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Circular economy and the sustainable use of natural resources: Trends and opportunities in the region of the Economic Commission for Europe

Note by the secretariat

This document presents major trends in resource use in the region of the Economic Commission for Europe (ECE) and discusses the role of a circular economy as a policy approach to reducing environmental pressures, enhancing resilience and increasing competitiveness. It describes 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 in connection with the work of ECE.

Several highlighted issues are critical for a circular economy, including designing and planning; dealing with waste; traceability, transparency and reliable data; innovation and the preservation of natural capital. Contributions of ECE in these areas are presented for reference.

Finally, and to inform the deliberations at the sixty-ninth session of the Commission, the document proposes some lead questions for consideration during the high-level dialogue to devise a roadmap for action which promotes a circular economy and the sustainable use of natural resources in the ECE region.

I. A more circular economy to address sustainability challenges

A. Trends in resource use

1. **Economic and population growth have increased demand for materials worldwide.** Globally, the extraction of raw materials has more than doubled since 1990 and could double again by 2060 should current trends continue. This unabated appetite for resources has generated multiple environmental impacts, including air and water pollution, threats to biodiversity and greenhouse gas emissions contributing to climate change. According to the International Resource Panel[1], resource extraction and processing account for 90 per cent of global biodiversity loss and water stress impacts and half of total greenhouse emissions, excluding those related to land use. Environmental degradation resulting from resource extraction is also associated with adverse health effects. Meeting the goals of the 2030 Agenda for Sustainable Development, in particular Goal 12 on sustainable consumption and production, requires a significant change in patterns of resource use.

2. **Efficiency in the use of resources has increased in the ECE region.** Between 2000 and 2017, domestic material consumption (DMC) per unit of gross domestic product fell by an estimated 10 per cent in ECE countries, while aggregate output rose by around 40 per cent. However, differences between countries in the region are significant: DMC in European member countries of the Organisation for Economic Co-operation and Development (OECD) declined by 3.1 per cent over this period, while increasing in the eastern part of the ECE region.

3. **Material footprint, which takes into account also the raw materials used in imported goods, continues to grow.** In contrast to the decline of DMC, material footprint of the region rose by an estimated 18 per cent between 2000 and 2017. The substitution of domestic production with imported goods explains in part the observed slowdown in DMC. Typically, countries with higher income levels tend to have larger material footprints. As the 2020 State of the European Environment report[2] observed, many of the environmental impacts resulting from European consumption and production take place outside of Europe. Given the important role of ECE countries in global demand for materials, progress towards more sustainable consumption and production patterns has a significance that transcends the region.

4. **Per capita use of material resources across the region reflects differences in living standards.** While domestic material consumption per capita has declined over the last decade in high-income countries, it has continued to increase in middle- and low-income economies. At lower levels of development, growth tends to be more resource intensive, given higher infrastructure building needs. As economies develop and income levels increase, demand shifts towards services, which are less material intensive. In less advanced countries in the ECE region, an increase in income levels will drive higher levels of material consumption. However, this trend can be mitigated by the deployment of practices and technologies that result in higher efficiency.

B. Circular economy – a policy approach to reduce resource consumption

5. A shift towards greater circularity aims to reconcile aspirations for increased prosperity with environmental protection. It goes beyond the correction of the often-damaging environmental implications of economic activity to encompass a deep rethinking of the way in which societies produce and consume.

[1] International Resource Panel (2019), Global Resources Outlook 2019.

[2] European Environment Agency (2020), The European environment – state and outlook 2020.

6. While there is not an internationally agreed definition of a circular economy, the description of the United Nations Environmental Assembly (UNEP/EA.4/Res.1) provides a shared understanding of some of its basic principles. A circular economy is presented as "one of the current sustainable economic models, in which products and materials are designed in such a way that they can be reused, remanufactured, recycled or recovered and thus maintained in the economy for as long as possible, along with the resources of which they are made, and the generation of waste, especially hazardous waste, is avoided or minimized, and greenhouse gas emissions are prevented or reduced". In line with this description, the implementation of a circular economy approach involves life cycle considerations and the prevention of programmed obsolescence. A circular economy thus provides an alternative to the "make-use-dispose" linear model. Such an alternative is based on the sustainable management of natural resources, the closing of material loops, and the preservation of natural capital. In this spirit, reliance on renewable energy is seen as a necessary component in the conceptual discussions on circularity.

7. Progress toward greater circularity is constrained by the presence of externalities. Prices are often not reflective of all environmental costs and may thus not be sufficient to drive fundamental change. Additionally, subsidies may create incentives for the overuse of natural resources, undermine recycling options and make linear production more attractive, for example in case of fossil fuel subsidies. There is a need to correct these externalities and, more broadly, to put in place policies and regulations that support the emergence of a more circular economy and create new opportunities for the business sector to engage in this transition, including by addressing barriers to international exchanges.

8. The ultimate aim of a circular economy is to effectively substitute primary finite raw materials with other more sustainable alternatives. This is not guaranteed by just closing material loops. It depends on the impact of circular activities on overall demand, including through the effect they have on prices. Real progress takes place when circular initiatives (such as the use of secondary materials) displace linear ones, not when they just coexist. Economic incentives can play a pivotal role in this regard.

