



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Industrial Resource Efficiency Division and **CIRCULAR ECONOMY**

Department of
Environment



INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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About this publication

The aim of this publication is to introduce the work of UNIDO's Industrial Resource Efficiency Division (IRE) and ways in which it supports the circular economy. Many of our projects align with the circular economy. The Division works to ensure that manufacturing is cleaner and resource-efficient; that products are safe, easy-to-recycle and enjoy longer lifetimes; and that at the end of a product's life, resources are recovered and disposal is safe.

This publication is part of a series by UNIDO showcasing ways in which to facilitate the uptake of circular economy practices, as well as views on how to simultaneously improve environmental sustainability and advance economic development in developing and middle income countries.

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1 | Retaining Value in Sustainable Industry

UNIDO's mandate is to promote and accelerate Inclusive and Sustainable Industrial Development (ISID) (SDG 9) in developing countries and economies in transition by contributing to poverty reduction, economic growth, and sustainable development.

UNIDO is fully committed to contributing to the achievement of the Sustainable Development Goals (SDGs), including responsible consumption and production (SDG 12) and climate action (SDG 13), while delivering on its mandate to support Member States in achieving ISID.

The building blocks of a circular economy have existed for decades now and already underpin many of our technical assistance projects, policy advice and innovation initiatives. Circular economy practices, therefore, fully complement UNIDO's mandate and we are dedicated to supporting Member States in introducing such practices into their economies and industrial value chains to help improve resource productivity and minimize waste.

Today's manufacturing takes materials from the materials supply chain and turns them into products. Within current consumption patterns, these products usually have only one lifetime, after which they are discarded. This "take-make-use-discard" model – also known as the linear economy – is enormously inefficient. It not only depletes the planet's limited resources and creates a multitude of waste, pollution and health issues, it also makes a substantial contribution to greenhouse gas (GHG) emissions.

An economy achieving full circularity is an ideal. It enables stakeholders to aim high when setting their vision, priorities and strategies for inculcating circular practices within their industries and societies for a better future.

Through circular practices and business models – reduce, replace, regenerate biomass, repair, refurbish, re-manufacture, reuse and recycle, product-as-service, and waste-to-energy – everything gets additional lifetimes, is reused as an input material, part or component, or energy source, or as a last resort, disposed of.

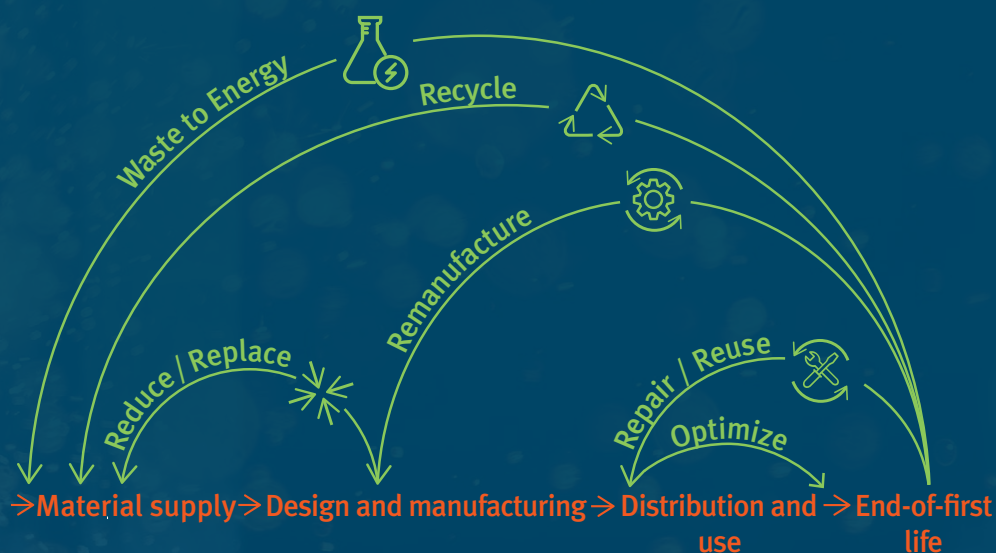
The retained value in products and resources continue to create new business opportunities, income and jobs many times, and not only once as in a linear industrial system, where products usually end up in landfills at the end of their first life with negative impacts on health and the environment.



UNIDO defines circular economy as an industrial economy that routes materials, parts and products back into use several times and creates more value and less waste. It is an alternative in which value is maintained for as long as possible, products are designed to last, and the generation of waste is minimized.

■ Linear supply chain

■ Circular economy practices



ECONOMIC OUTCOME:
increased resource productivity

Reduced production costs and improved competitiveness

New business activities and models

New markets and investment opportunities

Enhanced consumer loyalty

Increased long-term availability of supply

ENVIRONMENTAL OUTCOME:
reduced environmental impact

Reduced emissions of greenhouse gases

Reduced emissions of pollutants and end-of-life waste

Quality of ecosystem services ensured

Natural resources (water, land and materials) preserved

Biodiversity safeguarded

SOCIAL OUTCOME:
improved well-being

New jobs and incomes

Improved health and working conditions

New partnerships and collaborations

Innovations and technologies that make life easier

2 | Circular Economy and the Industrial Resource Efficiency Division

From population growth to climate change, a wide range of global trends and challenges are redefining our future. By 2050, an additional three billion new middle-class consumers are expected to enter markets. From 1970 to 2017, global gross domestic product (GDP) has grown fourfold and the global extraction of materials grew from 27 billion tons to 92 billion tons, with the projection that materials use will have risen to 167 billion tons by 2060.

