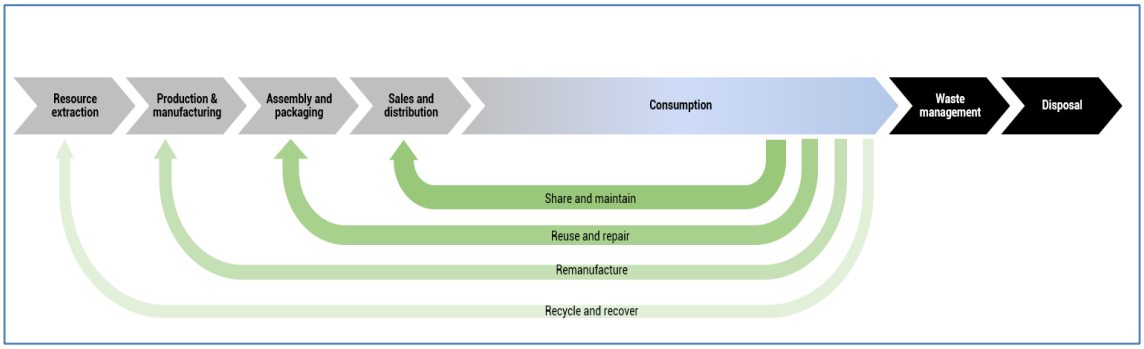
32. Transforming existing linear value chains into circular value chains requires prolonging the effective consumption stage and "closing the loop" as early in the waste stream as possible, preventing the final disposal of the product (Figure 3). In practice, however, this is a great challenge as it requires fundamental changes in mindset and

[30] Platform for Accelerating the Circular Economy (PACE) and World Economic Forum (WEF), "A New Circular Vision for Electronics, Time for a Global Reboot", (World Economic Forum, in support of the United Nations E-waste Coalition, 24 January 2019). Available at https://www.weforum.org/reports/a-new-circular-vision-for-electronics-time-for-a-global-reboot.

[31] ECE, "Circular economy and the sustainable use of natural resources: Trends and opportunities in the region of the Economic Commission for Europe", (4 February 2021) (E/ECE/1495). Available at https://unece.org/oes/documents/2021/02/working-documents/69th-session-economic-commission-europe-circular-economy.

processes. Companies may not currently be aware of any way to extract value from their waste streams, or they may find it too expensive or too difficult to implement a system or enter a business relationship that would allow them to close the loop. Also, some recycled materials are more expensive than newly extracted ones, leading to low market uptake. Looking forward, however, since we have no "Planet B", the "take-make-waste" model that has dominated the last 70 years must come to an end, and a circular economy with closed material loops must become the new norm.

Figure 3
The circular economy model with closed material loops



Source: ECE, 2023, Platform for Accelerating the Circular Economy (PACE) and World Economic Forum, 2019

B. Traceability and transparency for circularity

33. While the circular economy relies on continuous material cycles and extending the useful life of products, it also requires the harmonious collection and exchange of relevant data across the entire value chain. Traceability and transparency are key to this effort.

34. **Traceability,** or product tracing, makes it possible to identify all the goods and materials used to produce a product, as well as their history, their characteristics and how they were processed and transformed.[32] It involves assigning a unique identifier to each good, and tracking it as it moves through the complex value and transformation chain.

35. **Transparency** requires companies and organizations to know what is happening in their value chain, what impact this has had on people and the environment, and it requires that they disclose and make this knowledge available to different stakeholders.[33]

36. Traceability and transparency are fundamental for circularity. To reduce the environmental impacts of products and close the loop, internal and external stakeholders need information about the history, location and application of the product, and the names, certifications and accreditations of upstream and downstream actors in the value chain. Given this information, it is possible for stakeholders across value chains to scale up circular and regenerative approaches such as sharing, reusing, repairing, remanufacturing, recycling, and recovering. The information gathered and shared with stakeholders is also key to developing new circular business models such as industrial symbiosis, where current waste streams from industrial production are diverted and converted into resources for other processes. [34]

[32] ECE, *Recommendation No. 46: Enhancing traceability and transparency of sustainable value chains in the garment and footwear sector*, (Geneva, 2022), (ECE/TRADE/463). Available at https://unece.org/sites/default/files/2022-01/ECE-TRADE-463E.pdf.

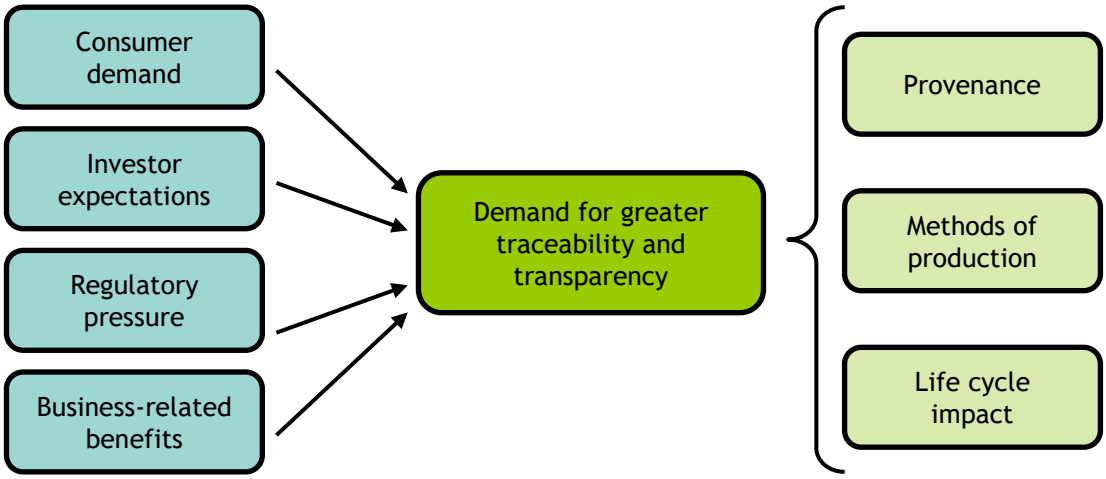
[33] Bateman, Alexis and Leonardo Bonanni, "What Supply Chain Transparency Really Means", *Harvard Business Review*, 20 August 2019. Available at https://hbr.org/2019/08/what-supply-chain-transparency-really-means.

[34] For instance, the use of sludge from fish farms can be used as agricultural fertilizer.

C. Drivers for traceability and transparency

37. The trend towards greater traceability and transparency in value chains is driven by several factors: consumer demand, investor expectations, regulatory pressure, and their business-related benefits (Figure 4). The extent to which each factor plays a role depends on the country in which a company operates and the market it serves. In general, however, most companies are affected by the increasing demand for traceability and transparency, and companies cannot afford to stall progress towards more traceable and transparent value chains, since otherwise they will become less competitive and encounter difficulties placing their products on markets, particularly high-value markets.

Figure 4
Drivers for traceability and transparency



Source: ECE, 2023

1. Consumer demand

38. Studies show that consumers are becoming increasingly sensitive to the environmental impact of the products they buy, and that this is a continuing trend.[35] Consumers around the world want to know more about how their products are made and want to be sure that they have not harmed the environment or the people who made them. This drives demand for socially and environmentally responsible goods and services that, for example, are locally grown, require less packaging material, use less water, are made from recycled materials, can be used multiple times, etc. And despite a measurable "intention-action gap"[36] between the desire to buy sustainably and actually doing so, changing consumer attitudes have effectively created a market for sustainable goods and services.

39. At the same time, having transparent and traceable value chains means that companies can satisfy this demand, build brand loyalty and charge a premium in return for higher verified environmental and social performance.[37] Attempts by some companies to satisfy demand for "green" products and increase profit margins have led to "greenwashing", i.e. changing the product superficially without significantly reducing the environmental and social impact. However, these cases usually become publicized quickly, increasing scepticism about sustainability statements and causing lasting reputational damage to the companies concerned. Hence, labels and independent

[35] PwC, Global Consumer Insights Pulse Survey, 2021. Available at https://www.pwc.com/gx/en/consumer-markets/consumer-insights-survey/2021/gcis-june-2021.pdf.

[36] White, Katherine et al, "The Elusive Green Consumer", *Harvard Business Review*, (July-August 2019). Available at: https://hbr.org/2019/07/the-elusive-green-consumer.