9. At the same time, circular economy aspirations need to be reconciled with other policy objectives. The desire to preserve the useful life of existing assets, for example, may slow down the introduction of technologies that reduce adverse environmental impacts. Moreover, climate change mitigation measures, including the shift towards renewable energy, may increase the demand for materials used in batteries, solar panels and other devices. Trade-offs between energy consumption and the minimization of the use of other materials need to be taken into account.

10. A shift towards circularity and a more sustainable management of natural resources also yields non-environmental benefits and generates business opportunities that can improve material productivity and strengthen economic competitiveness. Many activities linked to a circular economy, such as refurbishment or repair, are labour intensive and provide a source of employment. The benefits of circularity are therefore relevant for all countries, independently of resource endowments or level of development. Enhancing the potential social benefits of increased circularity would, however, require supportive policies to ensure social inclusion in this transition.

11. Lowering the demand for raw materials and improving the management of supply chains also increases economic resilience. The report of the United Nations Secretary-General on the response to the socio-economic impacts of COVID-19[3] drew attention to the need to strengthen approaches that enhance both resilience and efficiency, including the advancement of a more circular economy. The economic disruption created by the crisis is leading to a reconsideration of resource use and the fragility of supply lines.

12. As the world seeks to overcome the COVID-19 crisis and governments launch various support programmes to protect populations and restore economic dynamism, there is an opportunity to "build back better". Working towards a circular economy that

[3] Shared responsibility, global solidarity: responding to the socio-economic impacts of COVID-19.

contributes to the sustainable management of natural resources can help to shape a more resilient, prosperous and sustainable future for all.

13. The 2020 Circularity Gap Report estimates that the global circularity rate stands at 8.6 per cent, down from 9.1 per cent when the report was launched in 2018. In the European Union (EU), the circular material use rate (recovered materials as percentage of overall materials used) increased from 8.2 per cent in 2004 to 11.2 per cent in 2017. However, little change has been observed since 2012, which suggests that improvements become more difficult once certain levels have been achieved.

14. Future projections indicate that further progress in the ECE region can serve as catalyst to greater circularity worldwide. The International Resource Panel[4] envisages a scenario wherein a slowdown in resource use in high-income countries offsets increases in the rest of the world, amid general gains in resource productivity (rising by 27 per cent in 2015–2060), convergence in resource use per capita, and growing incomes. This results in absolute decoupling of environmental impacts from growth and large decreases in greenhouse gas emissions. A shift to circularity is one of the key assumptions underlying this scenario. Given its importance as resource user and trade partner, further progress in the ECE region will be key to driving greater circularity globally.

C. Policy impulses

15. The shift to a more circular economy is closely aligned with policy goals reflected in key international agreements. The 2030 Agenda for Sustainable Development incorporates goals and targets that directly relate to a circular economy, such as those concerning waste or energy efficiency. Progress towards a more circular economy impacts favourably on many sustainable development goals (SDGs), including those related to water (SDG 6), energy (SDG 7), decent work and economic growth (SDG 8), industry, innovation and infrastructure (SDG 9), sustainable cities (SDG 11), responsible consumption and production (SDG 12), climate action (SDG 13), life below water (SDG 14) and life on land (SDG 15). Thirty-one of the forty-one ECE countries that presented Voluntary National Reviews at the High-level Political Forum between 2016 and 2019 made a reference to the circular economy as part of their efforts to implement the SDGs.

16. Support for a more circular economy can also contribute to meeting the commitments under the Paris Agreement. Many European countries have made an explicit link between their efforts to reduce greenhouse gas emissions and advances towards a more circular economy. Changes in production and consumption patterns resulting from the shift to a more circular economy complement efforts to increase the use of renewable energy. In this way, the reduction of emissions can take place across the economy, including in sectors where the substitution of energy sources is more difficult.

17. At the fourth meeting of the United Nations Environment Assembly (Nairobi, 2019), a resolution was adopted that acknowledged that a more circular economy, “one of the current sustainable economic models, ... can significantly contribute to sustainable consumption and production”.

18. In the pan-European region, a commitment to “foster a circular economy” was made at the Eighth Environment for Europe Ministerial Conference (Batumi, 2016). The Pan-European Strategic Framework for Greening the Economy, endorsed at the Conference, reflects this commitment. The Framework has been operationalized through the Batumi Initiative on Green Economy, which includes a set of voluntary commitments. Many countries have submitted actions that relate to a circular economy, including in areas such as municipal solid waste management, eco-labelling, resource efficiency, the development of national sustainable consumption and production strategies, green public procurement, construction or the cross-border use of secondary resources.

[4] International Resource Panel (2019), ibid.

19. Countries in the ECE region are pursuing national policies that explicitly seek to promote a shift towards a more circular economy or address particular issues related to circularity and the sustainable use of natural resources. Such policies incorporate regulatory and market instruments, public spending on infrastructure or information and awareness-raising initiatives. They often focus on particular sectors, such as plastics, food or textiles. Another common ambition is strong engagement of the business sector in the transformation and collaboration across supply chains. Given the diversity of the ECE region, including regarding income levels, productive specialization and policy priorities, different aspects of circularity have been emphasized. This broad range of experiences creates a fertile ground for an exchange of good practices and mutual learning.

