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LABOR MARKET INTELLIGENCE REPORT

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TESDA
TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY

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TVET for the Circular Economy: PREPARING THE WORKFORCE FOR THE CIRCULARITY OF INDUSTRIES

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I. BACKGROUND

There is a general agreement among global organizations and development agencies that the concept of circular economy (CE) is about implementing a restorative economic system that helps address the problems of climate change, biodiversity loss, and waste. The current ways of production and consumption, by taking materials from the earth, making products out of them, and eventually throwing them away as a waste, is a linear process. The Platform for Accelerating the Circular Economy reports that this is unsustainable, as "nearly half (45%) of greenhouse gas (GHG) emissions come from the way we make and use products and food, and more than 90% of biodiversity loss is due to the extraction and processing of natural resources." In contrast, a circular economy stops waste from being produced.

The CE is based on three principles, driven by design:

1. **Eliminate waste and pollution**

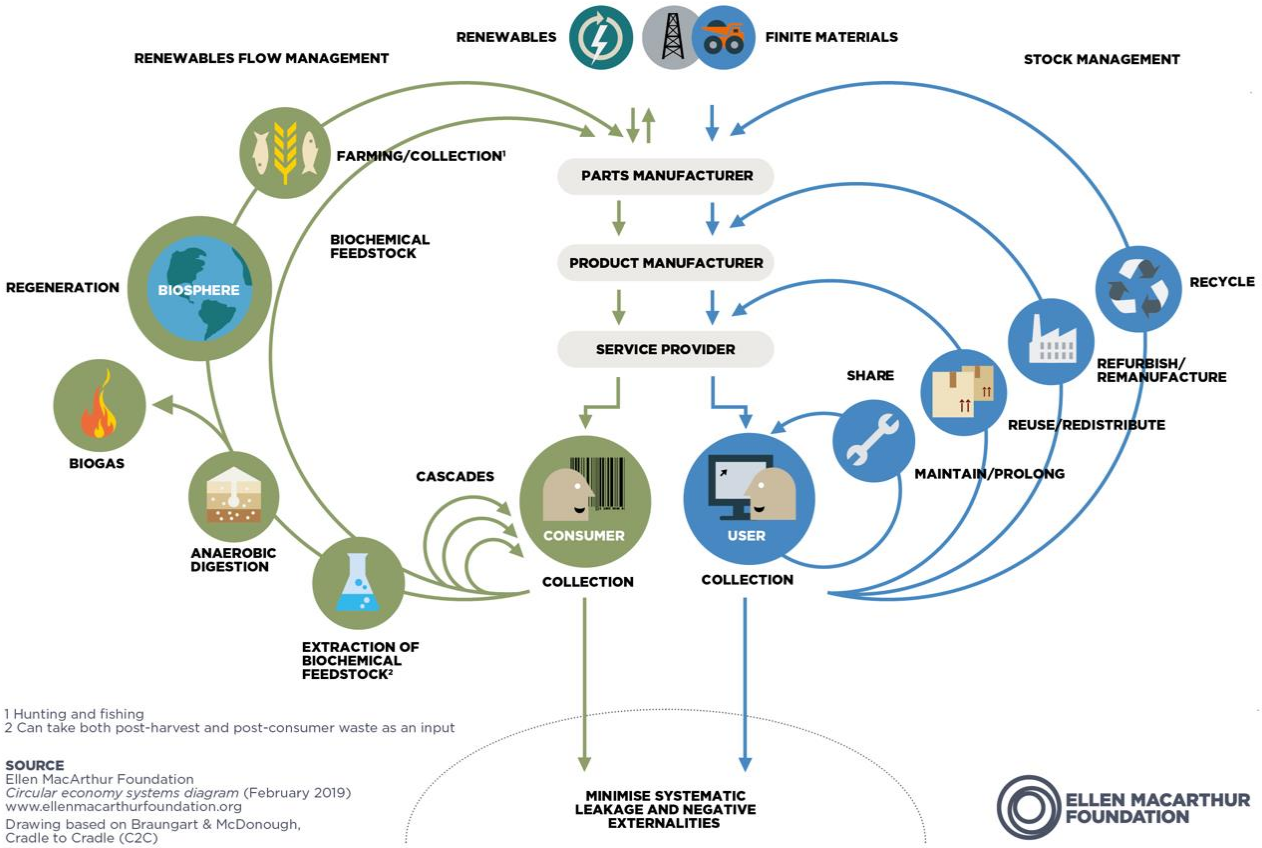
   The first principle of the CE is to eliminate waste and pollution. The current economy works in a take-make-waste system. Raw materials are taken from the Earth to create products which are thrown away as waste. Much of this waste ends up in landfills or incinerators and is lost. This system can not work in the long term because the resources on our planet are finite. Through a shift of mindset, a product can be designed in such a way that the product is "circulated by being maintained, shared, reused, repaired, refurbished, remanufactured, and, as a last resort, recycled. Food and other biological materials that are safe to return to nature can regenerate the land, fuelling the production of new food and materials."

2. **Circulate products and materials (at their highest value)**

   The second principle of the CE is to circulate products and materials at their highest value. This means keeping materials in use, either as a product or, when that can no longer be used, as components or raw materials. This way, nothing becomes waste and the intrinsic value of products and materials are retained.

   There are a number of ways products and materials can be kept in circulation and it is helpful to think about two fundamental cycles – the technical cycle and the biological cycle. In the technical cycle, products are reused, repaired, remanufactured, and recycled. In the biological cycle, biodegradable materials are returned to the earth through processes like composting and anaerobic digestion.

Figure 1
The Circular Economy Model as proposed by the Ellen Macarthur Foundation (2019).



In order for products to successfully be circulated in either the biological or the technical cycle, it is essential they have been designed with their eventual circulation in mind. There are many products in our current economy that cannot be circulated in either cycle and end up as waste. There are products that fuse technical and biological materials in such a way that they can't be separated and circulated, such as textiles that blend natural and plastic fibres.

If designers thought about how their product could fit into the technical or biological cycles after use, that product could be made with that onward path in mind. For example, products destined for technical cycles would benefit from being easy to repair and maintain, easy to take apart, and made of modular components that can be replaced. They could be durable enough to withstand the wear and tear of many users. And they could be made from materials that are easily recycled.

If products like wooden furniture were designed – as well as to be easy to maintain and repair – with the biological cycle in mind, their biodegradable materials (like wood) would be easily separated from their technical materials (like screws) and if glues and paints were used they would be biodegradable. Other products, like takeaway food containers, can be designed to be compostable after one use so that they increase the chances of the food scraps they contain returning to the soil.

