



TOGETHER
for a sustainable future

OCCASION

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TOGETHER
for a sustainable future

1966 - 2016



Making it Green

DEPARTMENT OF ENVIRONMENT

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION



CONTENTS

PART ONE: WHO WE HELP 08

CHAPTER ONE: GREENING LIVES 10

- 01 GRAFTING HELPED ME GROW (MEXICO)11
- 02 TURNING TRASH INTO OPPORTUNITY (GUINEA) 12
- 03 CALLING ALL ECOSUPERHEROES (PHILIPPINES) 13
- 04 A COMPANY REACHES OUT RESPONSIBLY (MYANMAR)..... 14
- 05 TRANSFORMING INTO A GREEN BUSINESS (THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA) 15

- 06 WOMEN NET BENEFITS WITH CLEANER FISH SMOKING (BENIN) 16
- 07 A GREEN BUSINESS FINDS A HOME (MEXICO) 17
- 08 MAKING POLLUTION OUR PRIORITY (CHINA)18
- 09 MINING GOLD WITHOUT MERCURY (SENEGAL).....19

CHAPTER TWO: GREENING BUSINESSES 20

- 10 SWEETENING THE DEAL (BELARUS) 21
- 11 DRIVING A SUSTAINABLE AND INNOVATIVE BUSINESS MODEL (SERBIA)22
- 12 GRADING ON GREEN (INDIA)23

- 13 GIVING OUR TEA BUSINESS A LIFT (KENYA)24
- 14 OUR COMPANY GETS A FRESH PERSPECTIVE (PAKISTAN) 25
- 15 BECOMING THE COMPANY WE WANT TO BE (ECUADOR)..... 26
- 16 A NEW BOILER PAYS OFF (LAO PEOPLE’S DEMOCRATIC REPUBLIC)27
- 17 HOME APPLIANCES GO ECO (CHINA) 28
- 18 THINKING OUTSIDE THE BIN (ISRAEL) 29

CHAPTER THREE: GREENING COUNTRIES 30

- 19 IF WE CAN DO IT (ST. VINCENT AND THE GRENADINES) 31
- 20 DOING OUR PART (HONDURAS)32
- 21 ACCELERATING TO THE FINISH LINE (CROATIA).....33
- 22 TRAINING IT FORWARD (CHAD)34
- 23 FOILING FAKE REFRIGERANTS (ERITREA)35
- 24 AN AUDIT BEARS FRUIT (VIET NAM)36
- 25 CLEANING UP LEATHER (TUNISIA)37

PART TWO: WHO WE ARE 38

CHAPTER FOUR: GREENING THE FUTURE 40

- Meet UNIDO’s Department of Environment46
- Crossword: Work In Words 48
- Mandala: Make Me Green! Or Red! Or Yellow!49
- Timeline: We Make It Green50



ON THE OCCASION OF OUR 50TH ANNIVERSARY, I CAN SAY WITH CONFIDENCE THAT UNIDO’S MANDATE TO PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT HAS NEVER BEEN MORE RELEVANT.

After all, the global economy faces strong headwinds: continued slow growth, geopolitical tensions, migration and rapid technological change. Fortunately, UNIDO has learned what works and what doesn’t when it comes to industrial development.

Over the past five decades, we have launched successful industries, safeguarded the environment, reduced carbon dioxide emissions, developed profitable partnerships with the private sector, promoted new innovative technologies, created jobs and developed skilled workforces that mitigate the risk of people falling into poverty.

The Department of Environment’s programmes play a crucial role in this work. One of its priorities is to assist industries to improve resource productivity and environmental performance through the adoption of Resource Efficient and Cleaner Production practices, methods and techniques, as well as through enhanced recycling, resource recovery and treatment of all wastes.

Others in the Department of Environment work to reduce and eliminate the prevalence of persistent organic pollutants. In doing so, they seek to develop new, as well as re-tool existing, industries for the better management of these substances.

In implementing the Montreal Protocol on Substances that Deplete the Ozone Layer, the Department of Environment’s projects phase out these substances—as well as similar substances with high global warming potential—from industrial processes and products by assisting countries to upgrade their industries and introduce alternatives. This does not only help the ozone layer, it also drastically reduces the emission of greenhouse gases.

Finally, the Department is also preparing for emerging environmental compliance regimes by developing methodologies to support the industries of UNIDO’s Member States in meeting the obligations of upcoming treaties, such as the Minamata Convention on Mercury.

One year ago, world leaders adopted 17 Sustainable Development Goals. Goal 9 calls on countries to “promote inclusive and sustainable industrialization”. As you’ll see in the following pages, UNIDO’s Environment Department takes that mandate to heart, working towards solutions that are sustainable not only for the Earth, but also for all the people who live on it.

Li Yong
Director General



IN UNIDO’S ENVIRONMENT DEPARTMENT, WE’RE NOT SO USED TO TOOTING OUR OWN HORN. BUT OUR ORGANIZATION’S 50TH BIRTHDAY IS WORTH CELEBRATING. AND, AS YOU’LL SEE IN THE FOLLOWING PAGES, WE HAVE A LOT TO SHARE ABOUT WHO WE ARE, HOW FAR WE’VE COME AND WHERE WE’RE GOING.

In *Part One, Who We Help*, you will meet extraordinary people in fascinating places around the world, as you hear directly from beneficiaries of 26 of our projects. Those beneficiaries include individuals such as an agricultural worker in Mexico, businesses such as a canning factory in Lao People’s Democratic Republic and governments of countries ranging from India to Eritrea to Saint Vincent and the Grenadines. Though far-flung in location as well as in scope, all these projects also share one beneficiary in common: the environment.

In *Part Two, Who We Are*, you’ll hear a little from us. A timeline of our history shows the twists and turns of UNIDO’s environment portfolio, which just last year led to the establishment of the Environment Department as it exists today, with divisions dedicated to the Montreal Protocol (ozone depleting substances), the Stockholm Convention (persistent organic pollutants), industrial resource efficiency and emerging compliance regimes. On other pages, we give you a window into who we are as a team—from the number of languages we speak to our caffeinated drink preferences.

Our team also shares a common vision. Its iterations have taken on many names over the years, but recently we’ve grown partial to the moniker “circular economy”. This economic model has been taking the world by storm, and we think we have something unique to add: The ability to help bring the circular economy’s benefits to developing countries. You’ll read a little about that vision in these pages, and we plan to share more through various channels in the months to come.

These pages also contain a few surprises: a crossword puzzle, a mandala for coloring and a photo challenge. These are offered in the spirit of dialogue: We don’t want to talk at you, but engage with you—whether you are a partner, a funder, a beneficiary or a member of the public. We hope this booklet will contribute to a larger conversation that will continue in meeting rooms and cafes, in waiting rooms and on airplanes, on Facebook, Twitter and WhatsApp...and even around all of our family dinner tables.

These pages represent our best summary of how we—as a department, as an organization, and as a global community—can “make it green”. We’re looking forward to our next 50 years, and we hope you will join us for the ride.


Stephan Sicars
Director, Department of Environment



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OUR ENVIRONMENTAL WORK HAS BEEN BACKED BY HUNDREDS OF FUNDERS OVER THE PAST FIVE DECADES.

THOSE LISTED BELOW HAVE SUPPORTED PROJECTS THAT WE HAVE UNDERTAKEN IN THE **PAST FIVE YEARS.**

- AUSTRIA: DEVELOPMENT BANK OF AUSTRIA; FEDERAL MINISTRY OF AGRICULTURE, FORESTRY, ENVIRONMENT AND WATER MANAGEMENT
- BELGIUM
- CANADA
- CHINA: MINISTRY OF COMMERCE (MOFCOM); CHINA INTERNATIONAL CENTER FOR ECONOMIC AND TECHNICAL EXCHANGES (CICETE)
- COMMON FUND FOR COMMODITIES (CFC)
- CZECH REPUBLIC
- EUROPEAN UNION
- FINLAND
- FRANCE: FRENCH DEVELOPMENT AGENCY (AFD)
- GERMANY: GERMAN FEDERAL MINISTRY OF THE ENVIRONMENT, NATURE CONSERVATION, BUILDING AND NUCLEAR SAFETY
- GLOBAL ENVIRONMENT FACILITY (GEF)
- GLOBAL GREEN GROWTH INSTITUTE
- HEINEKEN INTERNATIONAL B.V.
- INDIA
- INTERNATIONAL LABOUR ORGANIZATION (ILO)
- IRANIAN FUEL CONSERVATION ORGANIZATION
- ISREAL
- ITALY: MINISTRY FOR THE ENVIRONMENT AND THE PROTECTION OF LAND AND SEA
- JAPAN
- REPUBLIC OF KOREA: KOREA INTERNATIONAL COOPERATION AGENCY
- MONGOLIA
- MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL
- NIGERIA
- NORWAY: THE ROYAL NORWEGIAN EMBASSY, KHARTOUM
- ONE UN FUND
- ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)
- REGIONAL NETWORK ON PESTICIDE FOR ASIA AND THE PACIFIC MEMBER COUNTRIES (RENPAF)
- RUSSIAN FEDERATION
- SLOVENIA
- SPAIN: SPAIN MILLENNIUM DEVELOPMENT GOALS ACHIEVEMENT FUND
- SWEDEN
- SWITZERLAND: FEDERAL OFFICE FOR THE ENVIRONMENT; STATE SECRETARIAT FOR ECONOMIC AFFAIRS (SECO)
- TRUST FUND FOR LATIN AMERICA AND THE CARIBBEAN
- UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)
- UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP)
- UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION (UNESCO)
- UN PEACEBUILDING FUND
- WORLD HEALTH ORGANIZATION (WHO)

AND MANY THANKS TO ALL OF OUR PROJECT PARTNERS AROUND THE WORLD WHO HELP US MAKE IT GREEN.



WHO WE HELP

PART ONE

SUCCESS PLUS SUSTAINABILITY: THAT'S WHAT IT MEANS TO "MAKE IT GREEN". IN PART I, WE'VE LET THOSE THAT WE HAVE HELPED TO ACHIEVE THESE DUAL GOALS DO THE TALKING.