[37] Tim Kraft, León Valdés, Yanchong Zheng, "Supply Chain Visibility and Social Responsibility: Investigating Consumers' Behaviors and Motives", *Manufacturing & Service Operations Management* v. 20 no. 4, pp.617-636 (1 June 2018). Available at https://doi.org/10.1287/msom.2017.0685.

certification schemes have become important tools for companies to demonstrate compliance with environmental, social and governance (ESG) standards. For labels and certifications to be effective and trustworthy, they need to be backed up by verifiable data about impacts and risk management strategies along the whole value chain, and this trustworthiness, in turn, will drive demand for traceability and transparency.

2. Investor expectations

40. Similar to rising consumer demand for greener products, there has been an unprecedented increase in demand for investment portfolios that are aligned with ESG criteria. Investors are expecting companies to not only deliver financial performance, but also show how they make a positive contribution to the environment and society. While there is no general definition of what constitutes an ESG-aligned portfolio, investors usually pursue one of two ESG strategies:

- Identifying portfolios that avoid companies from certain industries that are considered environmentally and socially problematic, such as guns, tobacco, gambling, nuclear energy or fossil fuels; or
- Identifying portfolios that adhere to a best-in-class ESG approach, that do not exclude industries *per se* but eliminate the worst-performing companies (from an ESG standpoint) within an industry and replace them with a better-performing one.

41. Each strategy has its advantages and disadvantages, however these are not the focus of this paper. What is relevant is that the current demand for both types of ESG compliant products has been shown to outgrow their supply. [38] This incentivizes asset managers to create ESG portfolios that include companies that have better ESG performance than their peers, and which are supported by verifiable data. After all, it is important for the risk profile and value of the investment; investors need to be confident that companies will not be exposed to reputational risks or become caught in a scandal. To attract investment, companies are therefore increasingly required to have transparent and traceable value chains and demonstrate compliance with ESG criteria, including through independent, verifiable credentials and independent certification.

3. Regulatory pressure

42. Policymakers and regulators have a duty to ensure that goods are safe for human use and consumption. In the case of contaminated or pathogenic products, the affected products must be withdrawn from circulation as soon as possible and the cause must be found to prevent further contamination and the spread of disease. For this reason, transparency and traceability regulation is well developed in the agrifood sector, where food safety is a top priority.

43. More recently, other reasons, beyond immediate consumer protection, have led regulators to impose traceability and transparency requirements. For example, concerns by U.S. authorities that "conflict minerals" are being used to finance or benefit armed groups led to the passing of Section 1502 of the Dodd-Frank Act in 2010, which established traceability requirements for "conflict minerals" back to the smelter of origin, as well as a step-by-step due diligence reporting process. Similarly, modern slavery legislation in Australia and the UK and California's Transparency in Supply Chains Act were prompted by concerns about the use of forced labour. As regulators around the world become more aware of the need to mitigate the effects of climate change, environmental regulations, particularly in the EU, are beginning to include requirements for traceability and transparency. Since the EU is an attractive high-value export market, and the regulations and standards set by regulators increasingly apply to the entire value chain, they will promote traceability and transparency requirements even outside their own jurisdiction.

[38] PwC, “Asset and wealth management revolution 2022: Exponential expectations for ESG”, 2022. Available at: https://www.pwc.com/awm-revolution-2022.

44. Governments are also major procurers of goods and services, and decisions to procure in a socially and environmentally responsible manner have significant demand implications far beyond those of individual consumers, both in terms of the value of goods and long-term demands on producers. Importantly, the procurement of goods and services by governments is subject to greater scrutiny than consumer purchases, which means that companies wishing to bid for government contracts need to verify their sustainability claims and demonstrate their trustworthiness, which increases the demand for traceability and transparency along value chains.

4. Business-related benefits

45. The need to meet increasing consumer, investor and regulator demand for transparency and traceability from can also result in significant business benefits to companies that adopt them in their value chains. The following are some examples:

- Traceability allows companies to gain detailed **insight into their resource use**. Fully transparent and traceable supply chains enable reduced resource consumption, operational improvements, new uses for waste streams and generally leaner operations, resulting in lower operating costs and higher profit margins.
- Furthermore, the integration of traceability technologies **improves response times** for businesses and makes them less vulnerable to transport bottlenecks. In the event of supply chain disruptions, companies that know which products are affected by bottlenecks and can quickly reroute products or send supplies to prevent critical products from bringing the entire operation to a standstill. Being able to ensure a continuous flow of goods translates into better relationships with customers and suppliers and reduces operational liabilities.
- Finally, traceability and transparency enable **better decision-making** and more accurate corrective action. For example, in the case of defective, spoiled, contaminated or hazardous products, effective identification and traceability allows companies to recall only the affected products, rather than having to conduct an expensive, full-scale recall of all potentially affected products. This is particularly important for companies in the agrifood sector, which are exposed to a wide range of risks of food contamination. Constant temperature and humidity documentation, as well as regular, documented sanitary and phytosanitary controls significantly reduce the risks and impacts of food contamination, as well as companies' liability to downstream stakeholders.

46. In summary, value chain traceability and transparency enable companies to verify desirable product requirements and meet the growing demand for sustainable products. Second, traceability and transparency are critical for companies seeking to attract capital from investors who are increasingly interested in verified ESG performance. Third, international sustainability regulatory requirements are becoming more common, and companies that want to demonstrate compliance and continue exporting to these markets need to implement traceability and transparency. Finally, the adoption of transparency and traceability promises significant business benefits, such as more efficient resource use, faster response times, better supplier relationships and leaner operations.

D. Technology for traceability and transparency

47. Due to the complexity of modern agrifood, garment, footwear and minerals value chains, which regularly span multiple countries and involve hundreds of different suppliers and subcontractors, value chains can only be made traceable and transparent using emerging advanced technology. Technology fulfils four important functions related to traceability and transparency: (1) identifying products, (2) capturing information, (3) processing information, and (4) exchanging information.

48. A variety of technologies are currently available for companies wishing to introduce or strengthen traceability and transparency in their value chains, including sensors, RFID tags, digital product passports, GPS, and blockchain technology. Which specific technology is needed depends on the product to be traced and the characteristics of the value chain.

49. For example, a food item cannot physically be labelled in the same way as a garment. Also, a perishable food item should contain detailed information about its shelf life and maximum and minimum temperature values, which are less important for a garment. Consequently, the technology required to track these two items will be different.

50. Table 1 provides an overview of different technologies that support transparency and traceability functions for the circular economy.

Table 1
Technologies supporting the traceability of supply chains

Function	*Supporting technology*	*Description*
Identification of products	Product identification labels	Product identification labels are a broad category that refers to any label that contains information and allows identification of the product to which it is attached or on which it is printed. Product identification labels can be human readable (e.g. handwritten text), machine readable (e.g. barcode) or both (typed text). The type of information included depends on the characteristics and use of the product, but generally product identification labels contain a serial number, a brand name and the date of production.
	RFID and NFC	Radio-frequency identification (RFID) and near-field communication (NFC) are wireless communication technologies. RFID enables communication between an RFID tag that contains the data and an RFID reader with an antenna. Usually, RFID tags are passive and are activated by the RFID reader. However, active tags exist that have their own power source, allowing them to be read over long distances. RFID is ideal for asset tracking and is used in logistics and warehousing. NFC is also based on RFID protocols. The main difference is that NFC devices can act not only as a reader but also as a tag. Therefore, it is also possible to transfer information between two NFC devices. NFC has a very short range, so two NFC devices need to be in close proximity to exchange data.
	QR codes	Quick response (QR) codes are widely used machine-readable optical labels that contain information about a product. QR codes can be printed with any printer and most smartphones can read QR codes, making them accessible and inexpensive. QR codes are often used to redirect to a website or trigger an application.

