PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

Circular Economy in the Food and Beverage Industry for a Green Recovery – PAGE Indonesia

In-Depth Assessment of Green Jobs and Skill Needs

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FOREWORD

The circular economy refers to the idea of economic activity performed by reducing material use and resource intensity while recapturing waste as a production input thus reducing pollution and contributing to regenerate natural systems. It is meant to contribute to a more sustainable and resilient future, where human activities limit their impact on the environment.

The ILO is committed to supporting the transition to a circular economy as part of its mandate to promote social justice and decent work for all and consistently with the objective to warrant a just transition towards environmentally sustainable economies and societies.

As part of our support for the Partnership for Action on Green Economy (PAGE) Indonesia, the ILO has produced the present report introducing an in-depth assessment of green jobs and skill needs for circular economy in the palm cooking oil industry. Its relevance is high as circular economy has been established as one of the priorities in Indonesia's green economy strategy, itself instrumental to attain Indonesia Vision 2045. Furthermore, the palm oil industry is a strategic and pivotal sector for the country, contributing significantly to the national output and to job creation, but also experiencing significant environmental and social challenges.

The study, in addition to assessing green jobs potential and skills needs, informs the public about the context and economic potential of circular economy principles when applied to the industry and provides policy recommendations for amplifying green job opportunities and managing the Just Transition. Moreover, it also presents suggestions on research needed to support further uptake of circular economy principles.

The preparation of this report has been an exciting and insightful journey combining a comprehensive literature review, data analysis, stakeholder consultations and case studies. Social partners were an integral part of the research undertaking.

Thanks goes to the colleagues directly involved in the development of the report. Special thanks and appreciation go to the Directorate of Environment Affairs of BAPPENAS, which guided the study, and to our colleagues from the UNDP, as the PAGE Indonesia coordinating agency, We also express our appreciation to the ministries and other stakeholders who have supported the process of developing this document.

Diego Rei

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ILO Country Office for Indonesia and Timor-Leste

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ABBREVIATIONS AND ACRONYMS

BAPPENAS	Ministry of National Development Planning (Badan Perencanaan Pembangunan Nasional)
BPDPKS	Oil Palm Plantation Fund Management Agency (Badan Pengelola Dana Perkebunan Kelapa Sawit)
BPJS Kesehatan	National Social Security Agency for Health (Badan Penyelenggara Jaminan Sosial Kesehatan)
BPJS-TK	National Social Security Agency for Employment (Badan Penyelenggara Jaminan Sosial Ketenagakerjaan)
BUMDES	village-owned enterprises (Badan Usaha Milik Desa)
CPO	crude palm oil
CSR	corporate social responsibility
DOBE	de-oiled bleaching earth
EFB	empty fruit bunch
ESG	environmental, social and governance
FFB	fresh fruit bunches
ISPO	Indonesia Sustainable Palm Oil
JAPBUSI	Palm Oil Trade Union Network Indonesia
LCDI	Low Carbon Development Initiative
NAP	National Action Plan
NAP SPO	National Action Plan on Sustainable Palm Oil
NGO	non-governmental organization
OSH	occupational safety and health
POME	palm oil mill effluent
R&D	research and development
RPJMN	Middle-Term National Development Plan
RSPO	Roundtable on Sustainable Palm Oil
SBE	spent bleached earth
SMEs	small- and medium-sized enterprises
SPKS	Independent Palm Smallholders Association (Serikat Petani Kelapa Sawit)
SPOT	steamless palm oil technology
UCO	used cooking oil
WCR-LCA	Waste and CO2 Reduction Life Cycle Analysis
ZDC	zero-deforestation commodity supply chain pledge

EXECUTIVE SUMMARY

The circular economy is an alternative to a linear take-make-waste economy system. It is designed using three principles, namely: (i) to eliminate waste and pollution; (ii) to circulate products and materials at their highest value; and (iii) to regenerate nature. Within Indonesia's development policy, circular economy is set out as one of the priorities for green transformation aimed at accelerating growth in achieving Indonesia's 2045 Vision national development plan in the aftermath of the COVID-19 pandemic.

As part of the Partnership for Action on Green Economy (PAGE)'s support for green recovery programme,[1] the ILO together with other PAGE agencies are conducting a series of policy analyses to support Indonesia's plan on implementing circular economy. The ILO's work for PAGE is focused on green jobs and ensuring a Just Transition that manages workplace changes aimed at mitigating the impacts of climate change. Following up the results of a United Nations Development Programme rapid assessment that identified palm cooking oil as a potential circular economy sector, this study aims at identifying the green jobs potential from circularity within the palm cooking oil value chain along with the skills needed to undertake a circular transition.

Circularity trends in the palm cooking oil value chain

The palm oil industry is a strategic sector that significantly contributes to economic development and job creation, particularly in rural areas. The value chain for palm cooking oil exhibits distinct industry characteristics. The upstream (plantations and milling) and post-consumption (waste and recycling) elements of the palm oil value chain involve a wide range of actors with different organizational forms and high levels of competition, while downstream (refineries, packaging and distribution) the industry demonstrates an oligopolistic pattern. These differences impact employment characteristics and working conditions, with the upstream and post-consumption components of the value chain having a higher number of jobs, but with more varied contractual forms and greater vulnerability and informality. By contrast, downstream activities involve mechanized manufacturing work and offer stable employment.

These industry characteristics also influence the industry's capacity to transition to circular economy and choose circular strategies. The downstream industry tends to have higher capacity for innovation and focuses on core technology; while there is greater variation upstream in the value chain. The study confirms that circular economy adoption is not new in the palm cooking oil value chain, but circular strategies are typically motivated by broader strategies aimed at increasing productivity and sustainability. This trend makes circular economy adoption a gradual process, transforming business processes incrementally and to varying degrees across entities based on their priorities and capabilities.

The introduction of circular economy into the palm cooking oil industry creates opportunities for green jobs creation by greening existing jobs and creating new jobs to support the industry's sustainable production goals. However, the gradual introduction of circular economy also determines its impact on the labour market. From an enterprise perspective, it is challenging to separate circular work from regular business operations, resulting in a common pattern of job transformation within existing enterprises. That is, job creation or substitution occurs when a new business model is implemented or when the scale of circular economy is significant enough to require the establishment of new positions. In general, the study identifies the following trends in circularity and their labour impacts:

[1] PAGE is an alliance of five United Nations agencies, funding partners and 22 partner countries that work together to transform economies into drivers of sustainability by supporting nations and regions in reframing economic policies and practices around sustainability.

Component of palm oil value chain	Circular trend
Plantations and mills	• The most common circular strategy practiced in this part of the value chain is through waste management by processing waste and utilizing by-products produced from cultivation and milling in the production process. Some big palm estates with integrated farm-to-mill operations have reached full circularity for their biowaste. However, implementation by smallholders is suboptimal due to their limited access to technology, skills and capital. • Most of the initiatives are self-reliant and motivated by cost optimization or sustainability targets. They involve gradual and basic innovations in core technology that change the business process. The innovation usually comes from big companies and is replicated by others, but there are also grassroots innovations that can scale up with support from big companies or government. • The job impact mostly involves job transformation, while job creation only occurs when the scale of change is large or the business model is new.
Refinery and packaging	• The identified circular strategies mainly involve changing the technique or mechanism of processing crude palm oil (CPO) into palm cooking oil by innovating the core technology. The focus is on improving productivity and efficiency and on supporting sustainability programmes. • Companies invest in continuous research and development (R&D) programmes that enable them to continuously innovate and to adopt circularity. • The job impact mostly involves job transformation, and job creation only occurs when the initiative involves investment in new facilities or a new business model.
Post-consumption	• The circularity initiatives mostly revolve around enterprises engaged in the recycling of cooking oil packaging and used cooking oil. Various actors with different business models are involved in these processes, with digital technologies or socio-institutional innovations facilitating the transitions in some cases. • The emerging business model not only creates employment, but also induces the establishment of industrial symbiosis. • The job impact includes job transformation in existing enterprises, job creation from emerging business entities, and job substitutions where workers shift from conventional processes to the emerging circular economy.

Mapping green jobs potential from circularity in the industry

The introduction of circular strategies in the palm cooking oil industry has brought changes in how work is organized within related business process. These range from transformation of current functions to the establishment of new functions, depending on the innovations that were introduced. The changes resulting from increased circular practices can take place within current estates/actors in the value chain or be found in newly established actors, depending on the business model. A circular job is a green job if it meets the criteria of decent work standards. Using the "10R approach" of circularity to measure the environmental impact of the strategy and the likely work decency level, the study identified the green jobs potential from the introduction of identified circular strategies along the palm cooking oil supply chain. This green jobs potential is illustrated in the table below, which applies the "shades of green" approach to offer a visualization of green jobs potential by categorizing jobs into a green colour spectrum based on work decency and environmental friendliness. The darker the shade of green, the higher the degree of work decency and circularity. For a full explanation of the shades of green visualization approach, see Annex I of this report.

Mapping green jobs opportunities from circularity in the palm oil supply chain

Circular economy strategy	Circular economy initiatives	Work decency likelihood*	Job impact type	Shade of green
Plantations and mills (upstream)				
Recovery (R9)	Incineration of by-products for energy (briquetting solid waste for co-firing)	Above minimum national standard	Job transformation or creation	Medium
Repurpose (R7)	Methane capture from POME for biogas	Above minimum national standard	Job creation or substitution	Medium
Repurpose (R7)	Utilize by-products for other products (helmets from fibres, furniture from trunks)	Above minimum national standard	Job transformation	Medium
Reuse (R3)	Utilize by-products for biofertilizer (EFB, shells, fibre, POME)	Meeting minimum national standard	Job transformation	Medium
Reduce (R2)	Advancing cultivation technique • Optimizing legumes • Precision fertilizers • Water and pest management	Meeting minimum national standard*	Job transformation	Medium
Reduce (R2)	Development of small-scale SPOT milling facilities	Meeting minimum national standard	Job creation or substitution	Medium
Rethink (R1)	Share economy in the plantation: • Intercropping • Cattle–palm farming	Meeting minimum national standard*	Job creation or substitution	Medium
Refineries and packaging (downstream)				
Reduce (R2)	Optimizing refinery process • Improve chemical usage efficiency • Optimized bleaching process • Dry fractionation	Above minimum national standard	Job transformation	Dark
Reduce (R2)	Development of small-scale SPOT refineries	Meeting minimum national standard	Job creation or substitution	Medium
Reduce (R2)	Innovative packaging • Packaging redesign (to improve efficiency and reduce material usage) • Use of recyclable material (PET plastic)	Above minimum national standard	Job transformation	Dark
Repurpose (R7)	Converting spent bleached earth (SBE) into to recovered oil (R-oil) and de-oiled bleaching earth (DOBE)	Above minimum national standard	Job creation or substitution	Medium
Use and disposal (post-consumption)				
Recycling (R8)	Recycling PET packaging	Meeting minimum national standard*	Job transformation, creation, or substitution	Light
Repurpose (R7)	Converting used cooking oil (UCO) to biodiesel	Meeting minimum national standard*	Job transformation, creation, or substitution	Light

Legend: High | Low

** Only for the formal economy.*

While the quality of green jobs resulting from circularity in the palm cooking oil industry is potentially higher within the downstream portion of the value chain (refineries and packaging), upstream activities (plantations and milling) also offer a significant number of green job opportunities through job transformation, albeit with a lighter shade of green. This opportunity arises from the large number of workers involved in circular activities within this portion of the value chain, as well as the potential for expanding circularity, especially at the smallholder level. Although the circularity level is low in the post-consumption portion of the value chain, there are still ample opportunities, given that the current recycling capacity is well below its potential. Additionally, the economic activity resulting from post-consumption circularity has not only contributed to job creation but also to formalization of the economy.

Nevertheless, these opportunities come with a caveat. Jobs are green when they help reduce negative environmental impact, ultimately leading to environmentally, economically and socially sustainable enterprises and economies. Consequently, only enterprises (and individual smallholders) that operate in accordance with sustainable palm oil production principles can create green jobs.

In addition, ensuring the decency of work is critical for fully realizing the potential of green jobs resulting from circularity. Most of the potential employment changes within enterprises in the upstream and downstream portions of the value chain are likely to come from job transformations. It will be essential to promote and ensure that current enterprises are aware of and can uphold the principles of decent work. For smallholders, empowering them to secure stable and decent livelihoods while enabling them to adopt circular strategies will be a crucial step forward. Regarding the emerging business models introduced in the upstream and post-consumption stages due to circularity, promoting formalization and ensuring compliance with minimum national labour standards are necessary to ensure that circular job creation qualifies as green jobs.

Opportunities for a just circular transition: Industry symbiosis and green skilling

The growing recycling industry in the post-consumption portion of the palm cooking oil value chain promotes job creation and economic activity by fostering industrial symbiosis, that is, a business ecosystem where traditionally separate entities engage in a collective approach to enhance their competitive advantage through the physical exchange of materials, energy, water and by-products. New business models often incorporate social innovations, such as sharing economy and multiparty collaborations, although not all activities exhibit a complete symbiosis. Successful initiatives attribute their achievements to effective collaboration among local governments, enterprises and interested organizations. This collaboration and industrial symbiosis bring multiple benefits for amplifying a just circular transition.

Skilling is crucial for a Just Transition in the circular economy. Job transformations resulting from circular strategies require re-training to realign operational procedures, while job creation and substitution demand (re)skilling of both new and existing workers. The study identifies broad skill categories for direct jobs (core and enabling) involved in the process. These skills encompass:

- basic green job skills (environmental awareness, waste reduction, and energy and water efficiency);
- social and emotional skills (communication, collaboration, teamwork and willingness to learn);
- cognitive skills (analytical and critical thinking, creative and innovative thinking, strategic thinking, and problem-solving);
- digital skills (basic software and hardware proficiency);
- and technical skills (such as, good agriculture practices, green construction, circular supply chain, and occupational safety and health).

The table below summarizes the skills needs identified.

Type	Plantation	Mill	Refinery	Use and disposal (recycling)
Enabling	• Circular analytics, innovation, and design • Business planning and development • Problem solving and critical thinking • Environmental awareness • Waste management • Energy efficiency • Effective communication • Strategic thinking • Agriculture management	• Circular analytics, innovation, and design • Business planning and development • Problem solving and critical thinking • Environmental awareness • Waste management • Energy efficiency • Effective communication • Strategic thinking • Basic software and hardware • Green construction (for SPOT)	• Circular analytics, innovation, and design • Business planning and development • Problem solving and critical thinking • Environmental awareness • Waste management • Energy efficiency • Effective communication • Strategic thinking • Basic software • Supply chain management • Green construction (for SPOT)	• Business planning and development • Circular creativity and innovation • Problem solving and critical thinking • Strategic thinking and decision-making • Business acumen • Environmental awareness • Waste management • Energy efficiency • Effective communication • Negotiation • ICT system design and development • Supply chain management • Basic software
Core	• Environmental awareness • Waste management • Energy efficiency • Basic machinery operation • Basic software • Good agriculture practice • OSH • Collaboration and teamwork • Willingness to learn	• Environmental awareness • Waste management • Energy efficiency • Process management • Machinery operation • OSH • Collaboration and teamwork • Willingness to learn	• Environmental awareness • Waste management • Energy efficiency • Process management • Machinery operation • OSH • Collaboration and teamwork • Willingness to learn	• Environmental awareness • Waste management • Energy efficiency • Basic software • Basic hardware • Process management • Basic machinery operation • OSH • Collaboration and teamwork • Willingness to learn

Recommendations for optimizing green jobs potential

The introduction of circular economy into Indonesia's palm cooking oil industry opens up opportunities for green jobs creation, both by greening current jobs as well as creating new jobs in the emerging economic activities. Nevertheless, challenges persist for realizing this potential. Barriers include existing structural problems, such as the persistence of decent work challenges, as well as technical challenges such as the low availability of scalable technology. The impacts of these issues mean that marginalized groups are often left behind in realizing green jobs from circular economy strategies. This includes smallholders, temporary plantation workers, and most of the workers in the post-consumption portion of the value chain.

To avoid this, an action plan towards a circular transition needs to be accompanied with measures for a Just Transition. These measures include policy and efforts that can provide mitigation for negative employment impacts. Based on the analysis conducted, this study recommends steps to be taken by relevant stakeholders to optimize the green jobs potential from circularity within the palm cooking oil supply chain while ensuring a Just Transition as below:

1. **Improve data collection and transparency to inform policymaking and decision-making processes.** Data collection to estimate circular jobs and for use in designing policy needs to be improved. This includes: (i) compiling data from the national workforce survey (SAKERNAS) and related sectoral data to provide granular data for estimating circular jobs; (ii) collecting detailed data from related stakeholders when addressing certain issues; (iii) improving the Labour Market Information System (LMIS) so that it can integrate employment information; and (iv) implementing an action plan on data collection as mandated by the Regulation on Optimization of Employment Social Protection (Presidential Instruction No. 2 of 2021) and the National Action Plan on Sustainable Palm Oil (President Instruction No. 6 of 2019). At the other end, improved information

transparency is equally important to accelerate stakeholders' involvement and provide them with relevant information for decision-making that can enhance circular economy implementation in the palm oil industry.

2. **Accelerate programmes and policy to reduce existing decent work challenges, especially in the components of the value chain where vulnerable employment is predominant.** The various elements of the palm cooking oil value chain exhibit distinct industry characteristics with different decent work challenges that create vulnerable groups of workers. Refining regulations on employment contracts, including for emerging business models, is necessary to protect vulnerable workers, especially in the upstream and post-consumption portions of the value chain. A collective effort from workers, management and government to ensure freedom of association and collective bargaining is needed to maintain industrial relationships. Improving labour inspection processes and the capacity of labour inspectors is critical to ensuring an adequate monitoring process, and should include improving the coordination between national and subnational government institutions. As per the stipulation of Presidential Instruction No. 2 of 2021, promoting palm regions as priority areas for implementation processes may accelerate the improvement of labour protections among palm workers.

3. **Promote social dialogue to forge consensus and maintain industrial relationships.** Social dialogue may provide an effective mechanism for co-creating knowledge in planning a just circular transition and maintaining healthy industrial relationships necessary for a smooth transition. Efforts to institutionalize the social dialogue process are necessary to ensure its effectiveness. At the enterprise level, promoting a bipartite cooperating body (or LKS bipartit) is an effective avenue. Moreover, optimizing the role of labour mediators to settle disputes during the transition process can also help to maintain industrial relationships at the workplace level. On a larger scale, enhancing the role of tripartite bodies at the national and subnational levels in addressing issues related to the green transition should be pursued in the long term, especially in relation to policymaking process, particularly given the limited involvement to date of tripartite representation in policy discussions on a Just Transition.

4. **Maximize green jobs potential by supporting and scaling up circular strategies.** Investing in circular innovations in the upstream and post-consumption portions of the value chain is necessary for initiating and scaling-up the strategies that offer significant opportunities to realize green jobs potential. One strategy is to allocate more public funds to finance research and development (R&D), provide capital investment for equipment and supplies, and train smallholders and emerging business. Another strategy is to ease financing access and provide low-cost financing for smallholders and small- and medium-sized enterprises (SMEs) to finance circular economy implementation. For large and medium enterprises, accelerating circular transition can be achieved by providing better incentive mechanisms, collaborating with business associations to promote circular economy, and linking circular programmes with initiatives on sustainability. Partnerships are also an effective avenue for: mainstreaming circular strategies; establishing clear policy directives on circular strategies; and providing mechanisms to incentivize private sector involvement or public–private partnerships in the circular transition.

5. **Create an enabling environment for collaboration and industrial symbiosis.** Industrial symbiosis within the palm cooking oil industry is heavily linked to geographical context. To create an enabling environment, regional governments can establish provision of policies that provide a legal basis and ease of doing business for emerging enterprises related to identified circular strategies to operate within their jurisdiction. They can also support social campaigns to accelerate socio-behavioural change as well as support infrastructure development necessary for the industry, depending on the capacity of the region. Considering the geographic characteristics of industrial symbiosis, incorporating circular transition and creating industrial symbiosis when planning an eco-industrial park is an alternative that can have a substantial impact.

6. **Facilitate and promote reskilling and up-skilling (targeting vulnerable workers) and incorporate the basic skills for green jobs and circularity into formal education.** Skilling is important to prepare the labour market for a circular transition. Different actors require different skilling measures. For small businesses and individuals, policies that guarantee them access to skilling opportunities are crucial. Continuous skilling programmes for them can be delivered through public funds allocation, such as the Oil Palm Plantation Fund Management Agency

(BPDPKS) allocation for smallholders, to conduct training for the smallholders, to set-up training programmes in government training centres (BLKs), to establish community-based BLKs in palm regions, and to collaborate with universities or training providers to develop tailored programmes. At the enterprise level, optimizing the labour inspection process to ensure that all workers receive the necessary training is one way to ensure an appropriate skilling process. More strategically, efforts on reorienting the industry's paradigm to recognize the importance of circularity and the green economy through dialogue and socialization is needed. The provision of policies that incentivize green skilling and green innovation (such as subsidies or tax deductions for purchasing machin*ery* or equipment, for training and for R&D programmes) would also greatly benefit the industry, since industry-led training still dominates the skilling programmes *related to* circularity.

To anticipate future workforce needs, skill strategies need to be embedded into formal education. Incorporating fundamental skills – namely the basic skills for green jobs – and basic technology *in*to formal education will be needed. Moreover, introducing *a syllabus* on or elements of circular economy into subjects and related qualification programmes for fields that supply the industry – such as STEM[2], agriculture, *s*ustainability, systems information, and business studies – would help mainstream circularity within the formal education system. At a strategic level, embedding circular economy principles into the road map for green jobs development, currently being explored by BAPPENAS and cascaded into the Indonesian National Qualification Framework (KKNI) as the basis for skill development in green jobs, including circular jobs, can be addressed more systematically.

7. **Design policy that supports an inclusive circular economy.** Enhancing the capacity of enterprises, especially SMEs, and the most affected regions to adopt circular principles can be achieved through the provision of various incentive mechanisms, such as subsidies or tax deductions, capacity-development programmes, research and innovation support, and a legal framework for operations. Improving governance of activities related to targeted groups – such as, empowering smallholders (including those funded by BPDPKS), establishing clear rules for employment contracts, and ensuring labour protection on plantations – as well as ensuring governance of waste management and waste recycling (particularly used cooking oil (UCO) and plastic recycling) will also bring significant benefits to vulnerable workers within the palm cooking oil supply chain. In addition, specific programmes addressed to women workers that provide adequate labour protections while assisting them to re-enter the labour market when they face job loss risks is necessary. And finally, it is important to design policies that amplify the opportunities for youth to participate in circular economy. One avenue is to promote the scaling up of emerging circular enterprises that contribute to youth employment and create an enabling environment for them to thrive.

8. **Link circularity with sustainable palm oil initiatives**. Linkage with sustainability programmes will not only accelerate circular economy adoption, but also ensure that the strategy leads to green jobs. Improving Indonesia's mandatory sustainability mechanism for the palm oil sector (ISPO[3]); developing an incentives mechanism and ensuring inclusivity; promoting voluntary sustainability incentives such as the Roundtable on Sustainable Palm Oil (RSPO) and corporate environmental, social and governance (ESG) principles; and provision of policy that promotes supply chain-based sustainability initiatives are options to be considered at the programme level. At the strategic level, strengthening policy coherence for circular economy in the palm oil industry by harmonizing policy guidelines on sustainable palm oil, palm oil industry development, circular economy, and green jobs is essential to create linkages between industry development and the sustainability, employment and environment aspects of circularity in the palm cooking oil industry. This can then inform the next Long Term and Middle Term National Development Plans (RPJPP and RPJMN), which will direct the policies within sectoral ministries.

[2] STEM is an abbreviation for science, technology, engineering and mathematics.
[3] ISPO is an abbreviation for Indonesian Sustainable Palm Oil.

1 INTRODUCTION

1. INTRODUCTION

1.1. Background

The COVID-19 pandemic had an enormous economic impact in Indonesia. The pandemic curtailed the country's growth to minus 3.5 per cent by 2020, causing nearly 5.1 million people to lose their jobs and 24 million workers to reduce their working hours (World Bank 2020, 1). The Government responded to these conditions through a series of policy measures – including the National Economic Recovery Programme (Pemulihan Ekonomi Nasional) which set provisions for a flexible state budget (Law No. 2 of 2020 and Government Regulation No. 23 of 2020) and the stipulation of the Omnibus Bill on Job Creation (Law No. 11 of 2020) – as part of efforts to reopen the economy while maintaining sufficient restriction measures (Indonesia, BAPPENAS 2021a, 13).

Since then, the economy has started to rebound, albeit not yet achieving pre-pandemic levels. By the end of 2021, the economy had grown by 3.7 per cent, and the momentum continued in early 2022 with growth projected at 5 per cent (World Bank 2022, 1). However, at the current growth rate, Indonesia may not achieve its Vision 2045 goals,[4] with the Ministry of National Development Planning (BAPPENAS) estimating that the economy will need to grow by an average of 6 per cent to maintain the necessary trajectory (Indonesia, BAPPENAS 2021a).

Even so, the pandemic has urged the country to build forward better via inclusive and sustainable economic transformation. To design this transformation, the Government set six main strategies as game changers, namely:

i. green economy;
ii. digital transformation;
iii. economic productivity;
iv. human resources;
v. economic integration; and
vi. capital relocation (Indonesia, BAPPENAS 2022).

Within this framework, the green economy plays a critical role, as it is central to achieving Sustainable Development Goals (SDGs) and provides opportunities that promotes growth and productivity (Indonesia, BAPPENAS 2021b). The Government plans to implement a green transformation through seven sectors, including the implementation of a circular economy through waste management.[5]

A circular economy is a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution. While there are many concepts that define what a circular economy is, it can be understood as an economic model aimed at the efficient use of resources through waste minimization, long-term value retention, reduction of primary resources, and closed loops of products, product parts and materials within the boundaries of environmental protection and socioeconomic benefits (Morseletto 2020). It fundamentally differs from the traditionally linear system that relies on the "take–make–waste" cycle which poses significant sustainability challenges, and is instead designed according to three principles: (i) eliminate waste and pollution; (ii) circulate products and materials at their highest value; and (iii) regenerate nature (Ellen McArthur Foundation, n.d.). Within Indonesia's policy context, the concept has been adopted into development and climate mitigation policies, such as the Indonesia Vision 2045, the Long-Term Strategy for Low Carbon and Climate Resilience 2050, and the Middle-Term National Development Plan (RPJMN) 2020–2024.