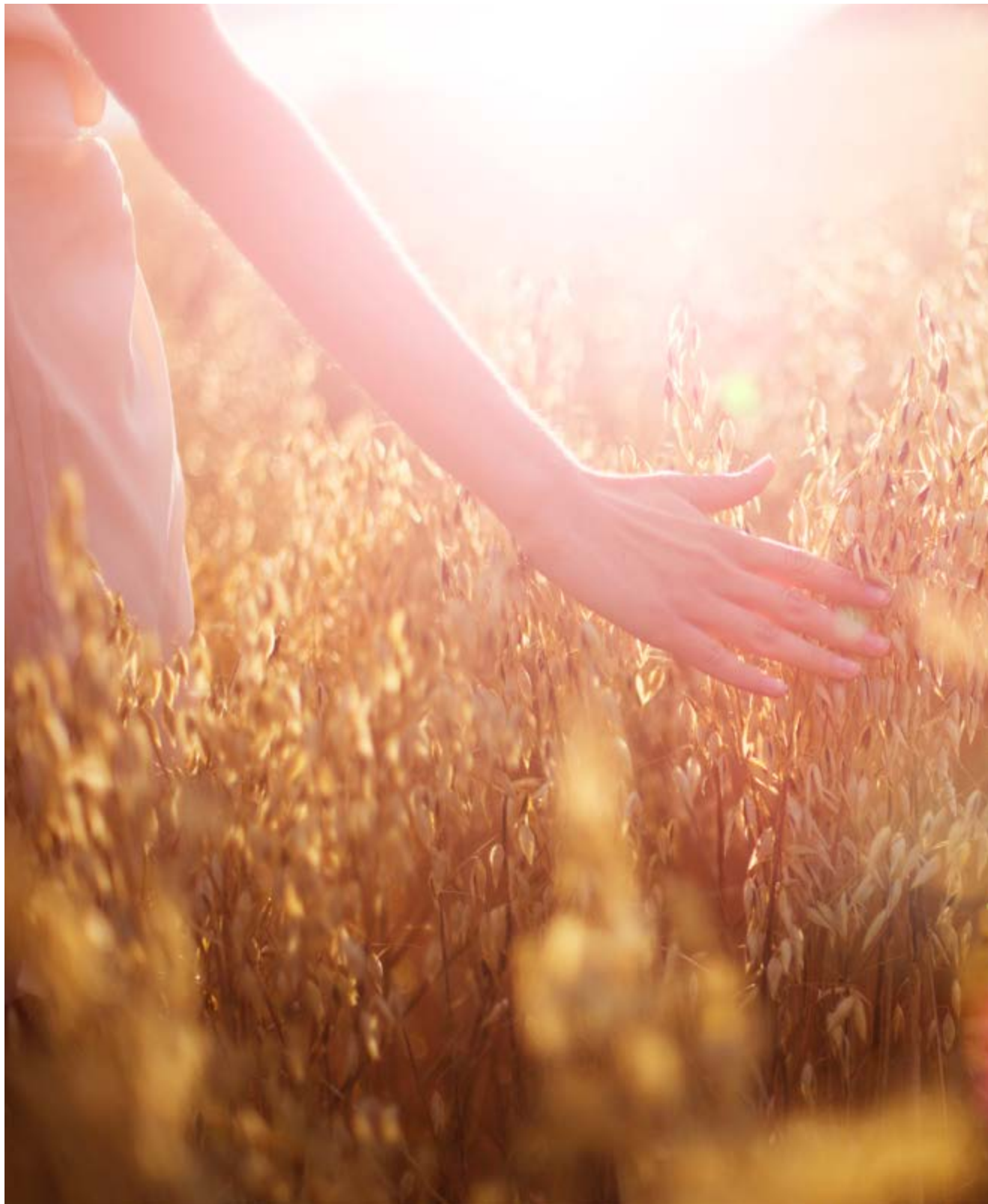
Chapter One is all about greening lives: As you'll see, we partner with businesses and community leaders to make sure that industries provide services and make products that don't put workers, local communities or consumers at risk for exposure to toxic chemicals, as well as to generate new green jobs that help young people and women enter the workforce.

Chapter Two spotlights how we make businesses green—which to us means guarding the environment as well as the bottom line. Small and medium-sized businesses make up more than 90 percent of businesses worldwide, so the new methods and technologies we help demonstrate for them have the potential to resonate at a truly global scale.

Finally, **Chapter Three** illustrates how we help countries go green

by sharing know-how that helps governments comply with the international environmental agreements that they make to reduce or eliminate harmful substances. For governments who want to take sustainable industrial development a step further, we advise them on their journey to adopt new overarching policies and strategies.

On each page in Part I, you will see icons from the Sustainable Development Goals, which countries adopted last year as part of a global agenda to end poverty, protect the planet and ensure prosperity for all. As you will see, each of our projects helps to further several of these goals. You can refer back to this page to remind you of each icon's meaning, as well as to <http://www.un.org/sustainabledevelopment> to learn more about the goals.



GREENING LIVES

CHAPTER ONE

For many years, methyl bromide, a fumigant that can deplete the ozone layer and is harmful to human health, was sprayed on soil before growing crops in order to control soilborne diseases. As part of a project to eliminate the use of methyl bromide, implemented by UNIDO in several states in **Mexico**, workers—especially women and young people—have been trained in alternative technologies to methyl bromide, such as the technique of grafting, in which they attach the roots of a pest-resistant plant to the top of the plant they want to grow.



GRAFTING HELPED ME GROW

Grafting makes the plant stronger so if we do it well, more plants will survive and produce fruits and vegetables. Grafting is good for Mexico, too, because it helps to create sufficient jobs for people here. When there is enough work, our lands, our families and our children will all benefit. Grafting has changed my life in many aspects.

Because grafting is specialized work, my salary has improved a lot. Before, when buying a newspaper, I was worried if there would still be light at home, if there would be water. So I said, I will not buy this. Now, I am no longer stressed, thinking, Oh, I will end up in the gutter! I can buy basic things, and I can keep extra money I earn for the future, for my son, for when someone falls ill.

In grafting, you are not outside in the sun all day. Many workers here work on the fields or along the assembly line. Now I work inside the sheltered greenhouse for eight hours a day, and earn more money. People treat me well here; they give me one hour of lunch time.

Working as a grafter made me grow as a person. Even at my young age—I am 18 years old—I am taking care of my own needs, of my house, of my family. I grew in my career, too. I started as a grafter here at Malichita. I had been working here for the longest amount of time and learned quickly how to graft well, so now I work as a supervisor of the other grafters and I train them as well.

Now I see a future that will only get better each day. If I want to study, this job will help me to pay for it. Same goes for my son, when he goes to school.

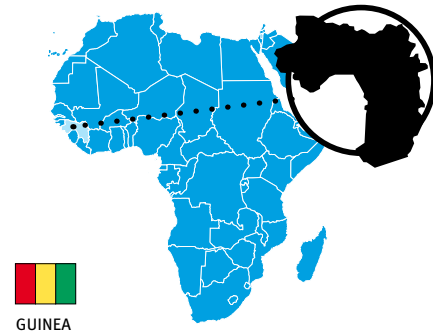
Because I like grafting, I want to become a qualified trainer in grafting—an agrochemical engineer. 🌱👨🏫📚🔧

“NOW I SEE A FUTURE THAT WILL ONLY GET BETTER EACH DAY.”



MARITZA PAOLA MEJÍA
Grafter for the company Agropecuaria Malichita in Sonora México

In Guinea, UNIDO trained more than 4,000 young people and women in solid waste management, including waste collection and sorting, sanitation and the integrated management of public spaces. Many of them subsequently found employment in waste collection centres or took advantage of UNIDO support to start their own businesses. The project offers a hopeful model for addressing West Africa's most pressing environmental, economic and social problems.



TURNING TRASH INTO OPPORTUNITY

Around 2011, unemployment was rampant among women and youth. In a country like Guinea, where young people make up half the population, the inability to provide for oneself and one's family was a considerable problem. It led to instability, social tensions and even violence.

Guinea is also a country where there are problems with handling waste. Where I live, in Labé, the main marketplace was overrun by trash bags. Public places were dirty and unhealthy. As Labé is the second largest city in the country, this was a real problem.

To solve all these problems at the same time, UNIDO brought together women's and youth organizations to form a composting company where women and young people could work. This eventually led to the Association of Women's and Youth Organizations for Composting in Labé Guinea, of which I am now the head. UNIDO experts trained me and many women and other youth in semi-industrial composting techniques and work safety, and also instructed us in how to run a company. They gave us the equipment to compost waste in a safe and hygienic way.

The municipality of Labé helped us as well and gave us a plot of land near the city's garbage dump. With them, we also set up a committee to collect garbage in the city and developed a system in which groups would collect solid waste.

The project helped us in many ways. Today, we have a composting centre that employs 25 women and young people, who have the opportunity to improve their living standards. We have a piece of land that we primarily use to test the quality of the compost, but we also harvest many potatoes from it. Besides composting, we also started to recover and sell plastic to Sodiaplast, a company in Conakry. This gave market value to waste, which helped to clean up the Labé marketplace and provided 100 more jobs along the supply chain of recycling and value creation of organic and plastic waste in Labé area. There are more jobs now and public spaces are cleaner, which helped to improve the social climate in the city.

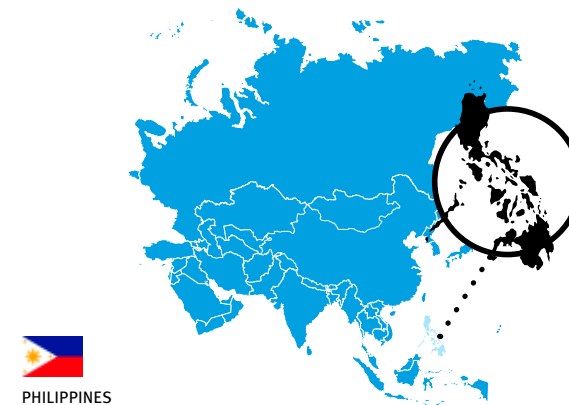
Personally, the project has given me hope, because I feel useful within my society. 🏠🌱♻️👩🏫👨🏫👨🏫

“THERE ARE MORE JOBS NOW AND PUBLIC SPACES ARE CLEANER.”



MAMADOU DIOULDÉ DIONFO DIALLO
President of the Groupement des Associations des Jeunes et Femmes pour le Compostage de Labé en Guinée (GAJFCL)

UNIDO works with countries to create comprehensive national plans to dispose of persistent organic pollutants. In the Philippines and other countries, this often means establishing new disposal facilities, which requires the coordination of experts, government officials and local communities.



CALLING ALL ECOSUPERHEROES

I remember April 22, 2008—Earth Day—very well. That day, we launched a pioneering environmental clean-up project in the Philippines. Its goal was to address the country's stockpiles of polychlorinated biphenyls (PCBs), which the Stockholm Convention lists as among the most dangerous pollutants for both human health and the environment.

Specifically, we would build a PCB disposal facility in the province of Bataan. It would use a non-combustion technology—that is, it would not burn the waste but instead destroy it with chemicals.

But in the following months, my excitement turned to worry. We had a problem: The local governor in Bataan had concerns about allowing a PCB storage facility in his municipality. We weren't sure he would give the approval.

Our partners, including UNIDO and the Department of Environment and Natural Resources, turned to us, the EcoWaste Coalition, to help overcome this problem. We are a public interest network of community, church, school, environmental and health groups pursuing sustainable solutions. We take on issues related to waste, climate change and toxic chemicals.

As part of our responsibilities, we arranged

a dialogue between the local governor and representatives from UNIDO and the national government. As a result, the governor gave us clearance to undertake a public awareness campaign, which included participants from the local communities, as well as academics, fisherfolk and local government officials. One aspect of this campaign was the introduction of a new superhero, the PCB Eliminator, who was the mascot of the PCB-free Philippines campaign.

We also helped with environmental monitoring in order to demonstrate the environmental safety of the non-combustion PCB disposal technology. With help from people in the local communities, including local fisherfolk, we took baseline samples of air, water and soil.