3. Regenerate nature

The third principle of the CE is to regenerate nature. By moving from a take-make-waste linear economy to a CE, the natural processes are supported which leaves more room for nature to thrive. By shifting the economy from linear to circular, the focus is shifted from extraction to regeneration. Instead of continuously degrading nature, natural capital is built. The move to a regenerative model is the emulation of natural systems. There is no waste in nature. When a leaf falls from a tree it feeds the forest. For billions of years, natural systems have regenerated themselves. Waste is a human invention.

Her Excellency Stientje van Veldhoven-van der Meer, Minister for the Environment in the Netherlands, the circular transition is necessary in order to meet climate and environmental goals, especially those that were articulated in the Sustainable Development Goals (SDGs):

a. CE has the potential to significantly reduce the emissions of dangerous greenhouse gases related to the extraction, processing and use of materials, which mitigates climate change across the whole value chain (SDG13).

b. CE stimulates economic activity and creates jobs. This links it closely to many of the SDGs, such as reducing poverty (SDG1), enhancing food and water security (SDGs 2 & 6), providing decent work and stimulating economic growth (SDG8), catalyzing innovation (SDG9), moving us towards sustainable communities (SDG11), protecting life below water and life on land (SDG 14 & 15) while being a central tenet of SCP (SDG12) and building partnerships (SDG 17).

Governments, businesses, and societies are facing increasing pressure to transition to net-zero economies. An aggressive and rapid transition would alleviate long-term environmental consequences but could have severe short-term impacts, such as putting millions of carbon-intense industry workers out of jobs or triggering societal and geopolitical tensions. By contrast, a slower but more orderly transition would prolong environmental degradation, structural fragilities and global inequalities. Divergent trajectories across countries and sectors are creating more barriers to collaboration and cooperation in both scenarios.

If the transition is managed well, it can generate multiple benefits for the labour market. The processes that enable the "closing material of cycles and reducing waste includes repair, refurbishment, reverse logistics and advanced resource sorting, call for existing, new, or new combinations of skills to be applied for establishing new social practices. As such, the CE is likely to call for a general upskilling of the workforce in line with wider labour market trends."

II. MAIN DISCUSSION

A. The CE and Industries

1. Tourism

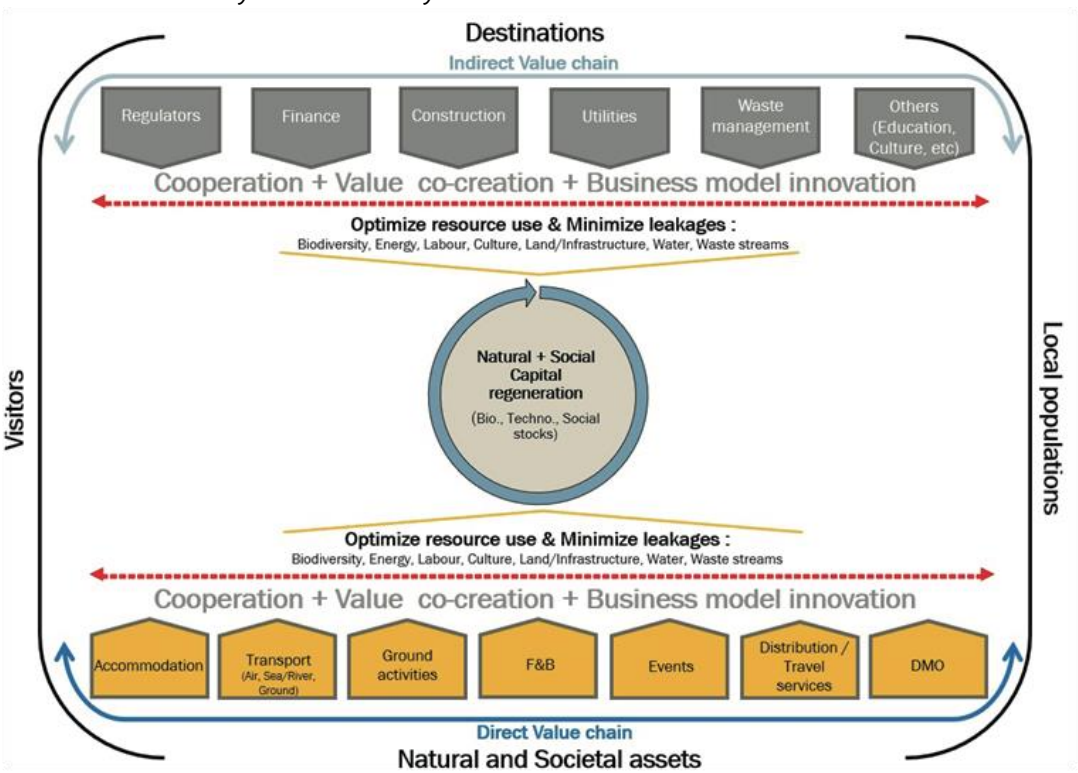
The tourism industry is deeply interlinked with and dependent on multiple value chains in society, such as agriculture, food and transport industries. The tourism industry has been a major economic contributor for countries but at the same time contributory to a lot of environmental and social impacts. "In a post COVID-19 recovery, tourism industry actors will need to address the various environmental impacts associated with their activities and adopt actions that help 'regenerate' rather than 'deplete' natural capital."

The CE360 Alliance reports on the transformation pathways for key tourism industry sectors, distinguishing between 'asset heavy' and 'asset light' industry actors. Asset heavy actors are those who operate physical assets such as accommodation and transport operators. Asset light actors are those who deliver non-tangible services, such as travel agencies and distributors.

- Asset heavy actors can undergo the circular procurement through the sourcing of materials "fit for a circular flow (non-toxic, designed for maintenance, reuse, remanufacturing, recycling) where the use of materials is extended and optimized to avoid wastage. "Asset sharing (within and/or across organisations), sourcing 'products-as-a-service' and innovative mobility-as-a-service (MaaS) platforms" can also be undertaken to "lower lifecycle GHG emissions", and also generate "CAPEX and OPEX savings and/or new revenues."

- Asset light businesses may position strategically as a "purpose, impact driven business with focus on sustainability and circularity". "Pure service operators could benefit from a coherent, clear, transparent, truthful market positioning built around strong sustainability objectives and delivered by the active deployment of the Circular Economy narrative to their operations."

Figure 2
A Circular Economy tourism ecosystem



Source. Sorin, F. and Einarsson, S., 2020

2. Construction

The construction industry has been determined as one of the largest sources of greenhouse gas emissions as generated through the manufacturing and transport of materials, as well as the operation of buildings. It is also a very resource-intensive industry that cannot be sustained indefinitely.