20. Cities have also emerged as influential actors in the quest for circularity. Many of the critical challenges faced in the advancement of a circular economy have a local dimension, including those related to mobility, waste and wastewater management, redesigning the built environment and many others.[5] At the same time, cities offer the potential to deploy interventions that can have far-reaching effects across various areas, including through the mobilization of multiple partners. Thus, cities are the places where many challenges arise but also where solutions can be shaped, given the potential for effective action and partnership-building. Some European cities have issued circularity plans or programmes where they outline supportive actions in specific focus areas.

II. Circular economy: the work of the Economic Commission for Europe

21. The three core functions of ECE – development of norms, standards and legal instruments, convening platform, and technical cooperation across a number of relevant sectors – provide the impetus for supporting circular and more resource-efficient economies and for providing tools that can help to facilitate the widespread adoption of this approach.

22. Norms and standards lay the foundation for incorporating circularity principles into products and supply chains. They support public authorities, industry actors and consumers in identifying and collecting relevant information about the desired characteristics of different products and the compliance with various requirements. Agreed standards are essential to underpin data flows across sustainable and circular value chains, including beyond national borders. Reducing transaction costs, including those related to the acquisition of information, is important to facilitate cooperation. International regulatory collaboration contributes to reduce the barriers to economic cooperation and trade and facilitates tapping into the large benefits that trade offers for the development of a circular economy, namely increasing scale and efficiency.

23. A review of the functions and capacities of the United Nations development system established that SDG 12 on sustainable consumption and production was the least well-resourced of all SDGs, while stressing that new norms and standards are likely to emerge in the coming years in these areas, where the United Nations system could play an important role[6]. ECE is well-positioned to make a significant contribution in this regard, as normative development across multiple sectors is among its core activities.

24 In addition to its normative production, ECE also delivers policy advice at the country level on different questions that are relevant to a circular economy and the sustainable management of natural resources. In this way, the gap between normative work and policy implementation is bridged and differences across the region are narrowed. Those advisory activities, which are most often integrated in ECE technical cooperation work, contribute to facilitating the adoption of normative outputs and the introduction of good practices, in response to the demands of member States.

[5] United 4 Smart Sustainable Cities (2020), A guide to circular cities.

[6] Dalberg (2017), System-wide Outline of the Functions and Capacities of the UN development system.

25. The difficulty of bringing all relevant actors together, most often beyond national borders, is a serious hurdle for advancing a circular economy. It requires coordination across both the public and private sectors and across national boundaries. ECE provides a strong platform to support this dialogue through multiple intergovernmental and expert groups that are open to relevant stakeholders. This convening power can be utilized to overcome existing barriers that constrain advances in better management of natural resources and the shift to a circular economy, in particular related to normative and governance gaps.

26. An integrated view across sectors and across borders is crucial to address the pressure on natural resources. The work of ECE, which is driven by a nexus approach that brings together different subprogrammes, can contribute to the advancement of a circular economy in multiple ways, encompassing its normative, advisory and capacity-building activities across sectors.

27. The double perspective - functional (type of outputs) and sectoral (substantive focus) - that characterizes the work of ECE offers concrete contributions in various areas relevant for a circular economy. These include designing and planning, waste, traceability, transparency, data and innovation. ECE is also deeply engaged with the preservation of natural capital, which provides a sustainable foundation for a circular economy. The rest of this note will discuss the relevance of these issues for circularity and present some related ECE contributions.

28. More details on relevant knowledge products that ECE has developed can be found in the companion piece to this document, entitled “Circular Economy and the sustainable use of natural resources: Toolbox of instruments of the Economic Commission for Europe” (E/ECE/1496). It contains a brief overview of major activities of the eight subprogrammes of the Commission related to promoting a circular economy and the sustainable use of natural resources, and provides a directory of a number of relevant ECE instruments and their impact.

III. Designing and planning for circularity

29. A circular economy requires changes in the way products are designed, produced and used. Critical features of a product are defined at the design stage and influence how easily circular principles can be applied at other stages of its product life. Anticipating and shaping future patterns of use are thus instrumental in designing for circularity. Sound design principles strive for durability, repairability and recyclability of products. Reducing the use of hazardous substances in various types of products not only lowers risks for health and the environment but also makes recycling and recovery of secondary products much easier. Mandatory requirements can also include minimum standards of efficiency.

A. Vehicle regulations

30. ECE work on transport has a critical influence on shaping the regulatory environment for the sector, including the characteristics of vehicles. Annually, 89 per cent of global production of new cars, trucks and buses and 53 per cent of new motorcycles comply with United Nations Regulations or United Nations Global Technical Regulations (GTR). Globally harmonized United Nations Regulations on the recyclability of motorized vehicles that were developed at ECE reduce the environmental footprint and life cycle impact of vehicle production and disposal. For example, United Nations Regulation No. 133 sets minimum rates for reusability, recyclability and recoverability. According to this regulation, 85 per cent of the vehicle mass should be reusable/ recyclable and 95 per cent reusable/recoverable. These rules have a significant influence on vehicle design.