Thanks to these efforts, we gained support from the local communities adjacent to the park where the facility would be located. Ultimately, that support helped overcome the local governor's objections so that we could get what we needed for the facility: an approved Environmental Impact Assessment Study and local government permits.

Today, the facility stands inside a petrochemical industrial park. However, due to delays, it is not yet fully operational. With many tons of PCB-containing equipment and

waste awaiting safe destruction at this facility, we will continue to encourage and support the government to fulfill its commitment to get it up and running soon. 🌱♻️🏠

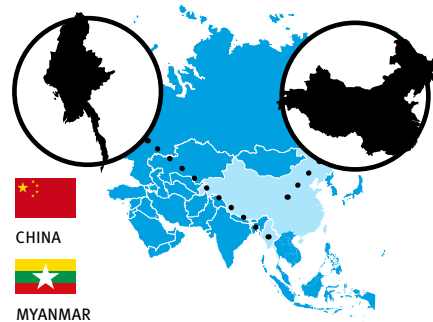
“SUPPORT FROM THE LOCAL COMMUNITIES ... HELPED OVERCOME THE LOCAL GOVERNOR'S OBJECTIONS.”



MANNY C. CALONZO
President of the EcoWaste Coalition



More than ever, consumers are pressuring companies to operate responsibly. UNIDO's Corporate Social Responsibility (CSR) projects follow a three-pronged strategy aimed at increasing awareness of the CSR business case, improving understanding of CSR practices and challenges and fostering usage of CSR practices and methods. The overall objective is to improve in an integrated, comprehensive and inclusive manner the social, environmental and economic performance of businesses.



A COMPANY REACHES OUT RESPONSIBLY

CITIC Construction Co., Ltd. is the flagship enterprise of CITIC Group, specializing in international project contracting. Some 97 per cent of its business is international, so its leadership is naturally concerned with guarding the reputation of Chinese enterprises abroad.

One way to do that is by incorporating CSR into business models. According to the World Business Council for Sustainable Development, "corporate social responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large."

In 2014, when UNIDO and the China Construction Industry Association jointly launched the CSR Project, CITIC Group signed on as a member of the steering committee. After trainings provided by our certification center, with the support of UNIDO experts on responsible business and the domestic version of the ISO 26000 social responsibility guidance standard, the CITIC Group leadership decided to pursue an initiative to improve the conditions

in remote villages in Myanmar by donating a \$1.5 million fund to 50 villages. Each village had a fund committee elected by the villagers. It managed the fund and provided low-interest micro-loans to qualified villagers.

On 4 February 2015, Yuan Shaobin, the Vice Chairman of CITIC Construction kicked off the donation ceremony in the Myanmar capital, and directly transferred the funds to the government of Myanmar.

Ma Chuanfu, the Vice General Manager of CITIC Construction, led the CITIC-Charoen Pokphand training team, which trained more than 300 fund committee members from the 50 villages. The training team explained how to elect a fund management committee, operate the fund and approve and recover loans. CITIC arranged for 100 fund management committee representatives to go to Thailand, where they could study the models of established and successful community funds.

By September 2015, the committees had issued \$1.5 million in loans to 8,496 qualified families. The villagers used the loans to buy poultry, fishing equipment, areca palm seed-

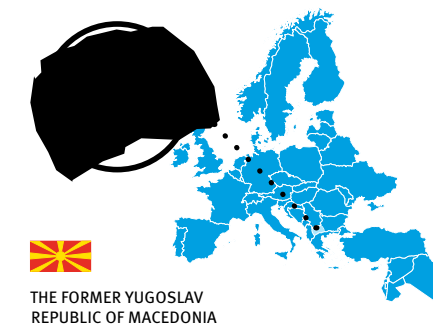
lings, vegetable crops and livestock forage, among other things. Some of them opened small shops. Borrowers were able to repay their loans on time, and the funds were then disbursed to other approved applicants. 🌱 🐔 🐟 🌿

"EACH VILLAGE HAD A FUND COMMITTEE ELECTED BY THE VILLAGERS."



HAISHAN WANG
Director of the Beijing Zhong Jian Xie Certification Centre Co., Ltd.

The former Yugoslav Republic of Macedonia faced significant hurdles when it came to managing polychlorinated biphenyls (PCBs). It lacked effective regulations, legislation, expertise and data, not to mention the disposal facilities themselves. But with the help of a multi-pronged project with UNIDO, the country is now well on its way to eliminating the threats that these harmful pollutants pose to human health and the environment.



TRANSFORMING INTO A GREEN BUSINESS

Our company maintains transformers. Transformers are the boxes that often sit at the top of electric poles. They shift the voltage of the electronic current running through the wires to a level that people can use in their homes and businesses. For many years, our industry used chemicals called PCBs in the transformer oil to eliminate the heat and sparks generated in the transformer, and therefore prevent fires and explosions.

Unfortunately, PCBs turned out to be harmful to human health and the environment. Our maintenance workers, in particular, faced danger through direct contact with the PCB oil and other contaminated transformer parts. As a matter of corporate responsibility, we wanted to eliminate the exposure of the workers to these chemicals and to prevent further contamination. So, in consultation with the technical experts at UNIDO as well as the Macedonian Ministry of Environment and Physical Planning, we decided to participate in a project to build a proper facility with the technology to deal with the PCB-contaminated transformers.

In addition to the environmental and human

health aspects, the project had a business aspect for us. The Balkan region lacked PCB treatment facilities, despite large quantities of PCB-contaminated transformers. Faced with a period of recession and unstable economic conditions, our managerial team decided that it was the right moment to invest in a new potential source of income in order to be able to maintain the financial condition of the company.

Since the installation of the treatment technology, which is both state-of-the-art and reliable, we have made considerable progress with decontamination. So far we have successfully treated 500 tons of PCB-containing transformers.

Moreover, our company now provides a higher level of service than before: When regional businesses send us transformers, not only can we offer diagnosis and repair of standard problems, but we can also identify contaminated transformers, treat them and return them back into the production process.

Our goal is to create a good climate for the next generations, both in an environmental

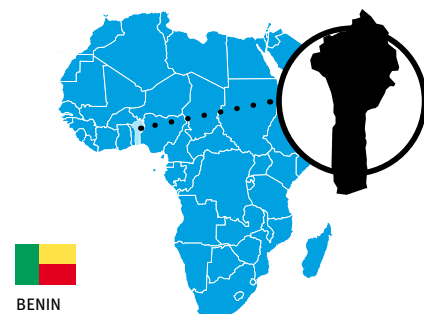
and an economic sense. Just as the appearance of a ray of sun through storm clouds can give us hope that the weather will improve, our facility gives us hope that we can eliminate the threat of PCBs to the environment. That's why we decided to call this facility Eco Ray on the Balkans. 🌱 🌿 🏠

"OUR GOAL IS TO CREATE A GOOD CLIMATE FOR THE NEXT GENERATIONS, BOTH IN AN ENVIRONMENTAL AND AN ECONOMIC SENSE."



ACE ANTEVSKI
General Manager of Rade Končar

Even the smallest businesses can produce large emissions. That's true in West African countries like **Benin**, where individual fish smokers in marketplaces, on the beach and by the roadside unintentionally generate substances that can harm their communities. However, a UNIDO pilot project is showing that change is possible.



WOMEN NET BENEFITS WITH CLEANER FISH SMOKING

Fish constitute the main source of animal proteins in our country's diet, in particular in the south. There, a quarter of fishing products are subjected to treatments such as smoking. Smoking is done for the main part with traditional ovens. Unfortunately, the incomplete combustion of plant fuels in these ovens generates certain persistent organic pollutants that can injure workers and contaminate food. These are carcinogenic and also affect the liver and the immune, nervous and endocrine systems. Indeed, on a visit to Djéffa Beach, a woman who smoked fish for sale complained to our team: "Because of the smoke, I was coughing and I frequently had pain in my eyes."

Our department is conducting a pilot project with UNIDO to replace several traditional ovens with a new technology using the FAO-Thiaroye Processing Technique. Developed in Thiaroye, Senegal, by a collaboration including the Food and Agriculture Organization of the United Nations, the technique minimizes the production of the pollutants through specialized accessories such as a furnace and filter that can be manufactured locally for less than \$600.

In the pilot project, 30 women of Djéffa Beach and 12 women of the market of Gbégamey are getting these new ovens. As it turns out, women are traditionally responsible for activities that increase the value of fishing products, so the project contributes not only to women's health, but also to women's economic empowerment. Other local businesses also benefit. Building the new ovens requires the expertise of local artisans. And the ovens enable the collection of fat as a by-product, which can be used in soap manufacturing.

What's more, the ovens are environmentally friendly: They require about 50 per cent less fuel and make use of other businesses' waste. The women of Gbégamey market, for example, use firewood, manioc peels and sugar cane waste for smoking. Significantly for the women who use them, the new ovens have a bigger capacity than traditional ovens and also generate better quality products. "To sell our delicious smoked fish is really easy," the sellers of Djéffa Beach proudly told our team. 🌿 ♻️ 🏠 🧼 🐟

"THE NEW OVENS HAVE A BIGGER CAPACITY THAN TRADITIONAL OVENS AND ALSO GENERATE BETTER QUALITY PRODUCTS."



EULOGE LIMA
Biologist/environmental scientist in the Direction Générale de l'Environnement

When old refrigerators aren't disposed of correctly, they can emit gases that deplete the ozone layer. That's a big problem in **Mexico**, where small recycling centers often don't follow proper procedures. UNIDO has addressed this problem by training thousands of technicians, as well as helping to open state-of-the-art recovery and recycling centres throughout the country.



A GREEN BUSINESS FINDS A HOME

Refrihogar is a small family enterprise dedicated to refrigeration and air conditioning that started its business in Oaxaca City 24 years ago.

About seven years ago, we started preparing for the switch to new refrigerants as a result of Mexico's obligations under the Montreal Protocol. We called the National Ozone Protection Unit to request information about a training course on good practices in refrigeration and air conditioning. Later we received an invitation to apply to become a recovery and recycling centre. These centres assist technicians in carrying out good practices, particularly in the recovery and recycling of refrigerants. We were fortunate to be chosen.

Immediately after our selection, we received training, including how to operate the new equipment that we received. We looked for and found a suitable place for our centre in the municipality of San Francisco Lachigoló, some 19 km away from the city of Oaxaca. In Lachigoló people speak Zapotec, one of 18 languages and dialects spoken in the state. In this language, "lachi" means flat and "goloo" means large or first.

We worked to integrate ourselves and our business into the new community. The construction of our centre began with the submission of our requests for permits to the municipality. In Lachigoló, officials are elected through a traditional form of governance based on indigenous customs and serve on a volunteer basis. They open the municipal offices at 8 p.m. after they have finished with their daytime activities.

It was difficult to get the permits, since many people had concerns about handling refrigerant gases and hazardous waste. We invited those people to our facilities and showed them what we were doing. We explained in multiple visits to the municipality that there was nothing unsafe about what we were doing. On the contrary, our work was to protect the environment for the benefit of future generations.