Some examples of the application of CE in the construction industry are as follows:

- New ways of designing buildings by "accommodating changing user needs and changing climate, or creating buildings in a modular way so that they can be taken apart and individual components can be incorporated into other structures."
- In a report by the European Commission, "information and communications technologies (ICT) have great potential to manage a product efficiently through its entire life-cycle in a collaborative and transparent manner based on digitised information, which makes them valuable to construction CE transition." Thus, a "robust information management based on ICT is essential to improve the traceability and accessibility of materials and facilitate the decision-making regarding construction material recovery" (Akanbi, et al., 2020 as cited by Yu, et al., 2022)

3. Transport and Logistics

Transportation is one of the leading sources of greenhouse gas emissions, both on the use and manufacturing of vehicles. Based on the study of the Ellen MacArthur Foundation, the switch to electric vehicles can partly mitigate greenhouse gas emissions in the industry, but can further reduce it through the transition to CE, such as:

- Making electric vehicles lighter and more durable in order that fewer materials will be used and less energy will be needed to power the vehicles.
- Sharing vehicles so that these vehicles are used more and that fewer vehicles are used.
- Designing vehicles for reuse and manufacturing, such as remanufacturing of engines or retreading tires to keep them in use.
- Use non-motorized transport more often

Oksana Seroka-Stolka, et al. (2019) define "green logistics" where supply chain management practices and strategies result to the reduction of "ecological and energy footprints of the distribution of goods." They also mentioned the following environment-friendly activities in order to realize the circular economy concept:

- green packaging
- green transport
- storage
- flow of processing.

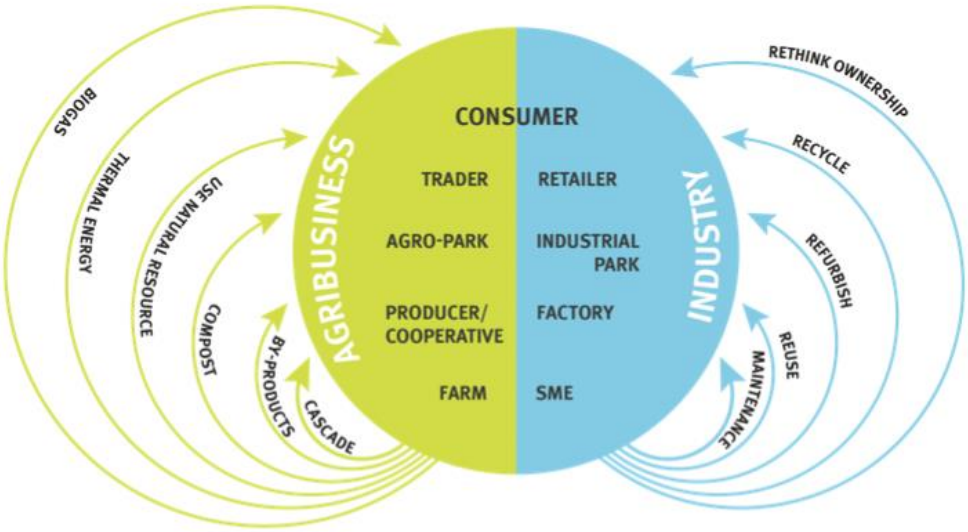
4. Health

In a report of the World Health Organization (WHO) Regional Office in Europe, "the transition to a circular economy can result in potentially significant net health benefits that will contribute to the attainment of the SDGs, particularly SDGs 3, 9, 11 and 12." However, it also notes that discussions on the "positive and negative health considerations must be integrated into circular economy strategies and national, regional and local implementation plans. Examples of negative effects are specifically found in the areas of waste management, diffusion of hazardous chemicals and reuse of waste-water."

5. Agriculture/Agri-business

The United Nations Industrial Development Organization (UNIDO) describes the circular economy in agriculture/agri-business through the interaction of the technical and biological cycles.

Figure 3
Circular Economy in Agriculture/Agri-business



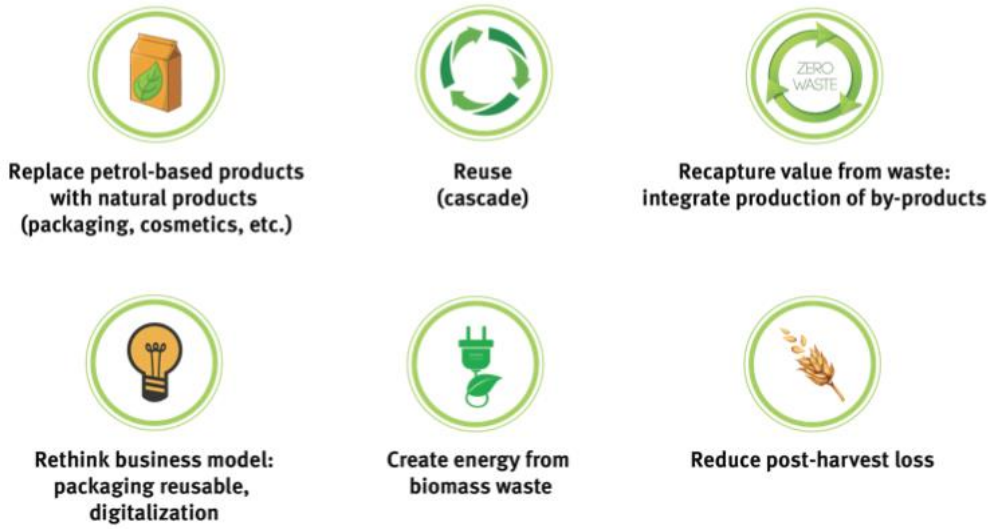
***Source*.** Ellen MacArthur Foundation concept, redesigned by UNIDO

The technical cycle tackles the agro-industrial technologies through the maintenance, return, renewal and reuse of "agri-processing technologies that support agricultural efficiency, and at the same time minimizes waste and provides cost-savings." The biological cycle, on the other hand, "recaptures value from waste in the system through the reuse of food, utilization of by-products and food waste, and nutrient recycling. Waste becomes the input to new products to support crop production, food processing, feed and energy, as well as the cosmetic and pharmaceutical industries. Closing input loops minimize discharges, reduces demand on resources, increases resource efficiency, creating circularity in agribusiness practices."

Technological advancements have allowed the introduction of new and more efficient value-added practices which allows for the "closing of nutrient loops and the reduction of negative discharges to the environment, and provides economies of scale for waste valorization and by-products development."

