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#### Implementation of the Programme of Work

## Towards the Circular Economy - Innovation Policies for Sustainable Production and Consumption

Note by the secretariat\*

### I. Introduction

1. This note presents good practices and policy recommendations on Innovation for Sustainable Consumption and Production. It is based on the presentations and discussions at the substantive segment on “Towards the Circular Economy - Innovation Policies for Sustainable Production and Consumption” of the tenth session of the Team of Specialists on Innovation and Competitiveness Policies (TOS-ICP), held in Geneva on 18 and 19 October 2017.<sup>1</sup> It reflects and benefits from the experiences of all relevant participating stakeholder groups, including national governments, academic institutions, the business sector and international organisations.

2. Following this introduction, the second section presents Sustainable Development Goal 12 and defines Sustainable Consumption and Production. The third section introduces the Circular Economy model, and the fourth section presents its benefits. The fifth and sixth sections discuss the role of innovation in the transition to a Circular Economy and the challenges to overcome. The seventh section discusses the policies to promote innovation for sustainable production and consumption. The eighth section covers financing innovation for the Circular Economy, while the ninth explores the role of cities.

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\* The document is submitted late because of unforeseen delays in completing the consultations on its contents.

<sup>1</sup> The presentations can be found at <http://www.unece.org/index.php?id=46514>



## II. Sustainable Development Goal 12: Ensure Sustainable Consumption and Production Patterns

3. In September 2015, the General Assembly of the United Nations adopted the 2030 Sustainable Development Agenda. It set ambitious global goals that commit the countries of the world to work towards achieving economic prosperity while protecting our planet and ensuring social inclusion.
4. Sustainable consumption and production involves resource and energy efficiency, sustainable infrastructure, and access to basic services, green and decent jobs and a better quality of life for all. This supports overall development, reduces future economic, environmental and social costs, strengthens economic competitiveness and reduces poverty.
5. The 1994 Oslo Symposium defines sustainable consumption and production (SCP) as “the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations”. Business can increase sustainability by designing more durable and recyclable products, reducing the waste flow through more efficient production processes, and reducing the extraction rate of resources by shifting to renewables. Consumers can contribute by buying more durable product variants, recycling more, and shifting to product sharing as an alternative to buying.
6. Sustainable consumption and production aims at “doing more and better with less”, increasing net welfare gains from economic activities by reducing resource use, degradation and pollution along the whole product lifecycle, while increasing quality of life.
7. Sustainable consumption and production patterns also enable several other Sustainable Development Goals (SDGs) and targets. For example, recovering just half of the food that is lost or wasted would be enough to achieve zero hunger (SDG 2). Managing and disposing of chemical and other waste well reduces negative effects on human health (SDG 3); and higher levels of water and energy efficiency help meet water needs (SDG 6) and contribute to achieve universal access to affordable energy (SDG7).
8. Innovation is at the core of SDG 9, but the potential that it offers for achieving all of the SDGs as a cross-cutting means of implementation is acknowledged in the 2030 agenda. Innovation is in fact a key enabler for SDG 12. In 2018, the United Nations Global High Level Political Forum on Sustainable Development as well as the Multi-Stakeholder Forum on Science, Technology and Innovation for Sustainable Development, will be dedicated, among other Goals, to SDG 12.

## III. The Circular Economy model

9. The circular economy model can play a strong role in achieving SDG 12. 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.
10. There are a range of definitions of the Circular Economy, which can result in challenges in determining the best targets and outcomes for policy intervention.
11. The Circular Economy may be broadly construed 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 in the Circular Economy. It is restorative and regenerative by design, enhancing

and preserving natural capital, optimising resource yields and minimising system risks by managing stocks and renewable flows.<sup>2</sup> In the Circular Economy, the ultimate goal is to decouple global economic development from the consumption of finite resources. It therefore offers a systemic paradigm to bring together sustainable production and consumption.

12. The Circular Economy rests on three principles:

(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.

13. Innovation has a key role in applying these principles.

#### **IV. The benefits of the Circular Economy**

14. The Circular Economy promises a range of benefits. Despite long-term secular decline in most commodity prices, recent times have seen record volatility, with negative macroeconomic impacts. This has forced businesses and economies to rethink their buy-process-sell model and shift to different production and management practices.

15. Supply risks and dependency on raw materials imports have also shifted attention towards more sustainable patterns of production. The European Union for example imports six times as much materials and natural resources as it exports.

16. Negative environmental externalities increasingly feature in business and financial planning, with large institutional investors starting to divest from companies with high exposure to fossil fuel.

