United Nations ECE/CECI/2022/3

Economic and Social Council

Distr.: General
14 March 2022

Original: English

Economic Commission for Europe

Committee on Innovation, Competitiveness and Public-Private Partnerships

Fifteenth session
Geneva, 25-27 May 2022
Item 4 of the provisional agenda
Implementation of the Programme of Work

Leveraging Innovation for the Circular Economy

Note by the secretariat

I. Introduction

1. This note presents good practices and policy recommendations on how to leverage innovation and innovation policy for the circular economy. It is based on the presentations and discussions at the substantive segment on "Leveraging innovation for the circular economy" of the thirteenth session of the Team of Specialists on Innovation and Competitiveness Policies (ToS–ICP), held in Geneva and on-line on 1-2 November 2021.[1] It reflects and benefits from the experiences of all relevant participating stakeholder groups, including national governments, academic institutions, the private sector and international organisations.

2. ToS-ICP has worked on innovation for the circular economy issues since 2017. Its tenth session in 2017 was dedicated to innovation for sustainable consumption and production. The resulting policy paper[2] "Towards the circular economy: innovation policy for sustainable production and consumption" identified good practices and policy recommendations for enabling and promoting innovation and the transition to the circular economy.

3. At its informal consultations in 2020, two webinars on circular economy related issues were held and resulted in policy papers on the platform economy and on innovation-enhancing procurement for sustainable development.[3]

4. In 2021 ToS-ICP substantive segment took stock of the progress made in the implementation of those recommendations and shared experiences and best practices in the ECE region. It responded to the outcomes of the sixty-ninth Commission session on "circular economy and the sustainable use of natural resources" held on 21-22 April 2021, where member States flagged the importance of circular economy and the sustainable use of natural

[1] The presentations can be found at: Thirteenth session of the Team of Specialists on Innovation and Competitiveness Policies | ECE.

[2] ECE policy paper "Towards the Circular Economy – Innovation Policies for Sustainable Production and Consumption", ECE/CECI/2018/3.

[3] ECE Policy papers on "Building Back Better: using platforms to enable sharing and progress towards the circular economy", ECE/CECI/2021/4; "Building Back Better: innovation-enhancing procurement for sustainable development", ECE/CECI/2021/5.

resources in achieving the Sustainable Development Goals (SDGs). The Commission emphasized the need to further strengthen its work in this field within its existing mandate as appropriate and subject to available resources.

5. All ECE subsidiary bodies are invited to engage in operationalizing the decisions taken at the Commission session, as appropriate, with a focus on enhancing the impact of relevant existing ECE instruments; replicating and scaling up current successful approaches; and considering developing proposals for impactful and measurable solutions.

6. Following this introduction, the second section presents the circular economy model, and what is needed to shift from a linear to a circular model of production. The third section explores the role of innovation in the transition to a circular economy. The fourth section discusses the role of governments in accelerating the transition and identifies a set of policy actions. The fifth section concludes.

II. From a linear to a circular system

7. The circular economy is defined by the Ellen MacArthur Foundation (EMF) as a system where the value of products, materials and resources is maintained in the economy for as long as possible. What is considered waste in the traditional linear economy is turned into an asset or resource as much as possible.[4] The circular economy is restorative and regenerative by design, enhancing and preserving natural capital, optimising resource yields and minimising system risks by managing stocks and renewable flow. In a circular economy, the goal is to decouple global economic development from the consumption of finite resources. It offers a profitable opportunity to move away from resource-intensive processes, maximising the use of existing assets and creating new revenue streams, and thereby rendering production and consumption processes more sustainable and competitive.

8. The circular economy rests on three principles:[5]

(a) Preserve and enhance natural capital by controlling finite stocks and balancing renewable flows. The use of technologies and processes allow, where possible, to use renewables or better performing resources, for example replacing fossil fuels with renewable energy.

(b) Optimise resource yields by circulating products, components, and materials at the highest utility at all times in both technical and biological cycles. This is translated in product design for remanufacturing, refurbishing, and recycling, favouring maintenance to extend products lifetime.

(c) Foster system effectiveness by revealing and designing out negative externalities such as water, air, soil, and noise pollution.

9. In the last few years, the circular economy has become part of national and international policies. The European Green Deal, with the overarching objective for the EU to become climate neutral by 2050, calls for the circular economy transition.[6] Today there are much better levels of understanding of the circular economy principles, embodied carbon,[7] and the role this plays in reaching net zero carbon emissions ambitions. Implementing the principles of the circular economy at scale is needed to tackle climate change and global resource scarcity.