The UNIDO also recommends the Circular agri-business solutions shown in Figure 4.

Figure 4
Circular agri-business solutions



Source. UNIDO

6. Electronics

According to the Platform for Accelerating the Circular Economy (PACE), the electronics industry is one of the "fastest-growing waste stream, amounting to an estimated 57.4 million tonnes of prematurely discarded products and raw materials valued at nearly $60 billion. Regretably, less than 20% of global e-waste is formally collected and recycled. Those that end up in waste dumps are handled by workers in the informal economy under unsafe working conditions, and without proper equipment or protection, leading to environmental and health hazards for workers.

Figure 5
Circular economy in electronics

Source. PACE

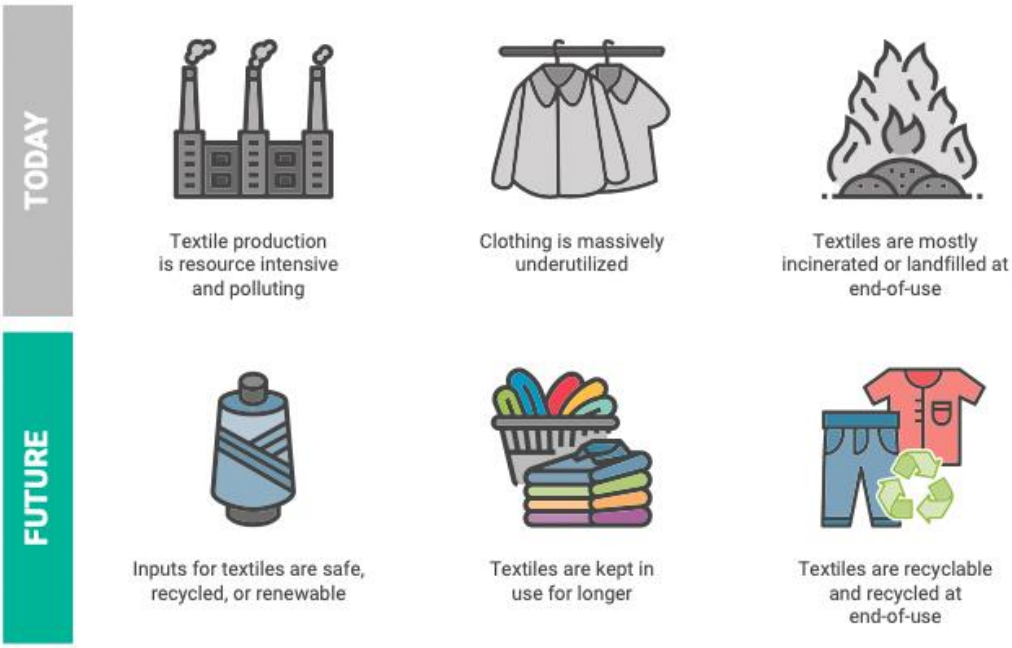
The PACE describes the circular economy for electronics as follows:

- **New products use more recycled and recyclable content** Making electronic products from recycled materials, and ensuring they are designed to be recycled again at the end of their life. Hazardous substances are also phased out.
- **Products and their components are used for longer** Designing electrical products and their components for longevity, coupled with robust options of reuse (including repair, resale, refurbish, and remanufacture), can keep products in use for longer and help delay waste flows.
- **End-of-use products are collected and recycled to a high standard** Products no longer suitable for use or reuse are collected, sorted, and recycled using responsible practices and standards supporting climate action, decent work and a just transition. There are no illegal shipments of e-waste.

7. Garments/Textile

According to PACE, billions of products of this industry go to waste, either as unsold, unused or discarded/thrown away even if they are still in good condition. "Fast fashion produces high volumes of low-quality fashion items that are often used for a short amount of time and are difficult to recycle. The estimated value of discarded apparel amounts to about USD460 billion." Transforming the textile industry into the circular economy "is both urgently necessary and an opportunity-in-waiting in order to deliver environmental, social and economic benefits."

Figure 6
Circular Economy in Garments/Textile



Source. PACE

The PACE describes the circular economy for textiles:

- **Inputs for textiles are safe, recycled, or renewable**

  The textiles industry consumes some 215 trillion liters of water per year, polluting the water system with chemicals, detergents, and microfibers. Using safe, recycled, or renewable materials reduces demand for finite natural resources, decreases greenhouse gas emissions, and removes exposure to toxic substances for workers and communities.

- **Textiles are kept in use for longer**

  Each year people throw away clothes worth an estimated $460 billion that they could continue to wear. Using textiles for longer means fewer new items are needed, reducing use of fossil fuels and chemicals, as well as reducing the pressure on water and land use for cotton farming. Keeping textiles in use for longer benefits both human health and biodiversity.;

- **Textiles are recyclable and recycled at end-of-use**

  When textiles cannot be used or reused any longer, they should be collected and recycled. Recycling textile waste materials is expected to unlock a potential $100 billion value a year, as well as reducing natural resource and chemical use.

8. Plastics

Plastics have become too ubiquitous as it brings convenience for the packaging and also part of actual products. However, plastic waste has been accumulating in our oceans at the rate of 11 million metric tons annually, harming marine life and damaging habitats. Current efforts on tackling plastic pollution, which are focused on improving waste management, coastal cleanups, plastic bans and reduction, have not made a significant impact. Thus, a comprehensive circular economy approach is being proposed, where the following activities will be undertaken:

- "Eliminate the plastics we don't need, which is not just removing straws and carrier bags but delivering actual products to customers with reusable or no packaging.
- We must circulate the packaging we do need. This can be done through the design of plastics to be reusable, recyclable or compostable. However, this would require 1) investment of at least USD 150 billion in collection and reprocessing over the next five years, and 2) establishment of mechanisms that provide stable recurring funding streams with fair industry contributions, such as Extended Producer Responsibility (EPR) or equivalent industry initiatives.
- We must innovate at unprecedented speed and scale towards new business models, product design, materials, technologies and collection systems to accelerate the transition to a circular economy. Research and development investments may amount to USD 100 billion per year."

B. Government policies

1. Philippine Development Plan (PDP) 2017-2022

Among the strategies for the promotion of a clean and healthy environment are the "strengthening compliance with environmental standards and safeguards as well as the development, promotion, and adoption of sustainable consumption and production practices" (NEDA 2017).

Improving the solid waste management, with a target of a national solid waste diversion rate of 80% by 2022, the following strategies are articulated:

a. enforce compliance of LGUs to RA 9003;
b. promote the practice of 3Rs (reduce, reuse, and recycle) and proper waste management;
c. promote strategic clustering of sanitary landfills and SWM technologies to address their large capital requirement, and allow low-income LGUs to pool their resources to finance such facilities; and
d. provide alternative livelihood activities for waste pickers in the remaining dumpsites identified for closure.