Function	*Supporting technology*	*Description*
	DNA tracers	DNA tracers are chemical substances that are applied to or integrated into a product on a nanoscale to mark it. DNA tracers are invisible to the human eye and can withstand industrial processes, making them durable and highly tamper-proof. With the help of a swab test, the authenticity of the product can be verified at any stage of the value chain. However, DNA tracers cannot store specific information.
	Watermarks	Physical and digital watermarks are optical markers that only become visible under certain conditions (e.g. ultraviolet light, special algorithms). Adding watermarks to product identification labels, makes them more tamper-proof.
	Digital twins and digital product passports	A digital twin is a virtual representation of a physical product. The digital twin contains complex information about its physical twin—for example, about the origin, composition, repair and disassembly possibilities of a product and how the different components can be recycled. The digital twin can be accessed online, for example via a QR code printed on the product or a link attached to the product. The European Union has launched a digital product passport initiative to structure the disclosure obligations of products.
	Stable isotope analysis	Stable isotope analysis can be used to verify the geographic origin of products, especially produce, using the unique composition of stable isotopes in products. The stable isotopes act as a "geographic fingerprint" of the environmental conditions at the product's point of origin, as well as the practices used during production. This can be used to verify claims about a product's claimed origin.
Capturing information	Cameras and scanners	Cameras and scanners are optical sensors that can capture visual information such as text, barcodes, QR codes, watermarks and more. Cameras can also be used to take pictures of products at different stages of the value chain to document the location (e.g. border control, arrival at transport hub) and condition (e.g. damage, missing parts, spoilage) of the product.
	Weighing scales	Scales and measuring devices are indispensable tools for traceability. Modern scales can be coupled with cameras and other sensors to inform algorithms that can independently identify the nature of the product.

Function	*Supporting technology*	*Description*
	Metal detectors and X-ray scanners	Metal detectors and X-ray scanners are important sensors to ensure the quality and safety of goods in the agrifood, clothing, footwear and minerals value chains, as they allow for the inspection of the products without having to open them. They can also detect material defects that could lead to premature failure of the product.
	Remote sensing	Aerial photography, satellite imagery, radar and lidar (light detection and ranging) technologies enable the detection of a wide range of physical phenomena such as smoke from factories, oil spills, slash-and-burn agriculture, erosion, falling water levels, etc. They are therefore a valuable tool for the transparency of value chains, enabling the verification of environmental conditions via the internet without having to physically go to these locations.
	GPS	A global positioning system (GPS) uses satellites to accurately determine the position of GPS-compatible devices or tracking modules. This enables continuous tracking of transporters, containers or even individual goods en route around the globe. This provides reliable and almost real-time data for route or production planners and can be used to verify origin information.
Processing information	Computers	Given the complexity of the information collected by the sensors, computers are needed to process, transform and display the data to make it usable for decision makers. The larger the amount of data, the more powerful the computers must be to process the data in a timely manner.
	Cloud computing	Cloud computing services allow users to remotely access the computing power of more powerful computers over the internet without having to own those computers. This reduces the initial capital cost and allows processing solutions that can be flexibly adapted to the processing power requirements.
	Manufacturing execution systems	Manufacturing execution systems (MES) are software systems that monitor, track and document the transformation of raw materials into finished goods.
	Enterprise resource planning software	Enterprise resource planning (ERP) software supports decision makers in the planning, controlling and management of personnel, resources, capital, assets, materials, and information and communication technology to ensure the efficiency of operations.

Function	*Supporting technology*	*Description*
	Customer relationship management software	Customer relationship management (CRM) software allows companies to provide their customers with a complete picture of all interactions, track their sales, organize and prioritize their business opportunities, and facilitate collaboration between different teams.
	Advanced algorithms	Advanced algorithms such as artificial intelligence (AI) and machine learning are programs developed to solve complex, real-world problems. For example, they can automatically recognize objects and people in images, generate texts and optimize processes. The algorithms are constantly learning and changing themselves to improve over time.
Sharing information	Internet access	Internet access is a prerequisite for many of the technologies described here. However, in places where Internet access is scarce or unavailable, data can be saved offline and uploaded to the Internet later.
	Databases	Databases, accessible via the Internet, allow stakeholders to upload images, documents, videos and other data to make them accessible to other stakeholders. Depending on the stakeholder, database administrators can grant different read or write permissions and upload new files to the database.
	Distributed ledger/blockchain technology	Distributed ledger/blockchain technology is a digital system for recording transactions in which transactions and their details are recorded in multiple locations simultaneously. The totality of all records of transactions (blocks) forms the blockchain. Unlike traditional databases, distributed ledgers have no central data storage or management functionality. Instead, distributed ledger technology relies on a consensus mechanism to verify transactions.
	Internet of things	The internet of things (IoT) is the network of physical objects that are equipped with sensors and software to connect to other devices and systems and automatically exchange data over the Internet (e.g. cameras that automatically upload images to a database that, in turn, informs CRM software about the location and condition of a product).

51. Properly implemented, these technologies can provide a level of traceability and transparency for products in the agrifood, garment and footwear, and minerals sectors that enables the efficient and circular use of resources. Among others things, these tools can help prevent premature failures, enable timely repairs, identify and disseminate information about potential uses with stakeholders and help verify sustainability claims.

IV. Traceability and circularity policy landscape in the ECE region

A. Transparency and traceability policy in the European Union

52. Transparency and traceability requirements have become a significant focus for policymakers and regulators worldwide, but the EU and its member States stand out with respect to the comprehensiveness of their regulation on transparency and traceability with regards to the circular economy. The transition to a circular economy is a main policy priority for the EU under the **European Green Deal,** which aims to make Europe the first climate-neutral continent. The **Circular Economy Action Plan (CEAP)**, adopted in 2020, is a key building block of the Green Deal. It proposes to accelerate the EU's transition towards a regenerative growth model, keep resource consumption within planetary boundaries, reduce its consumption footprint and double its circular material use rate in the coming decade.[39] The legislative proposals mapped out in the CEAP and Circular Economy Package, which includes the proposed revision of the **Waste Framework Directive**[40] include targets for landfills, reuse, and recycling, to be met by 2030 and 2035, along with directives requiring separate collection of textiles and biowaste in all member States by 2025. The Waste Framework Directive also introduces the *polluter pays principle* and *extended producer responsibility* concept, placing greater responsibility on the final producer for the whole life cycle of the product, and in particular for its reclamation, recycling and final disposal. [41]

53. With respect to traceability and transparency, several EU member States have made headway in improving corporate transparency by introducing rules on conducting human rights due diligence[42] (HRDD). Although many HRDD rules are still voluntary at the national level, the movements to achieve sustainable and responsible corporate practices in connection with human rights are becoming more prominent. In 2021, Germany passed its **Supply Chain Act**,[43] which obliges companies with 1000 employees or more to ensure the respect for human rights and several environmental standards through the implementation of defined due diligence throughout the whole value chain. Back in 2017, France had already enacted the **Duty of Vigilance Act**,[44] which requires companies with 5000 employees or more to develop a due diligence plan in order to monitor and prevent potential human rights abuses in their supply chains.

54. Following its member states, in 2022 the European Commission released its proposal for a **Directive on Corporate Sustainability Due Diligence**. The Directive would establish a comprehensive corporate duty to conduct not only HRDD but also due diligence to prevent, account for, mitigate and end negative social and environmental impacts in the company's own operations, their subsidiaries and their value chains. In addition, certain large companies would be required to develop a plan to ensure that their business strategy was compatible with limiting global warming to 1.5°C, in line with the Paris Agreement. The Directive also introduced duties for the directors of the EU companies, such as setting up and overseeing the implementation of the due diligence processes and integrating due diligence into the corporate strategy.

[39] European Commission (2020), COM/2020/98.

[40] European Commission (2023) COM(2023) 420 final.

[41] Ibid.

[42] Due diligence is the processes through which enterprises can identify, prevent, mitigate and account for how they address their actual and potential adverse impacts (as defined in the OECD Guidelines for Multinational Enterprises, chapter II – general policies, para. 15), (Paris, 2023). Available at http://mneguidelines.oecd.org/guidelines/.

[43] Gesetz über die unternehmerischen Sorgfaltspflichten in Lieferketten (Law on corporate due diligence in supply chains, 16 July 2021). Available at http://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&jumpTo=bgbl121s2959.pdf.

[44] LOI No.1 2017-399 du 27 mars 2017 relative au devoir de vigilance des sociétés mères et des entreprises donneuses d'ordre (1) (on the duty of vigilance of parent companies and contracting companies). Available at https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000034290626/.

Once adopted, the Directive would have to be implemented by all 27 EU member States, applying to thousands of large companies.