31. Design is also important to prevent the programmed obsolescence of vehicles and extend their life. A new United Nations Regulation on Software Updates is under consideration to facilitate vehicle upgrades that will limit the premature and aesthetic obsolescence of vehicles.

32. Mandatory performance requirements can be imposed on certain products to increase resource efficiency and reduce pollution. For these requirements to be effective, accepted standards and testing methods for verification are essential. CARS United Nations Regulation No. 101, United Nations GTR No. 15 and the upcoming United Nations Regulation on Worldwide Harmonized Light Vehicles Test Procedure (WLTP) measure fuel consumption and tailpipe CO2 emissions from cars and vans.

B. Infrastructure

33. Infrastructure has a major impact on sustainability through its influence on patterns of resource use. Shifting to a more circular and green economy requires an increase in targeted infrastructure investments, in particular in parts of the region where gaps are larger. Many of the core characteristics of infrastructure, which will determine its environmental impact and overall contribution to sustainability, are defined at the design and planning stage. The Ninth Environment for Europe Ministerial Conference (Nicosia, November 2021), which is serviced by ECE, will consider the theme "Greening the economy in the pan-European region: working towards sustainable infrastructure", as one of its major focus areas.

34. National planning frameworks can serve to anticipate the consequences of different choices, plan for their long-term implications and ensure coherence among various types of interventions, including in a transboundary context. The Protocol on Strategic Environmental Assessment (SEA) of the Espoo Convention provides a practical tool to improve the quality of such decisions.

35. The design of infrastructure and the way it is used determines its longevity and the overall needs for materials through the lifecycle. The ECE transport infrastructure agreements define key parameters for the construction, maintenance and upgrade of international networks in all inland transport modes. The harmonization of parameters across infrastructure networks, including in particular weight restrictions, leads to a better use of the infrastructure. By preventing excessive wear, the life of those assets is extended, and maintenance or repair needs are reduced.

36. Anticipating factors that could affect the proper functioning of infrastructure reduces the need for repairs. Climate change, in particular, could pose significant challenges for transport infrastructure, which may malfunction if not designed and constructed with commensurate resilience. ECE work identifies the conditions that need to be met to ensure that infrastructure serves its typical or even extended lifespan.

37. Buildings absorb around one third of the global consumption of materials and are responsible for 40 per cent of carbon dioxide emissions through the energy services they require. The Framework Guidelines for Energy Efficiency Standards in Buildings developed by ECE provide a set of principles to improve sustainability in the conception/design, construction, operation, maintenance, and decommissioning/recycling of buildings and their components. The principles reflect best practices to support the entire building construction and management chain in improving the overall performance of buildings. The Guidelines provide the basis for the recently launched High-Performance Buildings Initiative (HPBI) that seeks to improve health and quality of life while advancing decarbonization of the global buildings supply chain.

IV. Dealing with waste

38. Waste is a by-product of production and consumption that presents a major environmental concern. The World Bank expects that annual waste generation will increase by 70 per cent by 2050. Minimizing waste, disposing of it safely, and recycling and reusing it are critical goals for the advancement of a circular economy and the implementation of target 12.5 of the 2030 Agenda. Despite policy efforts, waste continues to increase in both absolute and per capita levels in many economies in the ECE region. However, dynamics have been quite varied across countries and sectors. In European OECD countries, the total amount of municipal waste has remained practically unchanged in the decade to 2018,

while the percentage recycled has increased from 23 per cent to 29 per cent in this period. In other parts of the ECE region, trends have been less favourable. Overall, there are large country differences in waste management performance and related infrastructure needs.

39. While the shift to a circular economy involves much more than dealing with waste, this is often the first problem that is addressed in many countries. Waste is therefore a major focus of policy attention, leading to efforts to create incentives to reduce waste, to develop an appropriate infrastructure to collect, sort and dispose of waste, and to facilitate its reuse. Policy initiatives combine regulatory requirements, economic instruments and infrastructure spending.

40. ECE undertakes multiple activities that relate to the management of waste, mostly of a normative character, including the definition of standards and provisions for the transboundary movement of waste and its safe transport. ECE work has also focused on waste in particular sectors, such as food, transport, wood and other raw materials, and energy, including definition and classification issues. Furthermore, ECE supports the creation of better conditions for waste management, including by engaging the private sector, through policy advisory and normative work. Broader measurement of waste and related methodological questions are explored as part of ECE statistical and environmental monitoring activities.

A. Movement of waste

41. An appropriate classification of waste is the foundation for addressing safety issues and identifying the potential economic value of various types of waste. Ensuring the safety of secondary raw materials, without harmful elements, is critical to the emergence of markets for these products. The movement of waste, including across borders, also requires a suitable framework that guarantees the safety of transport and builds the trust of all economic actors to facilitate the economic exploitation of waste, including in an international context.

42. The movement of waste for materials recovery across different jurisdictions remains a major hurdle for the development of a circular economy. The relevance of appropriate rules for waste shipments has increased, as the global waste market is in a state of flux, following import restrictions imposed by some countries. The Standards for the Transboundary Movement of Waste of the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) serve to classify waste, track and trace its transboundary movement and its disposal and exchange in compliance with the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal.