Natural resource extraction and processing is responsible for about 50% of greenhouse gas emissions and for about 90% of resource-related impacts on water stress and biodiversity loss due to land use. Food losses and waste are skyrocketing, and our oceans are polluted with plastic litter.

It is critically important to improve resource efficiency by closing the loops with circular economy practices to achieve climate change, biodiversity and water related targets, the Paris Climate Agreement and the Sustainable Development Goals (SDGs).



Circular economy practices increase resource efficiency and ensure products, parts and resources are in use for as long as possible. Products are designed to contain non-toxic, renewable, lighter, lower carbon footprint materials and to be reused, repaired, remanufactured and put back into use, or recycled to extract resources for new products. In addition, new business models such as “product-as-service” intensify the use of products.

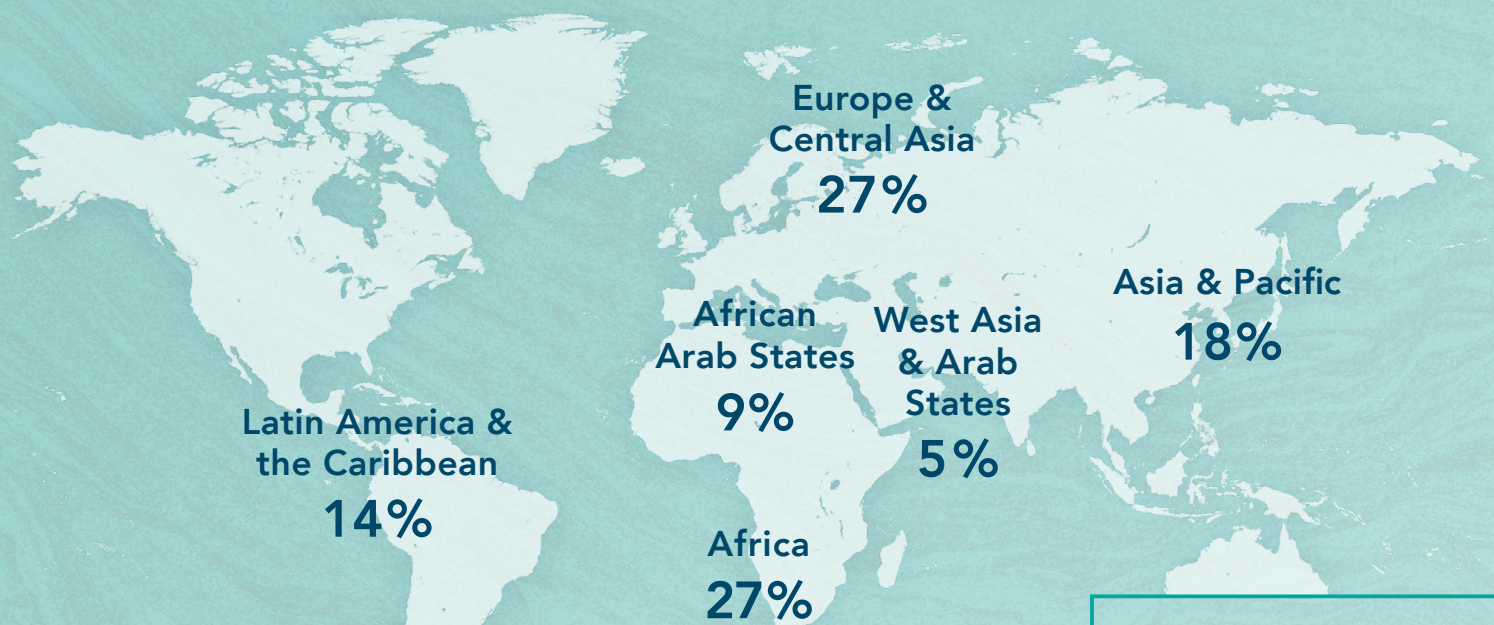
The Industrial Resource Efficiency (IRE) Division’s core business is to promote Resource Efficient Cleaner Production (RECP), which improves resource productivity through cost savings associated with the efficient use of resources, while preventing pollution at firm level and introducing circular economy practices. This ranges from product modification to better manufacturing process control and modification to technology change to on-site reuse and recycling of industrial by-products.

UNIDO’s Transfer of Environmentally Sound Technologies (TEST) methodology integrates RECP with material flow cost accounting to identify costs and potential saving opportunities and with the core elements of environmental and energy management systems to sustain performance. It also supports eco-design, eco-innovations and sustainable sourcing. Firms joining TEST programs identify and make investments in environmentally sound technologies that also make business sense.

Other IRE services aim to scale-up and mainstream RECP, TEST and circular economy practices along supply and value chains. This includes assisting in the development of eco-industrial parks and/or eco-cities, implementing innovative chemical solutions and ‘product-as-service’ business models such as chemical leasing, water saving practices and technologies at firm level, as well as measures towards conservation of ecosystem services.



3 | IRE in Action!