55. Additional requirements for transparency and traceability are set out in the **Sustainable Products Initiative (SPI)**, a package that comprises a communication on products sustainability, a proposal for a regulation on ecodesign requirements, a proposal for a directive on consumer empowerment and a proposal for the revision of the regulation on construction products. Specifically, the **Ecodesign for Sustainable Products Regulation (ESPR)** would impose ecodesign requirements on all products intended for sale on EU markets. Any organization placing goods for sale on the European market, whether or not they are based within Europe, would be required to comply with the requirements of the regulation. The regulation sets a horizontal framework with several obligations directed at manufacturers, authorized representatives, importers, distributors and other entities at various stages of the product life cycle.

56. In particular, two types of requirements are expected:

- **Performance requirements** demanding compliance with rules on durability, repairability, reusability, recyclability, environmental footprint, carbon footprint, microplastic release, presence of substances of concern and waste generation, among others.
- **Information requirements** implying that details related to a product's performance must be supplied with the product. The information may be provided on the product, packaging, label, website, in a manual or in a product passport.

57. Selected products will have a **digital product passport** that is intended to meet the general requirements for providing information, such as how to install, use, maintain and repair the product and how to return or dispose of it. Digital product passports will be the norm for all products regulated under the ESPR, aiming to ensure that products are tagged, identified, and linked to data relevant to their circularity and sustainability performance. These digital passports will help consumers understand the impacts of the products they buy and help them make more sustainable choices. They will allow the tracking of the presence of substances of concern throughout the life cycle of materials and products, improve transparency, support national authorities in enforcement and surveillance, and advance the circularity of products along the value chain. Digital product passports are supported by the proposal for the **Empowering the Consumers in Green Transition Directive**, as well as the **Substantiating the Green Claims initiative,** which aim to provide consumers with better information about products and strengthen consumer protection against unfair trade practices (such as greenwashing) that hinder sustainable purchasing and consumption choices.

58. The digital product passport is likely to be underpinned by the environmental performance measurement methodologies described in the Product Environmental Footprint measure (PEF), the Organisation Environmental Footprint measure (OEF), the Methodology for the Ecodesign of Energy-related Products (MEErP) and the Circular Footprint Formula (CFF), all of which have been, or are being, developed by the European Commission.

59. The EU also passed relevant regulations specifically targeting the agrifood, garment and footwear and minerals sectors:

60. The EU **General Food Law** came into force in 2002 and imposes traceability requirements on all food and feed businesses. It requires all food and feed operators to implement specific traceability systems, allowing them to identify where their products have come from, where they are going and to provide this information rapidly to the competent authorities.

61. To manage decreasing fish stocks, the EU reformed their **Common Fisheries Policy** in 2013, regulating all aspects of fishing within EU waters with the overall objective of ensuring economic, environmental and socially sustainable use of fisheries resources. The EU fisheries control Regulation (EC) 1224/2009 requires the traceability

and availability of production information on unprocessed fishery and aquaculture products throughout the supply chain.

62. The **Strategy for Sustainable and Circular Textiles** includes measures such as a mandatory EU extended producer responsibility scheme, ecodesign requirements for textiles,[45] actions to tackle microfibre pollution and greenwashing, and the new digital product passport. This strategy aims to make textiles more durable, repairable, reusable and recyclable, to tackle fast fashion, textile waste and the destruction of unsold textiles, and to ensure that production respects human rights. In addition, the **Global Chemical Strategy for Sustainability** aims to prevent and eliminate hazardous chemicals from entering products, such as textiles, from the very beginning of the design phase. The strategy also includes traceability and transparency measures to meet the challenges posed by chemicals.

63. In response to growing international concerns over minerals extraction and trade contributing to human rights abuses and conflict financing, the **Conflict Minerals Regulation** came into force in 2021. The regulation requires EU companies to do their due diligence and import minerals and metals from responsible sources only. Specifically, it aims to stop conflict minerals and metals from being exported to the EU, stop EU smelters and refiners from using conflict minerals, and protect human rights for mine workers.

64. This brief overview highlights the leading role of the EU in advancing policy and legislation for the circular economy, and traceability and transparency. Additional measures specifically supporting traceability and traceability in the EU subregion are analysed in Annex I. The next section provides an overview of relevant policy and legislation in the ECE programme countries. This comparison highlights common themes and strategies, discusses challenges, and identifies areas for possible pan-European cooperation.

B. Transparency and traceability policy in the ECE programme countries

65. The progress in enhancing circular economy and traceability frameworks is evident in the EU but the concept of traceability as an instrument for the circular economy transition is less known in the ECE programme countries.[46] Based on the research conducted for this paper, traceability legislation in those countries is still at an early stage of formulation, and relevant laws and policies are generally adopted at the national level, without considering cross-border value chains.

66. However, due to close trade relationships and EU accession processes, the EU can play a significant role in promoting traceability and circularity in several programme countries. In general it can be said that the traceability landscape for the circular economy transition has been transforming at a faster pace in those ECE programme countries that are EU accession candidates, than in those that have no immediate intention to join the EU.

67. For example, in 2020, the programme countries in the **Western Balkans** have signed the Sofia Declaration on the **Green Agenda for the Western Balkans (GAWB)** that aligns the region with the EU Green Deal and aims at unlocking the potential of the circular economy, promoting sustainable methods of food production and supply, and exploiting the tourism potential of the region, focusing on biodiversity protection and restoration of ecosystems. The GAWB action plan initiates the establishment of

[45] According to the EU Strategy for Sustainable and Circular Textiles, "textile ecosystem refers to textile, clothing, leather and footwear industries, in accordance with the definition provided by the Annual Single Market Report 2021".

[46] The 17 programme countries of the ECE lie in the Western Balkans, Eastern Europe, Central Asia and the South Caucasus. They are Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Montenegro, North Macedonia, Serbia, Tajikistan, Turkmenistan, Türkiye, Ukraine, and Uzbekistan.

working groups, who will, among other tasks, support the process on introduction of control and traceability of organic farming and products.

68. In **Albania** the requirements for traceability of agrifood value chains are included in the regulations that follow the Law of the Republic of Albania "On Food". Article 25 of this law outlines the requirements for food businesses to implement safety measures based on the principles of Hazard Analysis and Critical Control Point[47] (HACCP). Food business operators are obligated to register the needed information and prepare annual reports that are stored in regional departments of the Ministry of Agriculture. Food must be labelled and identified through documents and other types of information to ensure traceability. The requirements for traceability are determined by a decision of the Council of Ministers on the proposal of the Minister of Agriculture.

69. **Bosnia and Herzegovina** adopted the law "On Food" in 2004, which regulates general principles and requirements concerning the safety of food and cattle feed, conditions for placing novel food on the market, and conditions for placing cattle feed that contains or consists of genetically modified organisms on the market. It was developed to be compliant with the EU's General Food Law (Regulation (EC) No 178/2002).

70. In **Serbia** the law "On Food Safety" defines traceability as the ability to trace food, feed, food-producing animals, raw materials, or substances intended to be, or expected to be incorporated into food or feed, in all stages of production, processing and circulation. Any food or feed business operator shall identify each operator from which it procures and to which it supplies food, feed, or food-producing animals. The law requires operators to establish a system and procedures which provide for availability of the traceability data. State administration authorities enforce measures to verify that food or feed business operators are maintaining traceability. These measures can include veterinary, phytosanitary and agricultural inspections. The law also contains articles that regulate traceability and marking of novel food, genetically modified food and feed.

Box 1
Blockchain technology for better food waste management in Serbia

In 2021 the UNDP, in partnership with Delhaize Serbia, and with the participation of the NGO Food Bank Belgrade, developed Plate by Plate, the first digital platform for food donation in Serbia. Using this platform humanitarian organizations can access unsold fruit and vegetables from stores. The shops update the platform with the available quantities of produce daily and beneficiary organizations can reserve and collect the food from one or more shops. The platform also enables registration of new interested humanitarian organizations and associations which will, through the Food Bank, be given their accounts and an opportunity to collect available food on daily basis. "Plate by Plate" is based on blockchain technology, which ensures security and traceability for the entire process. The platform allows traceability and monitoring of the complete history of activities, and once a transaction is made, no modifications are allowed.