[4] Indonesia Vision 2045 sets an ideal target for the country to be a sovereign, advanced, fair and prosperous nation by its centennial in 2045. This vision targets the country to be the fifth-largest economy in the world and to realize growth that is sufficient to enable the country to exit from the "middle-income trap" (Indonesia, BAPPENAS 2019).

[5] Other priority sectors for green economy implementation consist of energy transition, clean transportation, sustainable forests, sustainable land and agriculture, sustainable water resources, and blue economy (Widyasanti 2022).

Implementing a circular economy for waste management in Indonesia is expected to result in economic, environmental and social improvement. A recent study estimated that the implementation of circularity in the five industrial sectors (food and beverage, textiles, construction, wholesale and retail trade, and electrical and electronic equipment) could increase gross domestic product (GDP) by 593 to 638 trillion rupiah, create 4.4 million net jobs, and reduce CO2 emissions and water use by 126 million tonnes and 6.3 billion cubic meters, respectively, by 2030 (Indonesia, BAPPENAS, Denmark, Embassy of Denmark Jakarta, and UNDP 2021, 6). Therefore, the circular economy is believed to be chief means for attaining a green and sustainable recovery in Indonesia.

In Indonesia, the Partnership for Action on Green Economy (PAGE) – an alliance of five United Nations agencies and funding partners – works to support the implementation of a green economy transition under the Low Carbon Development Initiative (LCDI) programme with BAPPENAS as the Government counterpart. The Ministry is also leading the green economic recovery efforts under Building Back Better with the LCDI. For this effort, the Government is preparing green stimulus packages for a medium- and long-term green recovery, focusing on LCDI sectors[6] where circular economy will be one of the key strategies. Moreover, BAPPENAS is also planning to develop a National Action Plan (NAP) on circular economy and will include a circular economy indicators matrix in the RPJMN 2025–2029.

In relation to this effort, PAGE Indonesia is working on supporting the policymaking process to implement circularity within the food and beverage industry subsector as part of its green recovery programme. Given the different mandates and expertise of PAGE agencies, the activities have been designed as an interrelated process to provide comprehensive input for the Government. The overall activity objectives are to:

- identify the highest potential areas for investment in circular economy practices for a green economic recovery;
- provide inputs for developing the National Action Plan on Circular Economy; and
- provide recommendations for mainstreaming circular economy into the RPJMN 2025–2029.[7]

At the first stage, the United Nations Development Programme (UNDP) conducted a rapid assessment to identify the subsector under the food and beverage industry that has the optimal potential for circular economy implementation. This assessment ultimately identified **palm cooking oil** as that subsector, and therefore this study focuses on analysing the potential labour market impact from circularity in the supply chain related to this commodity.

1.2. Objective and methodology

The ILO's activities within PAGE focus on green jobs and ensuring a Just Transition that manages workplace changes stemming from the impacts of climate change. In the context of the green recovery programme for Indonesia, the ILO's PAGE activities will be delivered through an in-depth assessment and policy recommendations on the green jobs' potential of and skill needs from circularity, in close collaboration with other PAGE agencies. The ILO will assess the employment impacts of circularity in Indonesia in the palm cooking oil industry based on the rapid assessment result carried out in the previous stage by the UNDP. Moreover, the study will also build on the circular strategy identified through a life-cycle analysis conducted as part of the study.

The in-depth assessment is specifically aimed at providing technical inputs on promoting green jobs through circular economy implementation so as to provide policy recommendations on how to attain a Just Transition towards a circular economy. The activity includes an in-depth assessment of green jobs' potential, identification of skills needs, development of policy recommendations, and identification of concrete/applicable activities/programmes for enhancing employment growth and quality in selected subsector. The objective of the study includes:

1. Identifying labour market implications of circularity in the subsector (including green jobs creation and skills needs).
2. Providing policy recommendations for amplifying green job opportunities and managing a Just Transition.
3. Providing guidance on policy and research development to support further uptake of circular economy and

[6] Energy, waste management, green industry, forestry and peat, agriculture, and blue carbon.
[7] PAGE Indonesia's presentation to BAPPENAS.

green job creation.

The study employs a qualitative approach and uses a literature review, interviews and tripartite consultations to understand the likely employment impacts from the circular economy approach under consideration. As part of the data collection process, a series of interviews were conducted with 16 organizations that represent key stakeholders in circular economy implementation in the palm cooking oil supply chain, namely:

- governmental bodies;
- palm oil companies;
- circular companies in the palm oil upstream and post-consumption elements of the value chain;
- palm oil industry associations;
- independent farmers associations;
- palm oil sector labour unions;
- Roundtable on Sustainability Palm Oil (RSPO);
- think-tanks; and
- community-based organizations.

The study's results were validated and elaborated upon via a tripartite workshop with stakeholders.

1.3. Structure of the report

This report has five sections. After this introductory section, Section 2 provides key concepts related to circular economy, circular jobs, green jobs and the scope oof the study. Section 3 provides contextual analysis of the palm oil industry supply chain in Indonesia, including the industry structure and the employment characteristic of the industry. Section 4 analyses the potential of circularity in the palm cooking oil industry and the labour market impact, including circular strategy trends, the green jobs potential of circular economy implementation (including the identification of circular jobs and decent work aspects), and the potential for a Just Transition. Section 4 identifies the skills needs for implementing a circular economy in the palm cooking oil industry. And last, Section 5 presents recommendations for promoting circular economy implementation in the subsector.

2

CIRCULAR STRATEGY IN THE PALM COOKING OIL SUPPLY CHAIN

2. CIRCULAR STRATEGY IN THE PALM COOKING OIL SUPPLY CHAIN

2.1. Circular economy, green economy and green jobs

2.1.1. Circular economy and green economy

A circular economy is believed to be a model for sustainable development; it creates economic value while minimizing resource depletion and environmental degradation (Murray et al. 2017; Babbitt et al. 2018; Hofmann 2019, as cited in Morseletto 2020). Through changes to enterprises' incentive structures that encourage the production of more durable goods and of goods that serve as inputs into other production streams when they are no longer usable, a circular economy keeps products, components and materials at a high level of utility and value. The system thus maximizes both product life and the value of resources by promoting the reuse, refurbishment, remanufacture and recycling of inputs and components (Ellen McArthur Foundation 2013). Embracing circular modes of production has benefits for enterprises (ILO 2019, 139). It may reduce short-term costs, add new profit sources, and help to identify and diversify long-term strategic opportunities. At the production level, circular economy may reduce complexity by making product cycles more manageable while improving customer interaction and loyalty.

The philosophy behind the circular economy can vary from that of the green economy (IISD and Sitra 2020, 3). A green economy aims to lessen environmental impacts and generally improve equality within the linear economy by introducing new institutional reforms and economic tools (Ellen MacArthur Foundation 2021a). A circular economy, however, calls for an evolution from the linear economic model and more of a paradigm shift, which contrasts with the climate and pollution avoidance/abatement policies in the green economy. Nevertheless, both concepts are joined by the common ideal to reconcile economic, environmental and social goals (D'Amato et al. 2017).

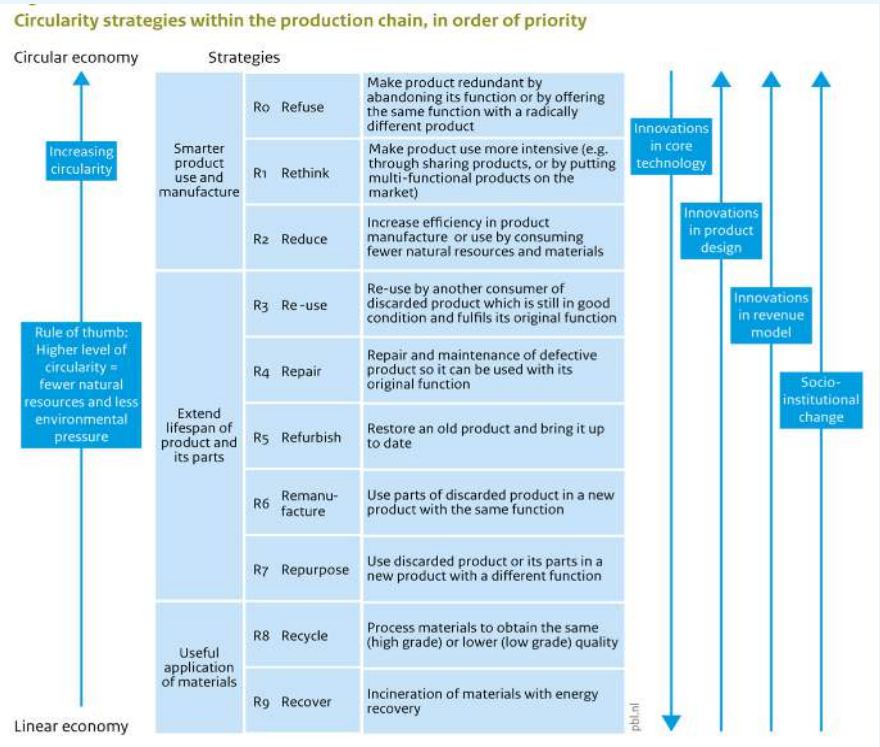
This delineation is relevant for policy design. Embedding the circular economy model across industries will require comprehensive policy frameworks and government leadership, as voluntary commitments by industry leaders alone will not achieve the scale required. Preconditions like incentives, regulation around product stewardship, and the availability of an enabling environment that promotes collaboration within supply chains play a significant role in encouraging firms to move towards the circular economy. As circular economy offers a solutions framework for economic renewal, innovation and industrial transformation, the Indonesian Government needs to plan and strategize the transition to circularity both at an economy-wide and sector-based level (Ellen MacArthur Foundation 2021b).

In Indonesia's economic transformation agenda, circular economy is a subset of the green economy. As such, the circular economy is expected to act as an engine of growth that generates economic development and creates employment without exceeding the environmental carrying capacity. The approach is interlinked under three (out of five) subthemes of the LCDI – namely, energy transition, waste management and green industry (LCDI, n.d.) – and championed in five priority sectors, which include food and beverage, textiles, construction, wholesale and retail trade, and electrical and electronic equipment (Indonesia, BAPPENAS, Denmark, Embassy of Denmark Jakarta, and UNDP 2021). It is through a process of policy mainstreaming that the circular economy can stimulate the economy to create the level of growth needed to attain the goals of Indonesia Vision 2045.

2.1.2. Circular strategy and circular transition

While current policy documents such as Indonesian Vision 2045, the RPJMN 2020–2024, and the economic transformation agenda have a stated circular economy strategy with an emphasis on waste management, circular economy implementation goes beyond waste management and recycling (Medrilzam 2020). Within current technocratic assessment for national development planning, BAPPENAS adopts the "10 Rs" approach in developing circular economy strategies. The 10 Rs approach ranges strategies ordered from high circularity (low R-number) to low circularity (high R- number) (Potting et al. 2017). A higher level of circularity of materials in product chains means that, in principle, smaller amounts of natural resources are needed to produce new (primary or virgin) materials (Potting et al. 2017). This order is not always consistent, as exceptions and secondary or rebound effects may exists, which means the hierarchy is not applicable in certain conditions (Morseletto 2020). However, the categorization provides a beneficial framework for policymaking (figure 1).

Figure 1. The "10 Rs" circularity strategies



Source: Potting et al. 2017.

The introduction of a circular economy is typically accompanied by socio-institutional change[8] and innovation in the use of technology and innovations to the revenue model. When considering changes in the technology and their relation to socio-institutional change, circular economy transitions can be categorized into three types (Potting et al. 2017):

1. Circular economy transitions in which the emergence of a radical innovation in core technology is central. To sustain the transition, socio-institutional change is needed to give the new technology a place in society.
2. Circular economy transitions in which socio-institutional change is at the forefront and technology is not as dominant as in type 1 transitions. This transition only needs incremental innovation, or no innovation, in core technology.

[8] That is, changes in regulations, customs, standards, manufacturing practices and consumer behaviour.

3. Circular economy transitions in which socio-institutional change is central, but which are facilitated by enabling technology. The major difference between the type 3 transition, and types 1 and 2, is that the enabling technology needed for type 3 is generic. There is thus no need for specific technological innovation to achieve a type 3 transition. Type 3 transitions are promoted by technology development in other areas of knowledge than those specific to a given product chain.

The characteristics of the circular economy transition may correlate with an employment impact. A transition that is driven by innovation in a core technology may have less of an impact in relation to employment, but most likely will redefine the existing jobs. However, transitions with high levels of socio-institutional change will likely be accompanied with innovations in the revenue model, and therefore will likely create employment shifts due to the substantial changes in the way the economy operates.

2.1.3. Circular jobs and green jobs

As a strategy to ensure sustainable growth, one of the impacts expected from promoting circular economy in Indonesia is green jobs creation (LCDI, n.d.). Green jobs are decent jobs in economic sectors and activities that contribute to the preservation and restoration of the environment in traditional sectors, such as agriculture and manufacturing, and new emerging green sectors, such as renewable energy and energy efficiency (ILO 2016a). At the other end, a circular job, as defined by Circle Economy and the United Nations Environment Programme (UNEP), is any occupation that directly involves or indirectly supports one of the circular economy's strategies, as mapped in table 1 below.

Table 1. Mapping of circular jobs based on key circular elements

Job category	Definition	Circular elements
Core jobs	All jobs that ensure the closure of raw material cycles	• Stretches the lifetime of materials • Uses waste as a resource • Prioritizes regenerative resources
Enabling jobs	Jobs that remove barriers to and enable the acceleration and upscaling of core circular activities	• Design for the future • Incorporates digital technology • Rethinks the business model • Team-ups to create joint value • Strengthens and advances knowledge
Indirect jobs	Jobs that provide services to core circular strategies	
Source: Circle Economy and UNEP 2020.		

In other words, a circular job, which is good for environmental preservation, should be a green job so long as it meets decent work criteria. The primacy of decent work is critical for policy design, with previous studies showing that many jobs linked to the circular economy, both in developing and developed countries, are not necessarily in line with decent work principles (IISD and Sitra 2020). These decent work deficits include low wage levels, lack of occupational safety and health (OSH) consideration, an increasing trend in the use of short-term contracts, and adopting digital technology without considering the workforce transition.[9] One particular condition that is relevant to Indonesia is the high level of informality that characterizes sectors

[9] The study from IISD and Sitra (2020) identifies several practices of employment linked to a circular economy that are not in line with decent work. Many jobs in Europe linked to waste management and recycling are often low-wage and raise worker safety issues due to exposure to harmful substances. Work in the construction sector is linked to circularity; developed and developing countries are increasingly hiring contract workers without the necessary levels of unionization or regulation that go along with decent work principles. A gender dimension within circular economy policies is also crucial, as men might benefit from higher wages or be disproportionately represented in certain occupations. The use of digital technologies for circular products might also crowd out the participation of women in certain countries.

related to circularity, such as waste management[10] and agriculture[11]. A well-designed circular economy can provide opportunities to improve the labour market, not only to create jobs but also to address pre-existing employment challenges and to create decent work opportunities, especially for vulnerable groups such as women and youth (IISD and Sitra 2020, 4).

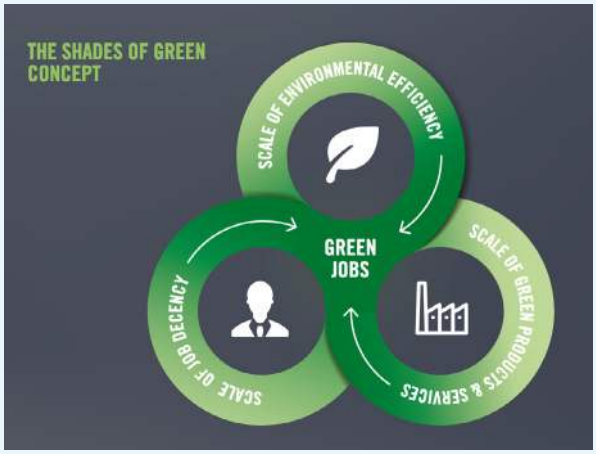
As noted above, jobs are green only when they help reduce negative environmental impacts, ultimately leading to environmentally, economically and socially sustainable enterprises and economies. This being the case, environmental concerns over the palm oil sector might raise questions as to whether it is possible to regard any job in the sector as a green job. According to the United Nations' Food and Agriculture Organization (FAO), a green employment in the food and agriculture sector comes from the green agriculture farming practices that considers the whole supply chain (Herren et al. 2012). Consequently, only enterprises and economies that are green – that is, those that operate in accordance with sustainable production principles – can create green jobs. This condition puts an imperative on sustainability when addressing the possibility of creating green jobs via circular economy in the palm oil sector.

The level of circularity within a sector or supply chain will depend on the implemented strategy employed (as captured in figure 1 above), and it is expected that differing degrees of circularity will also produce differing degrees of environmental impact. In addition, the degree to which work in a sector is decent will depend on the interactions of interrelated factors at the enterprise level (including management's policy), the industry level, and the governmental level (including regulations), and hence will vary across enterprises. Given these conditions, the extent to which green jobs can be generated from circularity may vary considerably. Figure 2 below presents the shades of green concept, which offers a visualization of green jobs potential by categorizing jobs into a green colour spectrum based on work decency and environmental friendliness. This concept is applied in this study to potential green jobs derived from circularity in the palm oil sector (see section 4.2.2 below), and is also elaborated on further in Annex I of this report, which considers a methodological framework for identifying green jobs.

[10] For example, Unilever and Sustainable Waste Indonesia's study in 2020 found that more than 80 per cent of plastic waste in Java was collected by waste pickers (Unilever Indonesia 2020).

[11] See Indonesia, BPS, n.d.-a.

Figure 2. Categories of green jobs derived from circularity



Work Decency	Circularity	Category
High	High	Dark
High	Low	Medium
Low	High	Medium
Low	Low	Light

The green aspect refers to the circularity level depicted by the 10 Rs theory (figure 1), assuming that the higher the circularity level, the better the environmental impact it brings. The decency threshold refers to the level of conformity to national labour standards. This categorization is a simplification for analysis purposes, as the level of circularity does not necessarily fully capture the extent of the environmental impacts from a given strategy, and the decency level beyond the minimum requirement can vary considerably.

Source: Author's analysis based on ILO 2016b.

Several studies on the impact of circular economy on job creation conclude that a positive net job effect could be created. The ILO estimates[12] that applying a circular economy can produce 78 million jobs and eliminate almost 71 million, resulting in a 7 million net job gain globally. The exercise performed to reach this estimate also shows that the nature of this employment impact is dominated by job reallocation: 69 per cent of the workers who might lose their jobs can find vacancies in the same occupation in other industries within the same country. Therefore, measures to assist the remaining 31 per cent of the workers who may lose their jobs to find new jobs in the labour market will be required. Chief among these measure are skills development programmes, both for re-skilling and up-skilling.

In 2021, BAPPENAS, with the support of the Danish Embassy and the UNDP, estimated the economic, social and environmental benefits of a circular economy on the five selected sectors referred to above[13] using dynamic system modelling. The model projects that implementing a circular economy in the five selected sectors might create 4.4 million cumulative jobs in Indonesia between 2021 and 2030, with estimations of the direct jobs impact across sectors varying between 2.5 million to 13.9 million jobs depending on the scenario. The analysis also shows that there might be a trend of job shifting, wherein some jobs in the upstream portion of the value chain will be displaced, but the downstream portion of the value chain will anticipate jobs creation.[14] Given this projection, the report emphasizes the need for a skill development policy to support the transition of jobs by retraining displaced workers to fill new roles created by the circular transition.

Another important point noted in the BAPPENAS calculation is the opportunity of the circular economy to address gender disparities at work. The study estimates that 75 per cent of the total net jobs potentially created by circular economy in 2030 could be for women. This is due to the expectations around job shifting, wherein the enterprises that will be negatively affected by the transition are more likely to be in male-dominated industries (such as manufacturing and construction), while jobs creation will likely be concentrated in the service sector, where women have a higher degree of participation (Indonesia, BAPPENAS, Denmark, Embassy of Denmark Jakarta, and UNDP 2021).

[12] The estimates are based on the update from the model in the ILO's *World Employment and Social Outlook 2018*. The circular economy scenario assumes a 5 per cent annual increase in recycling rates, replaces the direct extraction of primary resources for recycled products, and sees growth in the service economy, which promotes rental and repair services to reduce ownership of goods at an annual rate of 1 per cent. The complete result can be found in ILO, *Skills for a Greener Future*: A Global View, 2019; while the detailed methodology and the assumed scenario can be found in the *World Employment and Social Outlook 2018* (ILO 2018a).

[13] That is: (i) food and beverage; (ii) textiles; (iii) construction; (iv) wholesale and retail trade; and (v) electrical and electronic equipment.

[14] The employment impact scenario assumes that the net GDP contributed by implementing the circular economy can be realized (employment impact is the function of economic impact) calculated using the labour productivity ratio as a proxy. The calculation employs the input–output (IO) model disaggregated to the sectoral level. The exercise notes data limitation in which the real job impact may vary depending on the degree of labour productivity and capital intensity. Both will determine the rate/number of workers needed for the activity. The detailed scenario and methodology can be seen in Annex 5 of the *Economic, Social, and Environmental Benefits of a Circular Economy in Indonesia* report (Indonesia, BAPPENAS, Denmark, Embassy of Denmark Jakarta, and UNDP 2021).

2.2. Implementing a circular economy in the palm cooking oil sector

2.2.1. The scope of circularity in the study

The exploration in this study will be focused on the palm cooking oil's supply chain as the potential subsector for circular economy intervention. The UNDP identified this subsector through a rapid assessment of food and beverage value chains that contribute most significantly to green recovery and have high circular economy potential. The UNDP rapid assessment consisted of three interrelated studies:

1. a quick assessment using a combination of qualitative and quantitative methods[15] to identify the optimum subsector for a circular economy implementation under the food and beverage sector;
2. a Waste and CO_2 Reduction Life Cycle Analysis (WCR-LCA)[16] to identify the value chain that has the most impact when circular economy is being implemented, including sociotechnical feasibility analysis; and
3. a system dynamic modelling[17] to exercise the optimum policy and activity scenario to support circular economy implementation.

The rapid assessment employed criteria comprising indicators and proxies that reflect the inputs needed for implementing a circular economy and the expected output, which covers the economic, social and environmental dimensions. The results show that different scenarios result in different rankings of prioritized subsectors. However, it also indicated that the palm oil processing industry ranked high under all scenarios, with significantly higher values on all indicators, including economic (added value to GDP), social (number of workers), and environmental (energy consumption, emissions and so on).

The current policies around circularity in the Indonesian food and beverage sector are designed and focused on avoiding food loss and waste.[18] Using the 5R approach, BAPPENAS's study on the impact of circular economy identified two areas in which circularity can be implemented in the food and beverage sector:

1. **Reduce:** reducing post-harvest food loss, supply chain food loss and waste, and consumer food waste; and
2. **Recycle:** processing food loss and waste.

With this approach, a circular economy is expected to not only help avoid food loss and waste (for example, by shortening supply chains) but also to utilize food loss and waste for more productive purposes, such as compost generation and biogas (Indonesia, BAPPENAS, Denmark, Embassy of Denmark Jakarta, and UNDP 2021). In order to assess waste and carbon reduction in palm oil processing and refining, the WCR-LCA considered the whole supply chain as per figure 3 below.

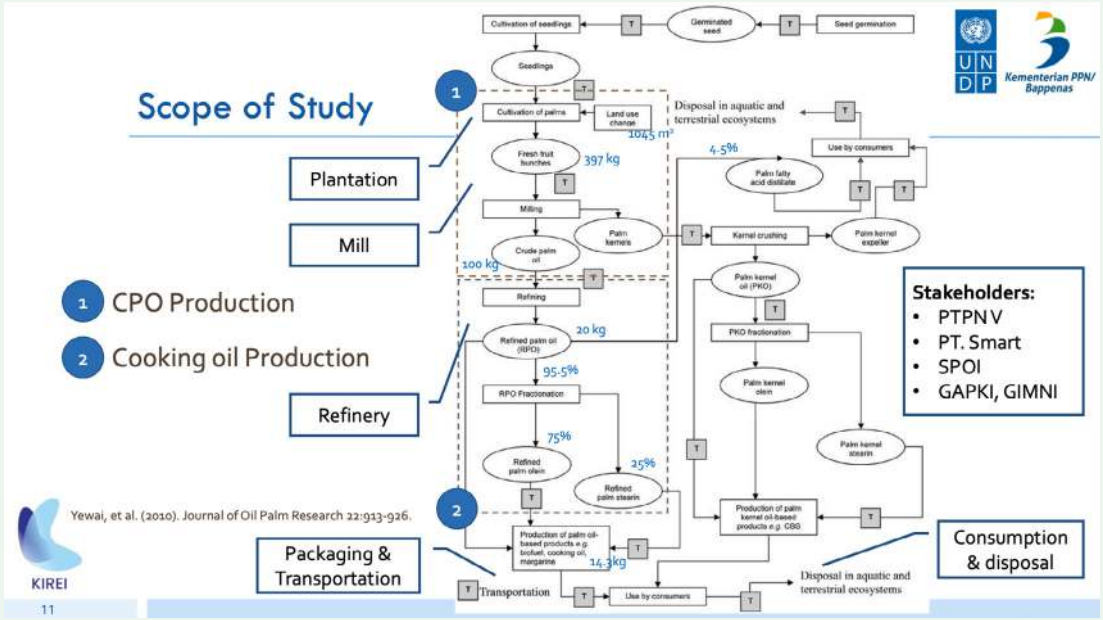
[15] For a detailed methodology, see part 1 (Quick Assessment) of the forthcoming UNDP report *Green and Inclusive Economic Recovery through Circular Economy in Food & Beverages Related Sectors*.