Albania, Algeria, Argentina, Armenia, Azerbaijan, Belarus, Bosnia, Cabo Verde, Cambodia, Central African Republic, China, Colombia, Dominican Republic, Ecuador, Egypt, Ethiopia, Georgia, Ghana, Guinea, Honduras, India, Indonesia, Iraq, Jordan, Kenya, Kyrgyzstan, Laos, Lebanon, Macedonia, Mexico, Moldova, Montenegro, Morocco, Mozambique, Niger, Nigeria, Pakistan, Palestine, Peru, Philippines, Russia, Rwanda, Senegal, Serbia, Slovakia, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, Viet Nam, Zimbabwe

56

**countries, where
IRE is active**

In the period
2014 – 2019



513

**Institutions
supported**



6,706

**Participants
trained**



100%

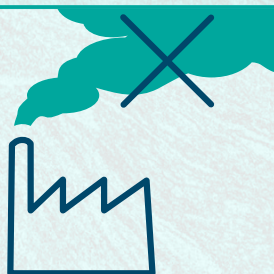
**of the projects with a
gender-informed design**

4 | From Action to Impact



AREAS

- Circular economy practices
- Resource efficient cleaner production (RECP)
- Transfer of environmentally sound technologies (TEST)
- Eco-Industrial Park development
- Water management and stewardship
- Chemical leasing
- Green chemistry
- Health and pollution



Estimated
CO₂-reductions
per year:

97,808 tons

The services of the UNIDO Industrial Resource Efficiency (IRE) work to encourage the adoption of sustainable industrial solutions for pollution reduction and circular economy by designing and implementing a wide range of projects tailored to developing countries and economies in transition. The following case studies provide a snapshot of some of the Division's projects, which form part of a much larger and growing portfolio of circular economy projects, as just one element of UNIDO's broader work on circular economy.

To read more on
all our projects in
partner countries,
PLEASE VISIT:



bit.ly/openUNIDO

3 | Safe and sound: Transfer of environmentally sound technology

WHAT'S THE ISSUE?

In developing countries, enterprises are facing numerous challenges in their efforts to maintain or increase their competitiveness in local markets, access international markets with good quality products, comply with environmental standards and reduce operational costs.

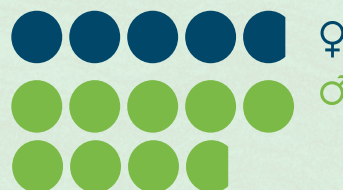
Photo: Shutterstock

Facts & Figures

The MED TEST II
project has enabled
44 service providers
with hands on
experience in RECP

682

professionals from academia,
business associations, government
institutions & industries received
training on the TEST tools





HOW DO WE HELP?

UNIDO's Transfer of Environmentally Sound Technology (TEST) helps companies face these challenges and encourages a wider shift towards green and circular industry. An integrated approach and a global programme, TEST provides small and medium enterprises (SMEs) as well as large industries with a set of tools **to initiate a cycle of continuous improvements within their business operations to manage the transition towards resource productivity.** Using the TEST methodology, UNIDO helps to identify ways to reduce energy, water and raw material costs through Resource Efficient and Cleaner Production (RECP).

125

RECP industry demonstrations

30,673

Directly impacted employees

87.6

Million € RECP investments in pipeline

41.7

Million € in annual economic savings identified

1,830

identified RECP measures

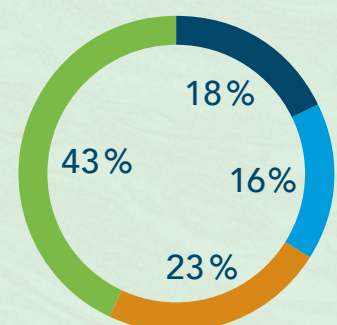
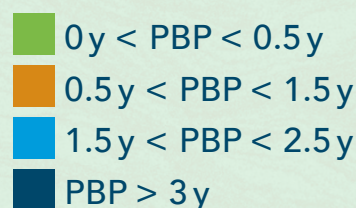
which annually save:

707 GWh of energy
3,512,660 m³ of water
33,623 t of raw materials

and will avoid:

197,525 t of CO₂ emissions
19,612 t of solid waste

Payback period of the identified RECP investments:

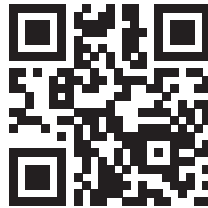


OUR WORK

SwitchMed programme: Southern Mediterranean

In the Southern Mediterranean, UNIDO is working with the European Union to progressively switch to a green, circular economy. SwitchMed is a flagship initiative funded by the European Union to support and accelerate the transition of the Southern Mediterranean countries toward Sustainable Consumption and Production (SCP). UNIDO introduced a TEST component as part of the programme, and the results from the programme's first phase can be found here.

SCAN HERE for
MED TEST II results:




RECP CLUBS

RECP clubs target small businesses and take them jointly through an RECP training and coaching program. These clubs were developed as an alternative assistance model aimed at scaling up RECP solutions to reach larger groups of enterprises. The set-up encourages peer-to-peer exchanges among businesses as well as engaging local authorities as host entities for the clubs.

The model consists of five capacity building modules (environmental profile; energy, water and wastewater; materials and waste; chemicals and emissions; action planning), all aiming to introduce circular economy practices and resulting in an action plan developed by the companies themselves.