Finally, we were able to convince the officials, which allowed us to get federal authorization as well. Now we are part of Lachigoló, and our recovery and recycling centre is as well. Lots of our time and effort have gone into opening the centre, but we know that it will bring re-

sults. Personally I am very satisfied that I could gain more knowledge in the field that I have dedicated myself to, particularly in that as a woman I am working in a field where traditionally men are employed.

"LOTS OF OUR TIME AND EFFORT HAVE GONE INTO OPENING THE CENTRE, BUT WE KNOW THAT IT WILL BRING RESULTS."

It is important to us to create jobs for local people, to share the training given to us with our workers and to implement good practices in the handling of refrigerants. We know that every activity we conduct contributes to the protection of the environment. 🌿 ♻️ 🏠 🧼 🐟



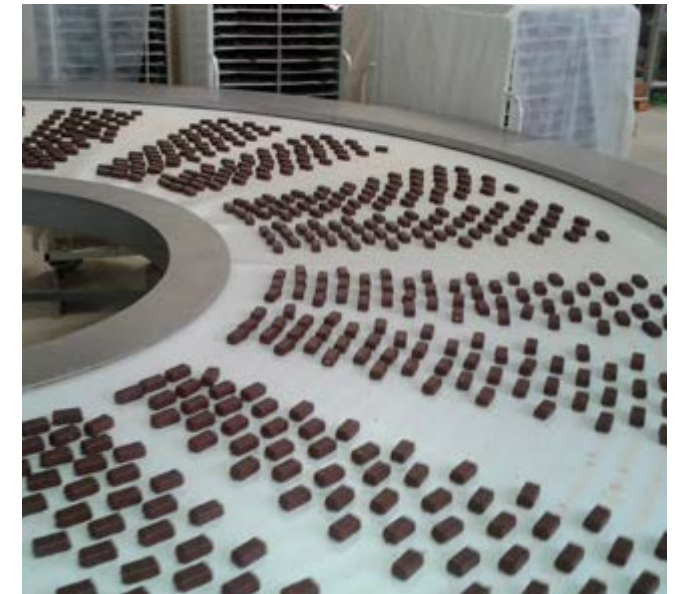
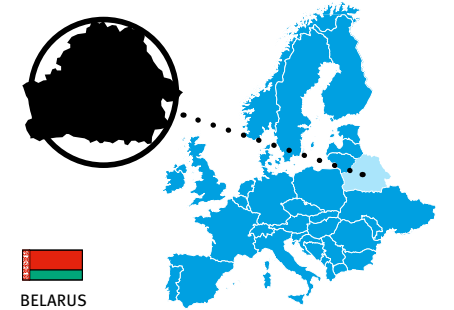
MARINA PÉREZ MONTIEL
Co-owner of Refrihogar, a refrigeration and air conditioning servicing business in Oaxaca



GREENING BUSINESSES

CHAPTER TWO

Since 2014, when UNIDO's Resource Efficient and Cleaner Production (RECP) demonstration project was launched in Belarus, the project has helped more than 30 companies to see for themselves how they can cut their production-related costs and at the same time reduce their adverse environmental impacts.



SWEETENING THE DEAL

In recent years, our confectionery factory has been increasing the output and assortment of our sweets and chocolates. We have been renovating production lines and using state-of-the-art equipment. This has enabled us to take the leading position in the industry in our country and to export our products. Due to increasing prices for raw materials and energy, we have been drawing the factory employees' attention to the necessity to reduce energy and water consumption, as well as waste and effluents generation.

Having been invited to take part in UNIDO's RECP demonstration project, we eagerly took up the idea, since this approach corresponds to our desire to make the factory's production more sustainable. UNIDO's team of experts drew our attention to the huge quantity of "sweet" wastewater we generate. Several tons of such water are generated at the factory every day. This is washover water that is left over after washing production equipment, connection lines, cooking equipment—and it contains various percentages of sweet ingredients. Previously, this water used to be flushed down the sewage line. UNIDO's experts asked us if we wanted to try

making marmalade filling for chocolate sweets from this water. The simplicity of this suggestion struck us. What used to be a problem and led to expenditures could turn beneficial! Having taken samples of this sweet wastewater, we first produced "sweet water" marmalade in laboratory conditions and then actually started using this water for manufacturing fillings.

At present, our company produces marmalade and other useful by-products from washover water that is left over after the first washing round of containers and connection lines. On average, 1,100 litres of this sweet water are used per shift. This figure includes 300 litres of washover water, of which 15 per cent is actually dry substances that are used in the candy shop. Sweet water left over after the subsequent rounds of washing is now used by another company that purchases it from our factory.

Taking part in UNIDO's demonstration project showed us the huge resource- and energy-saving potential our company has. We sought UNIDO experts' assistance and literally opened every door for them so that they could perform a comprehensive audit, using special

measuring equipment, to find out our weak points where we are currently losing money. The result was quick. We received a pack of

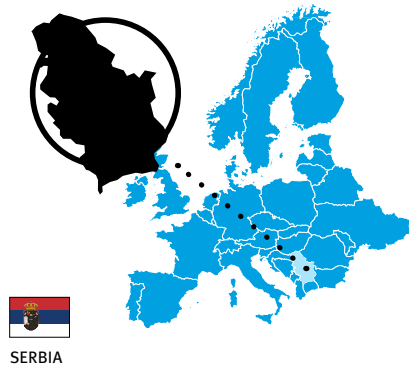
“UNIDO'S TEAM OF EXPERTS DREW OUR ATTENTION TO THE HUGE QUANTITY OF 'SWEET' WASTEWATER WE GENERATE.”

interesting assessments and suggestions that are now being converted into new business plans. We are setting brave and ambitious goals, because we know what we should work on. The joint work of the company's specialists and UNIDO's experts helped motivate the personnel to create plans and programmes aimed at RECP. ♻️



IVAN DANCHANKA
Managing Director of
JV JSC Kommunarka
confectionery factory in Minsk

In the 1990s, UNIDO and the United Nations Environment Programme established the first National Cleaner Production Centres (NCPC). Over the next two decades, these evolved into a global network of more than 70 members, promoting Resource Efficient and Cleaner Production practices in many industrial sectors in developing and transition economies. The NCPC in Serbia, established in 2007, is a particularly strong player in implementing sustainable chemicals solutions in the country, including the promotion of new business models such as Chemical Leasing, by providing technical assistance to industry stakeholders.



DRIVING A SUSTAINABLE AND INNOVATIVE BUSINESS MODEL

We are a manufacturer of metal parts for agricultural machines, business vehicles, mining equipment, transportation equipment and other products on the global market. Specifically, we specialize in bearings and Cardan shafts. Bearings constrain motion and reduce friction. Cardan shafts—which themselves contain bearings—connect components of the drive train, delivering power to wheels.

We pride ourselves in our modern plant, which allows us to produce products that are tailor-made for our customers. But, several years ago, we were not satisfied in one particular area: we were using large amounts of perchloroethylene (PERC), a chlorinated solvent, to clean metal parts. That generated hazardous waste, and the solvent was emitted to the environment and the working environment. We wanted to fix this, but we didn't know how.

In 2009, the Serbian National Cleaner Production Centre told us about a new business model called Chemical Leasing. Instead of selling a substance to the customer, the chemical company sells a service—providing as much of the substance as is needed, as well as recycling or disposing of it when the job is done. We saw that this model had the potential to

be a cleaner, safer and possibly even cheaper solution for us when it came to cleaning our parts. So in 2010 we agreed to start the preparatory phase of a Chemical Leasing project with the partners SAFECHEM Europe (a subsidiary of The Dow Chemical Company), Ravago Chemicals (a local supplier of chemicals) and Pero AG (a technical equipment provider from Germany). In 2012 we signed the Chemical Leasing contract for five years, and operations began in 2013.

The project dramatically changed the way we use solvent in our factory. In consultation with SAFECHEM Europe, we altered the composition of the solvent we used to one that would be less corrosive. We installed a distillation unit for recovering wasted solvent on site. And we changed how we stored and transferred the solvent so that it would not escape.

We saw benefits almost immediately. Due to these measures, which increased the lifetime of the solvent, we reduced our consumption from 30 tons to 5 tons per year. Additionally, we reduced the amount of hazardous waste we generated from 25 tons to 1.5 tons per year. Remarkably, we no longer emit any solvent at all into the environment or into the working environment.

These changes save us about €100,000 per year, most of it in hazardous waste disposal costs. On top of that we see increased productivity and lowered maintenance costs. And our cleaning costs are now more predictable than they were before. Instead of paying SAFECHEM Europe for solvent, we pay a monthly fee for the number of operating hours.

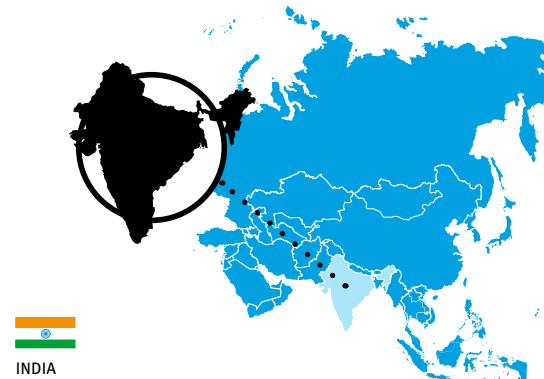
“THE PROJECT DRAMATICALLY CHANGED THE WAY WE USE SOLVENT IN OUR FACTORY.”

In 2014, the Global Chemical Leasing Award recognized our project with a certificate. We have achieved significant economic, environmental and occupational health and safety benefits. Perhaps best of all, however, is that our parts are cleaned consistently and well—indeed, better than they were before. 🏆 🌱 ♻️ 🌍



MILE MIJUSKOVIC
Deputy General Manager
at FKL a.d. Temerin.

Rapidly developing countries such as India aim to maintain a high growth rate, which usually translates into increasingly heavy use of natural resources as well as rising air emissions, waste generation and wastewater discharge. UNIDO is helping to address the conflict between growth and environment through the development of ecologically sustainable business growth models.



GRADING ON GREEN

Our confederation was keen that national development should not come at the cost of the environment. We wanted to develop a comprehensive evaluation mechanism to assess how green a company was and also suggest the way forward. In 2011, with the help of various national and international stakeholders including UNIDO, we took a step towards this direction with the launch of the GreenCo rating system—the first of its kind in the world. Since then, the GreenCo rating system has been evoking an excellent response from Indian industry.

GreenCo is a robust evaluation process that rates the environmental performance of a service or manufacturing company. It awards points to companies based on broad performance parameters, including energy, waste and water management, as well as their supply chains, product stewardship, product life cycles and relationship to their environment. Companies with sufficient points get certification; above that, companies can earn bronze, silver, gold and platinum recognition.

As of June 2016, more than 200 companies are working on the implementation of the GreenCo guidelines. As of August 2016, 78 companies have been certified through the GreenCo rating and the first 27 GreenCo-certified

companies have achieved recurring savings of Rs 543 million (about \$8 million) per year. Following the GreenCo implementation, companies have reported 312 megawatts of renewable energy capacity installed, 44 million kilowatt-hours of energy savings per year, 15 million m³ of rainwater harvested per year and 440,000 tons of carbon dioxide emissions saved per year.