[4] Ellen MacArthur Foundation, “Growth within: A circular economy vision for a competitive Europe”, 2015.

[5] Ellen MacArthur Foundation, “Growth within: A circular economy vision for a competitive Europe”, 2015.

[6] The ultimate goals of the European Green Deal are: 1. No net emissions of GHGs by 2050; 2. Economic growth decoupled from resource use and; 3. No person and no place left behind.

[7] A product embodied carbon is the carbon dioxide (CO_2) emissions associated with materials and production processes throughout the whole lifecycle.

10. There is momentum for the transition and the time to act is now. The circular economy offers a systemic paradigm to bring together sustainable production and consumption (SDG 12), and it also contributes to the achievement of a broad spectrum of nine of the SDGs.[8] A systemic approach is needed for the transition to happen, to open circular economy opportunities and establish the landscape for the circular economy to flourish.

11. However, the transition from a linear to a circular system of production and consumption will not happen automatically. Currently the Organisation for Economic Cooperation and Development (OECD) estimates that less than ten per cent of global economic activity is circular – far below potential.[9] Today models, incentives and structures in place are largely designed for a linear model of production and have to be re-thought for a successful transition to the circular economy. Progress will require deep re-thinking of and experimentation with many ideas of how to transform production and consumption patterns in all sectors.

12. According to the EMF, pursuing the current linear system of production is projected to lead to resource use nearly doubling from 2011 to 2060, which will further exacerbate global environmental challenges.[10] The systemic nature of the circular economy transition can unlock a series of economic, environmental, and societal benefits. According to the EMF, relying only on energy efficiency and renewable energy will only address 55% of global greenhouse gas emissions (GHGs).[11] The remaining 45% are the result of how we make and use products and food. These can be addressed by circular economy strategies (Figure 1).

13. The benefits of the transition to the circular economy are not only environmental. In Europe, an analysis of the construction, food, and mobility sectors indicated that the circular economy could yield annual benefits of up to EUR 1.8 trillion by 2030 - doubling the figure of the linear development path - with an additional Gross Domestic Product growth of seven percentage points.[12] A meta study of the OECD indicates that the adoption of circular economy policies will achieve an average net-positive employment gain under most scenarios.[13]

14. As detailed in the following sections of this note, policy has a key role to play in realizing these benefits, by promoting relevant innovation, facilitating coordinated change in critical systems, such as urban planning, mobility, or food, and by limiting counter-productive rebound effects.[14]

[8] International Resource Panel, “Resource efficiency: potential and economic implications”, 2017.

[9] OECD, “The circular economy in cities and regions: synthesis report”, 2020.

[10] Ellen MacArthur Foundation, “Completing the Picture: How the Circular Economy Tackles Climate Change”, 2019.

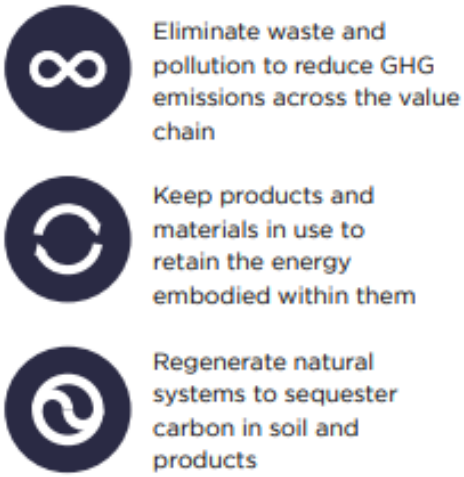
[11] Ellen MacArthur Foundation, “Completing the picture: how the circular economy tackles climate change”, 2019.

[12] Ellen MacArthur Foundation, “Growth within: a circular economy vision for a competitive Europe”, 2015.

[13] OECD, “Labour market consequences of a transition to a circular economy: a review paper”, Environment Working Paper N°162, 2020.

[14] Ellen MacArthur Foundation, “Growth within: a circular economy vision for a competitive Europe”, 2015.

Figure 1
The circular economy principles and their action on Greenhouse Gas Emissions (GHGs)



Source: Ellen MacArthur Foundation, "Material Economics, Completing the picture: how the circular economy tackles climate change"2019.