This model was developed as part of the EU-funded EaP GREEN project (2012–2017). In total, 26 clubs were created, reaching 255 companies in 20 cities. Further support to existing and new clubs continues under the EU4Environment that started in April 2018.



4 | A walk in the park: Eco-industrial parks

WHAT'S THE ISSUE?

Industrial parks use a large number of resources, resulting in considerable waste. However, they also present an ideal opportunity to introduce circular economy practices and promote industrial symbiosis, including water reuse, recovery of waste heat in industrial processes and solid waste valorization as a substitute raw material.



HOW DO WE HELP?

UNIDO assists in the transformation of existing industrial parks into eco-industrial parks (EIP). Within an eco-industrial park, businesses save energy, water and materials by sharing infrastructure and services, ensuring considerable gains for businesses, the environment and the wider community. The process is facilitated by a series of eco-industrial park tools developed by UNIDO. These tools cover park selection, policy support, assessment, industrial symbiosis opportunity identification, and monitoring. They support the transition to becoming an eco-industrial park as defined in the International Framework on Eco-Industrial Parks, a benchmark developed by UNIDO together with the World Bank Group (WBG) and the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ).

Eco-industrial park strategies can also be implemented in the surrounding community. Urban-industrial symbiosis can, for example, exchange and manage waste and energy on a regional scale, making use of a wider range of material sources, infrastructure, logistics and reuse and recycling options. Eco-industrial parks contribute to a circular economy by creating local jobs, improving the social conditions of local communities and offering solutions to reuse products, parts and components or recycle materials, water, energy and waste produced by the entire economic system.

Today, the eco-industrial park concept is gaining considerable international attention. Many governments and institutions are increasingly convinced that industrial parks are the ideal level of intervention to achieve sizeable and scalable economic, social and environmental benefits. These interventions enhance well-being at local, national and global levels.











Following the pilot phase, in 2019, UNIDO embarked on a fully-fledged EIP programme covering the countries shown on the map with financial support from the Government of Switzerland:



OUR WORK

Eco-industrial parks around the world

UNIDO completed a pilot Eco-Industrial Parks (EIP) programme, supported by Switzerland, for seven countries in December 2018. At both individual and company levels, a significant increase in skills development resulted in resource efficiency and industrial symbiosis opportunities. Action by companies and park management brought sizeable economic and environmental benefits. These environmental benefits impact on the wider community through savings in shared local resources such as water, as well as reduced impact on the global climate.

PILOT COUNTRIES		7	
PARTICIPATING PARKS		18	
PARTICIPATING COMPANIES		180	
PROFESSIONALS TRAINED		841	
NUMBER OF ...	IDENTIFIED RECP AND INDUSTRIAL SYNERGY OPPORTUNITIES (NO.)	1,685	
	IMPLEMENTED RECP AND INDUSTRIAL SYNERGY OPPORTUNITIES (NO.)	991	
	SOLID WASTE REDUCTIONS (T/YR)	20,939	
	GREENHOUSE GAS REDUCTIONS (T CO ₂ EQ/YR)	59,800	
	WATER SAVINGS (M ³ /YR)	1,962,218	
€	FINANCIAL SAVINGS (EURO/YR)	6,746,642	

from 2015 – 2018

Eco-industrial park: Colombia

UNIDO is currently working with Parque Industrial Malambo (PIMSA), located in the urban metropolitan area of Barranquilla, Colombia. The park management and tenant companies of PIMSA are committed to transitioning to an eco-industrial park. This includes extending the business model towards renewable energy and resource efficiency in industry, as well as social and economic community outreach activities.

An assessment of PIMSA against the International Framework for Eco-Industrial Parks revealed that the park adhered to 70 per cent of the benchmark indicators and 20 innovative eco-industrial park opportunities. This provides a robust foundation to enhance the environmental, social and economic performance of the park and the tenant companies. The tenant companies will be further strengthened through the adoption of Resource Efficient Cleaner Production (RECP) methods and approaches.



Parque Industrial Malambo (PIMSA),
Barranquilla, Colombia

Eco-Industrial Parks in Viet Nam

UNIDO partnered with the Global Environment Facility (GEF), Switzerland and the United Nations Development Programme (UNDP) for the implementation of an Eco-Industrial Parks project in Khanh Phu & Gian Khau (Ninh Binh), Hoa Khanh (Da Nang) and Tra Noc 1&2 (Can Tho) industrial parks in three provinces from 2014–2019.

The project led to increased transfer, deployment and diffusion of clean and low-carbon technologies and circular economy practices.

RECP measures resulted in reductions in greenhouse gas (GHG) emissions, persistent organic pollutants (POPs), water pollutants and improvement of water-efficiency and management of chemicals, as well as returns of US\$ 9.6 million to investments of US\$ 11 million in the 2016–2018 period alone.