Primarily, the GreenCo rating enables a company to assess where it stands in terms of environmental management. This in turn provides a realistic framework on how to raise the bar of environmental performance and encourages setting a roadmap for resource conservation and improved profitability in the long run. It also equips the company to meet future environmental compliance norms.

In addition, the GreenCo rating has facilitated the introduction of newer concepts such as green supply chains, product stewardship and life-cycle assessment in Indian industry. So far, 20 GreenCo companies have carried out life-cycle assessments for their products and processes. For instance, the replacement of plastic bags with eco-bags has made the GreenCo silver-rated Kempegowda International Airport the first plastic-free airport



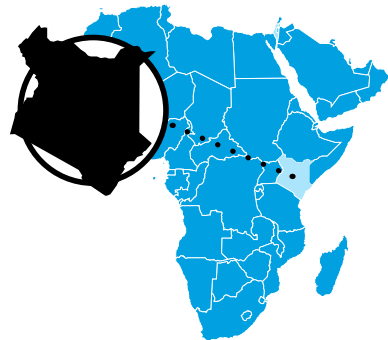
in India. As a part of a green-supply-chain initiative, many large companies have “adopted” smaller companies, helping them to implement the GreenCo rating for SMEs (small and medium-sized enterprises). This in turn will facilitate the introduction of green concepts among SMEs and make the overall global supply chain greener. So far, 13 SMEs are involved in the rating and three of them are GreenCo-rated companies.

The GreenCo rating system has offered new growth opportunities to various technology providers and service providers. New growth areas such as green logistics, green procurement, sustainable packaging and clean technologies are receiving increased attention, encouraging products and technologies that are ecologically superior and economically viable. In sum, the GreenCo rating is helping to create a robust ecosystem where companies are clearly seeing the business case for going green. 🌱 ♻️ 🌍



KIRAN ANANTH
Senior Counsellor at the
Confederation of Indian
Industry (CII)

Local solutions are often the most creative as well as the most successful. That's one reason why, since 1994, UNIDO and UNEP have been working together to build local capacity in Resource Efficient and Cleaner Production (RECP) methodologies in developing countries such as Kenya. National RECP centres established by UNIDO and UNEP around the world provide awareness-raising workshops, training programmes, in-house assessments, technical assistance and policy advice.



GIVING OUR TEA BUSINESS A LIFT

We are a member of the James Finlay Group, an international company with a 250-year old history and a focus on tea production. In Kenya, the use of diesel-fueled trucks to transport green tea leaves from our estate to our factory resulted in emissions of greenhouse gases, as well as dust on the all-weather road around the tea fields. This exposed workers in the fields and members of the community to increased air pollution with possible health problems.

In 2010, we received a training on the RECP methodology for the tea sector organized by the Kenya National Cleaner Production Centre (KNPC). Following that, we implemented a number of measures to better manage energy, water, raw materials and waste. To solve the problem with our diesel-fueled trucks, we decided, with the technical assistance of the KNPC, to construct a ropeway between the estate and the factory.

This had immediate environmental benefits. Between 2010 and 2011, our carbon intensity went down by 10 per cent. With the planned expansion of feeder streams to the main aerial conveyor line, we will be able to replace even more motor vehicles.

Our community's economy also benefitted. This project created new jobs, as additional

technical and non-technical workers have been employed to operate the system. At the moment, the ropeway provides further direct employment for at least 40 people. Plus, the ropeway has increased employment opportunities for the field workers, who are mostly women, since more green tea leaves can be plucked and transported on time through the system.

From a health perspective, field workers and community members now face less air pollution, as well as a reduction in traffic hazards. As for our bottom line, a cost-benefit analysis of the project between the months of December 2012 to August 2013 showed a net benefit of KES 23,674,739 (some \$270,000 at the time). This was approximately KES 2,630,567 (\$30,000) per month.

The total capital we invested was KES 60,000,000 (\$685,000); therefore, the payback period was just two years. This is a huge financial benefit, and better returns are anticipated in the future as we construct more feeder streams to the main supply aerial conveyor line. What's more, future ropeways will have even better returns, as they will serve larger production areas and could be loaded closer to their full capacity.

With improved savings both in terms of leaf

transportation, reduced fuel consumption and road maintenance costs, our company was able to inject some of the profits into the community in which we work. We funded facility construction and improvement for several schools within the estate, sponsored children of employees and from neighboring districts to attend tertiary education and upgraded the facilities of a health center within the estate, which supports employees, their dependents and also neighboring communities.

Several other players in Kenya are now interested in employing the ropeway system. We have shared information on it through exchange visits with other companies, and regulatory bodies have also helped to disseminate the positive impacts of the project. This innovation has revolutionized the tea industry. 🏠 🏢 🌱 🌍 📊



REUBEN LANGAT
Environmental Health and Safety
Manager at James Finlays Kitumbo
Tea Factory

Most industrialized countries have banned hydrochlorofluorocarbons (HCFCs), which are destructive to the ozone layer and also have a high global warming potential. Developing countries are now working to phase them out, too. In Pakistan, UNIDO took the lead on assisting industry with the phase-out in order to reduce the demand for the HCFCs.



OUR COMPANY GETS A FRESH PERSPECTIVE

The Dawlance Group is the biggest home appliance manufacturer in the country. Established in 1991, we are a locally owned enterprise that makes more than 550,000 refrigerators and freezers each year on three assembly lines in two locations. Until recently, like many manufacturers, we were using HCFC-141b to blow foam for insulation for those appliances. Unfortunately, HCFCs deplete the ozone layer and contribute to global warming, so we wanted to replace it with cyclopentane, which is a natural substance.

The project took 30 months to complete and involved making changes to foam dispensers, storage tanks, safety equipment and other parts. As we progressed, we realized that, although the project seemed to have a limited scope, it would have far-reaching implications on the way we were doing business. It provided an opportunity to revamp our operations to meet growing demand for products and train our workforce on converting our factories to green operations.

As a result, we were inspired to take additional steps to make further improvements. In our factory, for example, we decreased our electricity use and improved our productivity through changing our factory layout.

Through better insulation and improved circuitry design, we found we could reduce the power consumption of our refrigerators by 15 per cent. In doing so, we not only helped customers by way of lower electricity bills, but we also helped to mitigate the energy crisis in our country. Not satisfied just to phase out HCFCs, we also made plans to replace our refrigerants with cleaner ones. In fact, we made the highest contribution of any company in our country to reducing substances of concern for global warming and the ozone layer.

Importantly, we gained the valuable experience of handling a complex project, which involved the extensive movement of engineers, technicians and experts between two factories some 160 km apart. There were 13 local and international contractors working at two sites, as well as frequent expert visitors from machinery suppliers, consultants and auditors from China, Europe and Iran. Despite the complexities, it all went off without major hiccup.

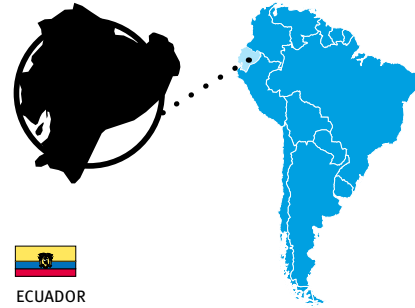
This project was challenging. But, in the end, it completely changed our perception of global warming and ozone depletion, and we enhanced our image as a green company. 🏠 🏢 🌱 🌍 📊

“THE PROJECT ... WOULD HAVE FAR-REACHING IMPLICATIONS ON THE WAY WE WERE DOING BUSINESS.”

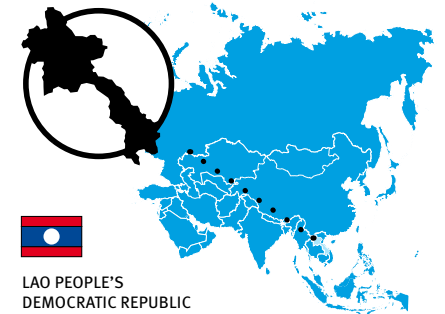


TARIQ SAUD QUDDUSI
Director Manufacturing,
Refrigerators and Air Conditioners
at the Dawlance Group

In some countries, changing a single company's operations can make a big difference in overall hydrochlorofluorocarbon (HCFC) consumption. That's true in **Ecuador**, where one domestic refrigeration manufacturer consumed 72 per cent of the substances—which are greenhouse gases that can deplete the ozone layer—until a UNIDO project stepped in.



From 2010 to 2016 UNIDO showed six Southeast Asian countries how to minimize pollution and climate effects by replacing and retrofitting old boilers. In **Laos People's Democratic Republic** and other countries, new boiler regulations, inspired by the project, ensure that the benefits will continue.



BECOMING THE COMPANY WE WANT TO BE

Indurama-Ecuador is a company dedicated to the environmentally friendly production of home appliances, especially freezers, fridges, stoves and ovens. One of our main concerns is keeping up with continuous changes in legal requirements, as well as best practices, in refrigeration. In 2010 we conducted a study of new technological solutions and saw that a change was on the horizon: a substance we imported for our appliances (HCFC-141b) would be phased out because of its effects on the ozone layer and on global climate.

Indeed, at the beginning of 2013, we learned that Colombia—one of our major export destinations—was going to ban home appliances that use HCFCs. The Colombian sector had been preparing for a few years, but the Ecuadorian sector was at a disadvantage. Our company was not in a financial position to make the necessary changes.

Fortunately, a comprehensive solution to our needs came from UNIDO and the Ministry of Industries and Productivity of Ecuador. This project encouraged us to invest in new technologies that would allow us to use cyclopentane instead of HCFC-141b. UNIDO helped us

pick the right equipment for our plant and for the needs of our national and international markets. These changes improved the quality of our products, enabled them to meet high environmental standards and reduced factory downtime.

“WE WERE ABLE TO MAKE ALL OF THE CHANGES WITHOUT ANY LOSS OF PRODUCT, ANY LONG DOWNTIMES AND WITH PERSONALIZED TRAINING TO OUR TECHNICIANS.”

This technological conversion led Indurama to a new work culture in our facilities regarding safety and risk management, and at the same time helped to increase exports and extend markets.

However, the most remarkable thing was that, through the expertise of UNIDO's supplier companies and consultants, we were able to

make all of the changes without any loss of product, any long downtimes and with personalized training to our technicians.

The project helped us become the company that we want to be, in full compliance with national regulations and standards, acting responsibly toward our local and global communities, and with outstanding fulfillment of our policies on product quality and the environment.

As our company philosophy states: “We believe that every effort made today to optimize the use of natural resources will contribute to the quality of life that the future generations will have.” 🏡 🌱 🌍 ♻️

MARCELO GALÁN
Production Manager at Indurama

A NEW BOILER PAYS OFF

Our company owns our country's first and only fruit and vegetable processing factory, which has been running since 1994.

