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**Contribution by UNEP**

**to the CSTD 2022-2023 priority theme on “Technology and innovation for cleaner  
and more productive and competitive production”**

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## PRIORITY THEME 1: Technology and innovation for cleaner and more productive and competitive production

- 1. What are some specific examples (from the public and private sectors) of green technology and innovation for cleaner and more productive and competitive production in your member countries? Please include contact, website, link to reports and any other relevant information concerning these projects and initiatives.**

### Waste

- UNEP, through the Climate & Clean Air Coalition (CCAC) provided technical assistance to the city of Sao Paulo, Brazil on the operation of composting plants, assessment of a pilot composting plan, and capacity building on organic waste treatment. This assistance helped increase the number of decentralized composting plants in Sao Paulo. The CCAC also provided technical assistance for a financial work plan on technical, regulatory environment, and financial feasibility aspects of an Eco-park Waste facility integrating different technologies for the treatment/recovery of two waste streams: mixed waste from households and biowaste separated at source from the large generators. Link here: <https://www.ccacoalition.org/es/node/3035>
- The CCAC also developed a [guideline for the management of organic waste](#) based on technical assistance provided to Novi Sad and Vrbas (Serbia) and Bijeljina (Bosnia-Herzegovina). For the city of Bijeljina, technical assistance included a study to divert organic waste, an assessment study for the implementation of a composting plant, and a compost market study. For the city of Novi Sad, a study was conducted that assessed the capacities of diverting and composting organic waste in the South Backa region. For the city of Vrbas, an implementation plan to source segregated organic waste was developed. Link here: <https://www.ccacoalition.org/en/activity/guideline-bio-waste-management-south-east-europe>
- In Penang, Malaysia, CCAC [designed an output-based program](#) to incentivize organic waste diversion and valorization from multi-family dwellings. Link here: <https://www.ccacoalition.org/en/resources/penang-state-municipal-solid-waste-minimization-and-recycling-project-output-based-program>

### Industry 4.0

- UNEP, through the Climate Technology Centre & Network (CTCN)<sup>1</sup> conducted a Technology Needs Assessment in Brazil on the use of Industry 4.0 technologies, particularly on how they can help create a circular economy. Link here: [https://www.ctc-n.org/system/files/dossier/3b/D2.4 Brazil Evaluation Report CE FINAL ENG CTCN.pdf](https://www.ctc-n.org/system/files/dossier/3b/D2.4%20Brazil%20Evaluation%20Report%20CE%20FINAL%20ENG%20CTCN.pdf)

### Process Innovation

- Innovation can be dematerialised, and includes processes including [eco-innovation](#), which is a UNEP methodology where SMEs apply life cycle thinking and business analysis templates to create new sustainable business models and business strategies to improve their performance and competitiveness, alongside value chain collaboration<sup>2</sup>.
- A private sector example of eco-innovation is Rasoda Dairies in Sri Lanka – initially 60% of the raw milk collected was wasted between milking and factory delivery due to improper storage technology and inefficient use of water and energy. Rasoda Dairies worked with farmers on animal welfare practices that can increase milk yield and quality from cows, and invested in resource efficient equipment for both milk storage and processing. As a result, water use has decreased by 50%, average daily milk yields increased from 8 litres per cow to 11 litres, and they have increased profitability from higher quality milk.
- Eco-innovation website: <http://unep.ecoinnovation.org/>, case study link: <http://unep.ecoinnovation.org/production-to-partnership-why-grassroots-success-means-better-business-for-sri-lankan-dairy/>

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<sup>1</sup> CTCN

<sup>2</sup> UNEP Consumption and Production Unit, Resources and Markets Branch, Economy Division