17. The circular economy offers the opportunity to make substantial net material savings and reduce exposure to price volatility. Estimates forecast net material cost savings at European Union (EU) level of up to 630 billion euros annually. By 2050 the Circular Economy could reduce mobility costs for the average EU household by 60 to 80 per cent, food costs by 25 to 40 per cent and housing costs by 25 to 35 per cent.<sup>3</sup>

18. The Circular Economy has also a high potential in creating new employment across industrial sectors, through local reverse logistics, and within small and medium sized enterprises, through increased innovation and entrepreneurship and a new service based economy.

19. The transition to the Circular Economy could increase primary resource productivity in the EU by up to 3 per cent annually by 2030, raising GDP by up to 7 per cent over the current development scenario. The annual benefits are estimated at up to 0.9 trillion Euro.<sup>4</sup>

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<sup>2</sup> Definition by Ellen MacArthur Foundation.

<sup>3</sup> Ellen MacArthur Foundation, "Growth within: A circular economy vision for a competitive Europe".

<sup>4</sup> Ellen MacArthur Foundation, "Growth within: A circular economy vision for a competitive Europe".

20. Both overall competitiveness and the environment will benefit. The UN Environment International Resource Panel has recently noted that improving resource efficiency is indispensable for meeting climate change targets cost-effectively. Achieving twelve out of the seventeen SDGs will depend on the sustainable use of natural resources. In a Circular Economy scenario, carbon dioxide emissions are estimated to drop by as much as 48 per cent by 2030 (2012 base scenario) and 83 per cent by 2050.

21. Progress towards the Circular Economy will be key to achieving SDG 12. SDG 12 progress indicators reflect this, especially those on reducing material footprint per capita and material footprint per unit of GDP, with equivalent measures for domestic material consumption.

22. “Decoupling” GDP growth from resource consumption is crucial, but trends remain ambiguous. Particularly high-income economies have made significant progress, driven largely by innovation. However, some of this progress may have been due to off-shoring of certain economic activities, leading to “hidden flows” in resource use and pollution. As a result, progress towards decoupling at the global level has slowed in recent years. There is even some evidence of “recoupling”, where the growth in global resource use outstrips economic growth.

23. The de-coupling of GDP growth from resource consumption has gained policy attention particularly in highly developed, resource-poor countries where reducing the resource intensity of GDP reduces both import dependency and environmental harm. By contrast, some countries with economies in transition, which have large endowments of natural resources, aim not necessarily to de-couple GDP growth from resource use, but to de-couple resource use from negative environmental impact. Innovation again has a leading role to play in this context.

## **V. The role of innovation**

24. 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.

25. 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.

26. However, the transition towards the Circular Economy is still at an early stage in most of the ECE region, and the potential of innovation to make production and consumption fully sustainable is far from being fully exploited.

## **VI. Challenges**

27. Fully realising the potential of innovation in this critical area will require dedicated and sustained policy efforts to create enabling frameworks and incentives for private innovation efforts in circular economy fields and to encourage consumers to rapidly and broadly adopt innovative sustainable consumption patterns. This will also require innovative approaches to regulation (regulatory innovation) to provide incentives and

eliminate barriers and, in financing tools (financial innovation) to mobilise private, public, and blended finance.

28. A central policy challenge is how to scale up from innovative start-ups catering to niche markets to large scale, more environmentally and socially sustainable business models and consumption patterns. Scaling up the circular economy needs support and capacity building to move from policies to concrete implementation. Governments can help create markets (including financial markets), coordinating among market participants and aligning incentives on all sides. This will help to make sustainable production and consumption commercially viable for all parties.

29. In doing so, policy makers have to address “rebound” effects, where falling prices encourage more consumption, which then offsets the positive impact of efficiency gains on material footprints. Ensuring that relative prices better reflect costs to society and internalise externalities, or include compensation for the costs society incurs, can help address this issue. It is important to assess such costs throughout the production cycle, reflecting interdependence across the value chain.

30. There will also be macroeconomic challenges, as structural changes in production and consumption create both winners and losers.

31. Moving towards a Circular Economy would also incur considerable transition costs. R&D and asset investments, stranded investments, subsidies and spending on digital infrastructure would account for most of the costs. In Germany the transition to renewables, from 2000 to 2013 costed 123 billion Euro in feed-in tariffs alone to operators of plants using renewable resources.