Our most important product is whole-kernel corn, which we mainly export to European countries such as Germany, the United Kingdom and the Netherlands. Another product is canned sugar-palm seed, which is a dessert product that we export to Southeast Asian countries such as Thailand, Vietnam, Malaysia and Cambodia. We also make sweet corn milk for the local market. Altogether, about 95 per cent of our products are exported.

To make every single product, we need steam. Until recently, we were using an old boiler to make that steam. Old boilers of that type were inefficient and had no mechanism for preventing the release of harmful pollutants. Countries including ours have committed to minimizing some of these pollutants, including those called dioxins, under the Stockholm Convention.

The Ministry of Natural Resources and Environment approached us about being a pilot demonstration facility for a

project with UNIDO that would both help our country meet its Stockholm Convention obligations and reduce climate impacts. It was a good business opportunity for us, too. After an initial assessment, we decided that it would be better to install a new boiler than retrofit the old one. We would invest in new infrastructure, including the boiler housing, and they would provide the boiler.

We've had the new boiler since March this year. I feel great. I am saving money. What's more, the old boiler made 2 to 3 tons per hour of steam; the new one makes 5 tons per hour of steam, and the steam is steadier, which improves our efficiency.

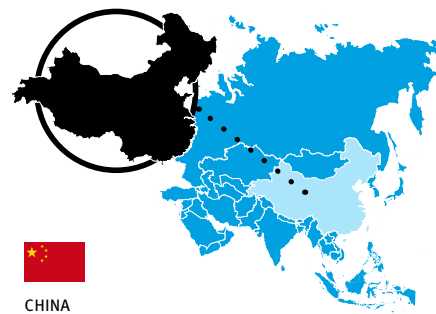
We are taking advantage of the savings and increased capacity to invest in new products, such as pineapple juice for export. We are also able to lower the price of our products, making them more competitive with those from other countries like Thailand and Vietnam. More than 70 per cent of our population makes a living from agriculture, so boosting agricultural exports could have a big effect on our country's prosperity. What's more, as we grow, our company is committed to employing more members of the local

community in our factory. It's nice to have the opportunity to show to the world that, even though ours is a small country, we're capable of producing this kind of agricultural product for the international market. 🏡 🌱 ♻️

“TO MAKE EVERY SINGLE PRODUCT, WE NEED STEAM.”

KHAMMANITHIP VONGXAY
Assistant Managing Director of Lao Agro Industry Co., LTD

In order to follow through on their commitments to phase out environmentally unfriendly substances, countries like China sometimes need help accessing the latest knowledge. That's where UNIDO can make a difference, offering everything from workshops to individualized advice.



CHINA



HOME APPLIANCES GO ECO

In 1994, a workshop in Xi'an of all of China's domestic refrigeration companies kicked off our association's cooperation with UNIDO. The sector had recently then started to replace chlorofluorocarbons (CFCs), both as refrigerants in the appliances and as foaming agents used to make the insulation for the appliances. At the workshop, UNIDO experts helped educate the companies' engineers by presenting new developments in alternatives to CFCs.

After the workshop, we started work with compressor companies. Converting compressors to work with new refrigerants is complicated but necessary for phasing out CFCs. In 1996, UNIDO became the International Implementation Agency for all of the enterprise conversion projects in the domestic refrigeration and compressor sector in China. Throughout the late 1990s and early 2000s, UNIDO experts provided specialized knowledge and constructive suggestions to every conversion project. Indeed, UNIDO foresightedly recommended a natural gas as a substitute for CFCs in the domestic refrigeration sector, which since has become the main alternative in the rest of the world. Then, in the early 2000s, UNIDO helped us develop a plan to phase out

the remaining CFCs in the entire domestic refrigeration sector. During the implementation, UNIDO provided technical and safety trainings in the use of the replacement substances. By 2007, CFCs were successfully phased out in the sector. It was a big achievement.

At that time, the focus of the Montreal Protocol shifted from CFCs to hydrochlorofluorocarbons (HCFCs), and thus the cooperation between UNIDO and our association shifted from the domestic refrigeration sector to the air-conditioning sector. We are now working together to limit the use of HCFC-22 in air conditioners in order to fulfill China's international commitments. Since 2009, we have also developed demonstration projects for air conditioners and compressors using environmentally friendly R-290 technology. In order to promote R-290 in air conditioners, we released an eco-label in collaboration with many government and international agencies including UNIDO.

The launch event took place at the Appliance & Electronics World Expo in Shanghai in 2015. Major manufacturers from the industry—Gree, Midea, Haier, TCL, Hisense, Changhong, Yangzi and Chunlan—showcased their air

conditioners using R-290 refrigerants with the R-290 logo on the machine. This launch event is the culmination of many years' work on alternative refrigerants. We expect the logo

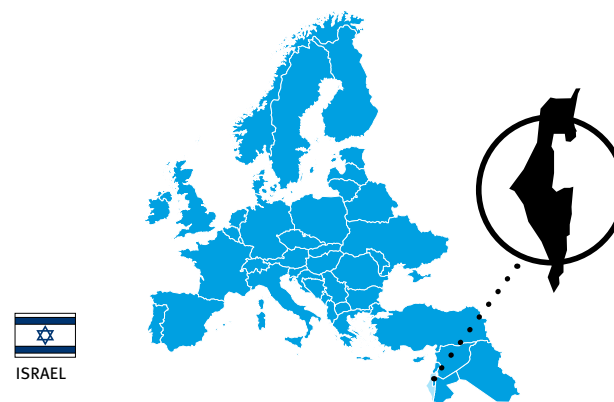
“CONVERTING COMPRESSORS TO WORK WITH NEW REFRIGERANTS IS COMPLICATED BUT NECESSARY FOR PHASING OUT CFCs.”

will boost the market for R-290 air-conditioning units in China. To enable the sharing of information and experiences, we, along with related international agencies including UNIDO, have organized an annual international workshop on alternative technologies in room air conditioners since 2008. The reduction of HCFC-22 is going smoothly, and the fruitful cooperation between UNIDO and our association continues. 🏠🌱🌍



WANG LEI
Vice President of the China Household Electrical Appliances Association

MED TEST II, a component of the UNIDO-led SwitchMed programme, facilitates the shift towards sustainable consumption and production in the Southern Mediterranean region. To date, UNIDO has trained nearly 160 professionals from Tunisia, Morocco, Lebanon, Jordan, Palestine, Israel, Egypt and Algeria to offer resource-efficient and environmentally friendly production solutions to companies by applying the Transfer of Environmentally Sound Technology (TEST) approach.



ISRAEL

THINKING OUTSIDE THE BIN

I have been working with Green Target for over 15 years now as a consultant to various types of industries in Israel such as the metal, polymer, chemical and electronics sectors, mainly in establishing and introducing environmental management. We started as a small company but today we are 18 people, managed by me and my partner.

When Israel became a member of the Organization for Economic Co-operation and Development (OECD) in 2010, the government decided to raise our environmental requirements to the standards of other OECD governments. As a result, the regulation has become stricter and consequently raised the demand from companies for our help in meeting the environmental requirements.

Over time, some organizations have realized that the way to handle the more stringent regulatory requirements is related to proper environmental management, and there are some companies that feel that they need to do it even better. Resource efficiency is better environmental management. Making wise decisions regarding the root cause of emissions, where in the plant they are generated and how we can prevent them in the first place, is good environmental management. The concept of MED TEST II, introducing the connection between energy efficiency, material efficiency and pollution reduction, is not necessarily

new. But it offers a practical approach.

That is what is special about this project. I feel that I look at things differently now, not only in the projects that I do for MED TEST II, but also with other customers. For example, while working with one of our clients in the chemical industry, one of our consultants was dealing with a point-source air emission issue. His first approach was to suggest a scrubber as an end-of-pipe solution. But I challenged him to find a more resource-efficient process. As a result, the consultant managed to come up with an alternate technology, which reduced the company's use of the emitted substance.

When consulting for one of the companies in the MED TEST II project, we tried to understand the production process and identify cost-saving measures out of a TEST perspective. We did a so-called Material Flow Cost Accounting to see where they lose their money. As we were doing an early walk-through of the factory, I noticed that a lot of the products lying under the machine on the floor eventually ended up as scrap, only used for recycling. My suggestion was to start measuring the quantity by putting everything that fell on the floor into big bins.

A couple of weeks later I asked if they had the numbers from the bins. In fact, the bins were nearly empty because the production peo-



ple had observed the quantity of the waste and had promptly fixed the production line, preventing products from falling on the floor.

When you show the people the numbers—for example, to buy this raw material costs you a certain number of euros per ton, and you get one-tenth of that value back when you recycle it—then it clicks. The dollar value grabs the attention of top managers. If they exceed pollution limits in the wastewater because some raw materials end up going into the wastewater, it bothers them, since they may have to pay a fine, but it bothers them even more when they realize how much money they are wasting by losing that raw material they purchased.

As consultants we help people to look differently at the problems they face with new tools of strategic thinking. That is better environmental management. 🏠🌱🌍



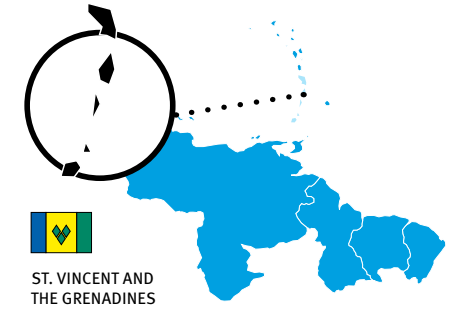
ERAN DORON
Partner in Green Target, a consulting company specializing in environment, health and safety



GREENING COUNTRIES

CHAPTER THREE

The Montreal Protocol successfully banned the refrigerants called chlorofluorocarbons (CFCs), substances that deplete the ozone layer. Unfortunately, their most common replacements, hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs), are potent greenhouse gases, and can contribute to climate change, which is why those are now also on the chopping block in many climate-conscious countries, including **St. Vincent and the Grenadines**.



IF WE CAN DO IT

When I was appointed as National Ozone Officer in 2004, we were not in compliance with the Montreal Protocol, and I had just a few months before my appointment gone to the Executive Committee of the Ozone Secretariat with an action plan to return to compliance. In a few short months we were able to fulfill our obligations and went on to completely phase out CFCs three years ahead of our target and started to focus our attention on introducing energy-efficient, climate-friendly and ozone-friendly alternatives such as hydrocarbons.

Our country has a good reason to be ambitious about climate policy. We are a 32-island nation in the Eastern Caribbean that is vulnerable to climate-related natural disasters, such as floods, landslides and drought. We have lost a lot of our beach area over the years to sea-level rise and storm surges. Nonetheless, we feel fortunate: we often joke that God has to be Vincentian, since most hurricanes in our vicinity do not directly impact us.