## Digital Sequencing

- Digital Sequence Information (DSI) technology maps the DNA sequences to allow goods to be produced on that mapping, eliminating the need to access biological or genetic materials. A lot of these genetic materials were preserved in the African region but profits from DSI do not flow back to them<sup>3</sup>.
  - South Africa is at the forefront of the ABS (Access and Benefit Sharing of Genetic Resources, from the [Nagoya Protocol on Access and Benefit Sharing of Genetic Resources](#)) work, with an operating national biodiversity economic system and several products already on the global markets, such as rooibos tea<sup>4</sup>.
- 2. What are the national strategies, policies, and laws concerning green technology and innovation for cleaner and more productive and competitive production in your member countries or region?**

### Chile

- The law that established the Extended Producer Responsibility (EPR) has significantly leveraged the implementation of a circular economy, and focuses on reducing waste generation and the valorisation of waste. More information online: <https://learnandconnect.pollutec.com/en/epr-law-new-opportunities-for-the-recycling-sector-in-chile/>
- Other examples are the national policy for the integration of recyclers or the plastics roadmap.
- CORFO's "Transforma" Strategic Programs, such as the Roadmap for the Sustainable Management of Construction and Demolition Waste (RCD), or the Roadmap Circular Economy of Agroindustry, carried out by the Ministry of Agriculture. Link here: <https://www.corfo.cl/sites/cpp/areas-de-trabajo/programas-estrat%C3%A9gicos-integrados>

### Kenya

- [Vision 2030](#) is the Kenyan strategy for green growth to transform Kenya into an industrialised middle income country, including its [Medium Term Plan for 2018-2022](#) which includes establishing national science technology and innovation parks and establishing the Green Technologies and Innovations Programme to promote use of green technologies for water treatment.

### Laos

- UNEP, through the CTCN is providing Technical Assistance to the Laotian Government to create a power to gas-related masterplan on the steps needed to increase use of green gases via commercially available power-to-gas to replace fossil fuels. Technologies on bioenergy, biogas streams, biomass plants, carbon capture utilization and storage technologies, and combination of hydrogen with CO<sub>2</sub> will be assessed for their suitability in this masterplan. Please find more details about the project - [Developing a power to gas masterplan in Lao PDR](#)

### South Africa

- The [Manufacturing Competitiveness Enhancement Programme](#) is a fund for companies to, among other things, invest in green technology that would otherwise not be financed commercially.
- The [Economic Reconstruction and Recovery Plan](#) outlines how the South African government aims to recover post-COVID through green economy interventions, including support for MSMEs to implement green innovation, using retrofitting technologies to improve energy performance, and creating an artificial intelligence institute to focus on advanced manufacturing and new materials.

### The European Union

- The EU [Strategy for Sustainable and Circular Textiles](#) will work to ensure all textiles products placed on the EU market are durable, repairable and recyclable, through a combination of incentives for ecodesign and repair/reuse, restrictions on greenwashing and textile waste, as well as fiscal policies to

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<sup>3</sup> UNEP Regional Office for Africa

<sup>4</sup> UNEP Regional Office for Africa

encourage innovation and responsible consumption. This will include all products requiring Digital Product Passports to track their composition.

#### The Philippines

- The ‘National Strategy to Reduce Short-Lived Climate Pollutants from the Municipal Solid Waste Sector in the Philippines’ contains measures to reduce methane emissions from the waste sector including management of organic waste from food industries, markets, and trading posts through composting and/or anaerobic digestion.
- The Philippine Circular Economy Act of 2020, as part of COVID-19 recovery policy, calls for mainstreaming circular economy and sustainable consumption and production strategies; a just transition to a low emissions and resource efficient circular economy; and a zero-waste circular economy program and scheme. The proposal also calls for a phaseout of single-use plastics and the establishment of an Extended Producer Responsibility scheme; a life-cycle assessment program; a circular public procurement program; integration of permaculture principles and practices in government; and circular economy mainstreaming in the national budget. The proposed measure, filed in September 2020, is currently pending at the Committee level.

#### Tunisia

- As part of its climate strategy, the [Tunisian Solar Plan](#) aims to generate 30% of its energy mix from renewable sources by 2030. The Plan includes provisions for regulations on renewable energy technology trade, manufacturing, training, and use.