[16] The study uses a life-cycle analysis based on the ISO 14040 standards, informed via a consultation process with the industries to collect the required data to be fed into the model. The study also includes an analysis on the sociotechnical option of waste and CO_2 reduction strategies to provide policy recommendations for a detailed methodology, see part 3 (WCR-LCA report) of the forthcoming UNDP report *Green and Inclusive Economic Recovery through Circular Economy in Food & Beverages Related Sectors*.

[17] For detailed methodology, see part 2 (System Dynamic Modelling) of the forthcoming UNDP report *Green and Inclusive Economic Recovery through Circular Economy in Food & Beverages Related Sectors*.

[18] These include, among others, the Government's Long-Term Strategy for Low Carbon and Climate Resilience 2050 (published in 2021); the 2021 report *The Economic, Social and Environmental Benefit of Circular Economy in Indonesia* by BAPPENAS, the Danish Embassy and UNDP; BAPPENAS' 2021 White Paper *Laporan Kajian Peta Jalan: Transformasi Indonesia Menuju Indonesia 2045 – Adil, Hijau, dan Maju*; and BAPPENAS' 2021 *Green Recovery Roadmap Indonesia 2021–2024*.

Figure 3. The scope of the palm oil value chain for the study



Source: UNDP, forthcoming-a.

2.2.2. Circularity and the opportunity for industrial symbiosis

Depending on the circular strategy adopted by the palm oil industry, the employment impact of a circular transition may vary, as business processes will determine how this process is organized. Looking from an employment lens, industrial symbiosis is believed to offer opportunities to optimize the circularity impacts on jobs (ILO 2022). Industrial symbiosis is a business ecosystem where traditionally separate entities engage in a collective approach to enhance their competitive advantage through the physical exchange of materials, energy, water and by-products. In a way, it is also a form of circular economy. Industrial symbiosis can be either spontaneously created by private enterprises or established with the support of associations or public institutions.

A recent ILO (2022) brief identifies that industrial symbiosis can create employment and contribute to the formalization of small and micro enterprises. The LCA-WCR analysis identifies circular economy opportunities across the value chain starting from upstream (plantations and milling) and moving into downstream (refineries, packaging and distribution) and ultimately consumption (use and disposal). While the downstream segment of the value chain is concentrated on big enterprises, the ecology of the players in the upstream and consumption segments of the chain vary greatly, and the roles of individuals and small-scale enterprises, often characterized with informality, are more significant. In addition, the Government also aims to develop industrial zones as part of its industrialization strategy under the economic transformation agenda (see figure 2). Among the designated areas, KEK (Special Economic Zone) Sei Mangkei and KI (Industrial Zone) Surya Borneo are focused on the palm industry (Indonesia, BAPPENAS 2021c). This industrial cluster can also promote industrial symbiosis (van Beers et al. 2020). Given the directives and context, the study will also identify opportunities for industrial symbiosis that may benefit the economy, especially within the palm oil value chain.

3

INDONESIAN PALM OIL

3. INDONESIAN PALM OIL

3.1. Indonesian palm oil industry's profile

3.1.1. The structure and development of palm oil industry

The palm oil industry is a strategic sector in the Indonesian economy; it is also one of the most labour-intensive industries in the country (Safitri 2021). During the pandemic, the sector showed resilience. Due to the nature of operations both upstream and downstream in the value chain, the operational disruption due the COVID-19 exposure is relatively low.[19] In 2020, the sector maintained production growth and experienced no significant disruptions to export levels, allowing the industry to contribute 3.5 per cent of GDP and 13.5 per cent of non-oil and gas exports in that year (GAPKI 2021). Crude palm oil (CPO) production slightly decreased during 2021 due to technical factors, including climate, fertilizing deficiency in the previous year, and labour shortages; however, the export value had increased by 52 per cent due to increases in the commodity price (GAPKI 2022), making the sector one of Indonesia's top exporters.

Palm cultivation in Indonesia was started during the Dutch colonial era.[20] Initially planted in Java, the Dutch colonizers began to expand plantations to Sumatra starting in 1870, and soon the "Kolonisatie programme", where landless people from Java were moved to less populated areas, became one of the ways to meet the plantations' labour needs. Post-independence, the linking of plantation expansion with transmigration programmes was also adopted as a rural development strategy during the New Order period (1967–1998). This was initially implemented via state-owned enterprises, especially in Sumatra and Kalimantan, but was then expanded to large private plantation through the Nucleus Estate and Smallholders for Transmigration programme (Perkebunan Inti Rakyat-Trans, or NES). After the 1998 financial crisis, the Government adopted a strategy of increased liberalization and democratization, wherein the transmigration programme was scaled back and the Government introduced a partnership approach instead. In 1999, Indonesia moved towards decentralization through the regional autonomy law. The combination of a power shift towards local governments and the withdrawal of the Government from directly influencing businesses meant the expansion of the sector was no longer dependent on joint ventures between private companies and the local people; it was now driven more by partnerships between the Government, smallholders and companies.

This historical background has shaped the current structure of the palm oil industry in Indonesia. A recent study concluded that the industry has a low level of vertical integration, with the upstream (plantations and milling) and downstream (refinery and distribution) elements of the value chain rarely being owned by the same corporate entity. Downstream activities are controlled by a small number of large corporate groups. By contrast, upstream activities are controlled by hundreds of smaller corporate groups and individual companies that own mills and plantations, with hundreds of thousands of independent smallholders contributing to production (Pirard et al. 2020). The PTPN III Holding Company, the state-owned enterprise that operates in the sector, maintains a modest role with the decreasing direct intervention from the Government. While mostly focused on plantations and milling (that is, upstream activities), the group is starting to diversify to include downstream activities[21] as part of their role in the Government's food sovereignty programme in order to mitigate the shortage of palm cooking oil and to stabilize the price in the domestic market.[22]

[19] Interview with GAPKI; also see PAPSI (2020), specifically pages 34–36 for smallholders' productivity and pages 44–45 for export productivity during the pandemic.

[20] The history of palm oil in Indonesia is summarized from Baudoin et al. (2017, 1–6).

[21] Via a subsidiary that operates in Sei Mangkei Special Economic Zone.

[22] Interview with PTPN III.

Upstream activities in the palm oil value chain are characterized by substantial fragmentation. The liberalization of the palm sector has promoted the growth of individual holders (Baudoin et al. 2017). Currently, smallholders own more than 40 per cent of palm plantations (Indonesia, Ministry of Agriculture 2022), although the generally operate with low productivity. Geographic differences shaped by the history of oil palm cultivation also persist: in Kalimantan, most plantations are industrial scale, while in Sumatra, smallholders tend to dominate (Perdana 2020). Nevertheless, big private plantations dominate the upstream activities on the value chain, as they own around 55 per cent of cultivated land and contribute around 62 per cent of palm oil production (Indonesia, Ministry of Agriculture 2022). One study that looked at the supply chain structure and mergers and acquisitions strategy in the palm industry argued that a consolidation trend in the upstream end of the value chain has emerged (Hawkins, Chen, and Wigglesworth 2016, 22). This trend has been induced by the increased requirement for sustainability, which has motivated companies, especially big enterprises with an export orientation, to increase the productivity of current plantations, since expansion is more difficult. The characteristics of upstream activities in the palm oil value chain, which do not require massive capital investment, and the availability of partnership mechanisms also appear to be attractive for enterprises. In addition, upstream production is proven to be more profitable compared to downstream *activities* due to the marginally lower value added of the processed palm oil product compared to bulk CPO production (Hawkins, Chen, and Wigglesworth 2016, 27).

These conditions have encouraged downstream industry to adopt a different strategy. The *tight* margins in the refinery and distribution process encourage the companies to expand their size, gaining value from increased production capacity *and* market control. Expansion is argued to also be encouraged by government policy, through the structuring of trade tariffs in 2011 that have boosted investment in refineries while disincentivizing smaller players (Hawkins, Chen, and Wigglesworth 2016, 26). This in turn has led to an oligopolistic pattern downstream in the value chain (Perdana 2020, 18), where big refiners have control over a significant portion of the supply of raw product entering their facilities. Diversification into downstream distribution of finished or semi-manufactured products is also a common path for value creation, especially by the largest companies. These integrated companies exhibit stronger financial performance even during commodity price fluctuations, suggesting that downstream diversification is *a proven mitigation measure for price risk* (Perdana 2020, 26–27).

Under the National Industry Development Masterplan (RIPIN), palm oil is *considered a* strategic industry with highly competitive advantages. However, the lack of downstream diversification in the industry means that CPO is the main palm-based export product (Perdana 2020, 16), and other challenges persist, including low productivity levels and the use of outdated technology in the production process. Under these condition, the industrial policy for palm oil is focused on the development of downstream segments and related industries, such as oleochemicals and biodiesel, as part of Indonesia's industrialization strategy.[23] Under this "downstreaming" (*hilirisasi*) policy, the Government developed the Palm Roadmap for 2019–2045 with the vision of developing a sustainable palm oil industry as one of the building blocks for economic development. The road map initiates three strategic areas: (i) improving productivity; (ii) downstreaming; and (iii) improving ecosystems, governance and capacity-building. The road map also aims to mainstream circular economy in the palm industry as a foundation for bio-economy development (Indonesia, BAPPENAS 2021c). Given this directive, the Government has set up related policies such as the provision of an Oil Palm Plantation Fund Management Agency (BPDPKS) fund for the development of palm-based biodiesel (Indonesia, BPDPKS 2020), which covers of 75 per cent of Fund allocation in 2022.[24]

Supply chain characteristics are relevant when analysing the potential circularity impacts on jobs, since they can signal the appropriate choice of circular economy strategy. An empirical study in the European Union concluded that the more radical the change, the higher the required workers' skills and the higher the number of green employees at the firm level (Moreno-Mondejar, Triguero, and Cuerva 2021). Given the characteristics of the Indonesian palm oil industry, downstream activities that are dominated by large-scale companies and

[23] See strategy 2 for improving economic sector productivity under figure 1.
[24] Interview with BPDPKS.

big plantations will have more capacity to invest in innovation, especially in the use of technology and product design, as part of their strategy. Moreover, the incentive structure and policy directives will likely affect companies' business decisions. Because there are greater barriers related to land expansion and resource allocation for diversification, innovation in upstream activities – including implementation of circular economy – will likely be driven by motives tied to cost efficiency and improving productivity. On the other hand, the high pressure for sustainability and the government policy to promote product diversification will likely affect the introduction of innovations downstream in the value chain aimed at ensuring sustainability to improve market perception and product diversification.

3.1.2. The trend towards sustainable palm oil practices

The policy focus on sustainable palm oil is not without fundamental reasons. The industry is associated with various environmental and social issues such as deforestation, biodiversity loss, land grabbing, violations of human rights and child labour (Voora et al. 2019). Due to poor perceptions of the sustainability performance of the palm oil industry, particularly in regard to its environmental performance, the industry has been subjected to numerous environmental campaigns. These campaigns have often been decried as unjustified in their negativity by Indonesian palm oil stakeholders. Even so, given the importance of palm oil cultivation for the food security, community livelihoods and the Indonesian economy, efforts to maintain continuity in the sector while mitigating its adverse impacts has become a policy priority.

Given these pressures, sustainably produced palm oil has become an aspirational goal for many consumers, buyers and governments (Watts and Irawan 2018). In Indonesia, movement towards this goal is reinforced through various efforts, including (among others):

- implementation through the adoption of voluntary sustainability standards (mostly via the Roundtable on Sustainable Palm Oil) (Voora et al. 2019);
- the provision of mandatory sustainability standards through the Indonesian Sustainable Palm Oil (ISPO);[25] and
- zero-deforestation commodity supply chain pledges (ZDCs) (Heilmayr and Benedict 2022).

All three of these mechanisms accommodate employment aspects among their requirements, albeit to varying degrees and levels of detail.

The Roundtable on Sustainable Palm Oil (RSPO) is a voluntary and market-driven initiative that focuses on encouraging the production and promotion of sustainable palm oil.[26] It tries to pave a road map for a sustainable palm oil sector by assuming the role of sustainability leadership, promoting system standardization and providing an inclusive engagement platform. One of the main instruments implemented by the organization is through the certification process, designed for three main clusters:

i. the Principles and Criteria (P&Cs) for big plantations;
ii. the RSPO Independent Smallholders Standard (RISS) for smallholders; and
iii. the supply chain certification system (SCSS) for downstream producers (manufacture, refinery and retail).

The RSPO recognizes safe and decent work principles and human rights safeguarding as intermediate outcomes (RSPO, n.d.-a), and translates them within the criteria for the certification process, especially under criterion 6 (respect workers' rights and condition) and partially under criterion 3 (optimize productivity, efficiency, positive impact, and resilience) (RSPO 2020).

In 2011, the Indonesian Government established Indonesia Sustainable Palm Oil (ISPO), a national sustainability certification scheme aimed at promoting sustainable palm oil to enhance industry competitiveness and ensure stricter environmental regulation (UNDP, forthcoming-b, 2). Similar to the RSPO, the ISPO mechanism uses

[25] Presidential Regulation on Sustainable Palm Oil Certification System in Indonesia, Perpres No. 44/2020. Available (in Indonesian) at: https://peraturan.bpk.go.id/Home/Details/134802/perpres-no-44-tahun-2020.

[26] Interview with RSPO.

certification as the implementing instrument, but the ISPO is compulsory and Presidential Regulation No. 44/2020 obliges all stakeholders, including smallholders, to acquire ISPO certification within five years. The criteria for the ISPO have been developed based on the stipulated regulations, including the aspects related to employment. In 2017, the RSPO and ISPO conducted joint research on their criteria and concluded that almost 75 per cent of their criteria are similar, with the main differences pertaining to the high conservation value (HCV) principle; free, prior and informed consent (FPIC); and New Planting Procedures (FCP), which are not required under ISPO.[27] Regarding employment in the palm oil industry, the ISPO refers to the Indonesian Labour Law and regulates organizations' responsibilities to their workers under six criteria that prohibit child and forced labour, ensure the health and safety of the workers, and guarantee respect for workers' rights to freedom of association and collective bargaining (Indonesia, BPDPKS 2021). However, regarding rights at work, the employment criteria provisions within ISPO are suboptimal, with aspects on OSH, harassment and other violations at the workplace being too general, and in addition there are no criteria that prohibit wage discrimination (Sisungkunon 2021).

Workers also view the RSPO as being better than the IPSO because it utilizes an approach that encourages multi-stakeholder participation and dialogue and because the RSPO displays a commitment to promoting non-discrimination on the basis of gender at work.[28] One of the RSPO's strategies to encourage dialogue and multi-stakeholder participation is by designing a complaint system that includes a dispute settlement facility that can be accessed by the public in addition to an internal grievance mechanism required by the RSPO that is to be managed by their members (RSPO, n.d.-b). The RSPO also encourages bipartite dialogue for dispute settlement in accordance with criteria around collective bargaining.[29] According to the RSPO, employment-related issues were the most commonly reported issues within the past two years, with complaints typically related to collective bargaining implementation and compensation.[30] In addition to workers, the RSPO is also favoured over the ISPO by palm oil companies and smallholders, as RSPO certification provides market incentives (premium pricing and market confidence) and financing facilities that can support organizations with limited capacities to conduct certification and surveillance audits.[31]

Another major area of sustainability progress in Indonesia is zero-deforestation commodity supply chain pledges (ZDCs).[32] A recent study shows that Indonesia has achieved a remarkable reversal in deforestation trends related to palm cultivation. Between 2018 and 2020, the annual deforestation stemming from palm cultivation was 45,285 hectares, which was just 18 per cent of the peak reached in 2008–12. Currently, more than 85 per cent of palm oil exports are traded by companies with formal ZDCs. These companies' disclosed data shows that 87 per cent of refined palm oil exports were sourced from refineries that publicly reported on the set of mills from which they purchased crude palm oil (CPO). The data indicates the increased commitment by exporters with ZDCs to only source palm oil from supply chains free from deforestation, which in turn lowers the overall risk of deforestation in the sector. However, most of the ZDCs were pledged by exporters, and because of growing domestic demand for palm oil, rising prices and the availability of a domestic market for non-ZDC products a risk of increased deforestation remains driven by market leakage, namely market access for suppliers that do not adhere to ZDCs. The country's mandatory biodiesel programme also prompts this leakage, since several non-ZDC refineries also contribute to the programme (Chain Reaction Research 2020). This being the case, some have noted that increased traceability – that is,

[27] Interview with RSPO representative. The study was based on the ISPO 2015 and RSPO P&C 2013, and can be downloaded here. Updates have been made to both mechanisms; KEHATI, LEI and SPOS Indonesia (2021) provides a comparison between the ISPO 2020 and RSPO P&C (2018), which is available at: https://sposindonesia.org/wp-content/uploads/2021/02/Comparison-ISPO-RSPO-EN.pdf.

[28] Interviews with HUKATAN and JAPBUPSI (Workers in Palm Oil Industry Unions)

[29] Interview with RSPO.

[30] Interview with RSPO.

[31] Interviews with SPKS, GAPKI, and palm companies.

[32] One main example of a ZDC is the No Deforestation, No Peat, No Exploitation (NDPE) policy. In 2012, three major refineries (Wilmar, Musim Mas, and GAR) adopted the NDPE, which pledges to high conservation value for forests, avoid palm cultivation on peatland, and respect the rights of local people and workers. The companies also committed to using their market value to ensure that their subsidiaries and suppliers will adhere to the NDPE standards (see Li and Samedi 2022, 288–290). In 2020 the NDPE had covered 83 refineries, including most of major groups in Indonesia (see Chain Reaction Research 2020).

requiring companies to disclose their supply chain information – is one a critical aspect that needs to be pursued to ensure a sustainable palm oil industry.[33]

To strengthen the sustainability of the palm oil industry, the Government of Indonesia developed the National Action Plan on Sustainable Palm Oil (NAP SPO) for 2019–2024, as stipulated under Presidential Decree No. 6 of 2019. The NAP SPO is aimed at promoting the capability and capacity of palm growers, accelerating the process of finalizing the status and legality of many smallholder farms, promoting the use of palm for renewables, improving sustainable palm plantation diplomacy, and promoting the acceleration of sustainable palm oil production (Indonesia, BPDPKS 2019). The NAP focuses on five areas:

i. improving data collection, coordination and infrastructure;
ii. capacity-development for palm growers;
iii. improving palm plantation governance and dispute settlement;
iv. acceleration of ISPO certification and market access; and
v. environmental management and monitoring.

There has been progress on several outcomes due to the NAP, such as resource allocation for the development of subnational NAP SPOs and multi-stakeholder processes, the promulgation of Minister of Agriculture Regulation No. 18/2021 on Facilitation of Smallholder Plantation Development, and the development of multi-stakeholder platforms at the national level and at the local level in certain provinces and districts (UNDP 2022). Nevertheless, challenges persist in practice, especially in regard to the limited resources available to subnational governments and regarding progress in areas such as data collection, monitoring and evaluation, ISPO certification for smallholders, and land legal settlement, which are all deemed to be inadequate to achieve NAP targets.[34]

Although it cannot be guaranteed, development towards sustainable practices in the palm oil industry sector is expected to also promote an improvement in safeguarding decent work within the sector. Most of the sustainability standards provide provisions for protection of fundamental rights at work and encourage multiparty dialogue.

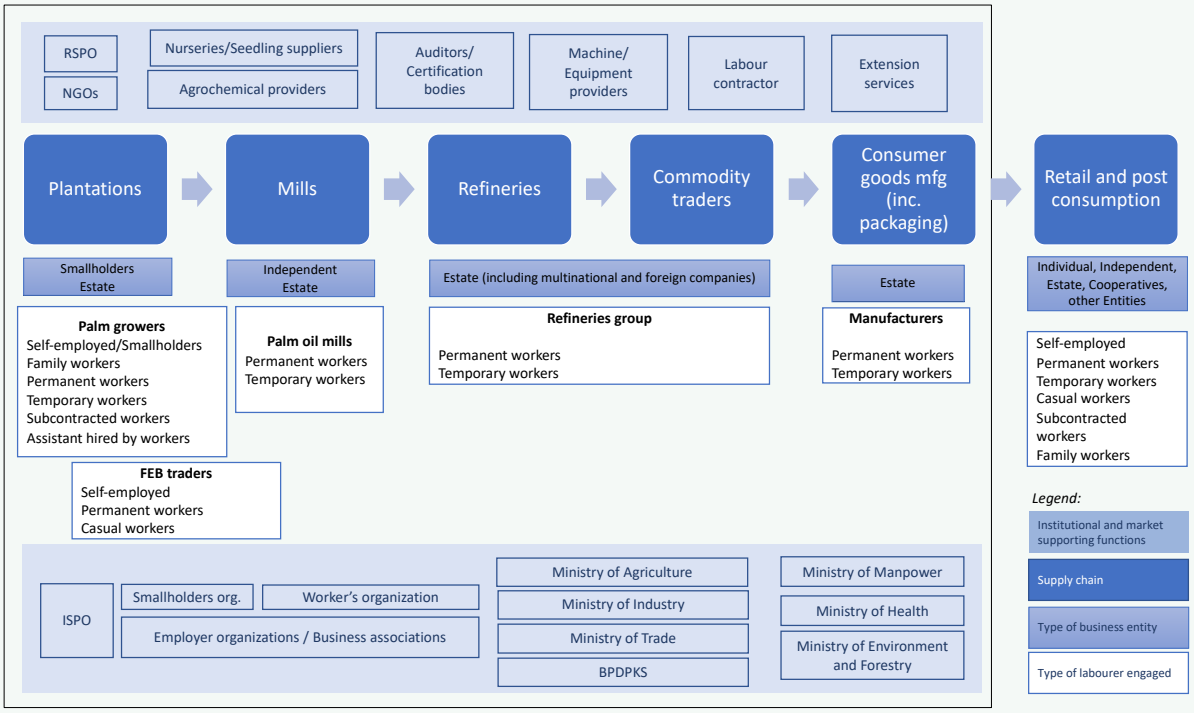
3.2. Employment characteristics in the palm oil industry

The palm oil industry is designated as a priority sector by the Government due to its contribution to job creation, especially for low-skilled workers (Santia 2021). According to the Ministry of Industry (2022), in 2021 the palm oil industry was estimated to have employed 4.2 million direct workers and 12 million indirect workers along its supply chain. These numbers show massive growth since 2013, when the Ministry put the number of manufacturing workers in the CPO and palm cooking oil sector at fewer than 180,000 workers (Indonesia, Ministry of Industry, n.d.). Regarding upstream activities on the value chain, data from the Ministry of Agriculture shows that in 2021 there were 2.6 million smallholding farmers and 4.5 million workers employed in privately owned palm plantations (93.5 per cent of whom are employed by large national private companies) (Indonesia, Ministry of Agriculture, Directorate-General of Estate Crops 2022). In total, these numbers represent 16.6 per cent of the national workforce in 2021 (Indonesia, Ministry of Manpower 2022). Nevertheless, the availability of disaggregated data on the total number of workers engaged in the palm oil supply chain from upstream to downstream in Indonesia is still limited. The NAP SPO had set data collection as one of its focus areas, but implementation is still suboptimal and the NAP is nearing the end of its period of coverage. Several stakeholders perceive the lack of data as placing limits on efforts to improve governance and to plan interventions aimed at ensuring a sustainable palm oil industry. Some stakeholders, such as SPKS (Independent Palm Smallholders Association) and JAPBUSI (Palm Oil Trade Union Network Indonesia), are conducting independent data collection, but their capacity is limited and they can only cover their own members.

[33] Interviews with Auriga, SPKS, and Sawit Watch.
[34] Interview with Sawit Watch.

The characteristics of workers and working conditions in the palm oil industry's supply chain in Indonesia are corelated with the history and characteristics of the industry. The upstream and post-consumption activities in the value chain, except for the milling process, consist of business actors of various types and sizes that are often characterized by non-standard forms of employment. The downstream industry, by contrast, is mostly dominated by large companies – foreign and domestic – wherein refineries and distribution (commodity traders) are typically vertically integrated. This type of establishment usually provides full-time employment with good governance and better working conditions.

Figure 4. Types of employment in the palm cooking oil value chain



Source: Created by the author based on ILO (2017) and stakeholder interviews.

3.2.1. Employment and conditions of work upstream in the value chain

The upstream activities in the value chain, especially the plantations, absorb more workers than the downstream activities. Data from the Ministry of Agriculture shows that the palm oil value chain has provided direct employment for around 7 million people over the past five years. The number of workers employed in the industry was not affected by the COVID-19 pandemic, and even shows a slight increase due to growing demand. Depending on the effectiveness of the palm cultivation process, a medium to large plantation generally employs one worker for every 5–7 hectares.[35] The ratio for the smallholders is much lower at 1 worker for every 2 hectares (Li 2017).[36] However, this higher ratio does not actually reflect higher job creation opportunities on smallholder farms, but rather is due to the low productivity of such farms due to limited capacity.[37] The work around palm cultivation is generally divided into three main phases:

[35] During the interview, the Vice-Secretary-General of GAPKI stated that the general norm for oil palm plantations is a ratio between 1:5 and 1:7 (that is, one worker for between 5 and 7 hectares of land), but the number varied depending on the practices employed. Based on 2015 data from two plantations in West Kalimantan, Tania Murray Li (2017) found that the ratio can even be smaller, with one of the two plantations having a ratio of 1:10 (the other was at 1:6, right in the middle of the range provided by GAPKI).

[36] This is also the ratio for the NES Transmigration programme, however, some view that this ratio limits the capabilities of smallholders, leading them into vulnerable livelihoods – as per Li and Samedi (2022) and interviews with SPKS, Sawit Watch and Auriga.