To promote sustainable consumption and production, the following activities are articulated:

a. formulate a "polluters pay" policy and implement corresponding measures;
b. establish a sustainable market for recyclables and recycled products;
c. strengthen the certification and establish information systems for green products and services;
d. strengthen the implementation of Philippine Green Jobs Act of 2016 (RA No. 10771);
e. promote green procurement in the public and private sectors; and
f. strengthen the promotion, development, transfer, and adoption of eco-friendly technologies, systems, and practices in the public and private sectors by increasing access to incentives and facilitating ease of doing business and other related transactions, among others" (NEDA 2017).

2. National Plan of Action on Marine Litter (NPOA-ML)

This was undertaken by the Government of the Philippines through the Department of Environment and Natural Resources as a response to growing calls to address the waste leakage into oceans and bodies of water. The NPOA-ML is a "strategic document that will provide overall direction, indicators, and targets to manage and minimize marine debris, including plastics" (WWF 2020). The draft of the NPOA-ML lists the following programmatic cluster of activities (WWF 2020):

a. establish science- and evidence-based baseline information on marine litter;
b. promote circular economy and support sustainable consumption and production (SCP)—which includes extended producer responsibility (EPR);
c. enhance recovery and recycling coverage and markets;
d. prevent leakage from collected or disposed waste;
e. implement a sea-based litter prevention and management program; and
f. institutionalize a management program for litter already existing in the marine/riverine environment.

The plan was officially launched by the DENR last November 2021 and is currently for public dissemination and implementation.

Other policies that are being finalized and for implementation include the Philippine

Action Plan for Sustainable Consumption and Production of the National Economic and Development Authority, and the Sustainable Science and Technology for Solid Waste Management Road Map of the Department of Science and Technology.

3. Proposed bills relevant to the Circular Economy

HB 7609 or Philippine Circular Economy Act of 2020 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 plastic (SUP) and the establishment of an EPR 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 still pending at the Committee level.

There are also several proposed measures calling for the establishment of an EPR scheme in the Philippines. One example is Senate Bill (SB) 2425, or Extended Producers Responsibility Act of 2021, amends sections of RA 9003 to institutionalize EPR in waste management. The proposed measure calls on producers to take responsibility for the recovery, processing, and disposal of their products (including plastic containers or packaging materials) sold to and used by consumers. HB 6279, or An Act Mandating the Creation Of An Extended Producer Responsibility Scheme To Address Leakage Of Plastic Waste Into The Environment, And For Other Purposes, mandates all producers to come up with an annual EPR scheme. This includes identifying minimum collection targets, establishing a producer responsibility organization, and charging EPR fees (WWF 2020). There are bills being consolidated that address the SUP and waste management which also include provisions on EPR.

C. Employment Opportunities

The Organisation for Economic Co-operation and Development (OECD) in 2019 reports that the Circular Economy will have the following drivers that can bring changes in the labor market:

- The use of fewer raw and refined resource inputs and more recycled inputs in production will induce firms to switch to technologies, thereby making adjustments in the labor demand through job creation and/or job destruction.
- Changes in demand patterns can cause either the expansion or contraction of certain economic sectors and industries, thereby leading to employment adjustments.
- Related policies can influence aggregate income and macroeconomic conditions. In the short run, additional fiscal revenues from related policies can be used to stimulate employment or to mitigate direct adverse employment effects of the policies. In the long run, i.e. environmental taxation, can improve environmental quality, while at the same time improve the health and well-being of citizens. It also shifts taxation from socially desired 'goods' (e.g. employment) to environmental 'bads' (e.g. natural resource use and consumption).
- Related policies can also change the production structures and prices, and can cause changes in international trade and competitiveness. The varying policies on circular economy can lead to significant discrepancies between countries.

The changes in the labor market can be grouped into four (4) main categories shown in Table 1.

Table 1
Four Main Categories of Labor Market Changes

Levels	Description
Job Creation	This is expected in 'green' sectors and activities, as well as new business models that are stimulated through the circular economy policies.
Job substitution	This takes place when labor activity is directly replaced by another due to shifts in economic activities from being resource-intensive to becoming more circular.
Job destruction	This takes place when labor activity is lost and is not replaced. This occurs in sectors with large environmental and materials footprints that are discontinued or banned.
Job redefinition	This takes place when existing jobs are transformed towards more resource efficiency and circularity which requires new work methods, profiles and skillsets.

Based on the review of modeling studies by the OECD, most of them "indicate that it is possible to obtain positive outcomes for resource efficiency and employment at the same time in the long run", and that most studies predict a positive effect on employment ranging from 0-2%. In addition, the average employment effect of environmental tax reform (ETR) is at 2.3%, while the average employment effect of non-ETR scenario is at -0.07%. The OECD report also shows that ETR also has an average positive effect on gross domestic product at 2.7%, while the non-ETR effect is at -1.5%.

The World employment and social outlook 2018 of the International Labour Organisation (ILO) provides data on the sectors that will gain or lose jobs in a circular economy scenario by 2030 (Table 2).

Table 2
Industries that are set to experience the highest job demand growth and decline.

Industries set to experience the highest job demand growth		Industries set to experience the strongest job demand decline	
Sector	**Jobs (%)**	**Sector**	**Jobs (%)**
Reprocessing of secondary lead into new lead, zinc and tin	15	Production of electricity by coal	-0.9
Reprocessing of secondary precious metals into new precious metals	11.2	Extraction of crude petroleum and services related to crude oil extraction, excluding surveying	-0.9
Production of electricity by solar photovoltaics	4.9	Extraction, liquefaction, and regasification of other petroleum and gaseous materials	-0.9

Industries set to experience the highest job demand growth		Industries set to experience the strongest job demand decline	
Reprocessing of secondary copper into new copper	4.3	Petroleum refinery	-0.8
Reprocessing of secondary wood material into new wood material	4.2	Manufacture of gas; distribution of gaseous fuels through mains	-0.8
Reprocessing of secondary steel into new steel	3.1	Mining of coal and lignite; peat extraction	-0.8
Reprocessing of secondary aluminium into new aluminium	2.7	Extraction of natural gas and services related to natural gas extraction, excluding surveying	-0.8