#### Uruguay

- The 2019 Action Plan for the Circular Economy, and since 2003, Extended Producer Responsibility is applied to specific products. Other initiatives include the project [Biovalor](#), the [Programme in Circular Opportunities](#).

#### Viet Nam

- Law on Environmental Protection 2020 stipulates that a “circular economy is an economic model which encompasses the design, production, consumption and services activities aimed at reducing raw materials, extending product life, reducing waste generation and minimizing adverse impacts on the environment.”
- The National Socio-Economic Development Strategy for the period 2021–2030, with a vision to 2045 to encourage the development of the circular economy model for integrated use and efficiency of the output of the production process.
- Sectoral strategies also include National strategy on green growth, National strategy on renewable energy, National programs on sustainable production and consumption, Scheme of the environmental industry sector and Scheme of digital economy.

### **3. What are the key industries that are pioneering green innovation in your member countries or region? List the key actors in the national ecosystem of innovation related to green innovation in your member countries or region (firms, universities, financial institutions, regulators)? What are the key networks of the ecosystem in your region (including online networks, innovation hubs, forums, etc.)?**

#### Global

- The textile sector is complex; convoluted regional and global value chains obscure the impacts, characteristics, and origins of a product from the moment raw materials are produced. It is also a sector pioneering key innovations, including using blockchain to help trace products to ensure they are free of hazardous chemicals, and created under socially and environmentally responsible conditions.
- Specifically on blockchain, UNEP, together with the [UNECE](#) are working to pilot blockchains as part of an eco-innovative project to identify and eliminate hazardous chemicals in textiles ([GEF 10523](#)).
- Additionally, technical intermediaries (also known as national cleaner production centres) are tasked with identifying green innovations and helping SMEs to adopt and implement them. They are often part of the [Global Network for Resource Efficient and Cleaner Production \(RECPnet\)](#). Their

engagement in eco-innovation projects has proven an effective means to building country ownership and sustaining results. Past experience shows that these technical intermediaries continue to support businesses in countries to advance over time in the adoption of green technologies and innovation and work closely with national partners, including governments, in the creation of the enabling environment.

## Africa

- South Africa – The Association of Cementitious Material Producers were supported by assessing the technical feasibility, GHG reduction potential and cost efficiency for a hybrid system of waste heat recovery and mineral carbon capture and utilization (MCC&U) at selected plants; and to explore linkages and potential application of mineral carbon capture and utilization technology in other industrial sectors.

Please find more details about the project - [Substantial GHG emissions reduction in the cement industry by using waste heat recovery combined with mineral carbon capture and utilization](#)

## South America

- Uruguay – the government focused on milk and meat, focusing on the beef value chain including the primary, industrial and commercial phases. The importance and potential of these sectors were shown when they were prioritised in the Action Plan for the Circular Economy<sup>5</sup>.
  - Chile –agriculture and food, construction, and transport and logistics are key priority sectors nationally, and mining in Antofagasta, agriculture and food in Valparaíso, Tourism and Manufacturing in Biobío and Aquaculture and Plastics in Los Lagos as regional priorities<sup>6</sup>.
- 4. What are the challenges that governments in your region (or from your member countries) have faced or may face in promoting green technology and innovation in your country to contribute to national development priorities and accelerate the progress towards the SDGs?**

## Financing

- Financing for green SMEs is a significant gap preventing governments from promoting eco-innovation, and better information is needed for policymakers to enact policies to encourage financial institutions to provide financing, particularly for SMEs that make the bulk of national economies, yet still struggle to provide information for financing. Better education and incentives for financing institutions are needed.
- Capital-Intensive: Scaling operations often requires high-end and capital-intensive technologies which are difficult to introduce as they require large capital investment. For example, in the waste sector, companies perform the waste sorting manually as it would require significant capital investment to use machinery and therefore often prevents new entrepreneurs to enter the industry and the prevents existing ones from expanding their business to a larger scale.
- No or Limited Access to Finance: Access to timely, affordable, and adequate financing is always a key barrier in efforts to go green and adopt sustainable practices in the private sector. It is very difficult to arrange a small amount of seed capital to start an enterprise. In particular for waste recycling sector, formal financial institutions are very reluctant to provide financing to recycling industries as they are not treated as mainstream business enterprises. When companies approach banks for initial and operational stage capital financing, banks often deny requests as recycling industries are not part of the approved business categories for lending<sup>7</sup>.