[37] In term of full-time employment, a previous study by the ILO (2017) documented that immature plantation requires about 56.50 person days of labour excluding administrative staff or a full-time equivalent employment (FTE) of 0.18 at 312 working days per year for each hectare of land. A mature plantation with an annual yield of 20 MT of fresh fruit bunches (FFB) generates 0.19 FTE per year. In high input plantations with all operations done manually and those located in peatland and difficult terrains, FTE can reach as high as 0.26 or about 80 person days per year. Labour inputs in smallholder plantation range from 30 to 60 days per hectare. Independent

i. farm establishment activities such as land clearing, drainage construction, seedling preparation and planting;
ii. farm management activities from maintenance (including fertilizing) to harvesting; and
iii. farm replanting.

All three phases rely primarily on manual labour, with phases one and three generally generating casual jobs and phase two providing regular and ongoing jobs. Harvesting accounts for the highest numbers of workers on plantations (ILO 2017).

Table 2. Number of workers in the upstream portion of the palm oil value chain, by type of farm/plantation (2017–21)

Year	Smallholder farms	Government estates	Private estates	Total
2017	2 618 127	n/a	n/a	4 340 848
2018	2 673 810	n/a	n/a	4 422 226
2019	2 509 214	308 754	3 971 169	4 279923
2020	2.566.066	284.587	4.142.686	4.427.273
2021	2 600 410	289 837	4 208 616	4 498 453

n/a = data not available.
Source: Indonesia, Ministry of Agriculture, Directorate-General of Estate Crops 2018; 2022.

Based on the contractual relationship type, workers in the palm plantation estates in general can be classified as:[38]

i. Permanent workers, mostly consisting of office/administrative staff, plantation supervisors/foremen, and a core group of plantation workers (generally harvesters). These workers are mostly male. Managerial and administrative staff are paid monthly wages, while plantation core workers are remunerated with fixed wages plus variable incentives based on daily volume – paid either monthly or daily.
ii. Daily casual workers (*buruh harian lepas*/BHLs) hired directly by the plantation, mostly for seasonal work (such as application of fertilizer, spraying of herbicide and pesticides, and other maintenance tasks) or to support core workers (such as harvesting and loading the fresh fruit bunches (FFB)). In general, they work for 15 to 19 days per month and are paid based on accomplishment of targets or a piecemeal rate.
iii. Subcontracted labour (temporary workers hired through agencies) who are mostly assigned for services related to farm maintenance, harvesting and transport of FFB. For these workers, wages, labour protections and access to training will depend on the contract with their agency.
iv. Assistants hired by permanent or casual workers on plantations and family workers, who are mainly contracted to help the plantation workers to meet their quota/target. These workers are essentially invisible workers since there is no contractual agreement between them and the company. The do not have any access to labour protections and training, and likely to be paid below the minimum wage.

Despite the long development of palm plantations in Indonesia and the country's ratification of nine of the ten fundamental labour Conventions, including Conventions on forced and child labour[39], there are reports of practices that restrain freedom at work for workers on plantations, such as unfair contracting, the casualization of work, and limited freedom of association.[40] One of the underlying conditions of such practices is palm enterprises' differing interpretations of laws and regulations on employment, especially on plantations. Moreover, the remote location of many plantations and local government autonomy can

smallholders, using a mix of certified and uncertified seeds and only about 50 per cent of recommended fertilizer and pesticide dosage, had the lowest labour requirements ranging from 30 to 40 person days. Some smallholder farms appeared to have higher FTE than plantations primarily because of their location (e.g., peatland), non-contiguous areas, problems with flooding, and general lack of efficiency.

[38] The analysis that follows is based on ILO (2017) and various stakeholder interviews.

[39] Specifically the Forced Labour Convention, 1930 (No. 29); the Abolition of Forced Labour Convention, 1957 (No. 105); the Minimum Age Convention, 1973 (No. 138); and the Worst Forms of Child Labour Convention, 1999 (No. 182).

[40] See, for example, Pye et al. 2016; Li 2017; Pratiwi 2020; Sinaga 2021; and Li and Samedi 2022.

complicate the labour monitoring and evaluation process, which in turn weakens enforcement of labour law compliance.[41] Participants at the tripartite consultation meeting for this study suggested that working conditions are usually worse in areas with the lowest degree of accessibility. Palm oil workers in these remote areas also face the risk of being excluded from coverage by trade unions, business associations, employment officials such as labour inspectors and mediators, and community-based training centres (BLK Komunitas), thereby reducing their capacity to improve working conditions.[42] These conditions portray a structural problem that needs to be faced by the tripartite constituents in the palm oil sector.

In general, for plantations, only permanent workers have a guarantee of decent remuneration, access to appropriate labour protection (including OSH and social security) and access to training (including training in good agricultural practices). Certain managerial positions on the plantation are also subject to certification under Ministry of Manpower requirements.[43] Other plantation workers face precarious working conditions to a varying degree, depending on the company's policy and their employment contract status. The most vulnerable group of plantation workers are the daily casual workers (BHLs), especially those who do not have a direct contract with the company. Labour activists had been adamantly criticizing the casualization practices on plantations. In response to these criticisms there has recently been increasing focus on outsourcing practices to replace the daily casual workers,[44] which makes matters contractually clearer, but still retains the precarious conditions faced by daily casual workers. Nevertheless, an ILO (2017) report found that the certification processes (especially that of the RSPO) improved companies' policies on skilling and labour protection, including for temporary workers.

Table 3. Dominant contractual relationships and dominant gender of operational plantation workers, by task performed

Task	Dominant contractual relationships	Dominant gender
Fertilizer application	Temporary workers Outsourced workers	Female
Pesticide spraying	Temporary workers Outsourced workers	Female
Harvesting	Permanent workers Occasionally temporary workers	Male
FFB collection, loading, and weighing	Permanent workers Assistants/family members hired by workers	Male

FFB = fresh fruit bunch.
Source: ILO 2017, 126.

The precarity of work is also predominant among smallholders. Smallholders are independent workers and mostly operate in the informal economy. A 2017 ILO study concluded that about 60 to 80 per cent of the labour requirements are provided by the farmers themselves and their household members. This practice induces the prevalence of child labour, including in its worst forms, which is still being reported. Workers employed by smallholders are mostly casual workers who are hired seasonally (mostly for harvesting, but also for other maintenance services), and are usually sourced among casual plantation workers who are seeking additional income. Both the smallholders themselves and their workers are generally considered to be in vulnerable employment, often with limited capacity and productivity – with the exception of a small percentage who have enough financing to secure wider land and have access to infrastructure (Li and Samedi 2022). In general, however, smallholders rarely have access to financing and training, and often lack

[41] Statement from the Ministry of Manpower representative during the tripartite consultation meeting.
[42] Statement from workers' representative during tripartite consultation meeting.
[43] Minister of Manpower Regulation No. KEP.124/MEN/V/2011 regulates the national standard on working competencies for palm oil plantation assistant managers and Regulation No. 413 of 2015 for palm plantation managers.
[44] Interviews with trade unions, GAPKI, and PTPN 3.

proper OSH equipment (except for the limited access granted to plasma farmers[45]),[46] and they often rely on the government-subsidized scheme for social security (ILO 2017).

Another line of work related to oil palm plantations is fresh fruit bunch (FFB) traders. FFB agents and collectors cater mainly to independent smallholders and supported smallholders with independent plots. The agents collect the FFBs from the farmers at the farm gate, and then deliver them to a dealer or collector who holds a delivery contract with oil mills. Local agents with delivery contracts may also deliver directly to the mills. FFB traders are not a homogeneous category of actors. They comprise of a wide range of businesses, from formalized medium-sized companies with salaried workers to small or individual businesses operating in the informal economy. Employment patterns follow, with a variety of categories from informal or partially formal independent workers to formalized salaried workers with permanent employment (ILO 2017).

Unlike on the plantations, which are heavily dependent on manual labour, milling is a highly automated process and generates fewer but generally better paying jobs compared to oil palm cultivation. For every hectare of mature plantation, an equivalent of 0.03 full-time jobs is generated at the mill level. Typically, an oil mill employs between 70 and 150 direct workers depending on their capacity (ILO 2017). For example, one milling plant with capacity to produce 60 tonnes of CPO per hour employed 132 operating staff and 71 indirect staff, with the latter consisting of 1 mill manager, 4 assistant managers, 10 administrative staff, 15 human resources staff, 17 processing staff, 20 maintenance staff, and 4 security staff (Hasibuan 2022).

Workers in mills generally have a higher level of educational attainment than plantation workers and are predominantly male. Most are permanent employees who receive higher wages because of the nature of their tasks (some are certified under the Ministry of Manpower requirements).[47] Tasks in the mills are divided into the following work sections: (i) grading area; (ii) loading ramp; (iii) sterilization area; (iv) press area; (v) oil room; (vi) boiler area; and (vii) workshop. Mill workers generally operate in two shifts, with workers assigned to specific work sections based on their competencies. To support the operation, mills usually outsource the cleaning of the premises and equipment to a labour contractor.

The conditions of work for mill workers are generally better than those of plantation workers. Mill workers have better contract arrangements and are entitled to better labour protections. Due to the nature of the milling process, mills are equipped with proper OSH equipment and systems. Mill workers often get better remuneration compared to plantation workers, largely because of their more advanced skill levels. Mill employees, especially those with permanent contracts, are covered by social security (both the BPJS Kesehatan and BPJS-TK schemes[48]). The 2017 ILO survey also documented that several companies provide additional benefits, including free medical care at the plant medical facilities (both for occupational and non-occupational ailments) and pension fund entitlements. Mill workers also have proper access to training (sometimes involving certification), including when new equipment, machinery or methods are being introduced. However, freedom of association needs to be encouraged, as there have been reports that workers (especially those under casual/temporary contracts) are rarely unionized, and the absence of collective bargaining is still quite common.[49]

As in other agriculture and manufacturing industries, the upstream activities in the palm oil value chain are mostly male-dominated. Female workers are employed mainly for maintenance service on the plantation,

[45] Plasma farmers are smallholders that are tied to supply their whole production to palm companies under a certain and binding contract (such as the plasma-nucleus scheme) in which the companies may also provide managerial or operational support/service to the smallholders as part of the contract.

[46] Interview with SPKS and Auriga

[47] The required competencies for workers in the mills, particularly operators of machinery (boilers, engine room), are stipulated in Ministry of Manpower Regulation No. 313 of 2013.

[48] BPJS Kesehatan (Badan Penyelenggara Jaminan Sosial Kesehatan, or the National Social Security Agency for Health) is the government agency that operates Indonesia's public healthcare scheme. BPJS-TK (Badan Penyelenggara Jaminan Sosial Ketenagakerjaan, or National Social Security Agency for Employment) is the government agency that operates Indonesia's social security benefit schemes related to employment.

[49] Interviews with trade unions, Sawit Watch, and companies.

such as fertilizer application and pesticide spraying (see table 3), and for tasks that are perceived as meticulous and requiring less physical labour. However, these roles tend to place women workers in more vulnerable working condition due to the contract types involved and increased risk of exposure to chemical substances. In addition, women are more at risk on losing jobs due to mechanization, which some plantations have started to implement for maintenance and harvesting processes.[50] There are also cases where female workers are replaced by male workers when mechanization is introduced into their workplace because men are perceived as being more skilful with the equipment.[51]

3.2.2. Employment and conditions of work downstream in the value chain

Downstream operations in the palm oil value chain may include the refining of crude palm oil (CPO) and the processing of olein and stearin into specialty fats, cooking oil, oleochemicals and biodiesel. These processes include degumming, bleaching, steam refining and deodorization, and fractionation (Indonesia, BPDPKS 2022). Similar to the milling process, the work in refineries is highly automated, and therefore it is a capital-intensive industry. Unlike plantations and mills, which are widely dispersed, a relatively small number of large corporate groups control Indonesia's oil palm refineries and dominate the export market, with the five largest groups controlling about two-thirds of the total refining capacity and export volume. Data from Trase shows that in 2020, there were 85 refineries owned by 57 companies that are controlled by 25 groups (Pirard et al. 2020).

Using data from the National Statistics on Medium and Large Manufacturing Industry, the UNDP-KIREI's study estimates that in 2020, palm cooking oil manufacture employed around 200,000 workers. The data shows a stable increase in the number of workers over the past five years, showcasing the sector's resilience during the COVID-19 pandemic. Although relatively small compared to the number of workers on the plantations, workers involved in the manufacture of palm cooking oil represent almost 20 per cent of workers in the food and beverages industry and 3.5 per cent of total employment in the manufacturing sector.

Table 4. Number of workers in the manufacturing of palm cooking oil

	2016	2017	2018	2019	2020
Total no. of workers	143 149	189 689	173 999	193 642	205 774
Total share of food and beverage industry employment	11.76%	16.69%	15.83%	17.46%	19.19%
Total share of manufacturing industry employment	2.24%	2.87%	2.84%	3.10%	3.49%

Source:
- Total number of workers is based on data collection and estimation (2016 and 2020 figures) from the UNDP-KIREI Team for System Dynamic Modelling based on national statistics on manufacturing industry.
- The percentages of total workers in the food and beverage and manufacturing industries are based on Indonesia, BPS, n.d.-b.

A refinery with capacity to refine 700–1,000 tonnes of CPO per day may require around 134 workers, which would include 6 managerial positions and 18 operational management positions, with the rest being operational staff ranging from machine operator to cleaning services (Mariati 2007). A case study in a Medan-based refinery under one of the big Indonesian groups documents that the plant's direct personnel needs for each shift were 15 staff for refinery and fractionation operations; while for indirect personnel, the number of workers required were: 10 for utilities, 10 for maintenance, 10 for laboratory work, 20 for security, 5 for stockkeeping, 20 for cleaning, and 50 general staff (Aritonang and Sucini 2020). The plant's operations are divided into three shifts, and the remuneration system is based on the contract type of the worker. The remuneration component includes monthly wages and daily incentives, determined based on the worker's skill, merit and position.

[50] Interviews with companies and trade unions.
[51] Interviews with trade unions.

In general, refineries offer better quality employment compared to the plantations. The workers are employed as either permanent workers or as temporary workers, with the latter mostly in indirect support roles. Refinery workers enjoy guarantees around decent wages, proper labour protection, and freedom of association. Like mills, several positions in the refineries are subject to certification under Ministry of Manpower regulations.[52] The economic scale and capacity of the refineries also enable them to attract skilled workers. Companies provide access to training and career development, including when they introduce new machinery, technology or approaches/systems.

Moreover, since most of the refineries in Indonesia are affiliated with a major palm oil group that supplies both the domestic and international markets, most also adhere to sustainability practices, including ISPO, RSPO, and the ZDCs. These pledges also cover criteria that ensure decent working conditions. With the growing pressure for sustainable palm oil, some major refineries[53] and fast moving consumer goods producers (FMCGs)[54] have initiated programmes to ensure human and labour rights in their palm oil supply chain as part of their environmental, social and governance (ESG) principles – which are often tied with traceability efforts under the ZDCs – and through market based collaborative programmes.[55] The oligopolistic market structure of the refineries provides them with enough market power to encourage their suppliers to also adhere to certain requirements and standards, and thereby provide an avenue to promote sustainable practices along the length of the supply chain.

[52] The required competencies for workers in the palm cooking oil refineries, particularly for administrator for quality assurance and operators of machinery (boilers, engine room), are stipulated in Ministry of Manpower Regulation No. 392 of 2014.

[53] For example, Golden Agri Group/GAR, Wilmar's Strengthening Labour Practices Progress Reports and Human Rights Framework, and Musim Mas.

[54] For example: Nestle, Unilever, and Cargill.

[55] For example, the Decent Rural Living Initiative supported by Cargill, Golden-Agri-Resources, Musim Mas, Sime Darby Plantation and Wilmar in 2019.

4

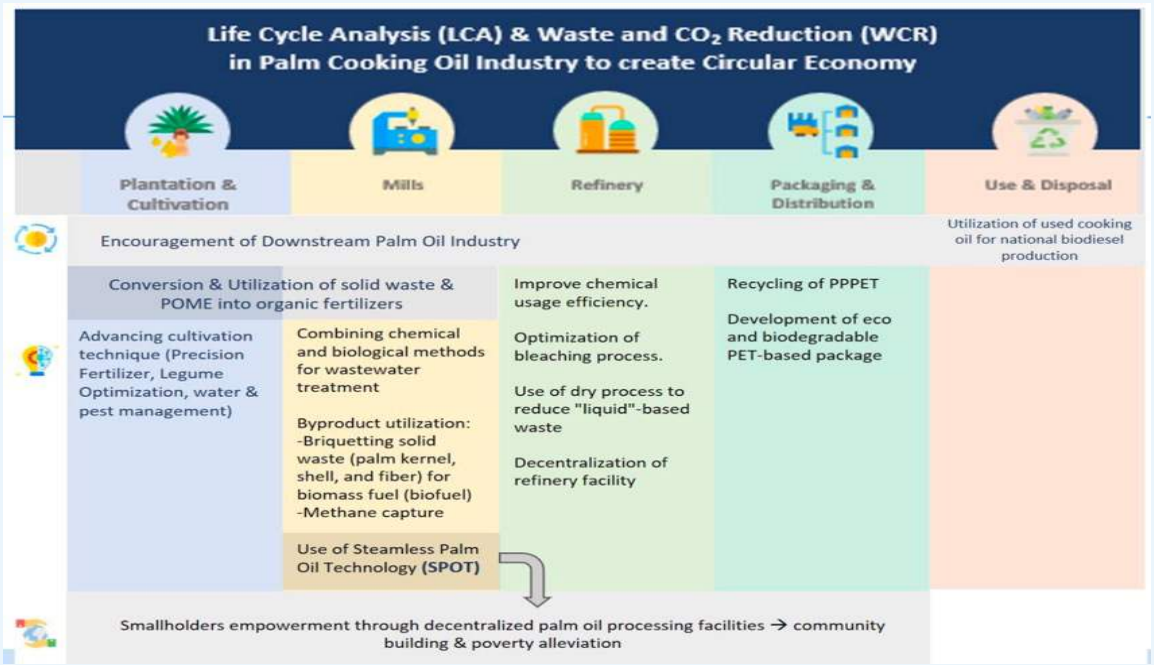
GREEN JOBS POTENTIAL FROM CIRCULARITY IN THE PALM COOKING OIL VALUE CHAIN

4. GREEN JOBS POTENTIAL FROM CIRCULARITY IN THE PALM COOKING OIL VALUE CHAIN

4.1. Trends of the circularity strategy in the palm cooking oil supply chain

Circularity is not a novel practice in the agriculture sector, including for the palm oil industry. The interviews conducted for this assessment confirm that a variety of circular strategies have been implemented in the industry to varying degrees depending on the organization's capacity, types of resources, access to technology and skills, and operational strategy. The WCR-LCA study conducted by the UNDP identified the potential for circular strategies along the value chain from palm cultivation to cooking oil use and disposal, as pictured in figure 5. This section identifies the circularity trends being practiced by the industry, which includes the strategies, innovations and related actors.

Figure 5. Circularity potential in the palm cooking oil value chain

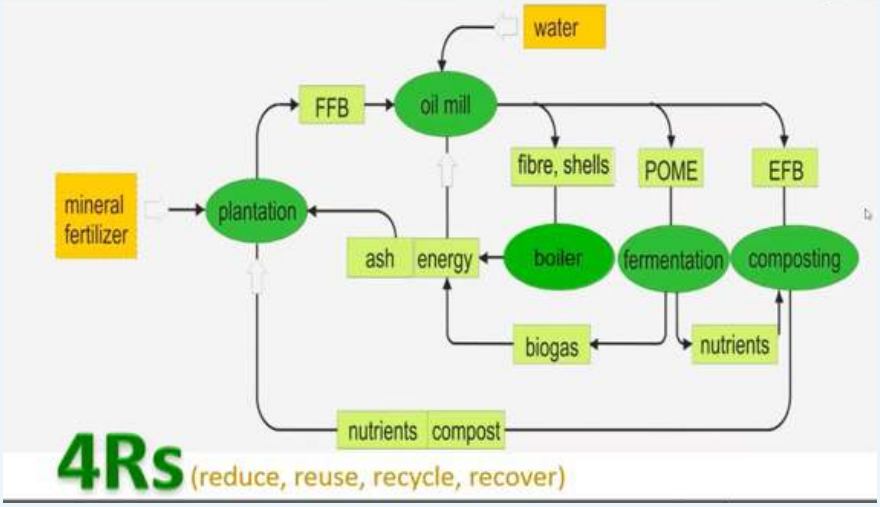


Source: UNDP, forthcoming-a.

4.1.1. Plantations and mills

Waste management by processing waste and utilizing by-products produced from the cultivation and milling processes is the most common form of circularity currently applied in the upstream portion of the palm oil value chain. These practices are mostly implemented by palm estates, especially those with integrated farm-to-mill operations. Interviews with large companies who own or control plantations and mills within the same proximity confirm that their farm-to-mill business processes are almost fully circular. Nevertheless, smaller estates also implement circularity, albeit with simpler technology. The initiatives are mostly based on self-reliance and aimed at optimizing costs. To this end, circular waste management processes are self-managed and the results are for self-use by the estate/mill unless there are greater economic advantages to be derived from transferring the waste products elsewhere (such as trading palm fruit shells because they offer better economic value than the energy savings earned by using the shells to cofire boilers).

Figure 6. Common integrated palm plantation-to-mill circular strategy



Source: Interviews with Palm Estates and GAPKI.

However, smallholders often face hindrances to applying circular economy principles. They have limited access to the knowledge, technology and capital needed to initiate a shift towards circularity, which only allows them to adopt the simplest strategies, such as direct land application of fronds, sapping and intercropping. Sometimes, smallholders can acquire empty fruit bunches (EFBs) or palm oil mill effluent (POME) from the mills to which they supply their palm fruit (especially for tied smallholders and mills that does not own a plantation), but companies engaged in milling generally prefer to prioritize their own plantations, since the waste produced cannot cover all of their own needs, much less the needs of other plantations. For strategies such as sapping or intercropping, smallholders sometimes cooperate with other farmers due to lack of skills, capital and market access. These conditions reflect the opportunity loss for smallholders to reduce the cost of production and environmental impacts, as well as to solve their ongoing problem on securing a supply of fertilizer.

The choice of circular strategy upstream in the value chain is also correlated with the ability of the actors to innovate. Companies with more resources, specifically those that have dedicated functions for research and development (R&D), often come up with more options and innovations in integrating circularity. These options and innovations include those that require capital investment and the introduction of new core technology, such as utilizing POME for power generation, refining cultivation techniques, and introducing mechanization for plantation maintenance tasks. Prior to the implementation of circular practices, these companies usually ensure that the change in the business process is standardized and will be incremental in nature. Therefore, it is likely that circularity shifts will take some time from initial implementation to when the shift can be brought to a substantial scale. This transition may involve changes in the company's operational procedures and organizational structure,[56] and in some cases may lead to the establishment of new business lines or business units.[57] When a shift is proven to be successful, the implementation can also go beyond the initiating enterprise and spread industrywide through the sharing of best practices (often mediated by business associations such as Indonesian Palm Oil Association/GAPKI), which demonstrates the somewhat top–down flow of innovations in the industry.

Nevertheless, a reverse flow also exists. Medium companies with limited capacity to start innovations can also be open to change and collaboration. The study found a medium-size palm estate in Riau that is

[56] For example, designation of the unit responsible for coordinating and implementing the circular strategy, such as organic fertilization or cattle supervision.

[57] For example, PT DSN established a subsidiary on renewable energy that is responsible for biogas production from POME and shell supply for power plant operated by its partners (DSN Group 2020). PTPN 3 during interview stated that the company has signed contract to supply energy that they produce from palm waste.

currently co-piloting an intercropping method on their plantation. Intercropping – or the practice of growing two or more crops in close proximity – is quite a common practice among smallholders, but not among palm estates due to their standardization and quality control processes.[58] The intercropping pilot on the palm estate in Riau is a collaboration with a tech-based agriculture start-up, and is an example of sharing economy, wherein the palm company acts as the landowner, the agro-tech company acts as the operator for the intercropping process, and both are supported by international and local universities' research centres that provide technical advice and monitor the process.[59] To implement the intercropping, the agro-tech company cooperates with local farmers, who are contracted throughout the intercropping period to cultivate the land. Previously, the same company also initiated the Integrated System of Cattle and Oil Palm (Sistem Integrasi Sapi dan Kelapa Sawit, or SISKA) in 1993, which introduced cattle farming into palm cultivation process to assist the harvesting process while providing additional income to the workers.[60] The initiative was perceived as successful and has been adopted nationally as part of government policy.[61]

Aside from innovations that cater to the needs of current actors, there is an emerging initiative to develop small-scale mills using steamless palm oil technology (SPOT), which is claimed to be more efficient and environmentally friendly (*Warta Ekonomi* 2022). This initiative is expected to enable the decentralization of palm oil facilities by bringing mills closer to the plantations (UNDP, forthcoming-a), thereby improving productivity by reducing the likelihood of fresh fruit bunches (FFBs) spoiling and reducing transporting cost. Currently, a newly established company working in collaboration with the University of Indonesia is exploring the feasibility of developing this business model (*Antara News* 2022a). While the initiative may ultimately benefit smallholders, for it to be scaled up it would need to address adjacent problems, such as the lack of infrastructure around smallholder plantations and their low bargaining power, since the price of CPO is determined by downstream players in the industry.[62] This initiative will also need an accompanying effort to improve smallholders' productivity to reduce the risk of new land clearance.

4.1.2. Refineries and packaging

Within the refining process, the circularity strategies identified by the LCA-WCR analysis (see figure 5) mostly involve changes in the technology or mechanism used to process CPO into palm cooking oil. Data from the Indonesian Vegetable Oil Association (GIMNI) states that some of their members – especially top refinery groups – have been implementing strategies such as dry fractionation, the use of chemicals for refining, and oil modification.[63] These mechanisms are believed to be more efficient and can improve the quality of the product. In addition, SPOT can be implemented for refinery processes. The technology allows palm extraction through pasteurization, which eliminates the need for the bleaching process. It also enables the development of refinery plants around the plantation without the requirement to be near a water source (such as river), like with conventional technology – allowing for the decentralization of refinery facilities (Elizabeth 2023). Nevertheless, the implementation of SPOT for palm cooking oil processing is still limited, so it is not yet possible to comprehend its full potential.