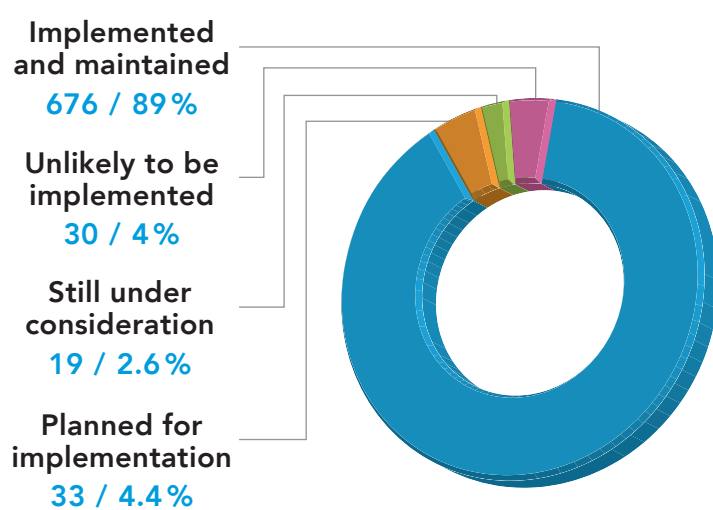
ENVIRONMENTAL BENEFITS

Pollutant or resource	Current and approved Investments (per year)	Pipeline investments (per year)	Total projected to life of investments
CO ₂ -eq	32,361 t	128,300 t	2,901,681 t
COD reduction	75 118 kg	—	225,354 kg/y
Water use reduction	2,705,333 m ³	—	8,115,999 m ³ /y
UP POPs	6,754 µg	—	20,262 µg/y
Solid waste	5,750 t	82,440 t	669,774 t/y

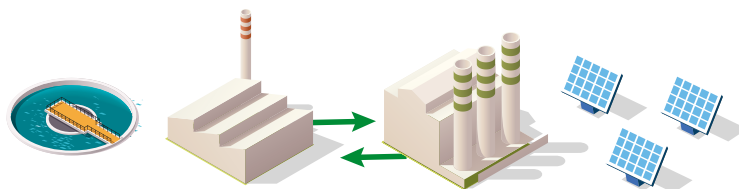
In 2016–2018, enterprises invested US\$ 11 million, with returns of US\$ 9.6 million achieved in the same period.

Implementation of RECP recommendations by enterprises

Total RECP recommendations **758**



Thanks to extensive capacity building, the Vietnamese Government rolled out the experiences and lessons learned in this project to the national level in Decree 82/2018/ND-CP, which defines inter alia the conditions and requirements for recognition as an Eco industrial park in Viet Nam and offers incentives to existing industrial parks for transforming into EIPs. The Government requested the continued partnership of UNIDO in scaling up transformations to EIP under the Global EIP Programme launched in 2019 with funding from Switzerland.



Industrial park assessments undertaken

(Photovoltaic, co-processing; wastewater management)

3



Participants
trained

2360



International
study tours

2



Events organized
(national/provincial)

38



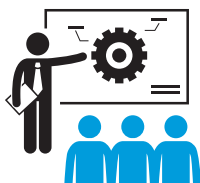
Publications

20



Experts
recruited

40



Expert group
meetings (2)

140 participants



Industrial
symbiosis studies
prepared

18



International
EIP training
course for
decision makers

17 participants



Enterprises
involved

76



Provinces
targeted

3

PYROLYSIS OF AGRO-WASTE: VIET NAM

After Brazil, Viet Nam is the second largest coffee producer in the world. With more frequent rainfall during harvest season, coffee drying is becoming a challenge for farmers, as the traditional form of sun drying is not reliable.

To overcome this challenge, UNIDO introduced flameless oxidation pyrolysis technology into the coffee sector in Viet Nam to provide reliable heat for drying and to produce biochar, a valuable soil enhancer, as a by-product. The project was supported by the Government of Switzerland and it was implemented in collaboration with Sofies, Viet Hien Ltd., the Swiss Research Institute Ökozentrum and Neumann Kaffee Gruppe.

Small-scale pyrolysis units produced in Viet Nam have been sold in Viet Nam as well as in other countries such as Cambodia, and they have been applied to different agro-waste, including rice husks.

- Primary waste flow input: coffee pulp
- Energy output: heat and biochar
- Equation: 3 kg of coffee pulp results in approximately 1 kWh energy and 0.5 kg of carbon dioxide stored as biochar.

The project showcases innovative technological action generating multiple benefits:

- Reduces local air pollution and GHG emissions (in some cases it actually reverses GHG emissions, by sequestering atmospheric CO₂ in the biochar)
- Enables coffee processors to better control and speed up the drying process
- Produces biochar that can be returned to the soil to improve soil fertility, or that can be sold, thus contributing to additional value streams for the processor or farmer
- Contributes to local industrial development, by introducing an innovative and clean technology manufactured in Viet Nam.

This project relies on local needs and resources to bring state-of-the-art technological solutions to manage waste more efficiently. The high scalability of this low-cost technology makes it suitable for multiple applications throughout Viet Nam as well as in other emerging economies.



SCAN HERE to learn
more about Pyrolysis

UNIDO will continue to promote the adoption of pyrolysis of coffee waste in Viet Nam through the global eco-industrial park programme of 2019–2023 with the support of the Government of Switzerland.

5 | Single out: Plastics

WHAT'S THE ISSUE?

An exponential increase in single-use plastics has led to dramatic environmental pollution and marine litter. Up until now, plastics have played an important role in adding lightweight, hygienic, functional and aesthetic features to consumer products through a wide variety of industrial applications at low cost and with high durability. On the other hand, a significant number of plastic packaging products and some consumer goods like toothbrushes have very short lifetimes, and quickly end up in dumps, landfills, waterways and oceans.