## **VII. Policies to promote innovation for sustainable production and consumption**

32. The circular economy transition requires not only new, improved products, but innovative business practices overall – in design, production, delivery models, and life cycle management. Often, existing regulatory frameworks and microeconomic policies are ill-suited for this transition, and sometimes well-intended policies in different areas may act as downright disincentives. Much more than before, policy makers, entrepreneurs and innovators need continuous, multi-level dialogue to understand these opportunities, remove bottlenecks, and ensure that incentives are fit for purpose.

33. Circular economy business includes:

- Waste value creation;
- Circular supply chains;
- Product life models;
- Using idle capacity; and
- Product service systems.

34. Scaling up these business models may require policy support, often through coordination rather than direct subsidy: producer consortia may share the costs of waste processing from both production and households. Companies also need to build core competences in circular design to facilitate product reuse, recycling and cascading. Standardised components, designed to last products, design for easy end of life sorting, separation or reuse of products and materials and design for manufacturing criteria need to take into account the use of by products and wastes.

35. Significant policy efforts have been made recently at the EU level. The Circular Economy Package of December 2015 included an EU Circular Economy Action Plan targeting five sectors: plastics, food waste, critical raw materials, construction and demolition, and biomass-biobased products. This represents a concrete and ambitious programme of action until 2019, with around 50 measures covering the whole cycle from production and consumption to waste management and the market for secondary raw materials as well as an annual report on implementation. The EU Packages recognizes a primary role for research and innovation to achieve the Circular Economy, in particular regulatory innovation to address regulatory barriers and financial innovation.

36. The European Waste Framework Directive (Directive 2008/98/EC) also offers an instructive example of policy principles to create markets to reduce waste on the production side, including: a waste management hierarchy, the polluter pays principle, and extended producer responsibility.

37. Various countries have been successful in creating a culture of recycling among consumers – a “recycling society”. There is now a need to create a culture of minimising waste in the first place.

38. The shift towards a Circular Economy requires “closing the loop”, through increased product reuse, repair and remanufacture as well as increased recycling of material. It requires to turn what was previously discarded as waste into a resource returned to the production process. To this extent creating appropriate incentives (e.g. labelling systems, standards, regulatory measures, or taxation) is necessary not only to change production practices but also to enable innovation to deliver new and more sustainable consumption practices.

39. A consumer often purchases a product to fulfil a need that could be sometimes fulfilled by a service e.g. the purchase of a new car. The purpose of a circular economy is thus not only to close the material loop but at the same time to reduce the material flow. A way of doing this is by sharing products, through car sharing for example. A sharing economy is also good for social inclusion as it enables some citizens to access goods that they could not otherwise afford.

40. In addition, there is also a need to “slow the flow”, i.e. to extend the useful life span of products and product use without reducing their attractiveness to consumers. Innovative business models have a central role to play here. For instance, assets can be rented rather than sold outright. The rental contract establishes a long-term relationship between the producer and the consumer, which gives the producer an incentive to design and produce the asset in a more sustainable way.

41. A sharing economy allows more efficient use of existing resources and assets. Policy questions remain on how to regulate these newly emerging markets and how to balance concerns about fair competition, consumer safety and labour standards. Policymakers can play an important role in enabling and, as appropriate, setting the direction for a transition to the circular economy.

42. The Netherlands presented the “Right to Challenge” as a good practice in this regard, where providers of sharing services, users, competing “ownership economy” incumbents and regulators come together to discuss how best to modify the regulatory environment to balance competing interests.

43. The German Resource Efficiency programme has the goal to make the extraction and use of natural resources more sustainable in the belief that improving resource efficiency can limit environmental damage, strengthen the competitiveness of the German economy, create new jobs and secure long-term employment. The measures of the programme include, among others, efficiency advice for SMEs, higher use of resource-

efficient products and services in public procurement, strengthening voluntary product labelling and certification schemes and enhancing closed-cycle management.

44. The Dutch government Green Deal helps companies explore circular economy opportunities. Denmark set up a task Force on Resource Efficiency to identify and address regulatory barriers. The Scottish Material Brokerage Service aggregates contracts for the 3 million tonnes of secondary materials collected annually across more than 200 public bodies into a robust and cost-effective supply chain.

45. Policy intervention should fix market and regulatory failure and stimulate activity actively, through targets, procurement policy, platforms, and technical and financial support to businesses.