Source: ECE, 2023

1. Eastern Europe

71. In **Belarus** the Decree of the President of the Republic of Belarus of 29 December 2020, No. 496 "On the Traceability of Goods" establishes that traceability is applicable to transactions with goods subject to information interaction with the member States of the Eurasian Economic Union. Collection, accounting, storage, processing and control of information are carried out in the software package

[47] HACCP is a systematic approach to food safety that involves identifying potential hazards and critical control points during the production process where these hazards can be prevented, eliminated, or reduced to acceptable levels.

"Traceability System of Goods" of the automated information system "Calculation of Taxes"[48]. The system for the identification, labelling and traceability of goods in Belarus is based on the concept of the digital product passport, which includes a description in the form of a set of standardized fields and an international unique identifier. Electronic passports are accumulated in the Bank of Electronic Passports of Goods[49] (ePass). The ePass is a centralized information resource containing descriptions of goods in a format conforming to international standards of electronic commerce. Product descriptions come to ePass from primary sources: manufacturers and importers. In the future, product descriptions will be transmitted to supply chain participants for use in business process automation systems. The electronic product passport combines a set of attributes that already contain the data required to implement certain stages of the circular economy concept and can be expanded to include data that may be required in the future by smart technologies managing the flow of secondary resources.

2. South Caucasus and Türkiye

72. In **Armenia** the strategy of the "Main Directions Ensuring Economic Development in the Agricultural Sector for 2020-2030" provides for development of a full-fledged food traceability system based on the field-to-consumer principle. The introduction of a system to ensure the traceability of agricultural products is highlighted as a priority of the Armenian Government.

73. **Georgia**, with the support of the FAO, the Swiss Agency for Development and Cooperation and the Austrian Development Agency, adopted a legal framework for the identification and traceability of small and large ruminants, such as sheep and cows. The National Animal Identification and Traceability System (NAITS) aims to build a system of animal registration and health control by strengthening agency capacities, involving veterinarians in the animal identification and registration process and launching an electronic system to promote traceability and protection of consumer interests. The registration of animals also helps farmers benefit from government support programmes and to sell both the animals and their products without impediment. By improving registration and traceability, production standards and confidence in Georgian products have increased in export markets.[50]

74. In **Türkiye** the Regulation of the Ministry of Industry and Technology "On Market Surveillance and Inspection" requires that economic operators regularly keep records of the name, trade name or brand and contact information of the previous and, if any, the next economic operator in the supply chain and other information that will facilitate follow-up on the product. They keep them for at least ten years and submit them to the ministry upon request. When corrective measures need to be taken within the scope of the regulation, economic operators must create a record containing the distributors to whom the product is distributed based on serial, batch or lot and the amount of product distributed and submit these records upon request.

3. Central Asia

75. The National Development Strategy of **Tajikistan** intends to strengthen the agrifood sector by creating agro-industrial clusters and enterprises for the complete processing of cotton fibre, leather raw materials and cocoons. To help accelerate the shift to a circular economy, the Ministry of Economic Development and Trade, with the

[48] State information system "Software and hardware complex for automating the process of calculating taxes, fees (duties) payable to the budget and submitting tax returns (calculations) to the tax authorities in electronic form." For more information see Decree of the President of the Republic of Belarus of December 29, 2020 No. 496. Available at: https://pravo.by/document/?guid=3961&p0=P32000496

[49] For information on the system "Bank of electronic passports of goods" (ePass) of the Republic of Belarus, see http://epass.by/?rvn=1.

[50] World Organisation for Animal Health, "Animal Identification and Registration Process an Ongoing Success in Georgia", 8 November 2021. Available at: https://rr-europe.woah.org/en/news/animal-identification-in-georgia/.

support of ECE, organized the First National Policy Dialogue on the Circular Economy in Tajikistan—Improving Traceability of Products Along International Value Chains in 2022. The policy dialogues aimed to strengthen the capacities of national stakeholders, which will lead to the development of one national gap analysis and one national road map or action plan to accelerate the transition to a circular economy in the textile and footwear industry through effective traceability systems.

76. To address concerns about the use of child and forced labour in the cotton harvest and production process in **Uzbekistan**, as well as environmental risks related to water consumption, the country is looking to modernize its agrifood sector and make it more sustainable.[51] International donors such as the International Finance Corporation, with support of GIZ, began piloting the implementation of the Better Cotton Principles and Criteria in Uzbekistan since 2017, with the aim to promote sustainable and decent work practices and standards in cotton farming.[52] In 2021-2022, the International Finance Corporation collaborated with the ECE to implement a pilot project to fully trace T-shirts back to the cotton field in Uzbekistan in the ECE blockchain platform. This work placed an important role in the scaling up of subsequent use cases to improve cotton traceability and transparency in Uzbekistan, following the introduction of the Better Cotton programme in Uzbekistan in 2022.[53] In addition, ECE is supporting Uzbekistan in developing a strategy for sustainability and circular economy in the textile industry and has conducted a blockchain pilot project on sustainability disclosure in a blockchain environment supported by DNA tracer technology (see Box 2).

Box 2
ECE blockchain pilot for traceability and due diligence

In 2020, ECE launched a pilot project to develop a blockchain system for traceability and due diligence in the cotton and leather value chain, spanning from field to shelf. The goal of this initiative is to equip governments and companies with a suite of tools to enhance traceability, transparency and sustainability in these industries. It also aims to aid in the identification and coding of key data that can be used to evaluate the sustainability performance of products, processes and facilities.

The pilot is testing a selected set of sustainability claims, identified jointly with partners, which concern origin, content, use of chemicals, and compliance with due diligence requirements. Partners have been asked the following:

- To identify those products and materials (traceable assets) to which one or more of the selected sustainability claims should be applied; and
- To collect and exchange relevant information and documents with business partners (e.g. shipping documents, delivery notes, invoices) as well as sustainability certificates and inspection reports at relevant nodes of the value chain.

Traceability is being further strengthened by the application of DNA markers to connect physical and digital assets moving along the value chain. A public, permissionless, Ethereum

[51] The presidential Decree No. UP-53 "On measures to stimulate deep processing, production and export of finished products with high added value by textile and sewing and knitting enterprises", adopted 21 January 2022, intends to stimulate the export of high-value finished goods with through effective use of the available source of raw materials.

[52] See International Finance Corporation (IFC), "IFC invests in Indorama Agro to Promote Sustainable Cotton and Improve livelihoods in Rural Areas in Uzbekistan", 27 May 2021. Available at: https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=26373

[53] Uzbekistan Textile and Garment Industry Association (Uztekstilprom), "Better Cotton Program Doubles Cluster Reach in Uzbekistan", 14 July 2023. Available at: https://uzts.uz/en/better-cotton-program-doubles-cluster-reach-in-uzbekistan/. For more information, see Uzdaily.com, "Better Cotton: We see great demand for Uzbek cotton and textile products", 16 November 2022. Available at: https://uzdaily.com/en/post/77211#:~:text=The%20Better%20Cotton%20initiative%20is,more%20than%2030%20thousand%20hectares

blockchain, which allows for the running of smart contracts, is being used to increase the trustworthiness of the data as well as the connectivity, cost-efficiency, scalability and transferability of the solution. The transfer of data from existing systems is allowed through the availability of an application programming interface (API). The pilots have thus far led to the issuance of the first third-party Better Cotton certification for cotton clusters in the country of Uzbekistan, in 2023.

The following considerations and recommendations are emerging from the ongoing implementation of the pilot:

- An enabling environment is needed to allow upstream and downstream actors in the value chain to engage and collaborate.

- Policies and regulations need to be tailored to reference standards for data interoperability and should consider other evolving technologies such as AI, IoT, big data, and cloud computing.

- Open source, inclusive solutions and capacity-building are needed to help businesses scale up, particularly small businesses.

- Supportive frameworks for data security, privacy and governance are preconditions to accelerating adoption.

- Data models for inspection reports, certificates and credentials need to be based on international standards for information exchange (e.g. UN/CEFACT e-business standards).