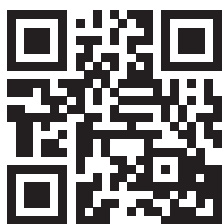


With 80% of the estimated 8 million tons of mismanaged plastic waste that enters the oceans annually originating directly from land-based sources, the global community has come together to put an end to marine plastic litter. UNIDO's contribution towards this global effort is a paper delivered to the G20 2019 Environment Group, under the Presidency of Japan.

Today, as we move away from the linear economy, we are in urgent need of resource efficient solutions through the adoption of circular economy practices.

HOW DO WE HELP?

The UNIDO Industrial Resource Efficiency Division is working to tackle the issue of plastic pollution and to incorporate plastics into the circular economy. Recycling initiatives and the use of innovative new materials help to decrease environmental impact, reduce global marine plastic litter and unlock new economic opportunities.



SCAN HERE for info
on marine littering

OUR WORK

Recycling PET bottles: Egypt

In MED TEST II in Egypt, UNIDO worked with BariQ Egypt, a subsidiary of Raya Holding and the biggest bottle-to-bottle recycler in the Middle East and North Africa (MENA) region. The company reprocesses post-consumer plastic PET bottles into food grade FDA, EFSA, and REACH and Health Canada compliant PET pellets. This fulfils two sustainability pillars, for both the economy and the environment. BariQ incorporates state-of-the-art green technology from major European suppliers with a total annual capacity of 15,000 tons, targeting major international bottle and food container makers and major fiber producers throughout Europe and North America.

TEST MEASURES

Identified
11



Implemented
8

Investment
358,000



Annual savings
982,000

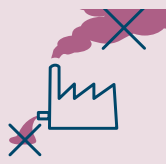
Annual savings

material consumption: 10%

energy consumption: 11%

water consumption: 88%

GHG emissions: 9%



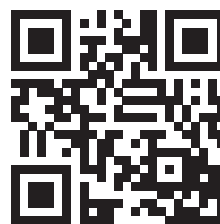
Following implementation, the company's TEST team continued to use the methodology independently. Applying the knowledge gained during TEST training, the BariQ engineers successfully identified two further energy measures that would deliver significant results, improve product quality and further increase project gains.

Tackling plastic waste in the oceans: South Africa

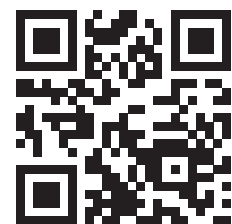
UNIDO supports selected African countries to manage the challenge of plastic waste leaking into the environment and to maintain the value of products and materials in use as long as possible with circular economy practices. In partnership with the Council for Scientific and Industrial Research (CSIR) in South Africa, UNIDO implements a project to support the transition from conventional plastics to more environmentally sustainable alternatives. Support consists of the development of an action plan to strengthen the capacity of local industry to produce alternative materials and strengthening capacity for plastic recycling by integrating the informal sector into the recycling value chain.

This project will help to assess appropriate materials suited to South Africa. Recently, biodegradable plastics have gained attention as one of the ways to deal with plastic pollution. However, when bringing new material into the market, particular attention needs to be paid to ensure that the overall environmental footprint is not larger. For instance, plastic alternatives chosen should not increase resource use and/or greenhouse gas emissions; create new types of waste that cannot be recycled due to the mixture of bio-based with fossil fuel-based plastic materials; increase the amount of waste; or hinder efforts to increase circularity. This project will facilitate an enabling and inclusive environment in order to identify and implement appropriate solutions.

The project has the potential to reduce plastic leakage into the environment and unlock new economic opportunities, both of which are urgently needed in South Africa.



SCAN HERE for new
report highlights



SCAN HERE for a
plastic littering flyer

6 | The water's fine! The beverage sector

WHAT'S THE ISSUE?

The beverage sector uses large volumes of water, creates significant volumes of wastewater and produces considerable greenhouse gas emissions.



Photo: Miguel Andrade/Unsplash

HOW DO WE HELP?

UNIDO is working to mitigate the industry's negative impact on the environment by reducing water usage and electricity consumption and implementing chemical leasing.

OUR WORK

Water stewardship: Indonesia, Algeria

Water plays a crucial role in the life cycle of beverage products. Circular economy approaches help to reduce the water footprint of beverage products at every stage of the life cycle. There are three stages where environmental performance assessment of beverage products is possible: the upstream, core and downstream stages. At the upstream is the inflow of raw materials, chemicals, and energy required for beverage production, as well as the transport of raw materials to the production site. The core stage comprises of production of the beverage. The downstream includes the transport to the consumer, the use and the disposal of the beverage products at the end of their life cycle.



The water footprint of beverage products throughout their lifecycle (hectolitres).



Barley

100 – 298* hl/hl



Malting

1,0 hl/hl



Brewing

3,5 hl/hl



Containers 0,5 – 8,0 hl/hl

* Average use based on calculation from Water Footprint Network, which varies greatly per region

Water stewardship is the responsible planning and management of water resources.