A recent regulation change that excludes spent bleached earth (SBE) – solid waste from the process of refining palm cooking oil – from the list of hazardous waste products also provides an opportunity for circularity (GIMNI 2021). SBE can be processed to produce recovered oil (R-oil) and de-oiled bleaching earth (DOBE), which have potential as export commodities. With the current production capacity of national refineries, GIMNI estimates that Indonesia will need 17 SBE processing facilities. However, in the past five years, only two of the three available facilities have been operating (PAPSI 2023). In addition, the decision to

[58] Interviews with Agricinal, Acronesia, and Bumitama.

[59] Interviews with PT Agricinal and PT Arconesia, and a press release from Universitas Bengkulu (2022).

[60] Interview with PT Agricinal. A brief profile of the programme is also available at: https://aim2flourish.com/innovations/integrated-cattle-in-the-oil-plantation.

[61] The Government formally promoted the initiatives as national programme through the provisions of Ministry of Agriculture Regulation No. 105 of 2014.

[62] Interviews with GAPKI, AURIGA, and SPKS.

[63] See GIMNI's website, available at: https://gimni.org/services/.

remove SBE from the list of hazardous waste has not been without criticism; environmental non-governmental organizations (NGOs) are concerned that this will enable refineries to avoid treating hazardous waste and thereby endanger the surrounding community and environment (*BBC News Indonesia* 2021).

The packaging process is one of the areas in which circularity can contribute significantly to reducing the environmental impacts of the palm cooking oil industry. Indonesia is the world's biggest consumer of palm cooking oil (*Index Mundi*, n.d.), and consumption per capita kept increasing steadily over the past five years (Rizal 2022). The Ministry of Trade estimates that around 26 per cent of the domestically traded palm cooking oil is packaged (Jelita 2022). In general, plastic (such as PVC, PET, PP or PE) is the most common material used for cooking oil packaging. Without mitigation and adaptation measures, this can pose environmental risk, as plastics constituted 18.9 per cent of total waste in Indonesia in 2022 (SIPSN, n.d.) and most of it comes from households, including palm oil packaging.

To tackle the issue of packaging waste, companies are trying to adopt certain strategies to reduce environmental risks, including through circularity. For example, PT SMART Tbk (a member of the Golden Agri-Resources Group) has been conducting sustainable packaging research in their downstream R&D department. They continuously innovate in redesigning their packaging to reduce raw materials and optimize distribution volume (Wassell 2017). Currently, their R&D focus is on improving the recyclability of packaging materials, especially for pouches (GAR 2022). Some companies introduced a circular strategy as part of their sustainability programmes. PT IndoAgri (part of the Indofood Group) stated in their sustainability report that they are actively engaging their suppliers to use completely recyclable packaging, fully adhering to the Indonesian policy on Extended Producer Responsibility, and are planning to phase out bagged oil (IndoAgri 2022). Another company implementing circularity for packaging in their operational strategy is the BKP Group, which has switched their bottle packaging to recyclable PET plastic and planning to use recycled materials for their palm cooking oil products, is supporting waste management programmes in collaboration with a recycling company, and is supporting community-based waste collectors (Prasetyo 2022).

4.1.3. Post-consumption (use and disposal)

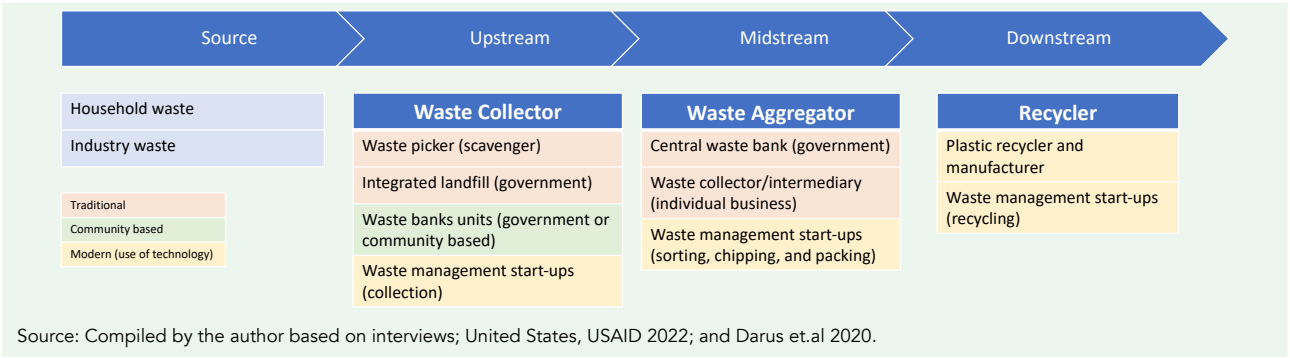
The increased use of recyclable packaging for palm cooking oil can benefit the recycling industry. Estimates shows that the current recycling rate in Indonesia is only at 7 per cent, with 75 per cent of recycling being PET plastics. Given the limited supply of recyclables from domestic waste collection and virgin plastic production, domestic plastic manufacturers need to import around 750,000 tonnes of material annually (Putra 2023), signalling significant opportunity for the plastic recycling industry. The recycling industry is dominated by small-to-medium players, accounting for around 1,590 businesses that employed approximately 177,000 people in 2019.[64] The formal sector within the recycling industry consists of municipal agencies and formal businesses such as waste banks and waste management start-ups; whereas the informal sector consists of individuals, groups and small businesses engaging in activities that are not registered and are not formally regulated. In an interview with a PET plastic recycling company, the respondents said that the industry began to grow rapidly in 2017, in part due to increased campaigning concerning environmental danger from plastic waste. There were numbers of waste management start-ups established around this time, as well as community-based waste collection initiatives.

In general, the industry ecology of plastic recycling in Indonesia is divided into three lines: (i) upstream (waste collectors); (ii) midstream (waste aggregators and intermediaries); and (iii) downstream (the plastic recycling industry). The upstream and midstream processes are still mostly within the realm of the informal economy, namely the waste pickers and individual waste collection businesses (ranging from small- to large-scale aggregators), which depend mostly on manual labour (Darus et al. 2020). The recent rise of waste management start-ups is, however, showcasing a move towards modernization in the business model, where technology and social innovations have been introduced into business processes as a result of social campaigns aimed at triggering behavioural change. This move towards modernization can be seen

[64] See Putri, Fujimori, and Takaoka 2018, and United States, USAID 2022.

in the growing use of innovative business models, the use of IT-based systems and applications for waste tracking and collection, as well as increased mechanization of processing (mostly through the use of simple technologies). Most of the start-ups focus on certain chains and processes, but some of them operate as an integrated business. The conventional recycling companies are mostly plastic manufacturing companies. They process plastics from various sources, including unprocessed plastic waste, recycled plastics from midstream companies (usually in the form of flakes or bulk), or virgin plastics from chemical companies. The most common technologies used for recycling involve mechanical processes, especially among small to medium companies (United States, USAID 2022).

Figure 7. Overview of plastic recycling industry's value chain in Indonesia



Source: Compiled by the author based on interviews; United States, USAID 2022; and Darus et.al 2020.

The plastic recycling industry in Indonesia is currently hindered by the limited amounts of qualified supply from upstream in the value chain, as well as limitations concerning the available technology in downstream components of the value chain.[65] The lack of proper waste segregation, especially at the household level, has made the input quality substandard, as plastic waste is often highly contaminated and requires extra efforts in order to process it. Contamination leads to an unstable supply of recyclable plastic waste, and is identified as the main obstacle to sustainability for waste management companies.[66] Concerning the downstream stages, most of the recycling companies currently operating in Indonesia only process rigid plastics (mostly PET, PP and HDPE) (United States, USAID 2022). Given this condition, promoting the palm cooking oil industry to switch its packaging to PET plastic can contribute to the growth of the recycling industry. However, this needs to be accompanied with support to enable behavioural changes and/or mechanisms that can improve the waste quality from the source in addition to improving collection management.

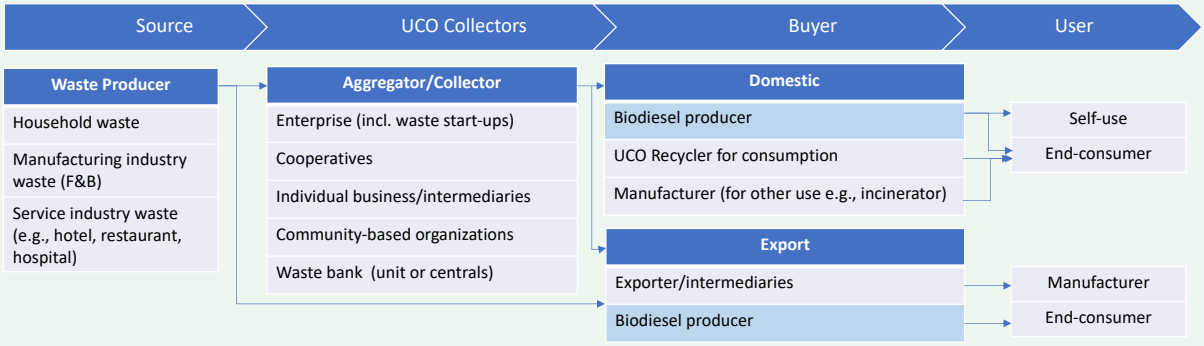
Another opportunity in the post-consumption portion of the palm oil value chain comes from the recycling of used cooking oil (UCO) for biodiesel. A recent study by National Team for the Acceleration of Poverty Reduction (TNP2K) and Traction Energy shows that in 2019, only 18.5 per cent of the total UCO from domestic consumption was collected. From this amount, around 75 per cent was recycled for consumption, 17 per cent was domestically converted into biodiesel and other manufacturing products, and the remainder was exported, mostly for biodiesel (Indonesia, TNP2K 2020). Similar to plastic recycling, the challenges involved in converting UCO into biodiesel come from the collection and the manufacturing processes. During the collection stage, the absence of a proper collection mechanism for UCO was identified as the cause of low conversion rates (Indonesia, MEMR 2020). On the manufacturing side, technological limitations also hamper the capacity of domestic biodiesel producers.[67]

[65] For examples, see Darus et.al (2020) and United States, USAID (2022).

[66] Interview with plastic recycling start-ups.

[67] In 2021, the Ministry of Energy and Mineral Resources identified that there were only two enterprises currently focusing on recycling used cooking oil for biodiesel (Indonesia, MEMR 2021).

Figure 8. Overview of palm UCO value chain in Indonesia



Source: Compiled by the author based on interviews; Perdana 2021; and Indonesia, TNP2K 2020.

Although the rate of UCO collection is still below the optimum capacity, awareness of its economic value is gaining traction. Currently, a variety of actors are involved in the UCO collection process, spanning formal and informal sector operators, and varying by organization type, size and characteristics. The formal sector players are also more diverse, as they include government entities, enterprises, cooperatives and social foundations. Nevertheless, there are also informal actors such as individual business and community-based groups that often partner with formal actors. In general, the transaction modes of these UCO collections are executed via trade, waste banks and charity (Syahni 2021).

The use of a circular strategy upstream in the value chain typically introduces social innovations that enable organized collection mechanisms. Examples of this strategy include community-based activism through environmental, economic and religious campaigns.[68] This is often accompanied by innovative partnerships between these organizations and local governments (such as villages and municipalities),[69] private enterprises or development partners.[70] Through this business model, circular strategies have allowed for economic value and job creation in waste collection, albeit at a small scale. Although some of the jobs created by circularity do not provide full employment, the initiatives have contributed to formalization of the economy by encouraging new formal entities establishment such as village-owned enterprises (or BUMDes[71]), cooperatives and small businesses. There are also examples of technological innovation within this chain, such as those introduced by waste management start-ups that incorporate IT-based systems to aid in the collection of household and industry waste – including UCO. These start-ups primarily act as platform providers, facilitators and collectors.[72]

Limited access to local producers and premium prices are the key reasons motivating UCO export. A UCO collector interviewed for this assessment said that their organization does not have access to local biodiesel producers and therefore depends fully on export. While profitable, this makes their business model vulnerable to trade regulation changes, such as export bans.[73] At the other end, most of the well documented biodiesel converters are operating under integrated business models (that is, covering the entire process from collection to conversion).[74] Often, they also create industry symbiosis through which they initiate strategic partnership with relevant entities that have access to:

[68] For example, the Tersenyum Program from Rumah Sosial Kutub, which uses environmental and charity and religious campaigns, and KSM Tarakan Timur, which uses environmental and local economy campaigns.

[69] For example, the Tersenyum Program is supported by Jakarta Provincial Government; Rumah Harum Waste Bank is supported by Depok Municipality.

[70] The KSM Tarakan Timur was supported initially by Pertamina Group's CSR, just like the Tersenyum Program was supported by PLN's CSR; while PT Bali Hijau Lestari was established as a partnership between the Government of the City of Denpasar, CARITAS Switzerland, Foundation myclimate, and Kuoni (Kumara et al. 2016).

[71] BUMDes is an abbreviation for Badan Usaha Milik Desa, or village-owned enterprises.

[72] Examples of integrated IT-based waste management start-ups that also collects UCO are Rekosistem and Jangjo.

[73] Interview with Rumah Sosial Kutub.

[74] For example, PT Bali Hijau Lestari Biodiesel and PT Beli Jelantah.

- suppliers (for example, cooperation with BUMDes and food and beverage industries);
- transportation services (for example, a strategic partnership with an online transportation platform); and
- buyers (for example, sale and purchase agreements with enterprises).

In addition, enterprise-led initiatives are also emerging, wherein companies use the recycled product for their own needs (examples include: Cargill, Adaro, Danone-Aqua, and Unilever Indonesia) (Indonesia, TNP2K 2020). However, some companies have decided to reduce their use of UCO-based biodiesel due to need and cost considerations.[75] One of the possible causes of this trend is price competition, in which the rising UCO market for biodiesel, including for export, has driven up the domestic conversion cost.[76]

4.2. Labour market impact from circularity in the palm cooking oil supply chain

4.2.1. Changes in jobs

The introduction of circular strategies into the palm oil sector has brought changes in how work is organized within related business processes. These changes range from transformation of current functions to the establishment of new functions, depending on the innovations that were introduced. The changes resulting from increased use of circular practices can take place within current estates/actors in the value chain or lead to new actors being established, depending on the business models involved. Table 5 summarizes the relation between the circular initiatives identified above and how they can affect jobs in the palm cooking oil value chain.

Table 5. Anticipated changes in jobs due to increased use of circular strategies in the palm cooking oil value chain

Strategy	Initiatives	Innovation	Incurred circular processes	Changes in current functions	Establishment of new functions
Plantations and milling					
Recovery (R9)	Incineration of by-products for energy (briquetting solid waste for cofiring)	Core technology; Product design	• Product design • Waste processing • Machinery operation	• R&D • Waste management • Boiler operator	n/a
		Revenue model	Trading by-products for bioenergy	n/a	Sales and marketing
Repurpose (R7)	Methane capture from POME for biogas	Core technology; Product design	• Product design • Waste processing • Machinery operation	• R&D • Waste management	Biogas plant operation
Repurpose (R7)	Utilize by-products for other products (helmets from fibres, furniture from trunks)	Core technology; Product design	• Material and product design and development • Product development • Product marketing	R&D	• Business development • Product manufacturing • Sales and marketing
Reuse (R3)	Utilize by-products for biofertilizer (EFB, shells, fibres, POME)	Product design; Core technology	• Circular product design • Biofertilizer production • Biofertilizer application	• R&D • Plantation maintenance • Plantation management	n/a

[75] For example, currently Adaro only converts UCO from their owned consumption and does not purchase additional UCO from the supplier to reduce cost (*Antara News* 2022b). The state-owned logistics enterprise PT BGR, which previously cooperated with Jakarta Provincial Government and Surabaya Technological Institute (ITS) to convert UCO into biogas for fueling their fleets (Sulistiyono 2021), confirmed to the writer that they no longer continuing the plan due to diminishing economic feasibility of the programme.

[76] See, for example, Kumara et al. 2016 and Prabasena 2016.

Strategy	Initiatives	Innovation	Incurred circular processes	Changes in current functions	Establishment of new functions
Reduce (R2)	Advancing cultivation techniques • Optimizing legumes • Precision fertilizer • Water and pest management	Product design; Core technology	• Material and methodology design and development. • Implementation of new techniques	• R&D • Plantation maintenance • Plantation management	n/a
Rethink (R1)	Development of small-scale SPOT milling facilities	Core technology; Socio-institution	• Business development • Construction • Business management • Facilities operation • Sales and marketing	n/a	• SPOT milling architecture and construction • Business management • SPOT milling operator
Refineries and packaging					
Reduce (R2)	Optimizing refinery process • Improve chemical usage efficiency • Optimized bleaching process • Dry fractionation	Product design	• Material and methodology design and development. • Implementation of new technique	• R&D • Plant/refinery operator	n/a
Rethink (R1)	Development of small-scale SPOT refineries	Core technology; Socio-institution	• Business development • Construction • Business management • Facilities operation • Sales and marketing	n/a	• SPOT refineries architecture and construction • Business management • Plant/refinery operator
Reduce (R2)	Innovative packaging • Packaging redesign (to improve efficiency and reduce material usage) • Use of recyclable material (PET plastic)	Product design	• Material design • Product design and production • Recycled material supply chain management	• R&D • Supply chain management • Packaging production	n/a
Repurpose (R7)	Converting spent bleached earth (SBE) into to recovered oil (R-oil) and de-oiled bleaching earth (DOBE)	Core technology; Product design	• Product design • Waste processing • Sales and marketing	• R&D • Waste management	• SBE facilities operation • Sales and marketing of R-oil and DOBE
Post-consumption					
Recycling (R8)	Recycling PET packaging	Core technology; Product design; Socio-institution	• Waste management • Waste collecting • Plastic recycling • Supply chain management	• R&D • Waste picker/ collector • Waste aggregator • Waste management • Plastic recycling	• Business development and partnership • IT system development • Plastic use and disposal educator/ campaigner • Plastic supply chain management
Repurpose (R7)	Converting UCO to Biodiesel	Core technology; Product design; Socio-institution	• Waste management • Waste collecting • Biodiesel manufacturer • Sales and marketing	• R&D • Waste aggregator • Waste management • Biodiesel converter	• Business development and partnership • IT system development • UCO disposal educator/ campaigner • UCO supply chain management

Strategy	Initiatives	Innovation	Incurred circular processes	Changes in current functions	Establishment of new functions
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Recycling (R8)	Recycling PET packaging	Core technology; Product design; Socio-institution	• Waste management • Waste collecting • Plastic recycling • Supply chain management	• R&D • Waste picker/ collector • Waste aggregator • Waste management • Plastic recycling	• Business development and partnership • IT system development • Plastic use and disposal educator/ campaigner • Plastic supply chain management
Repurpose (R7)	Converting UCO to Biodiesel	Core technology; Product design; Socio-institution	• Waste management • Waste collecting • Biodiesel manufacturer • Sales and marketing	• R&D • Waste aggregator • Waste management • Biodiesel converter	• Business development and partnership • IT system development • UCO disposal educator/ campaigner • UCO supply chain management

Legend:
Blue = Direct core jobs;
Red = Direct enabling jobs.

n/a = not applicable.

Circular strategies not only change jobs directly related to the business processes in question, but also affect jobs within the sector that provide services that enable the implementation of these circular strategies. These indirect functions include public services (mostly related to sanitation, waste management, and R&D), information services providers (especially for IT-based strategies), logistics services, and knowledge-intensive business services (providers of researchers and trainers).

4.2.2. Green jobs potential

The impact of circularity on jobs creates opportunities for green jobs creation. Green jobs from circularity can come from greening current occupations or through the creation of new jobs. This change can take place through distinct job impact scenarios related to the introduction of circularity (see table 6), or through a combination of impact scenarios.

Table 6. Employment impacts anticipated as a result of circularity in the palm cooking oil industry

Employment impact	Description
Job creation	Circularity will increase the demand for workers in some elements of the value chain, generating new employment. For example, methane capture from POME activity requires biogas plant operators in the milling facilities, and the digitalization of waste management requires ICT system designers, analysts and developers.
Job substitution	Some employment opportunities will shift from companies and sectors that are associated with linear models to the circular model. This usually can be seen when there are new sharing economy platforms and new business models. For example, the intercropping cooperation between plantations and farmers moves the individual farmers from traditional farming into an organized model facilitated by agro-tech start-ups.
Job elimination	Circularity will eliminate certain jobs where no direct replacements are available. This can happen when circularity is implemented via automatization, which not only eliminates certain tasks but also the jobs associated with those tasks, as they are being replaced by machinery. For example, when a plantation starts to mechanize the fertilizing process, this will reduce the number of workers significantly, or when digitalized waste collection is implemented on a mass scale, this will reduce the opportunities of manual waste pickers.

Employment impact	Description
Job transformation and redefinition	Circularity can transform or redefine existing jobs. This is the most common pattern observed in the palm cooking oil industry, especially in plantations, mills and refineries. The use of solid and water waste as biofertilizer changes the process and method for waste treatment in production plants and for fertilizing on plantations, transforming the jobs of plant workers and plantation maintenance workers. This type of change will require new skills and the retraining of affected workers. A job transformation happens when the activities related to circular work have been adopted into the business process. In common practice, at the enterprise level this happens when such activities are adopted into standard operating procedures (SOPs) or established as the standardized process. In the informal economy, such as among smallholders, this can be seen when the activity became the common norm.

4.2.2.1. Plantations and mills

Upstream in the value chain, the transition towards circularity has started and generally proceeded gradually, and is mostly motivated by cost optimization. On plantations, material and labour are the two most significant costs; therefore, the introduced circular economy strategies are aimed at reducing material cost and –to the extent possible – not increasing labour costs. The circular innovations on plantations have mostly been implemented by changing product design and core technology. However, the most common employment impact is job transformation, as substituting workers is likely more costly. Moreover, plantation operations are mostly driven by manual labour – especially within maintenance processes, where most of the circularities are being implemented – and therefore only require simple technology and basic retraining. In some instances, circularity may require the use of high-skilled workers, especially in the planning and design process, but as enterprises engage in circular economy as a strategy, work linked to circularity tends to be embedded in existing functions, such as in the R&D, sustainability or business development units.

Nevertheless, when changes are significant, there are cases in which plantations create new positions – and hence, new jobs – although they tend to be limited in number and mostly targeted towards high-skilled labour at the mid-operational management level.[77] These positions can be filled through either reorganization (job substitution) or recruitment, depending on the urgency and the company's strategy. This pattern also persists in mills, with most of the available initiatives introducing innovations in the core technology and product design that only require retraining of existing workers to adjust with the changes in their tasks. Job creation in mills occurs when the initiatives involve an investment in new facilities – such as with new biogas facilities that use methane captured from POME – or when the circular strategy leads to new business or revenue stream opportunities.[78] Nevertheless, the number of jobs created is usually small, since circular strategies of this sort are often capital intensive and driven by the use of advanced technology,[79] and the production capacity tends to be limited and prioritized for self-use.[80] There is also great potential to green the jobs of smallholders, but there are also substantial structural obstacles that inhibit these smallholders from adopting circularity and improving their working conditions.

Job creation potential comes from those initiatives that allow for a broader range of socio-technical innovations. Examples can be seen on plantations in instances of share economy (such as intercropping

[77] For example, PT Bumitama creates biofertilizer functions as mid-management job that responsible to coordinate, oversees, reports and ensure the quality of bio fertilizing process – mostly using the product from circular process. Similarly, PT Agricinal set-up cattle supervisor unit for their SISKA initiative.

[78] Such as the case of PTPN III that had signed a memorandum of understanding to supply their electricity from POME's methane capture to some manufacturers in Special Economic Zone Sei Mangkei (based on interview with BOD) or PT DSN that set up a subsidiary for renewable energy, mostly derived from palm circularity.

[79] During the interview, representative from PTPN 3 and PTPN 5 confirmed that for their 700kw biogas plant, they only require 3-4 personnel for operation.

[80] PT DSN utilizes the energy produced from their BioCNG plant to supply their own facilities. In 2021 it only amounted to 0.3 per cent of energy consumption, however almost 96 per cent of their energy was sourced from kernel shells and fiber – see DSN Group (2022).

or integrated cattle and palm) or in the decentralization of milling through SPOT utilization. These initiatives involved new business actors (often new entities) and new business models that will require labour supply and therefore create employment, especially from the local population and including younger workers (and often promoted using ICT and social campaigns). However, these types of initiatives also face limitations in capacity and ongoing sustainability risks. Many new business ventures are also characterized by vulnerable employment, as they often use either informal or non-full-time employment (that is, part-time or on-call work).[81]

4.2.2.2. Refineries and packaging

The employment characteristics and circular innovations applied in the refineries share the same pattern as that found in the palm mills. In the refineries, work is highly mechanized, and the circular economy strategies are implemented through changes in product design, core equipment and machinery technology. In many cases, these initiatives are sustained by continuous in-house research and development, as many refineries, especially major groups, have a dedicated R&D unit. In the case of refineries, increased circularity will mostly transform existing jobs, both within product manufacturing operations and in the supporting functions, such as R&D, business development and sustainability. Like the mills, job creation will occur when the refineries develop new facilities to support their circular strategy, such as the development and operation of SBE processing facilities.

The initiatives aiming to develop small-scale SPOT refineries may open opportunities for job creation in the manufacturing sector within rural areas where palm plantations operate. As the scale of these refineries is much smaller compared to the existing refineries, it may be the case that conditions of work in this business model will be suboptimal compared to the established and large-scale refineries.

4.2.2.3. Use and disposal

A broader opportunity for job creation and substitution is available in the post-consumption elements of the palm oil value chain. The circular strategies within this stage employ a wide range of socio-technical innovations, mostly revolving around PET plastics and UCO recycling. The range of the applied technology also varies greatly: recycling processes use simple technology and mechanical and/or chemical processes, while the use of ICT-based technology is increasing with the rise of waste management start-ups. This ICT technology is used mostly for facilitating waste collection, monitoring supply chains, and facilitating behavioural change. While the waste management sector is still heavily dependent on the informal economy, especially for waste collection, the increasing recycling trend has also induced the establishment of new business entities in the form of enterprises, cooperatives, individual business, and other legally recognized business entities (see section 4.1.3 above). This trend in turn promotes formalization in the sector, albeit mostly at a small scale due to limited capacity. This creates employment, which in some cases involves job substitution wherein previously informal workers have filled formal roles in newly established entities.