III. The role of innovation in the transition

15. Innovation is already driving the move to the circular economy and to sustainable consumption and production patterns. There are numerous examples of new technologies, processes, services, and business models that are re-shaping product life cycles from design through production and usage on to disposal and re-cycling. New forms of sustainable consumption, such as sharing platforms, appear in transport, housing, and other areas.

16. The private sector has an important role in driving the circular economy transition. Advances in technology create more ways to shift to circular economy models; many allow more efficient collaboration and knowledge sharing, better tracking of materials, improved product design and materials, and increased use of renewable energy. Smartphones, the internet of things, and advanced manufacturing and processing technologies such as 3D printing all contribute to the transition.

17. The circular economy is an innovation agenda that can lead to better growth. For example, the modelling of the benefits of a circular economy for plastic packaging alone has shown that systemic changes using existing technologies will not only reduce the annual volume of plastics entering the oceans by 80% and GHG emissions by 25%, but also generate savings of USD 200 billion per year and create 700,000 additional jobs by 2040. Near-zero plastics inflows into the oceans could be achieved by further accelerating innovation across the entire plastics value chain[15] (see Table 1 for other examples).

18. Multinationals, small and medium-sized enterprises (SMEs), and start-ups have all begun to embrace circular opportunities. However, the transition towards the circular economy is still at an early stage in most of the countries in the ECE region, and the potential of innovation to make production and consumption fully sustainable is far from being fully exploited.

19. To reach high circularity rates in the ECE region it is paramount to accelerate momentum, try out ideas to see what works more systematically and boost innovation. For innovation to flourish, new markets need to be created and externalities from unsustainable

[15] Pew Charitable Trust and SYSTEMIQ, "Breaking the plastic wave", 2020.

production and consumption patterns need to be addressed. Innovation alone is not enough though. To support a circular economy, innovation needs to be pursued with the objective of a systemic change in mind.

20. The circular economy transition requires not only new, improved products, but innovative business practices overall – in design, production, delivery models, and life cycle management. On product and systems innovation, for example, it is important to analyse the impact of material alternatives, for example alternatives to plastic, as material changes need to be for the better and the downstream capacities need to match the alternatives adopted.

Table 1
Examples of circular economy innovation opportunities and benefits in 3 sectors

Plastic Packaging	In a circular economy for plastics, reusable packaging alone represents a USD 10+ billion innovation opportunity that can deliver significant user and business benefits, including brand loyalty, improved user experience and insights, cost savings and optimised operations.
Fashion	A circular economy for fashion can address the USD 500+ billion of value lost annually due to clothing underuse and a lack of effective collection and recycling infrastructure, circular design, and business models, that keep products at their highest value (such as repairs, re-commerce, rental, remake), can drive innovation and lead to improved human and ecosystem health.
Food	A circular economy approach to food would generate annual benefits worth USD 2.7 trillion by 2050 globally. Based on GHG emissions reduction, water savings, avoided land degradation, reduced health costs and new economic opportunities.

Source: Ellen MacArthur Foundation, "Universal circular economy policy goals, enabling the transition to scale", 2021.

IV. The role of government in enabling and accelerating the transition

21. Policy makers have a unique opportunity to enable and accelerate the industrial transformation needed to scale the circular economy. Policy makers, entrepreneurs and innovators need continuous, multi-level dialogue to understand opportunities, remove bottlenecks, and ensure that incentives are fit for purpose.

22. Fully realizing the potential of innovation for the circular economy requires dedicated and sustained policy efforts to create enabling frameworks and incentives for private innovation and to encourage consumers to rapidly and broadly adopt innovative and more sustainable consumption patterns. This also requires innovative approaches to regulation to provide incentives and eliminate barriers. It will also require a strong role for education to build the right skills and to empower consumers to make circular choices.

23. Embedding the circular economy model across industries requires comprehensive policy frameworks, as voluntary commitments by industry cannot achieve the scale required. To take the example of plastic packaging, the signatories of the New Plastics Economy Global Commitment – a voluntary commitment for achieving a circular economy for plastics

– represent around 20% of the global market.[16] Policymakers can scale up the commitment by eliminating unnecessary and problematic plastic items across the economy, stimulating innovation, facilitating collection-for-recycling systems and the necessary funding, and incentivising the use of recycled materials.[17] Such policy initiatives and leadership are needed to scale the transition across all sectors.