43. A necessary component of a circular economy and, in particular, of waste management is transport. It needs to be conducted in safe conditions to avoid threats to health and environment. The Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) and the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) also cover transport of waste which are classified as dangerous. Contracting parties are considering revisions to further facilitate the disposal or recycling of waste in support of a circular economy.

44. The transition to cleaner energy production and mobility systems and ongoing digitalization trends are creating new challenges for safe transport. The provisions of the ADR and ADN apply, for example, to electric storage systems, such as batteries and fuel cells. Transport regulations include provisions for their safe transport for recycling or disposal, including when used or damaged. Provisions for the transport of waste batteries and electrical and electronic equipment were adapted in 2019 to cover the collection and transport from private households. Moreover, the ADR and ADN provisions envisage a “cradle-to-grave” approach regarding containment systems for dangerous goods, as they address not only their design, construction, remanufacture, use, reuse and repair but also the transport of damaged or waste packaging for recycling or disposal.

B. Waste in specific sectors: food, transport, wood and extractive industries

45. The food sector has been identified as a major policy area to reduce waste, as reflected in target 12.3 of the 2030 Sustainable Development Agenda. Globally, around one third of global annual production - around 20 per cent in the EU - is wasted or lost. ECE work has contributed to understanding and managing the links between different elements of the supply chain to avoid food loss and waste. It has developed an application, FeedUP@UN, which allows the systematic collection and analysis of data on food lost and resources saved along the food supply chain with the aim of reducing losses and redistributing the food recovered for commercial or charitable purposes. A Code of Good Practice for Food Loss and Waste Prevention and a Methodology for Food Loss and Waste Measuring provide policy guidance and help to quantify the misuse of resources.

46. Standards can contribute to reduce waste of agri-food supplies and to enhance the quality and productivity of soil. UN/CEFACT has developed eBusiness Standards for the digitization of food safety and quality control certificates, such as eLab, eCrop, eCERT and eQuality which help to speed up the exchange of documents in the supply chain, thereby avoiding unnecessary degradation of produce, transmission of pests and diseases and food loss. In this way, they contribute to waste prevention and increase resource efficiency.

47. Efficient customs procedures, priority treatment of perishable foodstuffs and the use of green lanes contribute to reducing food loss and waste. Additionally, eTIR, the computerized version of the originally paper based TIR procedure, will further expedite border crossings, thus saving valuable time in the delivery of goods.

48. Inland water transport has a low energy footprint but can also be a source of waste. ECE has developed normative frameworks establishing principles for pollution prevention on inland waterways through the control of waste from vessels. Currently, work is underway on harmonizing the types and categories of waste generated on board of vessels to facilitate its separate collection, efficient recycling and reuse.

49. The forest sector has great potential to contribute to a circular economy, as it provides a regenerative source of products. The cascading use of production residues is a common and long-standing practice throughout the forest products sector. Reuse and recycling, for example through lumber salvage and paper recycling, as well as energy production are likewise common. This virtuous circle improves economic outputs while reducing environmental impacts. ECE work on the promotion of sustainable forest management and the forest products sector is linked, explicitly or implicitly, to a circular economy.

50. Turning trees into wood products and the work of the wood processing industry produce minimum volumes of waste in the ECE region. The main issue is not on the production side but rather on how to close material loops after consumption, including furniture, wooden packaging, demolition wood and residues from construction. However, there are no internationally recognized definitions and classifications for wood waste, which raises the need for coordination. ECE is currently exploring the possibility of developing a wood waste classification for the region.

51. Energy and mineral value chains usually involve the generation of large quantities of residues. These residues often end up as waste and, if not properly managed, threaten not only the environment but also human health and safety. However, these residues can be important sources of secondary resources; often the residues themselves have potential for further productive use. The United Nations Framework Classification for Resources (UNFC) is a universal standard for the management of all energy and raw material resources. UNFC incorporates specifications for the recovery of value from residues or waste generated by human activities (“Anthropogenic Resources”). This approach has facilitated the economic exploitation of resources that, until recently, were considered waste. The implementation of the UNFC for the management of secondary resources, especially critical raw materials, is helping to reduce and extract value from industrial waste.

52. The extraction of fossil fuels can result in the release of methane to the atmosphere. Global atmospheric concentrations of methane are rising and, given that methane has an instantaneous global warming potential 120 times higher than that of CO2 emissions, improving its management would bring significant near-term climate change mitigation benefits. ECE has developed guidance for methane management in the oil and gas sectors and for operating coal mines. Closed coal mines continue to release methane for extended periods, and ECE has produced best practice guidance for effective methane recovery and use from abandoned coal mines.

53. A co-benefit of reduced demand for raw materials and chemical substances as a result of a more sustainable and circular economy is a potential reduction in chemical and industrial accidents resulting from stored waste, thus increasing industrial safety. Work under the Industrial Accidents Convention includes actions aiming to contain the negative impact of the extraction of raw materials, such as the safe management of mine tailings.