Nevertheless, the waste management sector still faces large challenges in achieving decent work. Due to their limited capacity, waste management and recycling start-ups tend to keep labour costs low by minimizing permanent employees while maximizing the use of temporary employment contracts for their supporting functions (and sometimes for core functions, such as system development) and the use of part-time workers for their non-managerial operational workers (sometimes paid using piece rates).[82] Most permanent and temporary/contract workers in these start-ups receive remuneration

[81] In an interview with the agribusiness start-ups, Acronesia, that had been pioneering intercropping for palm plantation, it is stated that their company employs only limited fulltime workers (mostly Board of Directors and Key Management and Operational function) and hire part-time worker for the supporting role (such as administrative and financial support), project-based worker for their operational agriculturist, and project based or business partner (through revenue sharing model) for the farmers.

[82] A PET plastic recycling company that was interviewed who currently operates in four area said that they employ 5 permanent workers in the head quarter (for managerial tasks), and 12 workers for each operational location in which one is assigned as area manager

that meets minimum wage regulations and have access to social protection (both BPJS-TK and BPJS Kesehatan). They also have the access to training, especially when the enterprise is starting to implement new technology or expand the business. However, labour unions and collective bargaining are very rare. By contrast, part-time workers in these enterprises rarely enjoy these rights at work, and although companies say that their wages are based on regulations, the prevalence of part-time and casual work means that many workers in these enterprises rarely achieve subsistence wages.[83]

Based on the above, the green jobs opportunities from circularity in the palm cooking oil chain have be summarized in table 7 below. This mapping only considers formal enterprises, since businesses in the informal economy generally do not meet decent work principles and therefore cannot be classified as providing green jobs. Table 7 applies the "shades of green" approach, which offers a visualization of green jobs potential by categorizing jobs into a green colour spectrum based on work decency and environmental friendliness. The darker the shade of green, the higher the degree of work decency and circularity. For a full explanation of the shades of green visualization approach, see Annex I of this report.

Table 7. Mapping green jobs opportunities from circularity in the palm oil supply chain

Circular economy strategy	Circular economy initiatives	Work decency likelihood*	Job impact type	Shade of green
Plantations and mills (upstream)				
Recovery (R9)	Incineration of by-products for energy (briquetting solid waste for co-firing)	Above minimum national standard	Job transformation or creation	Medium
Repurpose (R7)	Methane capture from POME for biogas	Above minimum national standard	Job creation or substitution	Medium
Repurpose (R7)	Utilize by-products for other products (helmets from fibres, furniture from trunks)	Above minimum national standard	Job transformation	Medium
Reuse (R3)	Utilize by-products for biofertilizer (EFB, shells, fibre, POME)	Meeting minimum national standard	Job transformation	Medium
Reduce (R2)	Advancing cultivation technique • Optimizing legumes • Precision fertilizers • Water and pest management	Meeting minimum national standard*	Job transformation	Medium
Reduce (R2)	Development of small-scale SPOT milling facilities	Meeting minimum national standard	Job creation or substitution	Medium
Rethink (R1)	Share economy in the plantation: • Intercropping • Cattle–palm farming	Meeting minimum national standard*	Job creation or substitution	Medium
Refineries and packaging (downstream)				
Reduce (R2)	Optimizing refinery process • Improve chemical usage efficiency • Optimized bleaching process • Dry fractionation	Above minimum national standard	Job transformation	Dark
Reduce (R2)	Development of small-scale SPOT refineries	Meeting minimum national standard	Job creation or substitution	Medium

(temporary contract) and the rest are operational staff (part time with wages based on volume/piecemeal). An organization that collects and supplies UCO for export and currently operates in 3 cities confirmed that they employed 12 full time workers, 8 of them are permanent (management and core staff position) while the rest are contract/temporary workers; in addition, they employ 6 workers in the warehouses and 8 workers for transporting – all with part-time contract.

[83] Based on the KSM Tarakan Timur Case, TNP2K (National Team for the Acceleration of Poverty Reduction) estimates that community-based UCO conversion to biodiesel can employ 20–50 part-time workers (4 working hours/day) with monthly wages of 2 million rupiah, which on average, meets the minimum wage regulation for part-timers (TNP2K 2020).

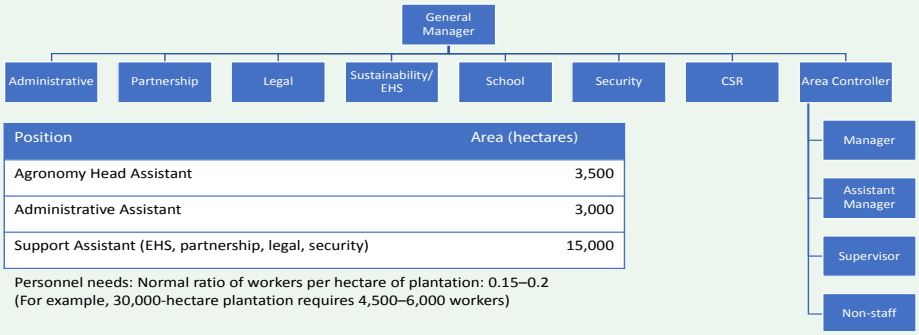
Circular economy strategy	Circular economy initiatives	Work decency likelihood*	Job impact type	Shade of green
Reduce (R2)	Innovative packaging • Packaging redesign (to improve efficiency and reduce material usage) • Use of recyclable material (PET plastic)	Above minimum national standard	Job transformation	Dark
Repurpose (R7)	Converting spent bleached earth (SBE) into to recovered oil (R-oil) and de-oiled bleaching earth (DOBE)	Above minimum national standard	Job creation or substitution	Medium
Use and disposal (post-consumption)				
Recycling (R8)	Recycling PET packaging	Meeting minimum national standard*	Job transformation, creation, or substitution	Light
Repurpose (R7)	Converting UCO to biodiesel	Meeting minimum national standard*	Job transformation, creation, or substitution	Light

Legend High Low * *Only for the formal economy.*

Box 1. Example of labour market impacts from the circular economy within palm cooking oil sector: Bumitama Agri Ltd

Bumitama Agri Ltd (hereafter, "Bumitama") is a CPO and palm kernel oil producer that operates in Central Kalimantan, West Kalimantan, and Riau. The company's supporting offices are in Jakarta and Singapore (headquarters), and it has been listed on the Singapore Stock Exchange since 2012. As of December 2022, Bumitama employs 33,058 workers, with 95 per cent of them working in plantations and mills. The remaining 5 per cent are managerial personnel and staff. The company aims to maintain an annual proportion of permanent employees above 97 per cent, which they successfully achieved in 2021 and 2022. Twenty-nine per cent of the company's workers are female.

General personnel ratio per hectare of plantation



Position	Area (hectares)
Agronomy Head Assistant	3,500
Administrative Assistant	3,000
Support Assistant (EHS, partnership, legal, security)	15,000

Personnel needs: Normal ratio of workers per hectare of plantation: 0.15–0.2
(For example, 30,000-hectare plantation requires 4,500–6,000 workers)

Source: Interview with Head of Sustainability and CSR, Bumitama.

Introduction of a circular strategy in Bumitama

The market's push towards sustainable palm oil production as well as the shift in regulations had driven the company to embed sustainability aspects into their operations. Bumitama became a member of the RSPO in 2007, and 60 per cent of their mills and 55.1 per cent of their land are currently RSPO certified, with a plan of 100 per cent certification by 2024. The company is also ISPO certified and committed to the NDPE pledge, under which they achieved almost 100 per cent traceability by the end of 2022. To ensure sustainability governance, Bumitama set up a dedicated sustainability function with support personnel placed in the Jakarta office (18 personnel) and across the regions (28 personnel). They also set up a sustainability policy in which their latest update (2022) shows an increasing focus on climate change mitigation and adaptation in addition to their current commitments on traceability, environmental protection and sustainable land use, and protection of labour rights and community partnership. In the new policy, the company also aims, among others, to introduce circular strategies into their production and community engagement.

Although only recently formalized, the Bumitama's shift towards circularity is not new. Their strategy for waste management, emissions reduction and chemical management had been implemented through circular approach and are interrelated. The company recognizes the importance of nutrient recycling to achieve a near-circular use of organic waste. An interview with their Sustainability Head confirms that Bumitama is now fully circular, as they maintain a closed loop of the organic material that enters their production chain, utilizing 100 per cent of solid and water waste for their own business processes (self-reliant). These strategies are always perceived as part of a holistic initiatives, mostly motivated by cost improvements (that is, maximizing the value derived from every cost spent) and sustainability programmes, and implemented gradually depending on cost–benefit considerations.

For example, Bumitama's strategy for managing POME contributes to the company's sustainability target for waste management, greenhouse gas emission reduction and chemical reduction – while at the same time reducing the company's costs and reliance on inorganic fertilizer (see the company's *Sustainability Report 2022*, pp. 8 and 17). The strategy was gradually introduced into the existing business process. Initially, the POME was treated before being applied for land irrigation. Following industry best practice, the company allocates around 10 per cent of their POME for co-composting mixture (with EFB), processed in the 13 composting facilities that had been developed by the company. Given POME's potential as a renewable energy source, the company is currently developing biogas facilities that will utilize a methane-capture process. The first plant was commenced in 2022, and the company aims to develop 15 facilities in all their operation regions by 2029.

Labour impact of Bumitama's circular strategy

The labour impact from the company's circular strategy also happened gradually. With the circular strategy activities being mainstreamed into existing processes by transforming the mechanism and business processes, Bumitama adjusted its SOPs for the related activities (for example, wastewater treatment and the fertilizing process) and trained the related personnel in accordance with the changes in procedures – transforming their work into greener processes.

As a result of the circular activities introduced by the company, several functions were transformed. These functions range from core work – namely, work that ensures the closure of raw material cycles, such as: waste sorting and boiler operators on mills, wastewater facilities operators, composting plant workers, agronomists (manager and assistant manager), and supervisors and maintenance workers, especially for fertilizing processes. In addition, certain jobs that enabled circularity have arisen; these involve work that removes barriers to and enables the acceleration and upscaling of core circular activities. In the case of Bumitama, this includes workers engaged in sustainability functions, R&D, training centres and planning processes.

Even though most of the employment impact from circularity in Bumitama has been job transformation, the circular strategy has also created new jobs. Along with their target to reduce chemical use on the land and improve land productivity, one of the key circular initiatives in the company promotes the use of organic fertilizers sourced from the organic waste produced from their plantations and mills. Given the importance and scale of these activities, Bumitama created a position for a biofertilizer assistant who is in charge of treating POME and solid waste (composting) for fertilizer and ensuring that there is no backlog that can disturb operations. The position is designated as mid-management staff, with one biofertilizer assistant assigned to each plantation. This position is usually filled by recruiting fresh graduates with a D3 to bachelor's degree, who will be trained by the company prior to assignment. In addition, the company's plan to develop biogas plants will also require new workers. An interview with another palm company (PTPN III) confirms that, generally, a biogas plant will require three to five workers, depending on the plant's capacity.

Challenges related to optimizing green jobs potential from the circular strategy

Given that Bumitama maintains a ratio of 97 per cent permanent staff and adheres to RSPO principals and criteria, it is expected that the company can meet the minimum decent working principles stipulated by in regulations, including international labour standards. Nevertheless, there are several challenges that the company is facing in relation to upholding decent work principles. The company's *Sustainability Report 2022* shows that Bumitama formally recognizes the freedom of association, and they report engaging in collective bargaining – a good practice in the industry. However, the number of unionized workers at the company is declining, and amounted to just 2.3 per cent of workers in 2022. While Bumitama has apparently already set up a foundation for good industrial relations, the company and the trade union need to promote freedom of association, including the right to join the trade union, to ensure that there is healthy dialogue and relations, especially in the bipartite level.

Moreover, the company is also facing a high employee turnover rate, which reached 40 per cent in 2022. High turnover is especially prevalent among harvesters of productive age (20–40 years old). An interview with the Chair for Employment Affairs of GAPKI shows that this is a common employment challenge in the industry. To tackle the problem, Bumitama is starting to innovate and transition towards mechanizing its processes, with the aims to replace manual and low-skilled workers with machinery. Initiatives along these lines currently being rolled out by the company include:

- the mechanization of FFB collections and transport, which can replace 8 manual workers with 6 skilled operators; and
- mechanizing the fertilizing process by using an EFB spreader, which can replace 8 manual workers with just 1 skilled operator, and by using fertilizer spreaders, which can replace 23 manual workers with 3 skilled operators.

While shifts of this sort can create better paying jobs, they can also threaten many positions, especially in the harvesting and maintenance processes that absorb most of the sector's workers.

Looking at mechanization from a gender perspective, the risk of job loss due to mechanization is typically higher for female workers. Bumitama has a high percentage of female workers compared to the industry average, so there may be a risk of decline in female employment numbers. The data disclosed by the company shows that the hiring rate by gender is higher for male workers, while female and male workers both resign at almost the same rate. Moreover, in general, according to an interview with an official from JAPBUSI (Palm Oil Trade Union Network Indonesia), female workers in the palm oil sector are most prone from the risk of job loss due to mechanization, especially in regard to fertilizing processes. This mirrors the projection of the company, wherein the anticipated reductions in workers are higher in relation to mechanizing processes related to fertilizing.

Source: Compiled by the author from various sources, including Bumitama's *Sustainability Report 2022*; *Annual Report 2022*; and Sustainability Policy, as well as interviews with the Head of Sustainability and CSR of Bumitama, the Director of Operations of PTPN 3, the Chair for Employment Affairs of GAPKI, and JAPBUSI.

4.3. Opportunities for a just circular transition

4.3.1. Ensuring decent work in circularity throughout the supply chain

Given the vast opportunity for creating green jobs via circularity in the palm cooking oil chain, ensuring decent work for those employed to carry out these circularity process – both core and enabling circular jobs – will be critical in fully realizing this green jobs opportunity. The majority of the potential employment change is likely to come from job transformation, so empowering and ensuring that current enterprises are aware of and can uphold decent work principles will be essential. In addition, promoting formalization and ensuring compliance with minimum national labour standards in the new business models introduced in the upstream and post-consumption portions in the palm oil value chain is also necessary to ensure that circular job creation is also green job creation. Figure 9 summarizes the relevant decent work challenges given the characteristic of each portion of the value chain that need to be addressed when designing a just circular transition.

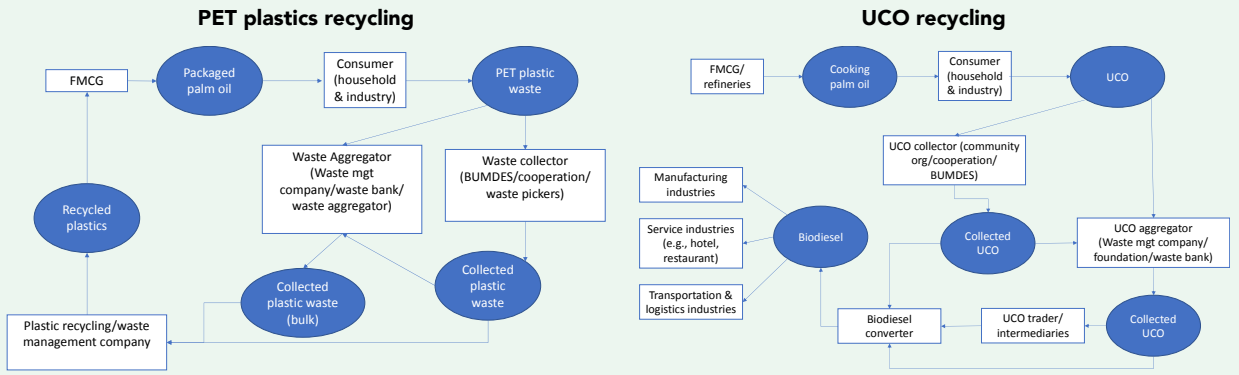
Figure 9. Decent work challenges related to circularity in the palm oil value chain

	Plantations	Mills	Refineries	Post-consumption
Characteristics	• Circularity mostly happens in the maintenance process using manual processes • Estate workers in this phase are mostly temporary and outsourced, including daily casual labour • Smallholders mostly independent workers that employ informal workers or family workers • Female workers are mostly stationed in this stage • Circular economy mostly promotes jobs transformation	• Circularity is introduced mostly in the production stage using mechanized processes • Workers are mostly permanent and skilled • Circular economy mostly promotes jobs transformation • Company provides retraining and certification (when needed)	• Circularity is introduced to manufacturing process • Companies invest in R&D to allow for innovations, including circular economy • The strategy is capital-intensive and uses mechanized work • Workers are mostly permanent and skilled • Circular economy mostly promotes jobs transformation • Company provides retraining and certification (when needed)	• Circularity induces new business model with varying organization formats and actors • Circular economy contributes to job creation, although full-time, quality employment is small in proportion to temporary work (including part-time jobs) • Mostly introduced in the recycling industry • Circular economy promotes job creation, transformation and substitution
Related decent work challenges	**Estates:** • High degree of outsourcing and casualization of work • Compliance with social protection and OSH depends on each enterprise • Wage structure (piece-rate) may promote use of unrecorded workers • Lack of collective bargaining • Higher precarity in remote areas **Smallholders:** • High degree of informality, including child labour • Low wages/livelihoods • Lack of access to social protection and OSH • Lack of access to training/skilling and capital	• Current OSH concerns • Lack of collective bargaining	• Current OSH concerns	• New business ventures promote non-standardized employment that leads to social protection concerns • High level of informality • Lack of OSH consideration, especially upstream where informality is high • Low wages • Absence of trade unions and collective bargaining

4.3.2. The opportunity for industrial symbiosis

The growing PET plastic and UCO recycling industries promote job creation and new economic activity and entities by inducing a pattern of industrial symbiosis. Although not all the activities show a complete pattern of symbiosis, the new business models often incorporate social innovations in which they promote sharing economy and other inter-organizational collaborations. Figure 10 captures the example of symbiosis networks in the palm cooking oil waste recycling in which various businesses form a network in a supply chain process that connects previously independent sectors into one industry ecosystem.

Figure 10. Industrial symbiosis network in post-consumption recycling activities in the palm cooking oil value chain



Source: Compiled based on interviews; Perdana 2021; Indonesia, TNP2K 2020; United States, USAID 2022; and Darus et.al 2020.

Geographical area is the common factor that drives this symbiosis. The absence of organized collecting mechanisms both for PET plastic and UCO motivates the recycling industry to engage in location-based cooperation, which in some cases, also promotes the establishment of new ventures that contribute to local economic development (for example, BUMDes or cooperatives for waste collection). Cooperation with industrial areas is another option pursued by recycling companies, especially in the up and mid-stream process. In some cases, government support in the form of regulations and policy measures that enable a recycling company to operate in certain areas (sometimes exclusively) is also a critical factor that accelerates the adoption of circular processes. Industry support that provides recycling companies with capital and access to skills – especially in their initial stages – was a determining success factor in several cases. This growing cooperation between various factors in the post-consumption component of the value chain contributes not only to job creation but also formalization of the economy, albeit still at a limited scale.

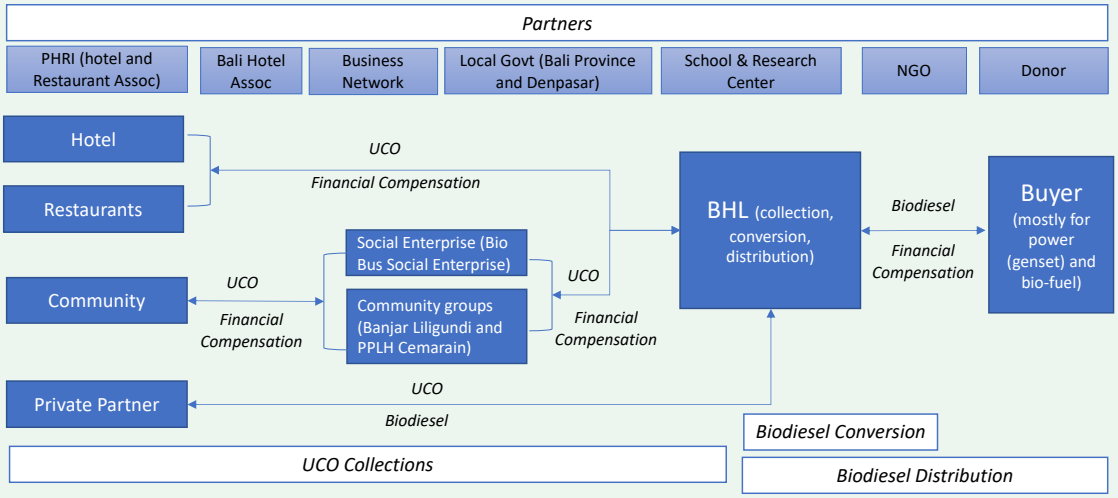
Box 2. Example of industrial symbiosis from the circular activities in the post-consumption portion of the palm oil value chain

Indonesian palm cooking oil consumption opens up opportunities for the UCO recycling industry. Previously, collected UCO was mostly recycled to be re-used as cooking oil, which presents health concerns (Indonesia, TNP2K 2020). But the rising trend of UCO conversion into biodiesel has triggered business development around the industry, both for the domestic and international (export) markets. Given the absence of existing, systematic efforts to collect and repurpose UCO (Kharina et.al 2018), a variety of business models have been implemented, depending on the social, political and environmental context in which each enterprise operates. Often initiated by private sector actors (Perdana 2021), several initiatives are driven by private–public–government cooperation, establishing a pattern of an industrial symbiosis. An initiative introduced by Yayasan Lengis Hijau (YLH) in Denpasar, Bali, is one such case. The organization is engaged in UCO-based biodiesel production, supported by a multiparty partnership.

YLH was established in 2013 as a partnership between the Government of Denpasar City and three NGOs, namely CARITAS Switzerland, Foundation myclimate, and Kuoni. YLH is a non-profit organization with a mission to protect the environment and public health through the management and processing of UCO into biodiesel. For its commercial operations, YLH established a corporation – PT Bali Hijau Lestari Biodiesel (BHL) – which handles UCO collection, biodiesel conversion, UCO distribution, and capacity-development. To kick-start the initiative, Caritas provided funding for an initial investment to build the biodiesel plant and rent the lot for ten years of operations (Suriyani 2016), and the Denpasar City Government supported road construction around the plant environment (YLH, n.d.).

The main challenge faced by BHL in its operations is securing an adequate supply of UCO. Throughout their operations, they innovate with their business model and set up multi-actor partnerships and cooperation to ensure their sustainability. In their first year, they partnered with hotel and restaurant business associations (notably PHRI Bali and the Bali Hotel Association) to collect UCO and distribute their product using trade mechanisms. To address supply deficiencies, they acquire UCO from a distributor in Surabaya, East Java. They also developed partnerships with local businesses to market their biodiesel, with the business mostly catering to hotels, restaurants and schools that use biodiesel for fuel and power generation.

UCO-based biodiesel supply chain and the business scheme of YLH



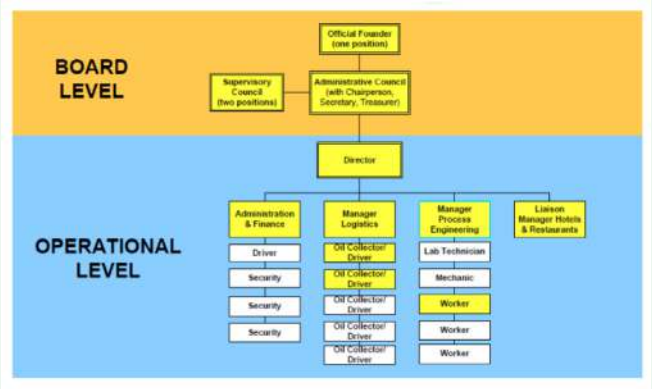
Source: Created by the author based on Kumara et al. 2016; Perdana 2021; and YLH, n.d.

Facing a growing challenge to secure UCO supply due to the absence of regulations on UCO governance and competition with private collectors that charge premium prices, YLH has continuously innovated their business model, optimizing the value from partnerships using environmental and social campaigns. To expand the collection process, the enterprise build partnerships with a social enterprise developed by a Bali-based international school (Green School) and their students, as well as community groups. With this partnership, they expanded their outreach to households; providing economic benefits for local people and nurturing entrepreneurship among the youth, while striving to achieve their main environmental mission. YLH also innovated through a transaction scheme in which they attract private enterprises to partner in a barter mechanism wherein the enterprises supply UCO and YLH gives back biodiesel based on an agreed monetary value. They have engaged eco-Mantra, a Bali-based environmental engineering consultancy, to expand the network for this model. They also use corporate social responsibility (CSR) programmes as part of a value add in addition to financial compensation as a means of attract more private involvement.

Another challenge came from production costs. Since YLH has no capacity or facility to innovate technically, such as substituting catalyst materials or improving engine efficiency rates, they also build partnership with universities and research centres. This partnership and networking mechanism has been evidenced to contribute to the sustainability of the organization while benefiting the academics engaged in knowledge creation.

Not only has the circular economy introduced by YLH triggered the development of a multiparty network and partnerships around Bali that are interconnected within the supply chain for UCO-based biodiesel, to some extent it also contributes to job creation and enterprise development. Based on their website, YLH employs seven staff for the UCO–biodiesel operation, with the chance of additional recruitment adding to their organizational structure. YLH's Biobus Initiative, which is run by students, collects 1,500 litres of UCO per month on average and has trained around 300 students on green entrepreneurship. The initiative is also being replicated elsewhere in Indonesia and internationally. Another source also notes that some of the community waste banks supplying YLH have established village-owned enterprises (BUMDes) to manage UCO collection – indicating the beginnings of a formalization process (Traction Energy 2022).