24. In 2017 ToS-ICP identified several policy recommendations for governments in the region to accelerate the circular economy transition- see box below.

Box 1
ToS-ICP policy recommendations for the transition to a circular economy

- Adopt regulatory instruments, including better implementation and enforcement of related existing legislation; revisions of relevant legislation, new measures and regulations;
- Adopt, implement, and use smart regulation, standards, and codes of conduct;
- Adopt fiscal incentives including taxes, charges, and levies, and promote information and advisory services and awareness raising campaigns;
- Promote public investment in Research and Development (R&D), skills and training and infrastructure, industrial symbiosis and clusters, innovation-enhancing procurement;
- Encourage innovation and the acceleration of public and private investment in resource efficient technologies, systems and skills;
- Abolish environmentally harmful subsidies and tax breaks; and
- Create better market conditions for products and services that have lower impacts across their life cycles and that are durable, repairable, and recyclable.

Source: UNECE Policy paper "Towards the Circular Economy – Innovation Policies for Sustainable Production and Consumption", ECE/CECI/2018/3.

25. Several ministries across government are responsible for policies that can facilitate the delivery of a circular economy model. Not only the ministry of environment leads the circular economy agenda but also the ministry for industrial development, the ministry of innovation, the ministry of economy and finance, the ministry of agriculture and the ministry of education – to cite a few- have central roles to play in driving the transition. Moreover, circular economy national roadmaps, strategies and policies have to be implemented at regional and city level. Cooperation across government and along different level of governance and institutional coordination are therefore essential for the success of the transition.

26. Cross-sectoral coordination and collaboration and policy alignment are needed not only at national level but also across borders and between systems, considering the global nature of supply chains and production and consumption systems. This will help avoid the creation of fragmented and different solutions which may create difficulties across borders and increase transaction costs to comply with different schemes.

27. Whereas the policy goals for the circular economy are universal, the transition will need to respond to local opportunities, strengths and challenges. It will also need to be mindful of the trade-offs of structural changes and take adequate policy support measures to ensure sustainability and social inclusion.[18]

[16] Ellen MacArthur Foundation, "The Global Commitment 2020 Progress Report", 2020.
[17] Ellen MacArthur Foundation, "Universal Circular Economy Goals, enabling the transition to scale" 2021.
[18] V. Moreau, et al., "Coming full circle: why social and institutional dimensions matter for the circular economy" 2017, 21(3), pp.497– 506.

28. At its session in 2021, ToS-ICP, specifically looked at some good policy intervention in support of the transition to the circular economy and identified three sets of policy actions, based on the experiences of some member States.

A. Invest in innovation, infrastructure, and skills

B. Collaborate for systemic change

C. Adopt innovation-enhancing procurement for the circular economy

A. Invest in innovation, infrastructure, and skills

29. Circular economy goods and services, and the technologies behind them are innovative and often pursued as high-risk investments. By shaping and guiding public investments, policymakers can support the transition to the circular economy. One of the important roles of government is to invest public money and stimulate private sector investment in developing the skills required to create circular economy opportunities, supporting innovation, and developing the infrastructures and capacities necessary to scale the transition.

30. The Finnish government has set a target of making Finland a global leader in the circular economy by 2025; it has adopted a circular economy roadmap and national strategy in 2021.[19] The strategy emphasises the government's role in facilitating a progressive growth platform that is favourable to the domestic market and companies but also has a strong export and technology orientation. This is combined with the search for comprehensive solutions and co-operation covering the entire value chain.

31. One of the identified policy actions in the roadmap is accelerating the circular economy by means of funding, export promotion, and cooperation with the private sector. The independent Finnish Innovation Fund (Sitra) as committed nearly EUR 100 million in venture capital funds investing in Finnish SMEs, such as Sulapac, a developer of alternative packaging for plastic; Swappie, which specialises in the maintenance and sale of used mobile phones; and RePack, which provides reusable packaging for business to consumers markets.

32. Investment priorities are not only supporting the SMEs, but also consumers' education and capacity building to create and improve skills for circular businesses. The circular economy will be integrated as a whole with training and research policy at all levels of education, including for teachers. Research funding will be directed at cross-disciplinary research projects that promote the circular economy.

33. In Georgia, the Georgian Innovation and Technology Agency (GITA), based on the national SME Development Strategy, is focusing on developing an entrepreneurial innovation ecosystem and high-potential start-ups, which is essential for the transition to the circular economy.