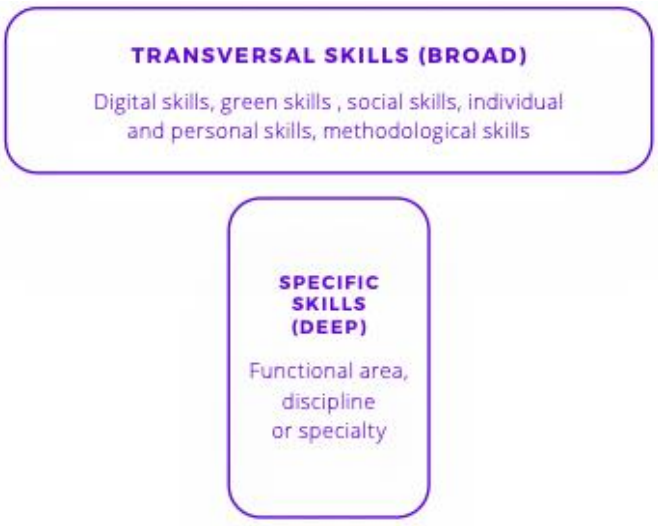
Source. ILO

In the Philippines, the National Climate Change Action Plan identifies the following priority sectors: Agriculture, Waste, Industry, Transport, Forestry and Energy (AWIT-FE). The Green Jobs Human Resource Development (HRD) Plan, which is part of the actions for the implementation of the Philippine Green Jobs Act, includes the creation and identification of green jobs in these priority sectors, as well as in emerging green sectors. The development of statistical system for green jobs, as well as the national registry of green jobs in the country are also being pushed in the plan.

III. SKILLS NEEDS

The Circular Jobs Initiative (CJI) reports that adopting circular strategies requires skills that can be applied to processes or business models that are involved in closing material cycles. Circular strategies also call for increasing need for workers to be multi-skilled. Workers need to develop their transversal skills apart from specific skills. The CJI recommends this T-shaped skills approach (Figure 7).

Figure 7
T-shape skills approach.



Source. CJI

Transversal skills are made up of core and foundational skills, as well as soft skills and digital skills. These skills can be applied to many different jobs, occupations and industries. The circular economy will require both transversal, as well as specific new (professional or technical) skills.

The CJI reports that TVET can help close the skills gaps by integrating skills at these three (3) main levels as shown in Table 3.

Table 3
Three main levels where skills may be integrated.

Levels	Integration
Systemic level	Skills are introduced into transparent institutional frameworks, specialised occupations, advanced qualifications and economic, social and environmental drivers.
Institutional level	Skills are developed through coordination between industry and VET providers and schools, in response to industry demands. Here sustainable practices, such as using refurbished equipment for teaching, can help to encourage acceptance and mindsets that value reuse
Programme level	New skills requirements are translated into teaching and learning materials, training for teachers and foundational—including transferable and digital skills—for learners.

Source: CJI

The circular economy will also require TVET systems to be able to meet the needs of current and future labor markets. Thus, the CJI recommends the following steps to be undertaken:

1. **Mapping skills and skills needs**

   Mapping skills needs across entire value chains can make better use of human capital and increase the competitiveness of industries. For example, strengthening skills and TVET provision in downstream services like logistics will boost the competitiveness of high-value activities in industries like remanufacturing.

2. **Championing Industry 5.0**

   Employers are well placed to judge the relevance of training and curricula. The human-centred and sustainable Industry 5.0 can act as a solution-driver—better matching skill sets to industry requirements. This could include facilitating the development of training on a specific technology in parallel to the development of the new technology within industry.

3. **Empowering labour unions to develop curricula for relevant skills**

   Labour unions can help ensure investments in training are reflected in better quality jobs and higher salaries for workers. Together with employers, unions can also help develop curricula that include a broader range of transferable skills and identify skills

that are applicable across different sectors and occupations to support occupational labour mobility.

4. **Improving the collection and use of skills data**

   Strengthening labour market information systems will facilitate skills forecasting, and with this support the increasing adoption of circular strategies within industries. Improvement in the collection and use of skills data on both local and global levels will support more efficient matching and a clearer understanding of where skills gaps exist and need to be closed.

5. **Working with stakeholders to match workers with circular opportunities**

   Skills requirements need to be translated into high-quality career guidance, utilising data on current labour market prospects. Local public employment services can work on a continuous basis with local employers, education and training providers to ensure careers guidance can match job seekers to suitable occupations that contribute to a circular economy.

The collaboration with industries, companies, sectors and the various stakeholders along value chains can be done through the following:

1. **Uptake of the knowledge triangle.**

   TVET systems need to "adopt new mindsets, strategies, technologies and pedagogies" in order to maximize labour market potentials. Cutting-edge circular economy knowledge need to be translated into training programs that are aligned to current, emerging and forecasted skills needs, including innovative forms of learning."

2. **Development of trainers, teachers and administrators.**

   These personnel need to be upskilled so that they can adequately support learners' development. They need to learn about the new skills using the new technologies along with the application of general and technical skills towards circular economy strategies.

3. **Mechanisms to support SMEs and informal sectors.**

   SMEs create between 70 and 80% of jobs worldwide and face the largest gaps in financing the transition towards the green economy. Investment in skills development for SMEs and informal sectors is crucial for the achievement of the circular economy, given the prevalence of micro enterprises and informal workers in circular value chains.

4. **Targeted training programs**

   Targeted training programs are needed to ensure the right training is available for new occupations that come with circular economy business models. It is also necessary to provide the right training in rural areas in order to attract and retain highly skilled workers.

IV. TESDA INITIATIVES

1. Green Jobs HRD Plan

TESDA is the lead agency for 4 out of the 5 strategic action points for the objective to ensure that the education and skills development system of the country is able to develop and inculcate the skills and mindset needed for environmentally sustainable and climate-resilient society in the Green Jobs HRD Plan. TESDA is one of the co-lead agencies in 1 out of the 5 strategic action points.

TESDA is one of the co-lead agencies for the objective to improve labor market information system necessary for creating and sustaining green jobs.

Table 4 below shows the strategic action plans to promote green jobs.