Source: ECE, 2023

C. Private-sector traceability initiatives in the ECE region

77. Driven by increasing demands from consumers, investors and regulators for greater transparency and traceability, as well as the positive economic benefits of implementing supporting solutions, businesses have partnered with academia, think tanks and government agencies in the ECE region. Together they have developed numerous traceability initiatives and solutions aimed at reducing negative environmental impacts, enhancing the efficiency of value chains, and recovering the economic value lost through the premature disposal of potentially valuable materials. These collaborations have been exploring the potential of advanced information-exchange systems, including blockchain technologies and use of APIs.

78. A few examples of such initiatives and solutions for the agrifood, garment and footwear, and minerals sectors are showcased below in Table 2.

Table 2
Private sector traceability initiatives in the agrifood, garment and footwear, and minerals sectors

Agrifood		
Blockchain for Agrifood is a Dutch pilot project, launched in 2017 in collaboration with Wageningen University & Research, and funded by the Dutch Ministry of Economic Affairs. It is one of the first pilots aimed at achieving a better understanding of blockchain technology	Food Trust is a platform, developed by The Sustainable Shrimp Partnership (SSP) in collaboration with IBM, that provide complete traceability of shrimp for consumers. It also helps to verify the authenticity of product claims. Data related to the shrimp production is uploaded onto the blockchain, which can be accessed by retailers and consumers at every stage of the process. This platform also ensures verification of the shrimp SSP qualification (e.g. that	Winnow provides a food waste management hardware and software that enables commercial kitchens to monitor their food waste. The system uses cameras and connected scales to measure and identify the amount and type of food waste. The software tracks where waste is happening so that appropriate operational decisions can be made to

Agrifood		
and its implications for the agrifood sector, especially how it can impact specific aspects of the food chains. The project developed a pilot use case on table grapes imported to the Netherlands from South Africa, where blockchain technology could be applied to track the validity of certificates for food quality.	it adheres to the Aquaculture Stewardship Council (ASC) standard and is antibiotic-free).	minimize it. Swedish multinational conglomerate IKEA installed Winnow in 35 per cent of their kitchens, allowing them to save an estimated 1 million meals within a few months.
Garment and footwear		
Vitelco Leather was founded by Vitelco, one of the largest veal slaughterhouses in Europe, and is part of PALI Group, a livestock trading company and meat producer. Vitelco Leather uses a traceable code, corresponding to the earmark of each calf, to store information about where the calf was born, what it was fed, and in which truck it was transported. By scanning this code, all the information of each individual calf and calfskin is immediately available.	Clear Fashion is a French company that has developed an app that makes it easy for consumers to find out about the sustainability of hundreds of fashion brands. Clear Fashion's rating method assesses brand performance in terms of environmental, human, health and animal impact, and provides information on the production location, so that consumers can check the sustainability claims brands make against an independent evaluation.	Reverse Resources is a textile waste tracking and trading platform that brings transparency to global waste streams. Reverse Resources works with manufacturers, recyclers, and waste recyclers in 24 countries to digitize textile waste data and connect manufacturers and fashion brands. Their goal is to help textile recyclers access secondary materials that they can use to produce yarns and fabrics for the fashion industry. In addition to waste mapping in more than 20 countries, they have established a platform that promotes collaboration in the fashion industry, providing full transparency from the source of secondary textile materials to their recycling.
Minerals		
Tracr is a distributed diamond blockchain by diamond company DeBeers, that starts at the source and provides tamper-proof source assurance at scale, enabling	Tomra Recycling is an automated system developed by a Norwegian company for the recovery and	Blockchain technology for ethically sourced cobalt Ford Motor Company, Huayou Cobalt, IBM,

Agrifood		
stakeholders to provide an immutable record of a diamond's provenance and empowering jewellery retailers to have confidence in the origin of the diamonds they purchase.	recycling of various types of valuable materials and minerals. This flexible sorting system enables the collection of data to facilitate recycling and material upgrading, as well as the sustainable sorting of ores, gemstones and minerals. Sensor-based technology can help reduce dependency on primary raw materials and mitigate the environmental impacts of incineration and landfills.	LG Chem and RCS Global announced plans to use blockchain technology to trace and validate ethically sourced minerals. The group, which includes participants at each major stage of the supply chain—from mine to end user—has launched a pilot project focused on cobalt. The aim is to create an open, industry-wide blockchain platform that could ultimately be used to trace and validate the sustainability performance of a range of minerals used in consumer products.

Source: ECE, 2023

V. Challenges

79. Despite the growth of circular economy and traceability regulations, and the development of traceability solutions and technologies that facilitate identification, data collection, processing and sharing, unresolved challenges still hinder large-scale implementation. Given the varied income levels, sectoral composition and pace of socioeconomic development across ECE member States, these challenges vary, as do their scale.

- **Fragmentation and complexity of value chains:** The sheer complexity of global and regional value chains is one of the biggest challenges in implementing traceability for producers in agrifood, garment and footwear and minerals value chains. Today's value chains consist of a multitude of actors operating in different countries, covering elements such as planning, sourcing, production, logistics and warehousing, sales, after-sales service and returns.
- **Lack of a harmonized regulatory framework:** There are overlapping and conflicting demands from national regulators with a varying range of policies, legislation and procedures. Since agrifood, garment and footwear and minerals sourcing spans multiple jurisdictions and time zones, this lack of harmonization poses regulatory and procedural barriers to trade and significantly affects the response times of organizations and companies for ESG compliance.
- **Lack of awareness of traceability requirements:** There is lack of awareness of how traceability can help facilitate more efficient use of resources and ensure compliance with ESG criteria. This lack of knowledge can restrict a company's access to markets that are imposing increasingly stringent circular and sustainability requirements on their value chains. Moreover, this undermines the effective uptake of the relevant regulatory frameworks in principle, as well as practical implementation of circular business models at the national level.
- **High costs associated with the necessary resources and technologies**: The resources involved in collecting, processing and sharing data, as well as procuring the necessary technology, represent a major financial burden and

prevent companies that are aware of the importance of traceability and circularity from implementing it. This is especially true for MSMEs as well as for ECE transition economies.

- **Data privacy and data security:** Companies often express concerns[54] about the risk that the introduction of transparency and traceability systems could bring due to the disclosure of business-critical information (e.g. prices, product formulas, key suppliers and customers) which may represent a competitive advantage for the company. Other risks relate to data security, as it is difficult to ensure that data systems are protected for all users.
- **Lack of support to companies:** There is a lack of guidance on how to implement risk-based due diligence, both within the EU and in non-EU ECE member countries, including on how social and environmental risk-based due diligence can complement traceability efforts. This is a priority, particularly for MSMEs, including those in emerging economies, due to the complexity of meeting the growing demand for verified compliance with circularity and sustainability requirements, especially in the production and processing of raw materials.
- **Lack of interoperability between information exchange systems**: The various value chain actors use different systems that are not always compatible with each other and have different requirements for sustainability, certification and traceability. Traceability demands good management and effective collaboration among companies and sectors, and the adoption of common international standards for information exchange. The ECE-UN/CEFACT traceability and transparency business and data models, based on the United Nations Core Component Library (UN/CCL), offer a solid starting point for achieving interoperability.
- **Technological barriers:** These include viability, scalability, access to technologies and lack of traceability infrastructures, especially for MSMEs in countries with economies in transition. It is not only challenging to access traceability technologies, but also to choose the best match for a specific set of traceability objectives, integrate the chosen solution with existing systems, and ensure interoperability with other solutions in the value chain. The Bain 2021 Global State of Traceability Survey revealed that most companies are still in the preliminary phase of implementation. Only 15 per cent have made progress in investing in traceability technology and scaling it, and 22 per cent are at the beginning of the journey, stuck in the strategy definition stage.55
- **The "invisible" informal economy:**[56] According to ILO statistics, several ECE programme countries have a high level of informal employment, especially in the agrifood sector, where temporary and seasonal workers frequently do not receive formal working contracts.[57] Informal work is neither taxed nor monitored, making it invisible to traceability systems, even though sectoral traceability frameworks might be in place.

80. With regard to **MSMEs**, many of the above-mentioned challenges are further aggravated, due to the lack of resources and management capacity regarding

[54] ECE, Accelerating action for a sustainable and circular garment and footwear industry: which role for transparency and traceability of value chains?, policy paper, (Geneva, 2020). Available at https://unece.org/DAM/trade/Publications/ECE_TRADE_449-AcceleratingTanspRraceabilityTextile.pdf.