34. Since 2016, GITA has been developing innovation infrastructure via the network of three tech parks, two innovation centres and 22 maker-spaces across the country. Start-ups or interested individuals benefit from the free of charge access to co-working spaces, training and high-tech equipment which help mature their ideas into specific products. GITA's overall goal is to foster a technology and innovation ecosystem for innovative individuals and enterprises.[20]

[19] Finland circular economy roadmap focuses on five interlinked areas: a sustainable food system; forest-based loops; technical loops; transport and logistics; and joint actions.

[20] ECE, Handbook on "Supporting innovative high-growth enterprises in Eastern Europe and South Caucasus", 2021.

35. In addition to investing in innovation infrastructures and services, GITA has partnered with the global 500 start-ups platform to launch the 500Georgia acceleration programme which include the combination of intense and remote training. Selected staff from a group of companies are then invited to spend four weeks in San Francisco for an immersion experience.

B. Collaborate for systemic change

36. Collaboration among different government layers, between national and local administration, and among policy makers, business and consumers is one of the key success elements for the transition to the circular economy.

37. The engagement of multiple stakeholders (e.g., the public sector, the private sector, NGOs, academia, citizens, and trade unions) is a fundamental step highlighted in several toolkits for the development of circular economy roadmaps.[21] The use of public consultations and inclusive processes in developing national circular economy roadmaps ensures an understanding of the opportunities, needs and barriers on all sides, taking into account how different counterparts are affected and ultimately creating a sense of shared ownership in the transition.[22]

38. From the findings of the consultation process, specific policies and programmes can be developed, including financial and capacity-building support schemes, amendments to regulation, investments in projects in priority sectors, and demonstration projects in selected regions or cities.

39. Although multi-stakeholders participatory processes can be time consuming, they ultimately help the adoption of policies universally accepted, thus avoiding costs and unexpected delays.

40. Zero Waste Scotland provides leadership and practical support to encourage growth of the circular economy in Scotland and offers interesting examples for partnerships and collaboration. Zero Waste Scotland has put in place different support mechanisms, among which, Business Support Service which delivers tailored, expert, one-to-one consultancy directly to SMEs looking to further develop circular business models; the availability of an Investment Fund with eighteen million pounds invested in grant funding to SMEs; the establishment of a business support network to share and build on good practices for the transition and; circular economy innovation workshops to increase knowledge and capabilities.

41. Partnerships and collaboration are central to Zero Waste Scotland strategy for the circular economy. For example, it works in partnership with Chambers of Commerce as part of its Circular Cities and Regions programme, to deliver a tailored programme of business engagement to identify and exploit sectors and businesses for circular growth.

42. Zero Waste Scotland also works closely with professional networks, industry and other key delivery bodies to ensure the circular economy is embraced in Scotland. It also works in collaboration with Scotland's Innovation Centres to promote circular economy innovation via research and development, particularly in the sectors of food and drink (bioeconomy), construction and energy.

43. The Innovation Centres aim to help businesses of all sizes increase the pace of innovation to grow and strengthen the circular economy. They are founding members of "The

[21] Sitra, "How to create a national circular economy roadmap", 2020.

[22] The ECE Task Force on circular economy is developing a policy paper on "Institutional Arrangements for Transition to Circular Economy and Sustainable Use of Natural Resources", which addresses the desirable characteristics of the institutional arrangements for the transition to the circular economy such as mechanisms for coordination, stakeholder engagement, partnership development and strategy formulation and provide criteria to assess existing institutional capacities gaps.

Scottish Circular Economy Business Network (SCEBN)", a platform for engaged, innovative and forward-thinking business leaders to work collaboratively, sharing and building on good practices. The platform provides opportunities for businesses based in Scotland to come together in a forum, to focus on collaborative action and work together as business ambassadors for the circular economy in Scotland. The SCEBN also provides the space and opportunity to help build responsive and networked supply chains.

44. In Ukraine, an open innovation approach, Innovation DTEK crowdsourcing platform, seeks to attract innovative solutions to challenges in the energy sector. DTEK group is the leader in Ukraine's energy sector and the industry's biggest private investor. With the launch of the platform, DTEK publishes queries to find teams, ideas, and technologies to address topical issues, including on sustainable development. With the help of the platform, DTEK seeks to collect innovative ideas aimed at increasing the level of safety, business efficiency and environmental friendliness of its production. DTEK uses an innovation crowdsourcing method with broad collaboration to advance progress.[23]

C. Adopt innovation-enhancing procurement for the circular economy

45. Innovation-enhancing procurement (IEP) is a demand side policy tool that can support the circular economy transition. Through IEP, governments can stimulate better environmental and social performance of products and build circularity in their economies.