## Digital infrastructure

- COVID-19 showed that SMEs in particular lack access to digital technology, and the gap between SMEs and larger companies increased because of this. Therefore digital infrastructure is needed to allow SMEs to adopt eco-innovation and remain competitive.

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<sup>5</sup> [CTCN](#)

<sup>6</sup> [CTCN](#)

<sup>7</sup> [Asian Development Bank](#) survey

## Policies

- Lack of Government Support Mechanisms- Circularity principles are fairly new and there is insufficient adoption of the application of green technologies to promote cleaner and efficient consumption and production. There are often a lack of enabling environments, such as fiscal support including tax rebates, tax holidays, or subsidies. For example in the waste sector, the lack of fiscal incentives for purchasing recycled materials is a barrier for the creation of a market for recycled outputs for the industrial, manufacturing and service sectors.

## Skilled workforce

- Lack of Education and Awareness- There is a low level of knowledge and awareness of recycling processes in the industrial, manufacturing, and service sectors about waste types and their disposal processes, which makes it difficult for them to source the right wastes they need from the right places in a timely manner. It allows harmful waste to go directly to the environment and cause significant damage. There is also a lack of understanding among firms across all sectors that wastes can be valorised by selling them to the recycling companies.
- Lack of Trained Human Resources- A skilled workforce through appropriate capacity building and training models is needed to support the implementation and operation of green technologies.

## Innovation hubs

- IT innovation hubs could be used for Digital Sequence Information (DSI) technology to share knowledge and build capacity
- Waste management and recycling are the obvious industries that require promotion of green technology, innovation and circularity. As the results of an show, waste recycling challenges are categorized as below:

### 5. **What should governments, the private sector, organized civil society, and other stakeholders do so that developing countries can benefit from these technologies?**

- Create enabling environment through feasibility study, policy and regulations
- Clear directions and roadmaps
- Mass awareness education
- Strengthen the institutional arrangements
- Creating market with business models integrating the approach on circularity and value chain based
- Ensure intra-regional cooperation, for instance on the biodiversity economy to eliminate ‘dumping’ where companies deliberately pick countries with weak regulatory/implementation systems
- Consumer demand is crucial in ensuring sufficient incentives to shift to circular business models, while ensuring a just transition to ensure the needs of developing countries and all population segments are met, with adequate access to necessary resources. Governments can ensure that infrastructure and incentives exist for the consumer demand shift to circularity, the private sector can adopt circular business models, civil society can provide inputs on the impact of any potential tradeoffs from circularity, and universities in particular can contribute research and data towards helping decisionmakers make fully informed decisions.

### 6. **What are some examples of international cooperation mechanisms, projects, programmes or strategies, including triangular and South-South cooperation, in green technology and innovation that your organization contribute or is part of?**

- UNEP’s work on the role of trade and trade policy in shifting the textile value chain towards circularity between Kenya and Thailand has contributed to South-South cooperation and a deeper understanding of the trade policies that can facilitate or hinder eco-innovation in the textiles sector. The study will be published in the coming weeks at: <https://www.unep.org/explore-topics/green-economy/what-we-do/environment-and-trade-hub/textiles>
- UNEP’s InTex project facilitates exchange cooperation between Kenya, South Africa, and Tunisia on green business models for SMEs in the textiles sector. Links have also been made between country partners and textile stakeholders in Bangladesh and Romania. <https://www.unep.org/intex>