46. Potential policies to facilitate the transition to the circular economy include:

- Regulatory instruments, including better implementation and enforcement of related existing legislation; revisions to relevant legislation, new measures and regulations;
- Voluntary agreements, fiscal incentives including taxes, charges and levies, information and advisory services and awareness raising campaigns;
- Public investment in R&D, skills and training and infrastructure, industrial symbiosis and clusters, green public procurement;
- Encourage innovation and accelerating public and private investment in resource efficient technologies, systems and skills;
- Implementing, using and adopting smart regulation, standards and codes of conduct;
- Abolishing environmentally harmful subsidies and tax breaks; and
- Creating better market conditions for products and services that have lower impacts across their life cycles and that are durable, repairable and recyclable.

## **VIII. Financing innovation for a circular economy**

47. A circular economy requires substantial public and private investment in hard and soft infrastructure, better technologies and processes for production and recycling. While ample global liquidity is available and investors remain eager to finance innovation across the world, businesses and governments are exploring new ways of blended finance – combining public and private capital, and allocating risk more efficiently.

48. The Circular Economy offers a way of generating multiple cash flows from one commercial activity, i.e. cash flows from secondary products from waste materials. As such, it is fertile ground for innovative approaches to financing. These are likely to go beyond loans to guarantees (trade financing) and equity participation. In some cases, there may be a need to “blend” such financial support with public grants, guarantees, or other interventions, reflecting the public good nature of the desired outcomes, and the various market and coordination failures.

49. Circular Economy investments frequently have to cover longer time horizons and present different types of risk than linear economy projects. These differences need to be taken into account when designing financing instruments.

50. There may be a rationale for the government to make investments in key infrastructures such as testing labs or temporary materials banks that then enable the growth of a sharing economy “eco-system”.

51. Given the complex nature of many Circular Economy investment projects, supply of appropriate expertise alongside financing and solid public-private partnership is crucial to success.

52. The European Investment Bank provides project advisory services alongside financing to address some of these challenges, improving the bankability and investment readiness of projects and provide earlier access to finance. The European Commission announced a Circular Economy Finance Support Platform in January 2017.

53. The European Bank for Reconstruction and Development (EBRD) has a target of 40 per cent of its investment activities to be “green” by 2020. Many EBRD projects include a Circular Economy component, with scope for further increase.

## **IX. Cities in the circular economy**

54. Nowadays half of the world population resides in urban areas; urbanisation and overall population growth is projected to add another 2.5 billion people to the urban population by 2050.

55. Cities and regions are increasingly becoming the agents for change on the Circular Economy agenda. National strategies and policies often fall short of covering the complex regulatory requirements. It is often preferable to make policy changes gradually, trying policies out. Cities have the flexibility and scope for such experimentation. Their high business and consumer density make them ideal locations for hubs of innovation, incubator spaces, maker labs and urban farming. A city government can also usually move faster than national authorities.

56. Cities are therefore at the core of the transition to the circular economy:

- They are centres of development; they provide concentration of people and activities, employment, education, businesses, administration, services, culture, innovation and creativity.
- They are a concentration of challenges – environmental, aging, migration, waste, social exclusion. They emit 70 per cent of CO<sub>2</sub> emissions.
- They are the place where policies interact through mobility, energy, infrastructure, building, water, waste.

57. They therefore offer opportunities for most efficient ways of life. They can be implementers of policies. They are also trend setters, by branding quality of living; they are laboratories that test new technologies; they are a source of experience and best practice examples. The cities of Amsterdam and London are among the champions of circular Economy best practices in the UNECE region.

58. Dialogue with non-governmental partners is crucial, and there is a need for platforms to share experiences between cities and regions in Europe and beyond. There is a need for “smart regulations” that stipulate the objective and not the approach to achieve them.

59. UN Habitat III in Quito represented a step forward on the international sharing of best policy practices on smart cities. Its Quito declaration reflected the important interface between urban and territorial planning and policy formulation and science, technology and innovation outcomes for sustainable development.

60. The Urban Agenda of the European Union has 12 priority themes: Air quality, urban mobility, inclusion of migrants and refugees, jobs and skills in the local economy, sustainable use of land and nature-based solutions, energy transition, circular economy,

innovative and responsible public procurement, urban poverty, climate adaptation, digital transition, and housing. It focuses on three pillars:

- Better regulation
- Better funding
- Better knowledge

61. The Synergic Circular Economy across European Regions (SCREEN) project, under the European Union Horizon 2020 Research and Innovation Programme, aims at defining a common agreed and replicable systemic approach towards a transition to a Circular Economy and the synergic application of different funds. It also sustains the regional stakeholders involved in Circular Economy activities in line with the Smart Specialisation of each region and it connects them in a trans-regional operational framework.

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