Table 4
Strategic Action Plan to Promote Green Jobs

Objective	Strategic Action Points	Lead Government Agency	Co-lead Government Agency
Ensure that the education and skills development system of the country is able to develop and inculcate the skills and mindset needed for environmentally sustainable and climate-resilient society	Extend scholarships or educational support necessary for the creation and sustaining of green jobs in priority sectors identified in the National Climate Change Action Plan such as Agriculture, Waste, Industry, Transport, Forestry and Energy (AWIT-FE)	TESDA (with CHEd)	DOST
	Continually update all training regulations to reinforce environmental awareness, sustainable development, and decent work in technical and vocational education system	TESDA	CCC, DOLE, DENR, DOST
	Foster and expand enterprise-based trainings, apprenticeships, and community-based trainings for priority sectors identified in the National Climate Change Action Plan such as Agriculture, Waste, Industry, Transport, Forestry and Energy (AWIT-FE), as well as emerging green sectors to promote sustainable practices and use of green technologies and skills development strategies	TESDA	DOLE, DTI, DA-BAFS, DOST

Objective	Strategic Action Points	Lead Government Agency	Co-lead Government Agency
	Develop and support, through public and private employment service providers, tailor-made courses, training, and learning systems for those who are at risk of job displacement as a result of greening, including youth, women and migrant workers, workers in the informal sector, indigenous peoples, older persons, persons with disability, and learners in difficult circumstances (displaced, in conflict areas, etc.)	DepEd (for alternative learning systems), CHED (tertiary education), TESDA (technical and vocational education) PRC (professional regulations)	DOLE-BLE, DOLE-BWSC, DTI, DOST
	Mobilize public and private funding for greening the education and skills development system by ensuring timely, innovative, and accessible financing for faculty development, scholarship for students, special training packages, development of Centers of Excellence and Specialized Training Centers, upgrading of facilities and equipment, among others.	DOF, BSP, GFIs, DBM, SEC, Insurance Commission	DepEd (for alternative learning systems), CHED (tertiary education), TESDA (technical and vocational education) PRC (professional regulations)
Improve labor market information system necessary for creating and sustaining green jobs	Strengthen national capacities for identifying and anticipating skills needs by establishing a statistical system for green jobs	PSA	DOLE-BLE, TESDA, PRC, DENR, DTI
	Develop a national registry of all green jobs in the country by launching the Career Information System (CIS) where information on green careers are integrated	DOLE-BLE	TESDA, PRC, DENR, DTI

Source: Green Jobs HRD Plan

2. Framework for Greening the Philippine TVET System

The Framework for the greening of the Philippine TVET System encompasses the green community, green jobs/skills, green policies, green culture, and the green competency standards/ green training regulations (Figure 8).

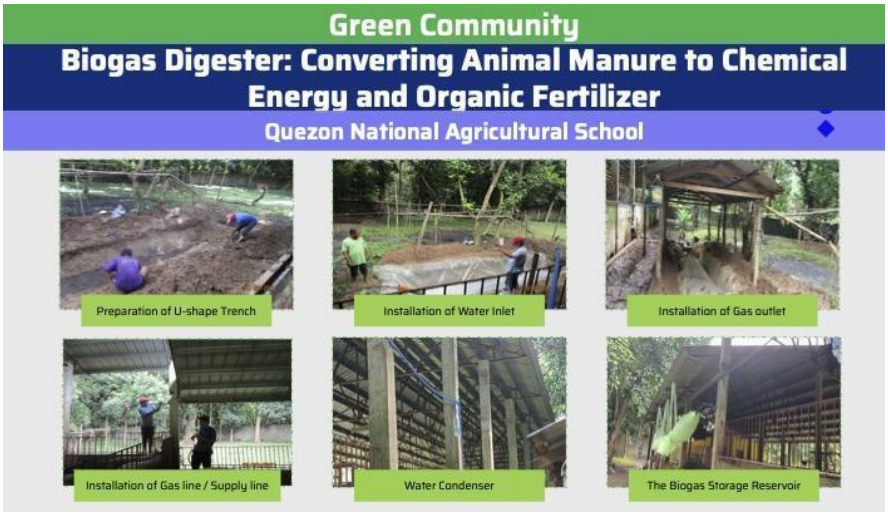
Figure 8
Framework for Greening the Philippine TVET System.

Source. TESDA NITESD

The circular economy is being practiced in the Greening TVET System through the following practices shown in Table 5.

Table 5
Green Practices in the Greening TVET System

Green Practices	
3Rs Initiative (Reduce, Reuse and Recycle) by the San Francisco Institute of Science and Technology	

Preset Watering System for Sustainable Mini-Organic Vegetable Garden by the TESDA – Camarines Sur Provincial Training Center	
Biogas Digester: Converting Animal Manure to Chemical Energy and Organic Fertilizer by the Quezon National Agricultural School	

Source. TESDA NITESD

3. Green Skills in TESDA Training Regulations (TRs)

One of the units of competency in the basic competencies of existing TRs is on the Exercise efficient and effective sustainable practices in the workplace. This competency tackles the knowledge, skills and attitude on the identification of efficient and effective resource utilization, the determination of causes of inefficiency and/or ineffectiveness of resource utilization, and how to convey inefficient and ineffective environmental practices.

4. TESDA-Green Technology Center Programs

Program	Year	Description
Global Partnership for improving the Food Cold Chain in the Philippines	2021 (ongoing)	UNIDO, in cooperation with DENR, initiated a project called "Cold Chain Innovation Hub, a Global Partnership for Improving the Food Cold Chain in the Philippines," funded under the Global Environment Facility (GEF) Trust Fund. This project aims to identify, develop and stimulate the application of low-carbon, energy efficient refrigeration innovation technologies and business practices for use throughout the food cold chain (CC) while increasing food safety and security.

		The project has three components: (i) policy and regulatory assessment on the use of low carbon and energy efficient technology within the food CC, (ii) awareness and capacity building on the use of energy efficient, climate friendly and safe alternatives in the food CC, and (iii) technology transfer and establish partnerships among key stakeholders. Through this project a Cold Chain Innovation Hub has been established at the former engine building of RTC -NCR.
Solid Waste Management Training Program for a World Without Waste (SWMTP-WWW)	2021 (ongoing)	The SWMTP-WWW is a training program intended to build competencies and enable capacities for individuals to earn a living out of participating in various stages of effective solid waste management, i.e., waste collection and assessment, program/project planning, program implementation, and monitoring and evaluation and creating awareness. The program is envisioned to enable graduates to work for solid waste management value chains such as LGUs, public and private institutions, and non-government organizations. The Training Program aims to achieve two major objectives: 1. Develop competencies of and improve existing knowledge and practices on solid waste management workers at the local level to comply with the requirements of RA 9003, and 2. Enable the implementation of good solid waste management projects and practice to contribute to appropriate segregation, collection, and recycling of solid waste materials. 3. capacitate individuals in identifying and establishing livelihood opportunities in the SWM.
Establishment of Aquaponics Demo Facility (Small scale & Medium scale)	2020 (ongoing)	Undertaken by the TESDA GTC in partnership with the Bureau of Fisheries and Aquatic Resources (BFAR), Department of Agriculture
Piloting the implementation of the ILO Greening TVET Toolkit ver 2022	2022 (completed)	Greening TVET Workshop in partnership with the ILO Country Office for the Philippines was conducted last June 22-24, 2022 to develop Green Competency Standards, Green Curriculum and Greening the Professional Development of GTVET Teachers & Trainers (Hybrid / Blended Workshop Series)
Green TVET e-Forum with the theme: "Integrating Green Practices in TVET for Sustainable Development"	2022 (completed)	The e-forum was organized in partnership with the ILO Country Office for the Philippines
UNESCO UNEVOC Coaction Initiative	2022 (completed)	Conduct of the UNESCO-UNEVOC Workshop on the Project titled, "Capacity Building for Addressing SDGs through Curriculum and Pedagogy Innovation in TVET" participated by selected trainers