We like to think beyond what is in front of us, so when it was time to develop our HCFC Phase-Out Management Plan we could not see the point of moving from CFCs to HCFCs and then HFCs, which are also greenhouse gases that many in the international community were discussing a ban on. We did a

local market assessment and noticed that most of the appliance suppliers were already bringing in appliances that use hydrocarbons. We thought, why not go for an accelerated phase-out, and use hydrocarbons as our alternative? This would enable us to skip a second phase-out later—just cut out the middle, and go as close to the end as possible. With UNIDO as our Technical Implementing Agency, we submitted our plan to the Executive Committee of the Ozone Secretariat. We said we'd go beyond the 35 per cent mandated HCFC phase-down by 2020, and we proposed a 100 per cent phase-out by 2025. They thought it was a bit ambitious, but I thought I know my market well enough, and I know my technicians. The committee approved it, and we went home and started implementing it right away. As it happens, we have already met our 2018 target two years ahead of schedule.

Training our technicians was essential. They were not familiar with hydrocarbons, so initially when they serviced appliances with hydrocarbons, most would replace the hydrocarbons with HFCs. Of the five main servicing companies in our country, three of them have sent all their technicians to our training. A few of the other companies' technicians take their own initiative to attend. We have

also partnered with other government and private-sector agencies to deliver training to their technicians over the years. Because of the small scale of the industry, a lot of our technicians do one-off servicing. They come to us asking for our recommendation on certain jobs. Even if we are not getting full support from all of the companies, the individual technicians are doing their part.

We need to improve the supply of hydrocarbons. We have the equipment on the market, but sometimes no refrigerant to service it. We are also heading in the direction of technician certification, so that if you're not certified you can't legally purchase or use the refrigerant. The National Ozone Unit now tests all refrigerants that enter at the port. UNIDO, our Implementation Agency under our HPMP, assisted with the provision of the equipment. We have had a few attempts at illegal imports. I hope that more countries will try for an accelerated phase-down of HCFCs. If we can do it, other countries can do it, too.



Persistent Organic Pollutants (POPs) pose high risks to human health and the environment. The Stockholm Convention on Persistent Organic Pollutants (POPs) requires its signatories to take measures to eliminate or reduce the release of POPs in the environment to protect the health of humans. For countries like **Honduras**, following through on this commitment is far from simple. UNIDO has been there to help.



HONDURAS

DOING OUR PART

In 2010 Honduras presented our first National Implementation Plan regarding POPs to the Secretariat of the Stockholm Convention, outlining how we were going to reduce and eliminate the 12 POPs listed in the Convention.

However, in 2009, during the Conference of the Parties of the Stockholm Convention, nine more substances were added to the agreement. Before we were even finished with our plan, we had to start amending it.

Successfully identifying the new POPs was a challenge for our country, since they are substances that are a part of items such as electronics, home appliances and industrial processes. But thanks to support provided by UNIDO and others from 2013 to 2015, the Secretariat of MIAMBIENTE managed to fulfill our obligation to review and update our implementation plan. In fact, we were proud to be the first country in Latin America to present the updated plan to the Secretariat.

Thanks to the new studies and strategic planning we did as part of this project, national authorities will be able to make more informed decisions regarding POPs in order to protect human health and the environment. We have also written the documents in every-

day language and made them readily available for other potential users.

This project will benefit the Honduran population in general. What's more, since POPs disproportionately affect society's most vulnerable groups, such as children, the project worked closely with participants from organizations related to early childhood, such as the Secretariat of Health and the Pan American Health Organization, in information gathering and strategic planning.

Most importantly, we have goals for the future: among them, to strengthen our institutional regulatory capacity, human resources and finances, to adopt international best environmental practices and best available techniques for industrial POPs and to deal with unintentional POPs generation through the integrated management of solid waste.

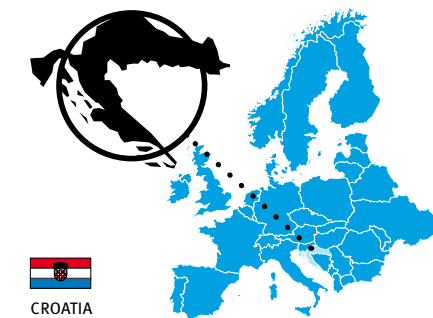
This project has been recognized for its transparency, as well as its ability to adapt to the challenges of a changing national context. As we are the first in our region to comply with our commitment to review and update our National Implementation Plan, we hope we can be a model for other countries in Latin America. 🏡👁️🌱

“THANKS TO THE NEW STUDIES AND STRATEGIC PLANNING WE DID AS PART OF THIS PROJECT, NATIONAL AUTHORITIES WILL BE ABLE TO MAKE MORE INFORMED DECISIONS REGARDING POPs IN ORDER TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT.”

ANA GABRIELA RAMÍREZ
 Coordinator of the Departamento para la Gestión de Productos Químicos (DGPO) in the Centro de Estudios y Control de Contaminantes (CESCCO), Secretaría de Energía, Recursos Naturales, Ambiente y Minas (MIAMBIENTE)



The phase-out of hydrochlorofluorocarbons (HCFCs) has been one of the most important goals of the Montreal Protocol. HCFCs damage the ozone layer and also contribute to global warming. UNIDO, as one of the implementing agencies, has been responsible for the HCFC Phase-out Management Plan of 73 countries, including **Croatia**.



CROATIA



ACCELERATING TO THE FINISH LINE

Croatia's HCFC Phase-out Management Plan, approved in 2009, was due for completion in the year 2016, although, as an Article 5 party (a category of mostly developing countries) we didn't have to eliminate HCFCs until 2040.

However, our country's accession to the European Union on 1 July 2013 increased our obligations in regard to the elimination of ozone-depleting substances. Thus the procedure had to be considerably accelerated: we had to stop the use of virgin and recovered/recycled HCFCs as of 2013 and 2014. What's more, we also faced an EU ban on the use of non-refillable containers for HCFCs and other substances. We had to work quickly.

Fortunately, we had strong support from the government, project partners including UNIDO, the University of Zagreb, industry and the service sector, which enabled training, retrofitting and replacement of equipment, distribution of demonstration units, and publication of training materials and technical literature to take place within a very tight deadline.

To achieve this goal, we retrofitted and replaced refrigeration and air-conditioning equipment in many of our national institutions. At the Croatian National Theatre in Split, one of the oldest surviving theaters in the region, we replaced two refrigeration units. Eight more units went to hospitals in Osijek, Split and Zagreb, the University of Rijeka and the Ministry of Interior in Zagreb. Those new refrigeration units use propane R-290, which is a natural substance with zero global warming potential.

The project also involved the training of refrigeration and air-conditioning servicing technicians, customs officers and—with Austrian and Slovenian government agencies—environmental inspectors. To help spread the word, the Ministry of Environmental and Nature Protection translated and printed several brochures for service technicians and vocational school teachers. A regional destruction project, supported by UNIDO, enabled us to collect and destroy huge quantities of ozone-depleting substances recovered from old equipment at new Recovery, Recycling and Reclaim centres.

“WE HAD TO WORK QUICKLY.”

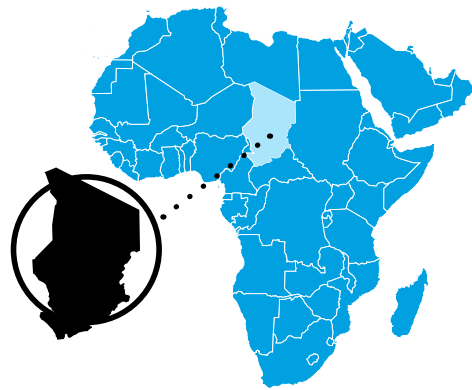
We held a ceremony to mark the successful completion of the project in Zagreb on 17 December 2015. All stakeholders participated in this event, including vocational schools, customs officers, environmental inspectors, institutions that replace HCFC equipment and the Environmental Protection and Energy Efficiency Fund.

Marija Ščulac-Domac, Assistant Minister of the Ministry of Environmental and Nature Protection, said: “We are proud that Croatia is the first among all the Article 5 countries of the Montreal Protocol to abolish the use of HCFCs 24 years before the final deadline set by the Montreal Protocol.” 🌱👁️🌱🌱

SNJEZANA ILIČIĆ
 Ozone Officer (Senior Expert Advisor) in the Ministry of Environmental and Nature Protection



UNIDO and UNEP cooperate in assisting 25 countries in the sub-Saharan African region with the phasing out of hydrochlorofluorocarbons (HCFCs), which are substances that can contribute to ozone depletion and global warming. In **Chad**, the implementation has been particularly successful thanks to a well-established refrigeration association, as well as a strong cooperation between the stakeholders—the Ozone Unit, the refrigeration association and the training institutions.



TRAINING IT FORWARD

For our HCFC phase-out, UNIDO's task was to provide the needed equipment, as well as the training on that equipment.

After delivery of the equipment, UNIDO sent experts, who trained 25 trainers on its use. Subsequently, those trainers did further technician trainings in the provinces.

After the training, we had meetings with the refrigeration association, which has 1,200 members, and the customs department to discuss the distribution of the equipment that was provided by UNIDO. Some equipment went to six Centres of Excellence, which are hosted in technical education institutions.

At those centres, 450 professional refrigeration technicians were trained, including in recycling, recovery and reuse of refrigerants. In addition, since the equipment is at technical educational institutions, 300 students were also trained as part of their education.

As new students enroll, they also get trained. In addition, some equipment was

given to the refrigeration association and to customs.

Customs got the identifiers, which are the tools that can say what gas is in the containers that are being imported—that is, whether the containers are correctly labeled, or whether they contain counterfeit refrigerants. One hundred and twenty five customs officers were trained on the use of those identifiers so that they can control the imports.

Sometimes we have trouble when equipment breaks. Spare parts are often not available locally. In some cases, spare parts came with the equipment, but it's not always enough. Plus, we lack technicians with expertise to repair some sophisticated equipment.

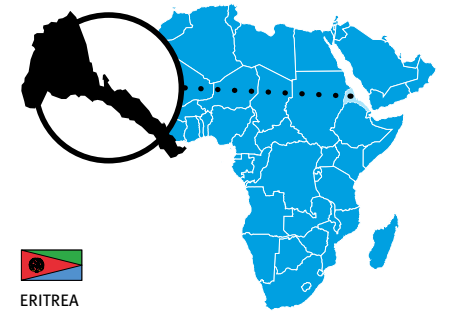
It's important to keep the equipment in order because we continue to use it to train technicians and customs officers, as well as for the recovery, recycling and reuse of refrigerants, in order to avoid venting those substances into the open. 🌿 ♻️ 🔄

“SINCE THE EQUIPMENT IS AT TECHNICAL EDUCATIONAL INSTITUTIONS, 300 STUDENTS WERE ALSO TRAINED AS PART OF THEIR EDUCATION. AS NEW STUDENTS ENROLL, THEY ALSO GET TRAINED.”



NADOUM KORO
Coordinator of the National Ozone Unit

Global efforts to save the ozone layer and keep our climate in check have spawned a new type of criminal activity: refrigerant counterfeiting. Fake and contaminated refrigerants not only hurt the environment, but are also potentially explosive or toxic, and can permanently damage appliances. UNIDO is helping countries like **Eritrea** build the capacity to fight this crime and keep consumers and the planet safe.