46. By procuring innovative goods, services and infrastructures, governments can make their own operations more productive and sustainable and can serve citizens and companies better. IEP can encourage innovation in the private sector for instance by articulating the specifications of the demanded product or service, by signalling the existence of unmet needs, and facilitating interaction between users and producers.

47. Policy makers can use IEP not only to stimulate innovation in general, but also for mission-oriented innovation, such as the circular economy, thus making IEP a strategic policy tool.

48. By applying the tools of IEP to promote the circular economy, public agencies can make a difference in facilitating the transition to the circular economy.[24] They can provide industry with real incentives for developing sustainable technologies and goods not only by providing the necessary funding but encouraging innovation in this field by:

- Clearly attaching evaluation criteria and payment streams to performance indicators;
- Formulating tenders around the impact envisaged, allowing margins for bidders to come up with different solutions to achieve it;
- Including circular economy aspects in procurement criteria.

49. In 2013, the Dutch Government established the Circular Procurement Green Deal to accelerate the transition to a circular economy. The programme brought together 45 public and private parties, tasked with carrying out two circular procurement initiatives. In three years, 80 circular procurement pilots were conducted, and their lessons shared. As a result, the Dutch Government placed special emphasis on circular procurement and the consideration of life-cycle costs in its 2016 Roadmap to a circular economy. It also pledged to raise the proportion of circular procurement to 10% by 2020.[25]

[23] ECE, Handbook on "Supporting innovative high-growth enterprises in Eastern Europe and South Caucasus", 2021.

[24] Liesbeth Casier, "The three challenges to innovative public procurement", IISD blog 2018.

[25]

50. Austria is at the forefront with IEP. It established a Competence Center for Public Procurement Promoting Innovation (PPPI) within the Federal Procurement Agency in 2013, with the primary goal of increasing the amount of public innovation procurement in the country. It also established a PPPI community encompassing key stakeholders from economic, scientific and research institutions as well as public procurers, and included innovation as a valid criteria within procurement laws and regulation.

51. The Centre for PPPI acts as innovation brokerage, building bridges, connecting public procurers and innovative companies. It offers an innovation platform, networking and events, strategic consultancy, trainings, pilot projects and financial support.

V. Conclusions

52. The circular economy transition is an innovation agenda run both by the private sector and the government, which demands multi-stakeholder, cross-sectoral cooperation, including at different level of governance.

53. With material flows and value chains stretching across borders, the transition to the circular economy also requires international cooperation, policy and regulatory alignment, for example product specifications, information labels, and standards. This can help to reduce transaction costs and improve the effectiveness of policies.

54. International fora, platforms and exchanges of good practices support mutual learning and can help to identify alignment opportunities and policy barriers that policymakers can address at the national, regional, and international levels.

55. ECE through its various workstreams (e.g., innovation policy, supply chain transparency and traceability, trade, and public-private partnerships) is supporting member States in the circular economy transition by offering a platform for learning and knowledge sharing at its intergovernmental meetings, such as ToS-ICP. It also provides policy advice and recommendations, for examples through its flagship publications such as the Innovation for Sustainable Development Reviews, such as the forthcoming reviews for Moldova and Uzbekistan, and policy handbooks, such as the Handbook on policy support for Innovative High Growth Enterprises. The latter are usually SMEs with an important role in the circular economy transition.

56. ECE also supports the implementation of its policy recommendations through national and regional capacity building programmes.[26] For example Georgia has requested a national capacity building programme to support the advancement of innovation-enhancing procurement in the country.

http://www.scpclearinghouse.org/sites/default/files/eng_green_deal_circular_procurement_magazine.pdf.

[26] On 28 October ECE launched a new capacity building project on “Accelerating the Transition to Circular Economy in the UNECE Region” (https://unece.org/circular-economy/press/unece-launches-project-build-countries-capacities-circular-economy) to help countries address challenges and harness opportunities in key areas, including traceability of supply chains, innovation-enhancing procurement, and the management of waste.