Cool Contributions fighting Climate Change (C4) Project	2018 (completed)	In partnership with the Deutsche Gesellschaft für International Zusammenarbeit (GIZ), the following activities were undertaken: * Demonstration-Workshop Session; * 5-Day Training of Trainers (TOT) for the Safe Installation, Service, and Repair of Split-Type Air-conditioning Systems using R290 Hydrocarbon as Refrigerant *Donation of R290 Split-type AC Units and Tools
Conduct of the Green TVET Forum and Strategic Planning on Greening the TVET System	2018 (completed)	In partnership with the ILO Country Office for the Philippines, TESDA was able to formulate its Green TVET Framework which now serves as TESDA's basis for all greening programs and initiatives.
Exhibits and technical Learning Sessions on Electric Vehicles and e-mobility	2016 (completed)	These were undertaken in partnership with the Electric Vehicles Association of the Philippines (EVAP) where support was provided for the conduct of Exhibits and Technical Learning Sessions on Electric Vehicles.

5. **Integrated Organic Farming System Program (IOFSP)**

   The IOFSP has been adopted by TESDA in line with the national government priority to ensure food security, availability and affordability during the COVID-19 pandemic. In the TESDA Circular No. 057 series of 2020, integrated organic farming system is defined as "a whole farm management system which aims to deliver more sustainable agriculture where 'there is no waste'. The circular further discussed that "wastes or by-products are used as inputs to improve the productivity and lower the cost of production of the outputs. The system allows for the increase in farm resources-use efficiency, as well as the maintenance of environmental quality and ecological stability through the reduced use of chemical-free fertilizers and pesticides, and the rejuvenation of the system's productivity and achieve agro-ecological equilibrium. The IOFSP is being implemented in the TESDA Technology Institutions, Integrated Organic Family/Community Farms, and Farm schools with TESDA registered agriculture programs.

6. **Electric Vehicle/Low Carbon Transport Initiatives**

   TESDA is involved in the human resource development and education and training components of the various initiatives for the electric vehicle and low carbon transport industries. TESDA participated in the Visioning and Strategic Planning for the formulation of the Comprehensive Roadmap for the Electric Vehicle Industry (CREVI), in line with the implementation of the Republic Act (R.A.) No. 11697 or the Electric Vehicle Industry Development Act (EVIDA). TESDA, together with the EVAP and the United Nations Development Program will be conducting the skills mapping for the EV industry.

7. **Consultation on Renewable Energy Initiatives**

   TESDA and the Department of Energy conducted a skills mapping and consultation last March 2021 with the Wind Turbine operators as part of TESDA's mandate to identify the skills requirements that are relevant to the wind turbine operation and the renewable energy (RE) sector. The shift to RE is a more sustainable way of utilizing energy resources since this is towards a cleaner and greener energy generation and consumption.

8. **Skills Needs Anticipation: Workplace Skills and Satisfaction Survey**

   TESDA's Skills Needs Anticipation: Workplace Skills and Satisfaction Survey includes questions relative to green jobs and green skills. The survey includes questions on how enterprises are implementing various aspects of green jobs and their various initiatives relative to the Republic Act No. 10771 or the Philippine Green Jobs Act of 2016. Unfortunately, many companies lack awareness on the green jobs and and the Philippine Green Jobs Act.

V. WAY FORWARD

As the circular economy finds increasing importance due to its global impact, the TVET system is being looked into in driving skills development, especially in response to the labor market changes. TESDA has made initiatives, foremost of which is the Framework for Greening the Philippine TVET System, which explains how TESDA addresses the greening of skills, including the skills requirements for the circular economy. Also included are the green culture and green community, which shows how TESDA as an institution shows its commitment to green and circular practices.

Here are some recommendations as to how TESDA can help develop the Philippine TVET system in response to the circular economy:

1. Continue coordinating with government agencies to ensure all roadmaps and policies in the pursuit of environmental goals are aligned with skills and wider economic development policy, i.e. Green Jobs Act, EVIDA and PDP.

2. Make use of labor market information relative to the circular economy to facilitate skills forecasting to ensure that appropriate education and training is being delivered to support the increasing adoption of circular strategies within industries.

3. Continue engaging with industry/employers, labor unions and other relevant sector stakeholders on the labor market and skills requirements (including transversal and specific skills) for the jobs that will be created, substituted or redefined through the implementation of circular economy strategies, as well as in the designing and validation of competency standards, assessment standards, curriculum, and trainers' development. The skills requirements shall be integrated at the systemic, institutional, and programme levels. Area-based requirements shall also be determined in order to deliver targeted programs for the circular economy in the area. Engagement with the industry and sector stakeholders is also necessary for the advocacy and promotion of green jobs and circular economy.

4. Explore partnerships that will support or stimulate TVET programs in response to the circular economy, including encouraging private investment. Current partnerships of the TESDA's GTC is limited to the HVAC-R, Cold, Chain, Agriculture, Solid Waste Management and Transport sectors. TESDA needs to pursue partnerships with other sectors that are engaged in green and circular economy practices. In addition, TESDA needs to strategize how it can encourage employers who are into greening and circular practices to implement TVET programs, i.e. enterprise-based training.

5. Facilitate access to circular economy training and upskilling for workers, including targeted support for SMEs, informal workers and other groups that are underserved in terms of training provision.

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Office of the Deputy Director General for Policies and Planning
Planning Office - Labor Market Information Division
Planning Office - Policy Research and Evaluation Division

TESDA Complex, East Service Road, South Superhighway, Taguig City, 1630
www.tesda.gov.ph | (02) 8817-2675

Labor Market Information Division and Policy Research and Evaluation Division
Planning Office
Office of the Deputy Director General for Policies and Planning
Technical Education and Skills Development Authority
TESDA Complex, East Service Road, South Luzon Expressway (SLEX)
Fort Bonifacio, Taguig City 1630, Metro Manila