A business can become a proactive water steward by:

- Understanding risks from water scarcity and pollution
- Taking action to help ensure water is managed sustainably
- Understanding water to be a shared, public resource
- Going beyond efficient water use within their own value chain

In 2015, UNIDO and Heineken agreed to cooperate on water stewardship. At the heart of these partnerships is the engagement of stakeholders, facilitated by UNIDO, located in and around the water catchment area where a beverage production firm is located. They are the ones to agree and adopt collaborative measures to reduce water stress in a catchment area. Those efforts can include reducing the amount of water used by beverage production firms, treating the water discharged back into the environment and recycling effluents for non-productive purposes at the factory site. In water-stressed catchment areas, Heineken has committed to return 1.5 litres of water per litre of product into the environment and to other

users. Although the largest part of the firm's water footprint is in agriculture, barley is at the lower end of the water footprint scale and generally survives on rainfall to meet its water needs. In areas that depend on irrigation, the firm is working with farmers to improve farming practices and grow more barley with less water.

In Indonesia, a collaborative project aims to restore the water retention capacities of degraded catchment areas. Community-managed agroforestry schemes will be established covering 231 hectares along with 700 absorption wells, which will help to retain 1,416,000 m³ of water per year during the rainy season in the catchment area. This water will be slowly released during the dry season, preventing floods, mitigating droughts and improving water security for people and businesses throughout the year.



Chemical leasing

In order to move towards a circular economy, we need new concepts and approaches for dealing with resource productivity in industry. Innovative business models such as chemical leasing accelerate the shift to a circular economy, by intensifying the use of the product over its life cycle.

Chemical leasing is a product-as-service model. The supplier sells chemicals as a function. The user pays for the benefit of chemicals, rather than the amount of chemicals. The supplier and the user both benefit from the arrangement, as the supplier provides less product, for instance, only the amount of chemicals to clean 100,000 bottles per year, and the user pays less, as in collaboration with the supplier, the user implements measures to reduce chemicals used, and in some cases,

collection and return of used chemicals to the supplier for recycling. The amount of chemical – and the amount of waste – is significantly reduced, resulting in a far lower impact on the environment and human health. Furthermore, a close collaboration is established between the supplier and the user. Once the business model is adopted, there are no ongoing costs.

The UNIDO Global Chemical Leasing Programme was established in 2005 to support enterprises to practice resource efficient and cleaner production, handle chemicals safely and establish sustainable business practices. In 2016, the governments of Austria, Germany and Switzerland signed a joint declaration with UNIDO for the global promotion of chemical leasing.

Chemical leasing in the beverage sector: Uganda

A Ugandan beverage company produces on average 140,500 m³ of beverage/year and consumes a high volume of water during cleaning, conveyor lubrication and washing of returnable glass bottles. This goes hand in hand with the utilization of many chemicals that are applied to ensure adequate hygienic standards and high product quality.

In order to use chemicals more efficiently, reduce costs and avoid potential adverse impacts on the environment and human health, the company decided to implement Chemical Leasing in conveyor lubrication, bottle washing and final rinsing. With the support of UNIDO and the Ugandan Cleaner Production Centre, the company and the chemical supplier agreed that payment would no longer be for the amount of chemicals used but for the function of the chemical.

Consequently, several process improvement measures reduced chemicals used, e.g. timers, flow regulators, measurement and monitoring devices and better maintenance practices.

ANNUAL CHEMICALS, WATER AND ENERGY SAVINGS

CHEMICALS

Bottle washing
20%



Conveyor lubrication
29%

WATER

Better maintenance
63,500 m³



Dry lubrication
1,150 m³

ENERGY

Bottle washing
230,000 kWh



Conveyors
465,700 kWh

TOTAL COST SAVINGS

US\$ 35,000



representing
25% of total operational costs prior to chemical leasing



SCAN HERE for info
on chemical leasing



VISIT the chemical
leasing toolkit

7 | Fashion forward: The textile sector

WHAT'S THE ISSUE?

Textile manufacturing and ready-made garment manufacturing demand a tremendous amount of resources and generate vast amounts of waste and effluents. In 2015, the global textile and clothing industry consumed 79 billion cubic metres of water and generated 1,715 million tons of CO₂ and 92 million tons of waste. More than 8,000 chemicals are required for the various processes of the textile value chain and the World Bank estimates that 17 to 20 per cent of industrial water pollution comes from dyeing and finishing treatments given to fabrics.

Photo: Waldemar Brandt/Unsplash

HOW DO WE HELP?

Through innovative business models such as Chemical Leasing, UNIDO is working to address some of these issues and create a circular value chain within the textile sector.



OUR WORK

Chemical leasing in the textile sector:
Colombia

UNIDO worked with a Colombian textile manufacturer that produces fabrics for different brands, including denim, casual and knit products. In the sizing process, as explained below, the company noted high consumption of different types of chemicals and considerable amounts of wastewater with organic substances, as well as gelling and losses due to detachments in the weaving processes.

During the sizing process, the yarn is covered by a film made of glutinous material, which preserves elasticity and protects it against abrasion and tensile forces, as well as allowing easy removal of sizing chemicals (de-sizing), and improved flexibility and good adhesion.

The company decided to adopt chemical leasing for this process, to reduce costs and negative impacts on the environment. With support from UNIDO and the Colombian

National Cleaner Production Centre, the company agreed with its chemicals supplier to establish a chemical leasing contract with a unit of payment of USD per metre.