- The [Global Network for Resource Efficient and Cleaner Production \(RECPnet\)](#) also facilitates international cooperation (including triangular and South-South) for technical intermediaries known as national cleaner production centres (NCPCs) to share knowledge and good practices on green technology and innovation.
- UNEP, through the CTCN and Japan supported Thailand on a bilateral cooperation basis for the [Benchmarking Energy & GHG Intensity in Thailand's Metal Industry](#). The technical assistance supported on the following:
  - Energy Efficiency Manual: A compendium of energy efficient operational practices and technological upgrades to improve energy efficiency, including EAF/RHF modelling tools, which can be used to .
  - Benchmarking Study: An in-depth study of the energy efficiency of Thai steel plants, focusing on Electric Arc furnace (EAF) and Reheating Furnace for Rolling (RHF).
  - Energy Reporting Guidelines: Procedures and best practices for recording energy consumption and using that information to improve plant performance and energy efficiency, including a detailed proposal of voluntary industry-wide reporting scheme for energy consumption and CO2 emissions.
  - Benchmarking Tool: Excel document for inputting and analysing energy consumption and GHG emissions at the plant and process level. Provides comparison and visual representation to industry averages, provides “Annual Plant Report” as output.
  - Financial Model for Technologies: Excel model that calculates changes in cash flows for steel plants resulting from upgrades. It was necessary to build a financial model with the desired outputs and populate the input cells with data on expected savings from the Energy Efficiency Manual.
  - Financial Options Report: Includes directions for using the financial model and various options for securing financing for energy efficiency upgrades to the Thai steel plants.

**7. What actions can the international community, including the CSTD, take to help developing countries take advantage of green technology and innovation for cleaner and more productive and competitive production?**

- Better mapping of trade flows, for example to understand the journey of a textile product, would help developing countries not only understand where the ‘hotspots’ are of a product, but also work with the private sector to counter these hotspots.
- SME-specific help is needed, as they are often not the focus of policymaking, as shown by the lack of SME focus in green responses to COVID-19.
- Better facilitation of exchange between countries for policymaking can help countries adopt green technology and innovation, due to cohesive policies across different markets. UNEP, through the [Global Alliance on Circular Economy and Resource Efficiency](#) (GACERE) is an example of this.

**8. Could you suggest some contact persons of the nodal agency responsible for projects/policies and international collaboration in this context as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further input or invite some of them as speakers for the CSTD inter-sessional panel and annual session.**

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**9. Do you have any documentation, references, technological assessments, future studies or reports on the priority theme in your country or region?**

Details of the CTCN Technical Assessments can be found here: [Assessment of the current status of the circular economy for developing a roadmap](#)

More information on the Climate and Clean Air Coalition (CCAC) support in key sectors, including agriculture, fossil fuels, waste, cooling, heavy duty vehicles and engines, household energy and bricks, as well as details on national action are available at: <https://www.ccacoalition.org/en/content/annual-report-2020-2021>

“Sustainability and Circularity in the Textile Value Chain: Global Stocktaking” report analysed the environmental and socio-economic hotspots along the entire textile value chain, as well as how different stages in the value chain are dominant in different impacts. Available online at: <https://wedocs.unep.org/handle/20.500.11822/34184>

The ‘Sustainability and circularity in the textile value chain – Recommendations for action and a global roadmap’ will be released in 2022, and will outline the key priorities and actions that each stakeholder can take to transform the complex and global textile value chain towards circularity. Once published, it will be available at: <https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-and-circular-textiles>

Additionally, the “Sustainable and Circular Textile and Apparel Value Chains: The Role of Trade and Trade Policy, Case study” series on Thailand and Kenya are scheduled for release in August 2022, as part of UNEP’s work on South-South Cooperation. Once published, it will be available at: <https://www.unep.org/explore-topics/green-economy/what-we-do/environment-and-trade-hub/textiles>