C. Economic instruments and infrastructure for waste management

54. Managing waste is a particularly serious challenge in some parts of the ECE region. In many countries in South Eastern Europe, Caucasus and Central Asia, arrangements for waste collection reach only between 40–80 per cent of the population. The ECE Environmental Performance Reviews (EPR) include analysis and recommendations on waste management and related issues in the country under review. It also assesses the existing infrastructure for waste management and offers recommendations to improve the conditions for private sector participation to address identified shortcomings. EPRs cover many other aspects related to the green economy and the recently adopted fourth cycle of reviews beyond 2022 foresees an enhancement of this content to address a circular economy, if requested by the country under review.

55. The collaboration between the public and the private sectors can help to identify opportunities and remove obstacles that prevent the mobilization of finance to support this transition. As part of its programme on Public Private Partnerships (PPP), ECE has developed Guidelines on Promoting People-first Public-Private Partnerships Waste-to-Energy Projects for the Circular Economy. These Guidelines provide guidance on how to identify and adopt measures to prevent or mitigate adverse environmental impacts during the design, construction, implementation and operation of PPP projects on waste-to-energy.

D. Measuring waste

56. The ability to carry out informed policy actions and to track their impact requires methodologically sound statistics. Although progress has been made in recent years (especially in the EU countries), the quality and availability of statistics in countries vary greatly depending on the priority given to waste management and on the financial and human resources available for statistics. Comparability of waste statistics is hampered by differences between countries in terms of the scope, definitions, classifications and methods used in their collection.

57. To improve international comparability, an ECE Task Force on Waste Statistics developed a framework on waste statistics (to be approved by the Conference of European Statisticians in June 2021) that considers waste in a broader context of flows of products and materials and includes important waste flows that are often not measured, such as waste handled by the informal sector. It furthermore includes a glossary of the most important terms and definitions in this area and recommends further activities to improve availability of internationally comparable waste statistics to inform multiple policy areas, including circular economy. The ECE Working Group on Environmental Monitoring and Assessment supports member States in improving their waste monitoring systems, among others, and the use of data and indicators for improved policymaking.

58. The ECE Environment and Statistics Divisions also service jointly the Task Force on Environmental Statistics and Indicators with the aim to support countries through

capacity development, guidance and experience sharing in enhancing environmental data, statistics and indicators, including on waste.

V. Traceability, transparency and reliable data

59. Availability of and access to reliable information are important for the advancement of a circular economy and the management of natural resources. This includes agreed classification systems and mechanisms to track and report related data. New technologies are opening new possibilities to address these needs. Ultimately, the aim is to facilitate the collaboration between different stakeholders, a major driver of the transition, and to gain a sound understanding of progress. ECE contributes to this goal through its normative work on traceability along supply chains, classification and reporting on resources, access to data on products and activities and measurement of a circular economy.

A. Traceability

60. The ability to trace, in a transparent and trustworthy manner, how materials and products move along value chains is critical for the advancement of a circular economy. It helps to identify obstacles that prevent recyclability, reusability and other circularity principles.

61. Agreed standards facilitate traceability and international trade. UN/CEFACT has developed standards for traceability of value chains for animal and plant-based products. It is currently putting in place a supporting normative framework and a technical standard for full traceability of sustainable and circular value chain in the garment and footwear sector.

62. The transformation of the textile industry is key for advancing circularity. Only around 1 per cent of textiles are recycled worldwide, according to the Ellen McArthur Foundation, while product lifetimes are becoming shorter. A report from the European Environment Agency established that EU consumption of clothing, footwear and household textiles is the fourth largest source of environmental pressure, with most of the impacts occurring in other parts of the world where production takes place.

63. Progress in circularity in the garment and footwear industry requires the use of sustainable materials and, critically, reliable certification and traceability systems. Increasingly, brands are confronted by “conscious consumers”, who question the environmental footprint of clothes and the social conditions in garment factories and call for greater transparency and sustainability. According to a 2019 ECE study, however, only about 34 per cent of companies track and trace their value chains.

64. Digital technologies offer great potential in tracking the environmental impact of products and afford consumers and suppliers greater opportunities to make informed choices. Using these technologies, ECE, with the UN/CEFACT, is working to provide the industry with concrete solutions to advance transparency, build trust and perform due diligence. A blockchain pilot for a sustainable and circular cotton value chain is being implemented with key industry partners that will allow companies to take risk-informed decisions and use a set of internationally agreed traceability and sustainability standards.

B. Classification and reporting on resources

65. Internationally harmonized classification and reporting specifications on primary and secondary (recyclable) raw materials are critical for the effective management of natural resources. UNFC facilitates comprehensive resource classification and management and ensures proper treatment of associated technical, social, environmental, and economic issues. The coverage and the use of the framework in the ECE region and beyond continues to expand. In Europe, UNFC is being tested in the context of the EU Strategic Action Plan on Batteries to gather harmonized data on primary raw materials availability: 19 EU member States have reported on cobalt, lithium, nickel and graphite. ECE is further

developing the United Nations Resource Management System (UNRMS), based on UNFC, that will be a voluntary global standard for the fundamental principles of UNRMS.

66. Observed trends in the ECE region show that it is possible to obtain increased amounts of wood as a raw material without depleting the resource base. The forest sector of the ECE region accounts for 60 per cent of wood provision worldwide, so dynamics here have global significance. ECE, working together with global and regional partners, conducts complex periodical assessments of state of forests, sustainable forest management, and assesses the production and consumption of wood-based products and wood energy.