Before chemical leasing, the sizing process required a large number of chemicals and additives. Now the process is optimized, with the substitution of low solid synthetic polymers for all the previously used chemicals. Not only did productivity increase, but there were reduced losses in the weaving process, and water consumption and storage space decreased.



8 | In our element: Green chemistry

WHAT'S THE ISSUE?

Throughout industrial production, many hazardous chemicals are used. Addressing the challenges posed by hazardous chemicals requires holistic, wide-ranging solutions and environmentally sound management. Designing hazardous chemicals out of products, innovation, transfer of environmentally benign approaches and technological solutions are essential elements of a reduction strategy with a goal of “zero” waste.

HOW DO WE HELP?

Green chemistry is a way of designing chemical products and processes to lessen or eradicate resulting hazardous waste. The concept applies to all stages of the chemical product life cycle, from design through to end-of-life for prevention of waste, design of safer chemicals and products, and designing for energy efficiency and degradation.



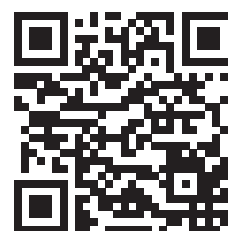
OUR WORK

Green chemistry around the world

UNIDO launched a Green Chemistry initiative to deploy new approaches and technologies and increase global awareness and capacities for the design of chemical products and processes that advance environmental benefits throughout their life cycles. The initiative is supported by the Center for Green Chemistry and Green Engineering at Yale University, Braskem, and National Cleaner Production Centres (NCPCs) from Latin America, Africa, Asia and Eastern Europe.

The Green Chemistry initiative focuses on the inherent properties of chemicals to ensure that they are benign and beneficial throughout their entire life cycle. The purpose is not simply to reduce pollution at the source by eliminating the hazards of chemical feedstock, reagents, solvents and products, but also to ensure that the broad spectrum of sustainability concerns are built into the design framework of chemicals through innovation and invention. Green chemistry affects virtually every business sector, including food, energy, plastics, drugs, cosmetics and cleaning products.

Awareness-raising materials and training tools are available on the initiative's website. From 2016 to 2019, more than 620 people received training as part of the Green Chemistry initiative. There are also 170 cases studies and one pilot project that document Green Chemistry in practice. A university curriculum was developed and shared with universities in the participating countries to adapt and include in their own programmes.



SCAN HERE to visit
the GGCI homepage

9 | Human nature: Health and pollution

WHAT'S THE ISSUE?

Global changes in consumption and production have seen the rapid growth of developing country economies. However, this growth has occurred without adequate pollution control or the capacity to manage negative impacts on health and the environment. Many inefficient practices and processes – in the extraction and processing of resources, production, distribution, and use of resources, as well as unsafe waste management – cause ambient air, water and soil pollution through emissions of particulate matter, chemicals and other pollutants.

Circular economy practices are by nature resource efficient. They seek to minimize and eliminate waste, and focus on designing harmful pollutants out of products. In its October 2017 report, the Lancet Commission on Pollution and Health recommended the implementation of circular economy practices to stem and eventually prevent pollution and the significant loss of life associated with it.

HOW DO WE HELP?

The health impacts of pollution can only be addressed through the collaborative action of many stakeholders. Within governments, at least the Ministries of Health, Environment, Industry, Labor and Economy need to work together, as well as with those who are affected and others who can help. UNIDO works with developing countries to address environmental

challenges by bringing these stakeholders together to identify actionable proposals they can jointly implement, in Health and Pollution Action Planning processes.

The Lancet Commission on Pollution and Health's October 2017 report, published in a stand-alone issue, supported by the European Union, UNIDO and Pure Earth, stressed the link between environmental pollution and risk of disease and death. The report estimated that air, water and soil pollution were responsible for 9 million premature deaths per year, equivalent to 16 per cent of deaths worldwide and three times more than AIDS, tuberculosis and malaria combined in 2015. The overwhelming majority of the global burden of disease from pollution – 92 per cent – affects the poor and vulnerable, including women, children and the elderly in low- and middle-income countries.

COLOMBIA

4 project proposals

Estimated budget:
US\$ 5,135,960**GHANA**

3 project proposals

Estimated budget:
EUR 9,019,000**KYRGYZSTAN**

2 project proposals

Estimated budget:
EUR 10,020,300**PHILIPPINES**

4 project proposals

Estimated budget:
EUR 94,518,700**THAILAND**

5 project proposals

Estimated budget:
EUR 24,492,289**OUR WORK****Health and Pollution Action Plans :
Columbia, Ghana, the Kyrgyz Republic,
the Philippines, Tanzania**

UNIDO has assisted in the development of Health and Pollution Action Plans (HPAP) in Colombia, Ghana, the Kyrgyz Republic, the Philippines and Tanzania. This process brought together high-level representatives and experts from the Ministries of Environment, Health, Industry, Labor, Economy and Planning, and Environmental Protection Agencies together with UNIDO, WHO, UNICEF, World Bank Group, Asian Development Bank, National Cleaner Production Centres, the private sector and NGOs.

Environmental pollution challenges were prioritized based on their health impacts and 18 project proposals, following circular economy principles, were prepared for immediate to medium-term implementation and funding. The proposals are available to access online – and available for discussion with the relevant governments.



SCAN HERE to
see the projects







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