[55] World Economic Forum, *Digital Traceability: A Framework for More Sustainable and Resilient Value Chains*, white paper, September 2021. Available at: https://www.weforum.org/whitepapers/digital-traceability-a-framework-for-more-sustainable-and-resilient-value-chains.

[56] The ILO defines the "informal economy" as all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements.

[57] ILOSTAT, "Statistics on the informal economy", topic webpage. Available at: https://ilostat.ilo.org/topics/informality/#elementor-toc__heading-anchor-1.

technology, know-how and skilled labour. MSMEs are often confronted with a lack of complete, accurate, timely and easily accessible product and process information. Moreover, MSMEs often lack awareness of the variety of systems currently available on the market and how they differ from each other. The lack of sufficient manpower of qualified IT staff must be considered as well. Consequently, it is difficult for MSMEs to select and access the most suitable solutions for their respective field of application to identify the data needed for achieving robust traceability. A methodology, applicable across industries and products, that helps MSMEs select and implement traceability solutions to fit their specific requirements, should be developed. Moreover, traceability solutions for MSMEs must be cost effective and user friendly.

81. Addressing these challenges is a complicated task that can only be done through cooperation and exchange between various companies, business sectors and jurisdictions. The following chapter features recommendations to support the implementation of traceability practices for the circular economy.

VI. Recommendations

82. To address the challenges of improving traceability and transparency along global value chains in critical sectors for the circular transition, governments need to adopt supportive policy measures. The following are a selection of recommendations for governments to consider when designing, developing and implementing a policy framework on traceability and transparency in the ECE region. These are particularly relevant for transition economies and for MSMEs, and involve technical assistance and capacity-building.

83. The recommendations below contribute to the outcomes of the 69th and 70th ECE Session and the ECE initiative on Traceability and Transparency of Sustainable Value Chains in the Garment and Footwear Sector.

Box 3
Policy recommendations for enhancing traceability and transparency of sustainable and circular value chains

Look at the market drivers and the sector
Assess the economic scenario to understand what drives value for consumers, investors and civil society in the country considered, including demand for verified compliance with ESG requirements.

Tailor the policy
The specific characteristics of each sector and its potential for the circular transition will be vary and must be considered when establishing supporting policies and regulations, and in developing roadmaps and action plans.

Engage industry stakeholders
Set up multistakeholder dialogues to assess the ESG risks and sustainability and circularity requirements, to achieve a shared the vision and to get commitment from the industry.

Define a roadmap
Establish an action plan to guide organizations in the transition, including the development of engagement plans with key stakeholders and establish checkpoints to assess progress. Such roadmaps could lead to the adoption of circular economy business plans in the following areas:

- ecodesign of processes and products
- eco-efficiency
- energy efficiency
- eco-innovation
- industrial symbiosis
- extension of the product life cycle

- valorisation of by-products and residues
- ESG compliance in value chains
- new business models, dematerialization and digital transformation

Create an effective and efficient system of incentives
This may include special financing instruments for business, such as preferable rates for loans related to supply chain improvements, or other forms of financial support such as tax credits or subsidies to facilitate the adoption of digital technologies for traceability and transparency.

Identify and analyse international best practices on traceability and circularity
Organizations need to be aware of global best practices and their key success factors and governments need to facilitate this knowledge exchange to aid in the development of domestic best practices.

Increase consumer awareness and education
Sustainable consumption patterns depend mainly on the level of information provided to consumers. It is important that consumers are informed and educated about the sustainability aspects of products so that they can make conscious choices in purchasing and using them, and during the product's end-of-life phase.

Promote research and development
Organizations must prioritize the development and adoption of technologies for a clean and safe environment and require the necessary support to do so. Tax exemptions and incentives could be introduced to lessen the short-term costs of investing in environmental technologies and green practices.

Provide information and support to MSMEs
MSMEs need tailored support and guidance to implement traceability systems. For example, a public investment bank could offer loans at favourable rates without collateral for MSMEs who adopt sustainable technologies or develop new ones.

Develop and adopt common traceability standards
Standards serve as a benchmark for organizations and governments to assess performance. Standards-based assessments can facilitate the development of robust policies that cover a wide range of tools to achieve circularity. They can also help governments introduce mechanisms to reward organizations that achieve these standards.

Use accepted traceability frameworks and solutions
By using a widely accepted traceability framework and solutions (such as the ones developed by ECE, which are global, publicly available and support interoperability) organizations can send a clear message to customers, investors and other stakeholders that they take ESG risks seriously and are incorporating them into their strategic planning.

Support national, globally connected, trading platforms
A dynamic and commercially functioning marketplace for resources, with traceability underpinning the provenance of the materials, is essential for circularity. Given the disparities and nuances at the local, regional and national levels, platforms should be country-specific, but globally connected (i.e. nodes in a global platform web). Such platforms should ultimately be commercially self-sustaining, but their initial development will likely require public support, involving a phased withdrawal of public monies and a transition to commercial funding over a fixed, initial development phase (e.g. five years).

84. Available ECE tools for implementing such policy recommendations include (i) the **ECE-UN/CEFACT Traceability and Transparency package of standards**, which include a business and data model for the exchange of traceability and sustainability information for the textile and leather value chains; (ii) the **United Nations Resource Management System**[58] (UNRMS) – a voluntary global standard for integrated resource management within the framework of public, public-private, and

[58] ECE, *Draft United Nations Resource Management System: Principles and Requirements*, (14 April 2022). Available at: https://unece.org/sed/documents/2022/04/session-documents/draft-unrms-principles-and-requirements.

civil society partnerships that is uniformly applicable to all natural resources such as minerals, petroleum, renewable energy sources, nuclear resources, anthropogenic resources, geological storage and groundwater; (iii) the **United Nations Framework Classification for Resources**[59] (UNFC) - a global classification and management system applicable to minerals, petroleum, nuclear fuel, renewable energy, and anthropogenic resources, as well as water and injection projects for geological storage.

85. Additional policy tools can be found in Annex II.

VII. Conclusion

86. Current agrifood, garment and footwear and minerals value chains are complex and predominantly opaque. However, consumers, investors and regulators are increasingly concerned about the protection of the environment and respect for social and human rights. These concerns are expressed in a growing demand for data and information about the sustainability performance of products, process and organizations. Data on compliance with ESG standards in value chains also allows companies to be more efficient in their operations, make better decisions and reduce their liabilities.

87. This policy paper argues that traceability and transparency is a key enabler of circularity. Effective ESG impact management in global value chains requires precise data to identify hotspots and to know exactly what is going on at each stage.

88. This policy paper offers recommendations to policymakers on how to design, develop and implement a coherent approach to traceable and transparent value chains in the ECE region. It also suggests how to create the right conditions for action by consumers, industry and civil society.

89. The recommended measures will enable scalable implementation of traceability and transparency, significantly aiding the transition to a circular economy. At the same time, it is critical to ensure that ESG traceability systems and policies in their design do not result in unnecessary barriers to trade. As such, capacity-building and technical assistance programs targeting MSMEs in developing countries and countries with economies in transition will be essential to avoid unintended regulatory and procedural barriers to trade, to support export enhancements and to fully harness the potential of the green and digital transformations.

VIII. Additional resources

Chatham House, *An Inclusive Circular Economy: Priorities for Developing Countries*, (May 2019). Available at: https://www.chathamhouse.org/sites/default/files/publications/research/2019-05-22-Circular%20Economy.pdf

International Renewable Energy Agency, *World Energy Transition Outlook: 1.5°C Pathway*, March 2022. Available at: https://irena.org/publications/2022/mar/world-energy-transitions-outlook-2022#:~:text=By%20laying%20out%20a%20map,use%20sectors%3A%20electrification%20and%20bioenergy

McKinsey & Company, "The raw-materials challenge: How the metals and mining sector will be at the core of enabling the energy transition", 10 January 2022. Available at: https://www.mckinsey.com/industries/metals-and-mining/our-insights/the-raw-materials-challenge-how-the-metals-and-mining-sector-will-be-at-the-core-of-enabling-the-energy-transition

[59] ECE, "United Nations Framework Classification for Resources Update 2019", *ECE Energy Series*, No. 61, (Geneva, 2020) (ECE/ENERGY/125). Available at: https://unece.org/info/Sustainable-Energy/UNFC-and-Sustainable-Resource-Management/pub/2772.