C. Access to information on products and activities

67. An effective management of natural resources and progress towards a circular economy require good data and publicly available information on activities and products that can impact the environment, spanning global production and supply chains. Under the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), a unique instrument has been adopted, the Protocol on Pollutant Release and Transfer Registers. Pollutant release and transfer register systems can be used to improve the monitoring and controlling of input and output parameters from industrial activities, such as energy consumption, pollutant releases and transfer of waste, while providing public access to related information.

D. Measuring circularity of the economy

68. Sound, relevant and internationally comparable statistics are needed to guide policy actions towards a circular economy. Several international statistical standards provide the basis for measuring economic development and its links to environment and sustainability.

69. Important aspects of a circular economy and its relationship with climate change policy (such as use of renewable energy or energy efficiency, for example) are addressed by the CES Recommendations on Climate Change related Statistics (2014) and its Set of Core Climate Change-related Statistics and Indicators (2020). The CES Recommendations and the related set of statistics and indicators guide National Statistical Systems in the regular production of policy-relevant information for climate change drivers, impacts, mitigation, adaptation and GHG emissions.

70. The System of National Accounts (SNA) is a global statistical standard that provides an overarching framework for measuring economic activity. In recent years this traditional framework has been reviewed and updated to ensure linkages between measures of economic development and environmental, social and wellbeing statistics, including circular economy aspects. ECE provides methodological inputs to this process and facilitates the exchange of experiences among its members.

71. The System of Environmental-Economic Accounting (SEEA) Central Framework is a global statistical standard for measuring the interactions between the economy and the environment. SEEA is a fundamental tool for measuring circular economy, providing the necessary links between environment statistics and the System of National Accounts. The annual Joint OECD/UNECE Seminars on SEEA Implementation have included discussions on measuring the circular economy in recent years.

72. ECE is launching work to explore the use of these well-established statistical frameworks for measuring the circular economy. An ECE task force will draft practical guidelines for National Statistical Offices and provide a platform for exchange of experience and knowledge in this area.

VI. Innovation

73. Innovation, including technological change and the introduction of new practices and business models, plays an important role in advancing circularity and improving the management of natural resources. It can reduce the cost of circular practices, make them

economically feasible, and broaden the scope of use of circular products. New organisational arrangements can bring efficiency gains and more intensive patterns of use. ECE work promotes innovation in different areas, including sustainable procurement, and explores new niches for sustainable products and new sharing practices in mobility.

A. Creating the demand for circular products

74. Insufficient demand is a major hurdle in the development and widespread use of innovative circular products and practices. It is not enough to close resource loops and make available circular solutions. The economic incentives for the displacement of linear material use also need to be in place.

75. The public sector can be a significant source of demand to steer the economy towards increased circularity, as public procurement globally accounts globally for 13–20 per cent of gross domestic product (GDP). In the EU, purchases of goods and services by the public sector represent an estimated 14 per cent of GDP. Although shares in some countries of the Eastern part of the ECE region tend to be smaller, public procurement remains a large source of demand that can be leveraged to create incentives for developing sustainable products, foster markets for circular products, and increase their acceptability.

76. Sustainable public procurement can also facilitate critical cooperation across sectors and value chains by aiming to find solutions to specific problems rather than targeting change only in a particular sector. An important barrier to the deployment of this powerful transformational tool is insufficient knowledge on how to use it. This underlines the importance of appropriate guidelines and capacity-building initiatives, as noted in ECE Environmental Performance Reviews and Innovation for Sustainable Development Reviews.

77. The international harmonization of purchasing practices in support of a circular economy encourages innovation. In 2019, UN/CEFACT adopted Policy Recommendation No. 43 on Sustainable Procurement, which offers approaches and criteria for the purchase of sustainable and circular products and services along the entire value chain. In this way, the Recommendation helps to identify measures to enhance the market share of sustainable and circular products and services.

B. Replacing materials with sustainable alternatives

78. The replacement of finite materials with renewable resources contributes to circularity. Using wood-based products from sustainable managed forests instead of, for instance, plastic, concrete or steel reduces the pressure on resources. Forest products come from biomass that regenerates and regrows; they are inherently circular. Moreover, these products are recycled or reused to a larger extent than other materials. Co-benefits for climate change mitigation can be significant. According to the Ellen Macarthur Foundation, European forests and the forest-based bioeconomy have the potential to capture around one quarter of current carbon emissions in the next three decades.

79. ECE has drawn attention to the role of forests in a circular economy and the potential role of new products in recent years. In particular, together with the Food and Agriculture Organization of the United Nations (FAO), it has been promoting the use of materials like lyocell in the textile industry, which can replace more water and resource thirsty materials like cotton. Forest certification is necessary to give confidence to producers and consumers that forests are managed sustainably.

C. New practices in a sharing economy

80. Innovation concerns not only new products but also new practices, including new forms of use. Underusing resources is wasteful. Therefore, a circular economy is supported by sharing platforms and business models that facilitate a more intensive use of products by

sharing rather than owning. More generally, shifting from a product to a service model can contribute to maximizing efficiency and reducing waste.