Organizational structure of YLH



Source: Kumara et al. 2016.

Source: Compiled from various sources, including the YLH, Green School, and Eco Mantra websites; Kumara et al. 2016; Perdana 2021; Suriyani 2016; Suriyani 2019; Traction Energy 2022.

4.3.3. Skills for circularity

According to the interviews, a wide range of skills are needed to support a circular strategy within the palm cooking oil value chain. These skill requirements are diverse across jobs and affected functions (see table 8) throughout the value chain. The modalities also depend on the job impact that was brought about by increased circularity. A circular induced job transformation will require re-training to bring the strategy into existing operational procedures, while job creation (and substitution) will require the (re-)skilling of new and existing workers to fulfil the new function. A generalization can be drawn to identify the skill requirement across the chain. This broad-brush identification is categorized based on the type of direct jobs (core and enabling) involved and may differ in the details for a given practice.

Table 8. Skills required for circularity in the palm cooking oil industry

Type	Plantation	Mill	Refinery	Use and disposal (recycling)
Enabling	• Circular analytics, innovation, and design • Business planning and development • Problem solving and critical thinking • Environmental awareness • Waste management • Energy efficiency • Effective communication • Strategic thinking • Agriculture management	• Circular analytics, innovation, and design • Business planning and development • Problem solving and critical thinking • Environmental awareness • Waste management • Energy efficiency • Effective communication • Strategic thinking • Basic software and hardware • Green construction (for SPOT)	• Circular analytics, innovation, and design • Business planning and development • Problem solving and critical thinking • Environmental awareness • Waste management • Energy efficiency • Effective communication • Strategic thinking • Basic software • Supply chain management • Green construction (for SPOT)	• Business planning and development • Circular creativity and innovation • Problem solving and critical thinking • Strategic thinking and decision-making • Business acumen • Environmental awareness • Waste management • Energy efficiency • Effective communication • Negotiation • ICT system design and development • Supply chain management • Basic software
Core	• Environmental awareness • Waste management • Energy efficiency • Basic machinery operation • Basic software • Good agriculture practice • OSH • Collaboration and teamwork • Willingness to learn	• Environmental awareness • Waste management • Energy efficiency • Process management • Machinery operation • OSH • Collaboration and teamwork • Willingness to learn	• Environmental awareness • Waste management • Energy efficiency • Process management • Machinery operation • OSH • Collaboration and teamwork • Willingness to learn	• Environmental awareness • Waste management • Energy efficiency • Basic software • Basic hardware • Process management • Basic machinery operation • OSH • Collaboration and teamwork • Willingness to learn

4.3.3.1. Green skilling to support circular transition in the enterprise.

The study shows that most of circularities in the palm cooking oil industry were not introduced as isolated initiatives, but as part of overall enterprise strategies – mainly on productivity and sustainability. Enterprises play a significant role in the skilling process. During interviews, palm estates described the common circular adoption process in the industry. After the company ensures that a circular strategy can be implemented (mostly after an R&D process or sharing of industry best practices), it will first adopt the changes into their SOP. At the same time, in order to meet their manpower needs, the enterprise will conduct any capacity-development that they deem necessary, usually depending on the existing business process, strategy, manpower needs, available resources and the scale of the

strategy.
Since the choice of circular strategy tends to be contextual with each enterprise's needs, generally the training is delivered through an in-house programme, especially for those involved in core processes (that is, operating process workers). Usually, this training is implemented via a training of trainers approach, wherein middle management workers responsible for operations (such as plantation assistant managers) are trained first with the relevant technical competencies and skills. Later, these middle management staff provide training for the field workers. The training of middle management can be done via internal workshops where experts are invited as trainers, or by sending designated workers to the training providers. This form of capacity-development is also happening in the post-consumption portion of the value chain; where companies tend to assign their operational (line) managers to train newly recruited operational staff. This strategy is chosen due to cost considerations and because work on plantations and in the post-consumption elements of the value chain involve basic technology and depend heavily on manual labour.

The circumstances are slightly different with the mills and refineries. In the plants, retraining occurs with the introduction of new technology, equipment or facilities. The training is usually offered and carried out by the equipment manufacturers during installation, and companies will send their workers for certification when it is required by regulations – although no specific job competency standards on green jobs in the palm oil sector currently exist (ILO 2019). Because the basic operation of the machinery does not require specific skills on circularity, enterprises perceive that current skill needs can be fulfilled either by retraining workers to operate the updated technology or by recruiting new workers with the adequate basic technical competencies on plant operation.

There are also examples where companies cooperate with universities for research and development on good agricultural practice, including circularity. These research programmes sometimes include capacity-development activities. Some of the interviewed companies stated that they signed cooperation agreement with universities[84] to develop circular strategies in which the university provides knowledge transfer while also reaping benefits from the knowledge co-creation process. Most of big enterprises that have enough resources also establish their own research centre and/or training centre.[85] These private programmes appear to be the predominant modality for green-skilling efforts related to circularity, specifically for existing and newly recruited personnel.

Nevertheless, with the adoption of circularity in the industry, some circular aspects of palm oil cultivation and processing have become part of the tertiary education curricula in related fields such as agriculture, chemical engineering and sustainability. The elements are usually integrated into the current syllabus, and there are only a limited number of tertiary education units that include sustainable palm oil production, including circularity, in their main curriculum (ILO 2019). Moreover, since circular economy is never an isolated system, embedding basic skills/knowledge for green jobs – such as environmental awareness, waste management and energy efficiency – would be important. This is particularly true for STEM subjects[86], as they enable the design of new materials and products (Sitra 2021).

In addition, the allocation of BPDKS research grants has also been perceived to contribute to circular innovation. Although not necessarily directly related to circularity, these grants have been promoting R&D activities on sustainable palm oil, especially by academics and think tanks. Moreover, universities, training providers and relevant organizations such as business associations, development partners and NGOs – including the RSPO – also regularly collaborate in providing capacity-development

[84] For example, Bumitama has signed a research and learning cooperation agreement with INSTIPER Yogyakarta to support their biofertilizer and good agricultural practices programmes, and Agricinal has signed cooperation agreements with Wageningen University and University of Bengkulu, as well as with PT Acronesia, to pilot intercropping initiatives.

[85] For example, PTPN Holding owns subsidiaries that positioned as research centres and training centres that not only provide services for the group but also for outside customers.

[86] That is, subjects in science, technology, engineering and mathematics.

programmes on the broader topics of sustainable palm oil and good agricultural practices.

4.3.3.2. Green skilling to support a circular transition among smallholders.

Unlike enterprises, palm smallholders face continuing difficulties in accessing training. This is the result of a structural problem, namely limited resources and access to information and training providers. This problem is not specific to circular economy only, but is the case for almost all types of capacity-development programmes. Tied (or plasma) smallholders can access certain capacity-development programmes from their partner estates; however, this depends on each estate's policy. Independent smallholders face even more difficulties in getting access to retraining. Generally, they acquire knowledge and skills only through observations, peer learning and their own experiences.

Stakeholders from the Government, smallholders' organization, companies, CSOs, and development programmes have been providing some training for smallholders, but these efforts are often on an intermittent basis and are sometimes not suitable for farmers' needs.[87] Organizations such as the SPKS offer training that sometimes includes good agricultural practice, but this training is limited to members only. There are certain fund allocations from the BPDPKS that are targeted at training of smallholders, but the allocation is deemed to be insufficient.[88] Some enterprises have also tried to contribute via their CSR programmes, but again, the coverage is very limited.

To ensure that smallholders – who retain substantial shares of both employment and plantation area – can seize the opportunities related to circular economy, policy and programme priority to retrain them is urgently required. This is especially urgent for training in skills pertaining to good agricultural practices, which may include material on simple circular farming techniques that can be easily implemented by farmers. In addition, this skilling for farmers will need to be accompanied by infrastructure support to enable them to implement the techniques they have learned. For example, training on how to compost trunks and fronds will not be effective without support in acquiring a chipping machine. Consequently, tailormade training developed based on the contextual needs of a group of smallholders with similar characteristics that is focused on palm growers' and farmers' organizations (such as cooperatives, farmers' groups/GAPOKTAN or associations) may benefit them more. Aside from circular economy-specific training, certain critical management skills should also be conveyed to support smallholders. This would include training on financial and administrative aspects (especially on legality) and capacity-building related to organizing.

4.3.4. Gender dimensions

The workforce within the value chain of palm cooking oil industry is male-dominated. Male workers are generally perceived to be fitter for manual work on plantations or within the manufacturing processes of mills and refineries.[89] Nevertheless, one particular circular strategy – namely reusing by-products and waste as biofertilizer – involves a business process (fertilizer application) that is dominated by female workers (see table 3). This strategy had been widely adopted by palm estates, and to some extent by smallholders, due to its various benefits[90] and therefore has the potential to green the occupation – albeit not fully, due to quantity shortages.

Nevertheless, challenges persist when it comes to ensuring decent work within this occupation. Fertilizer applicators are mostly under temporary contracts in which they face various forms of precarity at work and do not enjoy additional benefits such as those received by permanent staff. Moreover, during an interview with trade unions, it was stated that the extent to which plantations uphold labour protection varies greatly, with violations still being reported, especially among non-permanent workers. Nevertheless, the shift towards circularity by reusing waste for biofertilizer has contributed to improvement of working condition by reducing

[87] Interviews with companies, SPKS, and Auriga.
[88] As per interviews with companies and SPKS, and ILO (2017, 112).
[89] Interviews with trade unions.
[90] Interviews with GAPKI, palm companies, SPKS, and trade unions.

the OSH risk from chemical hazards related to the use of chemical fertilizers (ILO 2017, 112).
Another concern has been arising from the growing use of mechanization. As part of strategies to reduce costs and mitigate labour market shortages, palm plantations have begun to introduce mechanization into their palm cultivation process, including for fertilizing and pesticide application.[91] This shift will entail job loss risk for the affected workers, who, as noted above, are predominantly female. Moreover, trade unions also conveyed that in some instances, enterprises prefer to recruit male workers to operate the machinery that is being used to replace tasks previously done primarily by female workers due to a persisting perception that men are more competent in managing mechanized work. This state of affairs may ultimately undermine, if not totally eliminate, any benefit that many female workers in the palm cooking oil value chain may derive from a circular transition.

Within the post-consumption portion of the value chain, community-based UCO and PET plastic collection are often driven by women's organizations that work at the community level on various issues, ranging from the religious to the social to the economic. An interview with one organization that organizes charity-based UCO collection concluded that women are more willing to get involved in UCO collection, not only due to the proximity of the UCO withing their daily household activity, but also due to their awareness of the religious, environmental and societal value of the collection. However, at this stage, these initiatives generally do not create employment, as many are operated on a voluntary basis or treated as supplementary activity to earn their household a little additional income.

[91] Based on interviews with GAPKI and palm plantation companies. Also see box 1 for a case example.

5 THE WAY FORWARD

5. THE WAY FORWARD

The introduction of circular economy into Indonesia's palm cooking oil industry presents an opportunity for green jobs creation, both by greening current jobs as well as creating green jobs in an emerging economic sector. Nevertheless, practices in the industry show that circular strategies are not being introduced in specific, isolated ways but rather motivated by larger strategies focused on increased productivity (by optimizing costs) and sustainability. Given this condition, circular economy adoption had been a rather gradual process that transforms business processes little by little and to varying degrees across entities depending on their priorities and capabilities.

The above trend, in turn, determines the labour market impact from circularity. From the enterprise perspective, it is difficult to separate circular work from the business-as-usual work, making job transformation a common pattern of circular jobs in existing enterprises. Job creation (and substitution) occur when there is a new business model or when the scale of circular economy is so significant that it requires the establishment of new positions. Moreover, a vast opportunity comes with the rise of the palm cooking oil waste recycling industry in the post-consumption part of the value chain. This trend not only benefits job creation, but also can contribute to the formalization of the economy.

Nevertheless, challenges persist in regard to realizing this potential. Barriers include existing structural problems, such as persisting decent work challenges and suboptimal governance, as well as technical challenges, such as the availability of scalable technology and skilled workers. The impacts of these issues mean that marginalized groups are often left behind in realizing green jobs from circular economy strategies. These groups include the smallholders, plantations' temporary workers engaged in maintenance tasks, and most of the workers in the post-consumption portion of the value chain. To avoid this, an action plan towards a circular transition needs to be accompanied with measures for a Just Transition. These measures must also include policy and efforts aimed at mitigating negative employment impacts. Below are the recommendations for ensuring a just circular transition given the context and the green jobs potential identified during the study.

Recommendation 1: Improve data collection and transparency to inform policymaking and decision-making processes.

As circular strategies do not offer a one-size-fits-all solution, it is crucial to understand the nature and scale of potential impacts from circular economy when planning a transition. This includes preparing for the employment implications. However, there are existing gaps in available data and data collection mechanisms. Underlying reasons for these data collection gaps include the complexity of governance and the geographic location of the industry, particularly upstream in the value chain. Another challenge arises from the limited resources and capacity of government officials, especially at the subnational level. Gathering critical data for labour market monitoring and evaluation – such as the number of workers, their profiles, contract types, wages, social security coverage, and OSH conditions – is difficult to maintain, especially in regard to plantation workers (due to geographical considerations) and in post-consumption activities (due to high levels of informality). Additionally, similar challenges can be seen in regard to supporting data collection to understand enabling conditions in the industry, such as the economic actors, plantation areas, legal status, and production capacity, particularly of smallholders.

Estimating circular jobs will require granular data (namely ISIC level 4 microdata) as a baseline (Circle Economy and UNEP 2020). Given the limitations of the National Labour Force Survey (SAKERNAS) to provide data at this level of disaggregation, complementing and aligning the data set with sectoral data can improve the estimates. While data on plantation workers is accommodated by the plantation statistics from the Ministry of Agriculture and manufacturing workers can be accommodated by the industrial statistics collected in the National Industry Information System (SIINas) of the Ministry of Industry, there is a gap concerning waste management workers' data,

as the national waste statistic information system (SIPSN) does not collect data on the number of workers involved in the process. Therefore, adding data requirements on the workers engaged in waste treatment facilities will be beneficial. On a more strategic level, improved coordination and data management of the sectoral bodies need to be strengthened, with alignment to the Satudata policy as one of the alternatives in the long term.

To understand the profile of workers and the decency level of the work they perform, data collected via the labour monitoring and evaluation process by officers from regional employment agencies will be critical. Therefore, it is necessary to improve the capacity and effectivity of this process. In the long run, enhancement of the Labour Market Information System (LMIS) that currently being prepared by the Ministry of Manpower can be very important to improving the availability and reliability of labour market data. In this regard, the proposal on establishing a single digital employment identification for all workers so that currently dispersed employment information can be integrated into the LMIS can be explored as part of improving the LMIS (Gunawan et al. 2022). When addressing issues within certain domains, data from related stakeholders – such as business associations, trade unions (such as data collected by JAPBUSI), and smallholders' associations – can also provide insightful information. Specifically in regard to information on social security within short to medium term, synchronization of social security with sectoral data such as tax, industrial, and business entities as mandated by Presidential Instruction No. 2 of 2021 will improve the collection of data needed to monitor the labour protection rate.

Related data necessary to understand the industry context and enabling environment can be collected if the action plan on data collection under the NAP on SPO can be optimally implemented. However, despite the NAP nearing its end, implementation remains far below the target, mainly due to budget and capacity constraints at the subnational level. In the short term, efforts to accelerate data collection activities as mandated by the NAP under President Instruction No. 6 of 2019 are crucial to providing baseline data for further analysis of circular economy impact and labour market consequences. The data collection process should also cover smallholders. Although plantation statistics have estimated the number of smallholders, a previous study concluded that having detailed data on smallholders, including their names, addresses, and spatial information, significantly contributes to policymaking (KEHATI 2019). This detailed data will be particularly beneficial for targeted programme and policy design based on geographic or spatial considerations. This study also provides a recommendation for the data collection methodology in relation to collecting smallholders' data: Given the budget limitations of the data collection process, an alternative of channelling the data collection process as part of the BPDPKS' programme to support smallholders can be explored. Another alternative that can be explored is to optimize SiperiBUN, the plantation information system under Ministry of Agriculture. Over a longer period, continuous support and commitment to maintain these data collection processes is also necessary.

As circular economy is almost never an isolated practice, the involvement of a wide range of actors will optimize the benefits from a circular approach. To accelerate stakeholders' involvement and to provide them with relevant information for decision-making, improving data transparency is of great importance. The information provided to social actors should not be limited only to statistical data, but also include relevant practical information that can help them to implement circularity. In addition, a recent PAGE Indonesia study on the energy sector indicates that the asymmetric information held by government, businesses and workers hinders dialogue and a Just Transition process (PAGE 2023). The tripartite consultation process has also identified that enterprises and workers are lacking awareness of the policy for circular economy. Improving transparency and information access among stakeholders and social partners can therefore be beneficial for awareness-raising, promoting dialogue and coordinating multiparty efforts.

Recommendation 2: Accelerate programmes and policy to reduce existing decent work challenges, especially in components of the palm oil value chain where vulnerable employment is predominant.

The palm oil sector and related circular economy activities exhibit distinct industry characteristics. The upstream and post-consumption components in the value chain involve a wide range of actors with different organizational forms and high levels of competition. By contrast, the downstream industry demonstrates an oligopolistic pattern. These differences also impact the working conditions, with greater challenges in achieving decent work standards

in the upstream (except in mills) and post-consumption parts of the sector (see figure 9). Within these portions of the value chain, addressing challenges related to non-standardized employment, the implementation of work contracts (especially in relation to daily casual labour and unpaid labour), and access to OSH and social protections are top priorities.

As different interpretations of employment laws and regulations persists and lead to unstandardized employment contracts, especially on plantations,[92] measures to refine regulations on employment contracts needs to be a priority in the short to medium term. Such refinements should also take into consideration the development of new emerging business models that may also lead to risks of non-standardized employment. The policy formulation process should involve inputs from relevant stakeholders, particularly workers' and employers' representatives, under the coordination of the Ministry of Manpower through a social dialogue process. To ensure the effectiveness of the dialogue process and compliance with employment regulations, continuous efforts to guarantee freedom of association and collective bargaining, raise workers' awareness of their labour rights, and protect their right to associate will be required. A collective effort involving trade unions, management representatives, and the Government, through the Regional Employment Office, is important in this regard.

Ensuring labour protection is a crucial aspect of the transition process. Indeed, inclusive social protection is one of the priority areas for improving working conditions identified during the tripartite consultation meeting for this study. Therefore, increasing workers' participation in social protection programmes is vital. To this end, the Government has issued Presidential Instruction No. 2 of 2021 on optimizing employment social protection programmes, which mandates multiple government bodies at the national and subnational levels, including the Social Security Agency for Employment (BPJS-TK), to take action to promote these programmes. The Presidential Instruction requires each region to establish regulations, allocate budgets and ensure that all citizens are covered by the programmes. It also encourages integrating participation in employment social security programmes as a requirement to access one-stop integrated public services or integrated administrative service centres. Given the geographic considerations of the palm oil industry, prioritizing efforts to implement this regulation within palm-producing regions will benefit palm workers. This can be achieved through various measures, such as technical assistance from the Ministry of Home Affairs in coordination with the Ministry of Manpower, collaboration with development partners, and coordination with BPJS-TK to improve services and launch campaigns targeting these regions and groups, including smallholders and non-permanent workers.

For regulation compliance, labour inspections play a significant role in ensuring decent work principles are upheld in enterprises. However, there are several challenges to implementing effective inspection processes, especially upstream in the value chain. These challenges include the geographical context and limited resources, including personnel, at the subnational government level. It is important to enhance the capacity of labour inspectors, particularly at the subnational level.[93] As part of this effort, the ILO supported the Ministry of Manpower in developing a guide for labour inspection in the Indonesian palm oil sector in 2021 (ILO and Indonesia, MOM 2021). The guide has been piloted with labour inspectors at the national and regional levels and can serve as a reference to improve the quality of their work. In the short to medium term, the Ministry of Manpower can collaborate with regional governments in palm-producing areas to provide training for labour inspectors using the guide. Additionally, ensuring an adequate inspection process and promoting better coordination between the Ministry of Manpower and local governments are necessary to maintain a continuous process.

Recommendation 3: Promote social dialogue to forge consensus and maintain industrial relationships.

Social dialogue may provide an effective mechanism for co-creating knowledge in planning a just circular transition and for maintaining healthy industrial relationships necessary for a smooth transition. Stakeholders recognize one of the strengths of the RSPO is that it promotes sustainability through an inclusive approach via social dialogue. There is also a growing consensus among employers, workers and government on the importance of promoting collaboration through social dialogue processes (ILO 2023). At the enterprise level, social dialogue can facilitate

[92] Statement from the representative of the Ministry of Manpower at the tripartite consultation meeting.
[93] Interviews with trade unions, SPKS, Sawit Watch, and Auriga.

innovation, address or prevent employment issues, and support a green transition. At the subnational level, it can promote dispute resolution and foster healthy industrial relationships while forging consensus for policy and regulation design in programme implementation. Finally, at the national level, social dialogue can facilitate inputs from relevant stakeholders in policy design and raise issues that need to be addressed by regulations. Well-designed regulations can tackle root problems, contribute to resource mobilization, mitigate implementation risks and ensure inclusivity.

Efforts to institutionalize the social dialogue process are necessary to ensure its effectiveness. At the enterprise level, promoting a bipartite cooperation body (or LKS bipartit) is an effective avenue.[94] This forum facilitates dialogue between workers and management to address issues, champion innovations and align understanding on matters affecting the day-to-day operations of enterprises, including supporting a green transition. This mechanism is also endorsed by the RSPO to promote sustainability. When disputes related to a circular transition cannot be avoided, the role of industrial relationship mediators can be optimized to help maintain dialogue processes and conducive industrial relationships. The mediator's role can be effective, since employment issues arising at the workplace level might be distinct and related to specific cultural and social conditions. At a larger scale, especially in relation to the policymaking process, enhancing the role of tripartite bodies at the national and subnational levels in addressing issues related to a green transition should be pursued over the long term, especially given the limited involvement to date of tripartite representation in policy discussions on a Just Transition (Romo 2022).

The effectiveness of the social dialogue process relies on adequate understanding and awareness of the circular economy. While the industry largely understands and implements circular strategies, the concept of the circular economy itself is not universally understood. Socialization and dialogue with the palm oil industry, in coordination with business associations (including those representing smallholders), can be pursued when designing policies to promote circularity in the industry. In addition, workers have even more limited access to knowledge on the circular economy and green economy transition in general. To remedy this, socialization and dialogue that incorporate capacity-building elements can be implemented, focusing on policy directives and how they might impact work, skills and support to ensure a just circular transition for workers. This can be done in coordination with palm oil trade unions (such as JAPBUSI) and the newly established workers' coalition on climate change and Just Transition issues, which is affiliated with most union confederations. Policymakers also need to establish coordination mechanisms across related ministries when developing circular transition policies, with representation from the Ministry of Manpower as the responsible body for labour, in order to ensure that the plan includes measures to mitigate employment risks and to adequately inform other relevant ministries about policy directives that may affect their responsibilities.

As a circular transition in the palm oil industry necessarily would involve multiple stakeholders, dialogues should also engage important local actors and wider communities beyond the tripartite structure. Various stakeholders and forums have been established to promote sustainable palm oil, and connecting these forums with actors from the world of work can be one way to bridge employment concerns with discussions on sustainable palm oil, specifically by introducing the concept of the circular economy.

Recommendation 4: Maximize green jobs potential by supporting and scaling up circular strategies.

The upstream and post-consumption elements of the value chain offer significant green jobs potential through work transformation because of their current employment sizes and the fact that there is plenty of room for increased circularity. Although the greening impact will be lower than what is anticipated to occur in the refining and packaging portion of the value chain, as indicated in table 7 above, the number of jobs affected within the upstream and post-consumption portions of the value chain is anticipated to be large, as is the potential impact of circularity in these activities. However, these upstream and post-consumption activities are currently lacking access to finance, technology and skills. Investing in circular innovation initiation and scale up and in the skilling of workers within these elements of the value chain represents a clear pathway to support the creation of circular jobs. In the

[94] This was noted, for example, in a June 2021 statement from Minister of Manpower (Hardum 2021), as well as in interviews with trade union, the RSPO, and GAPKI.

immediate term, allocating more to public funds – such as the BPDPKS' fund – in order to finance R&D, provide capital investment for equipment and supplies, and train smallholders and emerging business both in agriculture and post-consumption activities can be very beneficial in scaling up activities. Easing access to finance – including the provision of low interest financing for smallholders and small- and medium-sized enterprises (SMEs) to initiate or scale up business related to circularity, such as sustainable agriculture, waste management, and recycling – is another strategy.

Supporting the maximization of circular jobs in large and medium enterprises is equally important, but it requires different strategies. Since decent work characteristics are usually well established in these enterprises, efforts can focus on providing better incentive mechanisms to attract companies to champion and promote circular strategies. This can be achieved via fiscal or non-fiscal incentives or by enhancing R&D activities that can be shared and implemented by the industry. The involvement of business associations can also be maximized, as they have demonstrated a significant contribution in promoting best practices across the industry. The effort can also be linked to well-established policies promoting sustainable palm oil, as circular economy strategies can also be aligned with sustainability objectives. Enterprises play a significant role in skilling programmes to enable a circular transition, and efforts to prepare skilled workers with the basic skills needed for circular economy, namely basic skills for green jobs and technology, can accelerate the transition in the industry. Promoting sustainable palm oil practices, including implementing supply chain standardization, will also be likely to accelerate circular economy transition. The study finds that sustainability targets are one of the most common drivers for an enterprise to choose circular strategies. Therefore, improved sustainability is expected to result in improved circularity.