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World Economic Forum, *Digital Traceability: A Framework for More Sustainable and Resilient Value Chains*, white paper, (September 2021). Available at: https://www.weforum.org/whitepapers/digital-traceability-a-framework-for-more-sustainable-and-resilient-value-chains

Databases

ILOSTAT, Statistics on the informal economy. Available at: https://ilostat.ilo.org/topics/informality/#elementor-toc__heading-anchor-1

UNCTADstat. Available at: https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en

World Bank Data, "Employment in agriculture (% of total employment)". Available at: https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS

Laws, decrees, acts, regulations

Albania

Law of the Republic of Albania dated January 28, 2008, No. 9863 "On food". Available at: https://www.wipo.int/wipolex/en/legislation/details/17650

http://aku.gov.al/wp-content/uploads/2016/06/Ligji-Nr-9863-datë-28.-1.-08-i-ndryshuar-me-26.03.20013.pdf

Western Balkans

Regional Cooperation Council, *Action Plan for the Implementation of the Sofia Declaration on the Green Agenda for the Western Balkans 2021-2030*, (Sarajevo, 4 October 2021). Available at: https://balkangreenenergynews.com/wp-content/uploads/2021/10/GAWB-ACTION-PLAN-Final-04.10.2021.pdf

Regional Cooperation Council, *Sofia Declaration on the Green Agenda for the Western Balkans*, 10 November 2020. Available at: https://www.rcc.int/docs/546/sofia-declaration-on-the-green-agenda-for-the-western-balkans-rn

Belarus

Decree of the President of the Republic of Belarus dated December 29, 2020, N 496 "On the traceability of goods". Available at: https://www.alta.ru/tamdoc/20bl0496/

The "Pool of electronic passports of trade items" system of the Republic of Belarus (ePass). Available at: http://epass.by/?rvn=1

EU

Proposal for a Directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937, COM/2022/71 final, 23 February 2022, Brussels. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0071

Serbia

The Law of the Republic of Serbia dated May 29, 2009, “On Food Safety” ("Official Gazette R.S." No.41/09). Available at: http://www.minpolj.gov.rs/dokumenti/zakoni/

United States

The U.S. Dodd Frank Act Fact Sheet. Available at: https://www.sec.gov/opa/Article/2012-2012-163htm---related-materials.html

Annex I

Selected measures supporting traceability and transparency

Traceability and transparency drivers	*Goods in the supply chain*	*Legislation*	*Type of legislation and number of laws*	*Type of measures*
Product quality and claims	Textiles and footwear	EU 1007/2011 EU 11/1994	2 EU Regulations	Mandatory correct, clear, visible and accessible information on composition and presence of non-textile parts of animal origin Obligations for economic operators to ensure the accuracy of the information on labels
Human and animal health; consumer information	Textile	U.S. Textile Fiber Products Identification Act (1984) U.S. Truth in Fur Labeling Act (2010) U.S. Care Labeling of Textile Wearing Apparel (2000) U.S. Wool Products Labeling Act (2006)	4 U.S. Laws	Mandatory correct, clear, visible and accessible information on composition and origin Mandatory information on economic operators
Human life and health; consumer information	Food of animal origin; animal by-products[60] not meant for human consumption	EU Regulation 931/2011 EU Regulation 1069/2009 EU Regulation 178/2002	3 EU Regulations 1 U.S. Law	Mandatory traceability system Mandatory information on labelling

[60] Animal by-products are defined in Article 3 of Regulation (EC) 1069/2009 as 'entire bodies or parts of animals, products of animal origin or other products obtained from animals that are not intended for human consumption'. This includes catering waste, used cooking oil, former foodstuffs, butcher and slaughterhouse waste, blood, feathers, wool, hides and skins, fallen stock, pet animals, zoo and circus animals, hunt trophies, manure, ova, embryos and semen not intended for breeding purposes. See Guidance on Regulation (EC) 1069/2009 and the accompanying implementing Regulation (EC) 142/2011, enforced in Wales by the Animal By-Products (Enforcement) (N0.2) (Wales) Regulations 2011, at https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009R1069 and https://www.legislation.gov.uk/wsi/2011/2377/made).

Traceability and transparency drivers	*Goods in the supply chain*	*Legislation*	*Type of legislation and number of laws*	*Type of measures*
		U.S. FDA Food Safety Modernization Act (2011)		Additional voluntary information on labelling
				Eco labelling reporting
				Risk management
				Obligations for economic operators
Safety	Non-food products; personal protective equipment; toys	EU Regulation 2016/425	1 EU Regulation	Traceability and standards of quality and safety
		Directive 2009/48/EC	2 EU Directives	
		Directive 2001/95/EC	1 U.S. Law	
		U.S. Consumer Product Safety Improvement Act (2008)		
Animal health and welfare	Fish; seal	EU Regulation 1379/2013	4 EU Regulations	System for identification of fishery and seal products
		EU Commission Regulation 2065/2001		Obligations for economic operators
		EU Council Regulation 1224/2009		
		EU Council Regulation 1005/2008		

Annex II

ECE publications on traceability and transparency for a circular economy and sustainable use of natural resources

Name of the document	*Type of document*	*Contents*
Cross-sectoral		
Natural Resource Nexuses in the ECE region 2021 Link	A study report prepared by the ECE secretariat with work led by the Sustainable Use of Natural Resources Nexus team	✓Complex interactions and feedback loops between human and natural systems affecting the natural resource base such as energy, food, land, materials and water ✓ Highlights on systematically measurable data in sustainable resource management
Measuring and monitoring the circular economy and use of data for policymaking 2021 Link	The background paper for the Second Regional Conference on measuring and monitoring the circular economy and the use of data for policymaking	✓ A snapshot of the circular economy and how it could be measured in target countries using a proposed circular economy scoreboard of quantitative indicators
Circular economy and the sustainable use of natural resources: Trends and opportunities in the region of the Economic Commission for Europe 4 February 2021 Link	ECE policy brief for the sixty-ninth session if the Commission in April 2022	✓ Major trends in resource use in the ECE region, the relevance of normative instruments, policy advice and capacity-building activities for the promotion of a circular economy and the sustainable use of natural resources ✓ Highlights on traceability, transparency and reliable data in this context
Agrifood		
Circularity concepts in forest-based industries May 2022 Link	Study prepared jointly by ECE and the Food and Agricultural Organization (FAO)	✓ Existing and possible limitations to circular approaches in forest-based industries, and evidence that not all circular approaches are sustainable under all circumstances ✓ The role of traceability in the sustainable use of cellulose-based fibres
ECE Code of Good Practice for Reducing Food Loss in Handling Fruit and Vegetables	The Code was endorsed by the ECE Working Party on Agricultural Quality Standards (WP.7) in November 2019. It is	✓ Measures that can be taken by producers, traders, and retailers to prevent and reduce food loss and waste at the various stages of the supply

Name of the document	*Type of document*	*Contents*
July 2020 Link	intended to help maintain quality along supply chains, reduce food waste and associated costs	chain before the fruit and vegetables reach the consumer
Minerals		
Policy Brief: Transforming Extractive Industries for Sustainable Development May 2021 Link	This document was published after a six-month global consultation process conducted by the five United Nations regional economic commissions, which was led by the United Nations Secretary General and his team	✓Concrete recommendations for transforming the extractives sector into an engine for sustainable development that can support a just transition to a net-zero, circular and inclusive global economy
Concept Note: United Nations Framework Classification for Resources and United Nations Resource Management System - Systems approach to enabling the resource as a service paradigm through blockchain technologies February 2022 Link	This concept note was prepared by the Sustainable Development Goals Delivery Working Group of the Expert Group on Resource Management for the thirteenth session of the ECE Expert Group on Resource Management	✓ Arguments for progressing towards a sustainable, integrated and more circular economy utilizing systems thinking ✓ Assessment of the blockchain model
Extractive Industries Transition to Sustainable Systems April 2021 Link	Regional policy brief developed based on the outcomes of the five Regional Roundtables on Extractive Industries organized by the United Nations Regional Commissions	✓ Clear list of 15 recommendations on strengthening sustainable performance of extractive industries, including on strengthening transparency, accountability, and governance through supply chain traceability