81. In recent years, interest in initiatives such as car sharing and carpooling, which ensure access to the use of car without individual ownership, have increased. These models bring many potential benefits. Fuel consumption, distance travelled, and the number of personal vehicles tend to decline, with obvious positive environmental and health implications.

82. Cities can integrate shared mobility initiatives as part of sustainable urban mobility plans. These initiatives can help to reduce local congestion, pollution and the demand for private vehicles by using existing ones more efficiently. The relevance of car-sharing schemes as part of the urban mobility portfolio has been reviewed and discussed at ECE as part of the work of the Transport, Health and Environment Pan European Programme (THE PEP).

83. Changes in technical provisions and other regulations may facilitate the extension of such sharing models. ECE work on transport is developing digital keys, which will facilitate car-sharing. This would open the door to more efficient use of vehicle fleets and a reduction in the number of vehicles needed for the same number of trips.

VII. Natural capital, renewable energy and a circular economy

84. A circular economy is intrinsically linked to the sustainable use of natural resources – in fact, both share a symbiotic two-way relationship. Natural capital provides a stream of ecosystems services that are necessary for life and economic activity, such as clean air and water or timber. It offers nature-based solutions that contribute to the advancement of a circular economy, such as bio-based materials. Renewable sources of energy largely rely on natural capital. Preserving natural capital therefore ensures a sustainable foundation for a circular economy. At the same time, a circular economy contributes to maintaining natural capital by reducing the environmental burden resulting from the use of material resources.

85. The symbiotic relationship between a circular economy and the preservation of natural capital creates potential synergies between policy initiatives in these two areas. Thus, legal and policy frameworks that strengthen environmental protection create incentives for circularity and for moving away from a linear economy model, which exacerbates pollution and other environmental risks.

86. ECE promotes the conservation of natural capital in multiple ways. Its multilateral environmental conventions are legal instruments for international cooperation that reduce air pollution, diminish pressures on water resources and address other sources of environmental threats. It is actively engaged in sustainable forest management and contributes to various initiatives on forest restoration, including the Bonn challenge. This is an issue which will become more prominent during the new UN Decade on Ecosystem Restoration 2021–2030. ECE also works to improve effective land use and land administration and promotes sustainable land use policies.

87. Despite progress over the last decades, much remains to be done to enhance environmental protection and the preservation of natural capital in the ECE region. The Air Convention has brought many advances but the median annual economic costs of deaths by air pollution in the pan-European region still exceeds 7 per cent of GDP. In 18 out of 43 ECE countries for which data is available, less than 80 per cent of domestic wastewater flows are safely treated. By 2030, low to medium water stress and scarcity are expected to affect half of the water basins in the ECE region, triggering increased consideration of water reuse as an alternative source. The ECE-WHO Regional Office for Europe Protocol on Water and Health supports countries in considering and developing legislation on wastewater reuse through policy and scientific advice. An accelerated shift to increased circularity would contribute to address these environmental problems.

88. There are multiple linkages between the different components of natural capital. The quality of air and water have a determinant influence on the health of ecosystems. One of the clear successes of the ECE Air Convention has been to dramatically improve the state

of European forests. A regular monitoring of the effects of air pollution on forests under the Convention serves to assess ongoing impacts. Better resource management in a particular area can have positive effects on reducing the demand for other resources. For example, savings in the use of water would also lead to energy savings stemming from water abstraction and distribution.

89. Those linkages are also very clear regarding the exploitation of renewable energy resources, where a significant untapped potential remains in the ECE region. The share of renewable energy in the total energy supply is increasing continually, amid growing policy momentum and heightened private sector interest in the opportunities created by decarbonization. However, there are still large differences across countries; in some of them, the relative importance of renewables remains low.

90. Exploiting the potential for development of renewable energy system requires paying attention to broader questions of natural resource management, as this development is often interlinked with water, agroforestry and ecosystem issues. Those links demand an integrated approach that considers both the positive and negative effects of renewable energy expansion on other sectors, as a prior step to identifying solutions, and bring together all actors.

91. The water-food-energy-ecosystem nexus assessments, carried out under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, reflect these links and the impact that actions in one area may have on other areas, including in a transboundary context, and propose also jointly identified integrated solutions. Linkages are also explored in the context of another series of multi-stakeholder dialogues carried out by ECE, the so-called “hard talks”, which seek to identify barriers and policy responses to renewable energy deployment.

VIII. The road ahead: Some policy issues for discussion

92. As outlined above, a wide range of instruments is available to promote a circular economy and a more sustainable use of resources. Given the currently still modest rate of circularity in the economies of the ECE region, there is ample room for further action. A high-level policy dialogue could explore opportunities and lingering challenges that need to be addressed to facilitate further progress. This may include the identification of focus areas for future work within the multi-sectoral mandate of ECE and opportunities for closer collaboration with other actors. Discussions could consider the following questions:

(a) What are the barriers that constrain faster progress towards a more circular economy and sustainable management of natural resources in the ECE region? How could these barriers be overcome, including through international cooperation?

(b) What are the normative and governance gaps that should be closed to facilitate the shift to a more circular economy? How these could be addressed through ECE work in its different areas of expertise?

(c) How can partnerships among all relevant stakeholders be strengthened to support circularity and a more sustainable management of natural resources?