Partnerships are also an effective avenue to promote circular economy implementation. Various collaborative mechanisms – such as, private sector support via CSR programmes for financing circular economy initiatives and capacity-development; multiparty cooperation between the public sector, private sector and academics; and supply-chain collaboration – have been shown to be effective in accelerating circular transformation in several cases (see sections 4.1.1, 4.1.3 and 4.3.2 above). Establishing a clear policy directive on prioritized circular strategies and sectors, including within national development planning; the provision of mechanisms to incentivize private sector involvement or public–private partnerships in promoting the circular transition; and improved information transparency and awareness on circular economy are all avenues to mobilize more resources and contributions from stakeholders.

Recommendation 5: Create an enabling environment for collaboration and industrial symbiosis.

The success of several initiatives in recycling UCO can be attributed to effective collaboration among local governments, enterprises and interested organizations (see sections 4.1.3 and 4.3.2 above). These stakeholders joined forces to achieve a common goal of economic development and socio-technical innovation. In most cases, these initiatives were established with the support of enterprises or public institutions, which then led to the establishment of wider collaboration – thereby forming an industrial symbiosis. Collaboration and industrial symbiosis have brought benefits such as economic formalization and local job creation, which motivate policymakers to establish regulations and ecosystems that further support industry symbiosis.

To create this enabling environment, regional governments can establish policy provisions that provide a legal basis for and improve the ease of doing business in emerging enterprises working along the palm oil value chain that are related to the identified circular strategy within their jurisdiction. Regional governments can also support social campaigns to accelerate socio-behavioural change. Successful examples of this strategy can be seen in the collaboration between the regional environmental office and emerging enterprises in Jakarta (Rumah Tersenyum Program) and in Denpasar (Lengis Hijau). Depending on their capacity and responsibilities, regional and national governments can collaborate to create programmes that improve access to finance and capacity-development for emerging recycling businesses. They can also support infrastructure development necessary for the industry, such as road and waste management infrastructure. Considering the spatial characteristics of industrial symbiosis, incorporating circular transition and creating industrial symbiosis when planning an eco-industrial park is an alternative that can have a substantial impact.

On a larger scale, to attract more collaborative efforts from actors not traditionally directly related to the palm oil value chain, such as private companies or think tanks, initiatives that link circular strategies with ongoing activities can be pursued. This can include creating linkages between circular approaches and CSR and ESG practices, which can be facilitated by related regulators in collaboration with business associations. To promote research and innovation, initiatives to encourage research collaboration between industry and research bodies, such as universities, think tanks or official research agencies, can also be pursued. This may involve promoting international research cooperation, as demonstrated by the intercropping initiatives in Bengkulu, initiated by Agricinal and Acronesia, which benefited from research collaboration between Indonesian and Dutch universities.

Recommendation 6: Facilitate and promote reskilling and up-skilling (targeting vulnerable workers), and incorporate the basic skills for green jobs and circularity into formal education.

Skilling is a necessity for a Just Transition. Currently, the palm oil industry plays a significant role in meeting its own skills needs by providing programmes that retrain existing workers and train newly recruited workers. The gradual application of circular economy practices across the industry is driving this training pattern. However, there are few other options, as the availability of circular economy programmes from training providers that can address the palm oil industry's needs is lacking. This creates structural imbalances, since only enterprises with enough resources to afford this retraining can effectively implement circular economy strategies through retraining. To support small businesses and individuals in transitioning to circularity, it is crucial to have policies that ensure access to skilling opportunities. Targeted assistance will not only enable their participation in the circular transition but also optimize the potential for green jobs by accelerating the process of greening their occupations.

In the short term, providing continuous skilling programmes for small enterprises and individual businesses can be done through the allocation of public funds, including optimizing the BPDPKS allocation for smallholders. This can be implemented by conducting training for smallholders, setting-up training programmes in government training centres (BLKs), piloting/establishing community-based vocational training (BLK Komunitas) in palm plantation regions, and collaborating with universities or training providers to develop programmes tailored to this marginalized group. Companies can also take part in the effort by providing skilling through CSR or partnership programmes, although these may be intermittent.

The training design needs to be customized based on the target group, emphasizing the feasibility and cost benefits of the circular approaches being taught. For smallholders, training can focus on recycling, good agricultural practices and circular cultivation techniques (such as intercropping and the use of legumes). Considering that circular strategies are influenced by spatial characteristics; the training design and modality should also be contextualized for the participants. Strengthening existing mechanisms that can already reach smallholders in rural areas, such as agricultural extension workers and farmers' groups (such as *kelompok tani*/*Poktan* or cooperatives), to deliver circular skilling and promote good agricultural practices is an alternative approach. When possible, skilling programmes should be accompanied by the provision of equipment or materials needed to implement the techniques, such as chipping machines, composting equipment and seeds. In terms of decent work considerations, training on OSH is important; as is training in basic managerial skills, such as legal and administrative knowledge and financial management.

At the enterprise level, while companies mostly provide retraining when introducing circular strategies, the quality and quantity of training greatly depend on the company's capacity and policies. Optimizing the labour inspection process to ensure that all workers receive the necessary training is one way to ensure an appropriate skilling process. Moreover, reorienting the industry's paradigm to recognize the importance of circularity and the green economy through dialogue and socialization is important in encouraging businesses to align their strategies, including skills development, accordingly. The provision of policies that incentivize green skilling and green innovation (such as subsidies or tax deductions for R&D programmes and to purchase machines or equipment for training) would also greatly benefit the palm oil industry.

To sustain the transition process, it is necessary to ensure that the future labour market is equipped with the necessary skills. To anticipate future workforce requirements as circular strategies continue to evolve, skill strategies need to be adjusted, including changes in the delivery of formal education. Incorporating fundamental skills necessary to support transition – namely, basic green job skills (environmental awareness, waste reduction and management, and energy and water efficiency) and basic technology skills (hardware and software) – at all levels of formal education will be needed. Additionally, introducing a syllabus or elements of circular economy into subjects and related qualification programmes that supply personnel for the palm oil industry, such as STEM[95], agriculture, sustainability, systems information, and business studies would help mainstream circularity within the formal education system. At a strategic level, embedding circular economy principles into the road map for green jobs development – which is currently being explored by BAPPENAS and cascaded into the Indonesian National Qualification Framework (KKNI) as the basis for skills development in green jobs, including circular jobs – can be addressed more systematically (see box 3).

Box 3. Promoting skills for green jobs in Indonesia

In 2018, the ILO had conducted a study on skills for green jobs in Indonesia. The result indicated the gaps among:

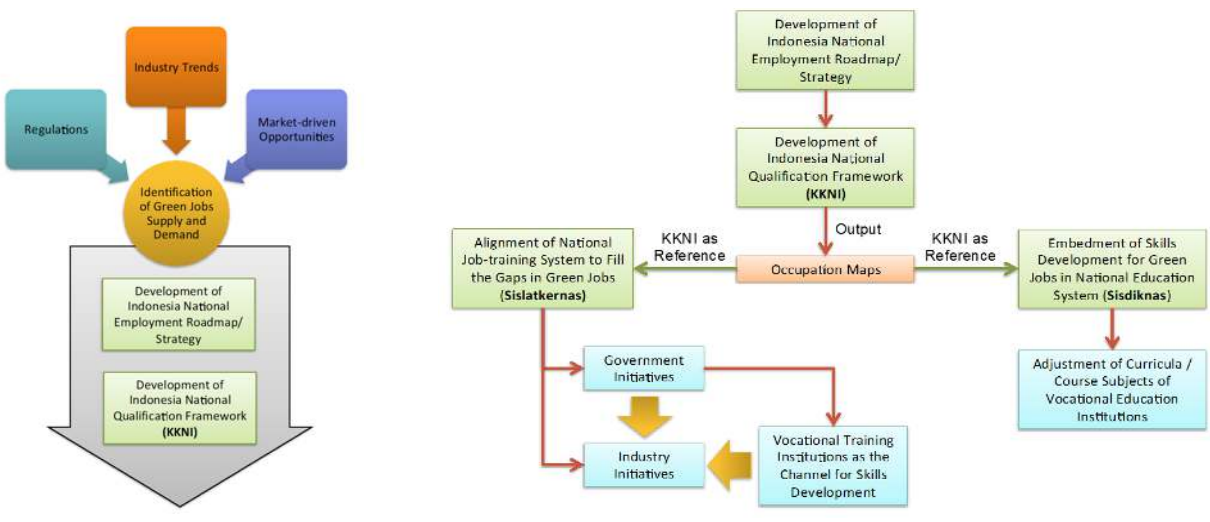
1. the national strategy on green economy;
2. the national strategy development on employment; and
3. skills development efforts at the industrial level.

Given that a national employment road map or strategy is still absent, the study suggests that Indonesia needs to develop an adequate system for identifying needs and gaps in employment, including in relation to green jobs.

To achieve this, the study recommends that the Ministry of Manpower should lead the identification of employment needs and gaps in collaboration with BAPPENAS at the national level and with other related ministries at the sectoral level. The process should also involve companies, business and professional associations, vocational education and training institutions, and workers. The result can then be used to inform the development of the national employment road map or strategy, which would also cover skills development for green jobs. The strategy should include quantification of green jobs supply and demand, skills development requirements, and the approaches to meeting the needs and requirements of green jobs. The strategy document would them become the reference for developing the national qualification framework, which subsequently becomes the reference for developing job competency standards.

To ensure alignment between the strategy and its implementation, the study also recommends that strategies pertaining to skill needs for employment (including green jobs) should be centred on the Indonesian National Qualification Framework (KKNI), which can then be translated into occupational standards (SKKNIs). The focus of interventions can be directed either towards greening occupations (that is, introducing green functions within current occupations) or developing new green occupations. These focuses should be implemented through government-led routine skilling and research programmes or by involving ad hoc or routine industry-led training programmes.

Summary of recommendations for anticipating skills needs for green jobs



Source: ILO 2018b.

[95] STEM is an abbreviation for science, technology, engineering and mathematics.

Recommendation 7: Design policy that supports an inclusive circular economy.

Circular strategies require the implementation of socio-technical innovations, which can lead to the emergence of new business models, changes in required competencies, new revenue models, and shifts in consumer behaviour. However, these strategies can also bring about technological innovations that may pose risks to certain jobs. Therefore, there is a need for policies that can effectively manage and guide these changes. In this context, a social dialogue process focused on designing policies that enable all actors to transition while minimizing negative employment risks across various levels and among different stakeholders, groups and communities becomes crucial.

Particular attention should be given to enhancing the capacity of companies, especially SMEs and independent businesses, and the most affected regions to adopt circular principles. This can be achieved through the provision of various incentive mechanisms, as mentioned earlier (such as subsidies or tax deductions, capacity-development programmes, research and innovation support, and a legal framework for operations). Improving governance for activities related to targeted groups, such as empowering smallholders (including those funded by the BPDPKS); establishing clear rules for employment contracts; and ensuring labour protections on plantations and governance of waste management and waste recycling (particularly UCO and plastic recycling) will also bring significant benefits to vulnerable workers within the palm cooking oil value chain.

Furthermore, it is important to consider the needs of vulnerable groups, particularly women and young workers. Some circular strategies found upstream in the value chain are implemented in activities where women workers are predominantly employed. These workers are not only more susceptible to changes resulting from circular strategies within their activities, but also face the threat of automation or mechanization being introduced alongside the circular strategies. Ensuring that their employment contracts provide sufficient protection – including the right to upskilling during transitions and compensation when termination cannot be avoided – is essential. Improvements in the regulations and mechanisms of social security programmes that ensure inclusivity, including coverage by unemployment benefits, are particularly important for vulnerable workers. Promoting bipartite dialogue at the workplace is another approach to minimize negative impacts on women. This mechanism facilitates discussions between workers and management to find solutions to operational issues, including during transition phases.

Circular strategies have the potential to offer increased and improved employment opportunities for youth, especially at a time when youth unemployment rates remain significant. However, specific strategies need to be in place to enable young people to take up these positions. In the upstream and post-consumption components of the palm oil value chain, where barriers to entry are low, there are examples of start-ups established by young entrepreneurs that participate in circular economy-related activities. These enterprises introduce innovation, often by combining digital technology with socio-institutional change, to differentiate their operations and employ young workers (typically under the age of 30). Interviews with enterprises of this type have revealed that their ability to scale up is often enhanced through cooperation with larger organizations or with support from the Government. Creating policies and programmes that provide a conducive environment for these businesses to thrive – such as partnership programmes with public offices, establishing clear governance and a business-friendly environment for their operations, and CSR programmes that promote circularity in collaboration with emerging enterprises – can foster the sustainability and growth of such businesses.

Recommendation 8: Link circularity with sustainable palm oil initiatives.

Linking circular strategies with sustainability is important for two underlying reasons. First, sustainability is imperative, since the implementation of circular economy practices can only create green jobs if it also fosters sustainably. Second, industry trends show that sustainability is one of the main motives for palm enterprises to implement circularity, as circular strategies have proven to be beneficial in achieving sustainability outcomes – and the market incentivizes sustainable practices. Therefore, promoting circularity should be done hand-in-hand with accelerating sustainable palm oil initiatives, as the two can mutually reinforce each other within the industry.
Several interviewed enterprises and stakeholders have acknowledged the benefit of the RSPO in promoting such an approach, not only through providing guidelines but also through creating mechanisms that enable actors to

shift towards sustainable practices, particularly through financial incentives and governance mechanisms such as consultative processes, industry benchmarks and dispute resolution mechanisms. While the RSPO operates on a voluntary basis, the Government has established the ISPO as the mandatory certification programme, and therefore the ISPO has the potential for broader outreach. However, the ISPO is perceived to be lacking due to the absence of incentive mechanisms and inclusivity. Embedding these features into the ISPO programme and exploring how the programme can be synergized with the RSPO (for example, by promoting joint audit processes) are areas that can be pursued in the short to medium term. Furthermore, companies – including palm enterprises[96] – are starting to incorporate environmental and social and governance (ESG) principles (PwC 2021), mostly driven by market demand and to secure benefits related to accessing financing. Policies that promote corporate ESG not only have the potential to create green jobs,[97] but also to enhance a circular transition. Other sustainability practices that are perceived to potentiality bring broader impact are traceability, transformation and no-deforestation within the palm oil supply chain. Provision of policy and programmes to accelerate and promote supply chain-based initiatives of this sort may enhance the sustainability of the industry.

At the strategic level, strengthened policy coherence is important. The Government of Indonesia has established the National Action Plan on Sustainable Palm Oil, which serves as the basis for developing the 2045 road map for the national palm oil industry. Furthermore, BAPPENAS is currently working on two planning documents: (i) the national action plan for circular economy, which outlines the specific strategies and policies for advancing circular economy in Indonesia; and (ii) the road map for green jobs, which identifies the approaches to foster and accelerate green jobs. Harmonizing these policy guidelines is essential to creating linkages between industry development, sustainability, employment and the environment aspects of circularity in the palm cooking oil industry. This can then inform the next Long Term and Middle Term National Development Plans (RPJPP and RPJMN) that will direct the policies within sectoral ministries.

[96] For example, Bumitama had started to incorporate the ESG into their business. During the interview, PTPN Holding also conveyed their plan in moving to ESG which entails strategies that closely related to circular strategy.

[97] For example, PTPN Holding is currently creating special taskforce for ESG and planning to recruit personnel with sustainability functions specifically dedicated to establishing frameworks, assisting in planning, and measuring implementation.

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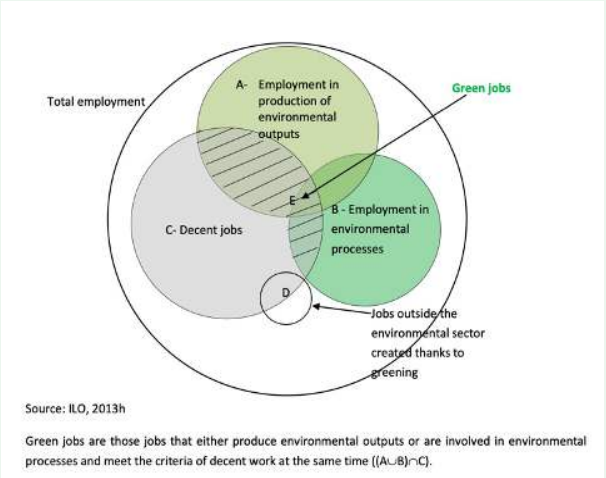
Annex I. Methodological framework for identifying green jobs potential

Definition of green jobs

The ILO defines green jobs as "decent jobs that contribute to the preservation and restoration of the environment, be they in traditional sectors such as agriculture and manufacturing, or in new, emerging green sectors such as renewable energy and energy efficiency" (ILO 2016a). Decent jobs refer to work that meets the ILO decent work criteria; that is, work that pays a fair income, guarantees a secure form of employment and safe working conditions, ensures equal opportunities and treatment for all, includes social protection for the workers and their families, offers prospects for personal development and encourages social integration, and workers are free to express their concerns and to organize (ILO 2013).

For the ILO, the concept of green jobs summarizes the transformation of economies, workplaces, enterprises and labour markets into a low-carbon, sustainable economy that provides decent employment opportunities for all. Green jobs help to improve energy and raw materials efficiency, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems, and support adaptation to the effects of climate change (ASEAN and ILO 2021, 23). At the enterprise level, green jobs can produce goods or provide services that benefit the environment. However, these green outputs (products and services) are not always based on green production processes and technologies. On the other end, green jobs can also be derived from contributing to more environmentally sustainable production processes, even when the final outputs of these activities are not environmental goods and services.

There is no universal definition or accepted way of categorizing and counting green jobs. Statistically, green jobs are a subset of employment in environmental activities that meets decent work requirements.



Source: ILO, 2013h

Green jobs are those jobs that either produce environmental outputs or are involved in environmental processes and meet the criteria of decent work at the same time ((A∪B)∩C).

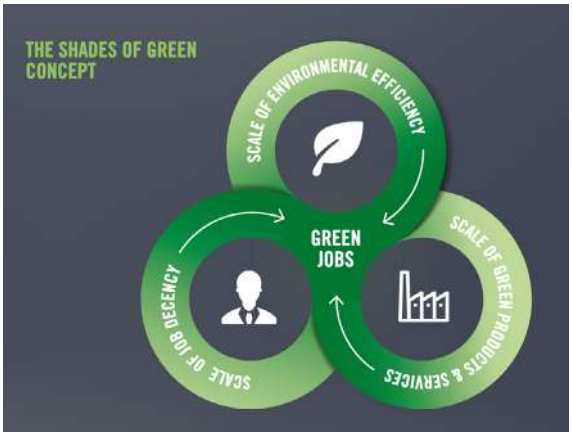
- Total employment in environmental activities (A+B): This includes some jobs that do not meet decent work criteria.
- Employment thanks to greening (A+B+D): In addition to working in environmental activities, this includes jobs created in other sectors thanks to greening. These can consist of jobs in industries that sell products to environmental industries (indirect jobs) and jobs created by people's consumption in environmental sectors (induced jobs).
- Green jobs need to be in E at the centre of the figure – that is, they contribute to the environment but are also decent jobs.

Source: Proposals for the Statistical Definition and Measurement of Green Jobs, Room Document No. 5, 19th International Conference of Labour Statisticians, Geneva, 2–11 October.

The shades of green jobs[98]

The extent to which a green job benefits the environment and upholds decent work conditions can vary considerably. The shades of green concept acknowledges and represents this by depicting the decency and environmental friendliness of a green job along a green colour spectrum.

For instance, jobs related to reactive and remedial measures to control pollution and waste fall on the lighter end of the spectrum. Job positions related to more comprehensive measures to avoid and prevent the generation of pollution fall on the darker end of the spectrum. Similarly, jobs in enterprises that only meet the minimum national labour standards are "light" green, while jobs in enterprises that provide additional social benefits for workers, such as maternity protection, are "dark" green.



Countries at different stages of development have varied capacity to implement the types of changes that are necessary to generate green jobs and economic activities. The national context must therefore be considered when determining the shade of green of a particular job. Improving the environmental and social conditions of jobs, enterprises, industries and economies is a continuous process. Achieving jobs that are fully decent and green is the ultimate objective.

Correlation between circular and green jobs

Circle Economy and the UNEP (2020) categorize circular jobs – that is, jobs created due to circular economy – into direct and indirect jobs. Direct jobs consist of: (i) core jobs, namely jobs that ensure the closure of raw material cycles (operational functions); and (ii) enabling jobs, which cover all jobs that remove barriers to and enable the acceleration and upscaling of core circular activities (supporting functions). Indirect jobs are those which provide services to core circular strategies.

By their very nature, circular jobs contribute to environmental preservation and restoration. Circular strategies bring about various benefits ranging from energy and raw materials efficiency improvement, greenhouse gas emissions reduction, waste and pollution reduction, ecosystem protection and restoration, and support for climate change adaptation. In other words, circular jobs are green jobs if they meet decent work criteria. However, given that the level of circularity can differ depending on the circular economy strategy being implemented, it is expected that the environmental impact of these strategies will also differ.

Applying the shades of green concept to identify green jobs potential

The identification of the circularity level (and therefore the potential environmental benefit) follows the 10Rs approach adopted by BAPPENAS for policy analysis. Potting et al. (2017) sorted the circularity strategies that are more appropriate to reduce the consumption of resources and materials and the generation of waste, and their analysis indicates that circular strategies can be ordered for priority according to their levels of circularity. As a rule of thumb, more circularity equals more environmental benefits, which means that the lower the R number the higher the positive environmental impact. This being the case, smarter product manufacturing and use (R0–R2) is generally preferred over extending product lifetimes because the smartly manufactured product is being used for the same product function as other products produced with less circularity or more users are being served by one product (strategy with high circularity). Lifetime extension (R3–R7) is the next option and is followed by recycling (R8) of materials through recovery. Incineration from which energy is recovered (R9) has the lowest priority in a circular economy, because it means the materials are no longer available to be applied in other products (low circularity strategy).

[98] The shade of green concept for identifying green jobs potential here is adopted from ILO, *Green Jobs: Progress Report 2014–2015*, 2016.

For the level of decent work, the ILO prescribes that work decency will depend on the interactions of interrelated factors at the enterprise level (including management's policy), at the industrial level, as well as at the government level (such as regulations), and hence will naturally vary across enterprises. To diagnose the green jobs potential, this study follows the categorization recommended by the ILO, namely identifying green jobs in enterprises that only meet the minimum national labour standards as "light" green, while green jobs in enterprises that provide additional social benefits for workers, such as maternity protection, are "dark" green (ILO 2016b).

As a broad-brush identification, this study simplifies the categorization of both the potential environmental impact and the decency level into two categories only: high and low. While the level of circularity and the additional benefit to workers will vary across enterprises, even within the same industry, the simplification used here should be sufficient as a policy diagnostic since the common circular strategy introduced in the palm cooking oil varies around R1–R3 and R7–R8 and there is no available detailed data on decent work criteria that can be disaggregated at the subsector level.

Proxy for identifying green jobs potential from circularity

Criteria

Component	High	Low
Work Decency	Above minimum national standard	Meeting minimum national standard
Circularity	R0-R4 (Refuse, Rethink, Reduce, Re-use, Repair)	R5-R9 (Refurbish, Remanufacture, Repurpose, Recycle, Recover)

Categorization

Work Decency	Circularity	Category
High	High	Dark
High	Low	Medium
Low	High	Medium
Low	Low	Light

Source: Developed by the author based on ILO 2016b and Potting et al. 2017.

While further data collection especially at the enterprise level will be needed to quantify the labour impacts from circularity in the palm oil sector, the identification of the shade of green jobs in the sector can be beneficial for policymaking, as a green transition is a continuous process. In this regard, light green activities have an important role to play in the overall process of greening economies, especially in the short and medium term. They can provide the time and flexibility required to pursue the "dark green" initiatives necessary for long-term environmental sustainability and social progress. From this transitional lens, achieving jobs that are fully decent and green is the ultimate objective (ILO 2016b).

The primacy of sustainability

Careful consideration is needed when delineating green jobs. Jobs are green when they help reduce negative environmental impacts, ultimately leading to environmentally, economically and socially sustainable enterprises and economies. Environmental concerns over the palm oil sector might raise questions as to whether it is possible to regard any jobs in the sector as being green jobs. While there are certain activities in the sector that may be considered "green" based on the aforementioned definition, an emphasis on sustainability as the ultimate goal of green employment is imperative.

Specific to the food and agriculture sectors, the FAO (2012) defines green employment as covering the full spectrum of decent jobs that are created by green agriculture farming practices, which encompasses not only on-farm job creation but also input supply chains and post-harvest field-to-market value added food sector operations. Further, green agriculture is defined as the use of farming practices and technologies that simultaneously:

i. maintain and increase farm productivity and profitability while ensuring the provision of food on a sustainable basis;
ii. reduce negative externalities and gradually lead to positive ones; and
iii. rebuild ecological resources (such as soil, water, air and biodiversity "natural capital" assets) by reducing pollution and using resources more efficiently.

A diverse, locally adaptable set of agricultural techniques, practices and market branding certifications such as Good Agricultural Practices (GAP), Organic/Biodynamic Agriculture, Conservation Agriculture and related techniques and food-supply protocols represent the various forms of green agriculture (UNEP 2011). Referring to this definition, the green jobs potential from the circular economy within the palm cooking oil industry needs to also come from the enterprises and economies that conduct green economy, namely those that operate in accordance with the sustainable palm oil production principles.

PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

Indonesia's post-COVID economic recovery faces a pivotal moment in achieving its 2045 Vision. To revitalize growth while meeting the country's enhanced climate commitment, a policy of green transformation has been forged by the Government. Under this policy, circular economy has become a priority strategy, offering an alternative to a linear take–make–waste economic system that instead relies on the three core principles of eliminating waste and pollution, maximizing material and product value, and regenerating nature.

Despite assessments signalling the benefits of circular economy, including the creation of green jobs, there is still a limited understanding of how this shift will impact employment. This in-depth assessment of green jobs and skills needs aims at contributing to filling this gap by assessing the green jobs potential from the circularity within Indonesia's palm cooking oil value chain – one of the country's prioritized sectors – and identifying the skills needed to realize this potential. To this end, the report explores recommendations for measures aimed at supporting workers, businesses and government in preparing the labour market to seize the opportunities offered by circularity and to promote the enabling environment needed to ensure a Just Transition.

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