FOILING FAKE REFRIGERANTS

Our government has been undertaking commendable work to effectively phase out ozone-depleting substances and the equipment that uses them. We have published the regulations in the Gazette of Eritrean Laws (which makes them legally binding) and trained customs officers and legal officers to implement the regulations, and we continue to collect data at entry points to ensure that the regulations are strictly followed and actual importation matches quotas. We have established training centers for the refrigeration and air-conditioning sector and distributed tools and equipment to that sector, and we conduct ongoing training and regular monitoring of technicians. We also promote public awareness.

As Eritrea closed in on the complete phase-out of the ozone-depleting substances called chlorofluorocarbons (CFCs), one of our main problems was the availability and trade of fake refrigerants. Often, these are mixtures of different types of refrigerants, such as recovered refrigerants originating from other countries. It is also a common practice to hide low-cost refrigerant under the trademark of more expensive and widely

used coolant. Fake refrigerants cause equipment failures, and as a result, the refrigerant may be vented, leading to the emission of ozone-depleting substances. UNIDO provided tools and training to help us deal with the problem of fake refrigerants. This included equipment called Ultima ID PRO, which can identify the contents of refrigerant cylinders.

The equipment was distributed to customs of the main ports, as well as the National Ozone Unit (NOU) office in Asmara and other cities. The NOU provides refrigerant identification services to all stakeholders, including service technicians and importers. Based on test results, the refrigerant is either seized or allowed for trade and use. Through this service several bottles of fake refrigerant have been found and seized by the authorities.

In one particular case, we examined a bottle labelled R-134a. Using the new equipment, we identified the origin of the refrigerant as contaminated R-22. It was composed of 90 per cent R-22 and 10 per cent R-410a. We have encountered similar problems on other occasions. This practice is now being eliminated.

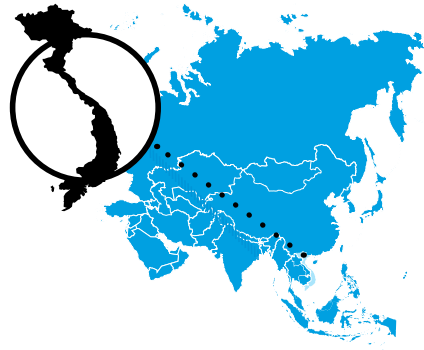
Thanks to the availability of testing, the refrigerant importers are now requesting certificates from suppliers. Thus the volume of fake refrigerants has been reduced enormously, and we are closing in on our goal of total elimination of CFC emissions. 🌿 ♻️

“FAKE REFRIGERANTS CAUSE EQUIPMENT FAILURES, AND AS A RESULT, THE REFRIGERANT MAY BE VENTED, LEADING TO THE EMISSION OF OZONE-DEPLETING SUBSTANCES.”



KIBROM WELDEGEBRIEL
National Ozone Officer

In recent years, rapidly developing industrial zones have brought about socioeconomic development in countries such as Viet Nam, but there have also been environmental downsides, as many of these parks don't have waste-appropriate management and wastewater treatment systems. Since 2014, a UNIDO project has aimed to convert these zones into eco-industrial parks, where companies work together to reduce waste and increase resource efficiency. Similar projects are underway in Indonesia, China, India, South Africa, Colombia and Peru.



VIET NAM

AN AUDIT BEARS FRUIT

Les Vergers Du Mékong—which means the orchards of the Mekong River—was founded in 2000 by a French health-food specialist. Our factory is in an industrial park in Can Tho in the heart of the richest orchards of Viet Nam. Thanks to this proximity, we commit to an exclusive local sourcing; we endeavour to build trust with local farmers through long-term relationships.

We produce small-batch coffee, organic tea, not-from-concentrate fruit juice and single-strength and artisan-created jams, which are distributed domestically to high-end hotels, restaurants, cafes and supermarkets, as well as exported. The seasonal fruits and coffee are carefully selected and directly collected from farms in the Mekong Delta and the central Highlands. Concern for the environment was one of the company's founding philosophies and is a fundamental guiding principal today. Being sustainable is in the company's DNA.

In order to be competitive in both domestic and foreign markets, we have also worked to reduce our costs. In August 2015 we received an invitation to an informative workshop of the UNIDO Eco-Industrial Park (EIP) Project. They proposed to bring us technologies, knowledge and methods that help minimize wastewater and chemical waste,

greenhouse gas emissions and energy use.

After participating in the workshop, we registered to receive Resource Efficiency and Cleaner Production (RECP) Audits offered by the project. The first training on RECP for participating projects was conducted in January 2016. After that, from February to June 2016, we received three RECP audits arranged by the UNIDO EIP Viet Nam Project. Experts from the Vietnam National Cleaner Production Centre recommended some immediate solutions to cut down on energy and resource consumption.

These suggestions included reusing water for gardening, recycling water and chemicals in the fruit washing machine, using solar energy to pre-heat juice before pasteurization and rearranging our space and lighting in order to decrease electricity consumption and improve conditions for workers.

“BEING SUSTAINABLE IS IN THE COMPANY'S DNA.”

These were easy and simple solutions that the RECP audits helped us apply effectively within only a few months. Without investing any money, we can now save up to VND 48 million (more than \$2,000) per year.

During the project phase, we identified other important improvements that would better protect the environment and especially reduce water consumption, including a cooling system incorporating a chilled-water plant, a tunnel to recycle the water and process our own chilled water and a fruit-washing machine. None of those investments would improve the efficiency or the profitability of the production. They are purely environmentally oriented. What's more, those investments would cost about \$200,000, which is quite consequential for a business of our size. That's why, in the long run, UNIDO's support for the next investment phase towards a sustainable development is crucial.

We hope other companies in our industrial park will follow this eco-friendly path with the support of the UNIDO EIP Viet Nam Project, so that we can all grow more competitive by creating links with other companies, reducing costs and waste, increasing efficiency and decreasing our collective negative impact on the environment.



JEAN-LUC VOISIN
Managing Director
of Les Vergers Du Mékong



Industries in the Southern Mediterranean region face high energy costs, scarcity of water and increasing pressure for environmental certifications from international markets. In 2009 UNIDO launched the MED TEST initiative to help industrial enterprises meet these challenges through the transfer of cleaner technology, including those operating in the leather sector in Tunisia.



TUNISIA



CLEANING UP LEATHER

The leather sector is one of the most important economic sectors in Tunisia. However, the industrial process involved in leather production uses high quantities of water and chemicals and is, next to the oil industry, one of the most polluting production sectors in the world. For us in Tunisia, it is important not only to decrease pollution and improve the environment, but it is also equally vital to strengthen the competitiveness of the leather production sector and to create new opportunities for green jobs.

At the Centre National du Cuir et de la Chaussure (CNCC), we work together with UNIDO to improve the production standards of the Tunisian leather industry when it comes to the environment and resource efficiency. Together with UNIDO, we demonstrated in the MED TEST project, which ran from 2009 to 2013, that the transfer of environmentally sound technologies (TEST) not only reduces costs for the producer but also reduces pollution from leather production. For instance, one tannery installed equipment to valorize the waste from leather production. A major part of this waste is made of the lower layer of the skin and the underlying fatty tissue. Instead

of flushing this into the water system, we established a process where it gets turned into resources for making soap and fertilizer.

The circular economy model, where we increasingly recover the materials and energy from used products, is becoming more and more important in the international development agenda and also for us in Tunisia. We consider this a pioneering and thrilling concept, which could solve some of the global environmental, social and economic challenges that existing economic models fail to address.

Following on the successes of the MED TEST project, MED TEST II gives us the chance to raise awareness among companies by implementing Resource Efficient and Cleaner Production tools to help them to simultaneously improve their economic performance in terms of productivity and competitiveness, reduce their environmental footprint through measures related to the effective use of resources (water, energy and raw materials) and prevent pollution at source.

This approach will create green job opportunities through the establishment of a sustain-

able industrial waste exchange that links industrial waste generators, potential users and waste recyclers in order to improve cross-industry resource efficiency. For example, the leather plant that began recovering waste in the framework of the MED TEST project created more than four jobs, including one engineer, two technicians and one worker.

Our expectation is that MED TEST II will help us to develop the sector for local Tunisian TEST experts, who will give advice to Tunisian production facilities on how to meet environmental standards that will lead to better products, a cleaner environment and an improved competitiveness of the Tunisian leather industry on the global market. This will lead to new export markets for Tunisian products and services and could attract more foreign investors in Tunisia.



NADIA SOMAI BOUBAKER
Engineer at the National Centre
of Leather and Shoe and
National Coordinator of the
MED TEST II project



WHO WE ARE

PART TWO

AS YOU READ IN THE LAST CHAPTERS, THE DEPARTMENT OF ENVIRONMENT UNDERTAKES A BROAD ARRAY OF PROJECTS. IN PART II, WE'D LIKE TO TELL YOU A BIT MORE ABOUT US.

In [Chapter Four](#), we'd like to share our vision for sustainable and inclusive industrial development with you. It's a vision that ties all our work together.

After that, we'd like to introduce ourselves. We've gathered [facts about our team](#), both serious and silly. Because our projects are diverse, we must be, too. Then, if you're ready for a little fun and relaxation, try your hand at solving the [crossword puzzle](#) and coloring the sustainable-development-themed [mandala](#) we made.

Finally, we close these pages with a [timeline](#) that touches on many of the big themes that are in these pages. The Department of Environment was established in its current form just last year, but you'll see that our portfolio has been a long time in the making.

If you'd like to get to know us even better, you can join us on our website, YouTube and social media pages, which are listed on the back cover. [We hope to see you soon!](#)



GREENING THE FUTURE

CHAPTER FOUR

WHAT WOULD TRULY SUSTAINABLE INDUSTRY LOOK LIKE?

IN OUR DEPARTMENT, THAT'S A QUESTION WE THINK ABOUT EVERY DAY, WHETHER WE'RE HELPING A LOCAL SRI LANKAN COCONUT MILL REDUCE EMISSIONS AND REUSE ITS WASTE PRODUCTS, OR ADVISING THE GOVERNMENT OF PERU ON THE DEVELOPMENT OF A COUNTRY-WIDE, MULTIDISCIPLINARY, TECHNICAL COOPERATION PROGRAMME TO UNDERPIN ITS FUTURE DEVELOPMENT STRATEGY.

Over time, one approach to sustainable development has gained traction among economists, policymakers and business people, and has also caught our attention. It's called the circular economy. Although there are many conceptions of the circular economy, they all describe a new way of creating value, and ultimately prosperity, through extending product lifespan and re-locating waste from the end of the supply chain to the beginning—in effect, using resources more efficiently by using them over and over, not only once.

By and large, today's manufacturing takes raw materials from the environment and turns them into new products, which are then disposed into the environment after use. It's a linear process with a beginning and an end. In this system, limited raw materials eventually run out. Waste accumulates, either incurring expenses related to disposal or else polluting—indeed, a 2012 World Bank report estimates that municipal waste generation will double over the next 20 years in low-income countries. On top of that, manufacturing processes are often themselves inefficient, leading to further waste of natural resources.

In a circular economy, however, materials for new products come from old products. As much as possible, everything is reused, remanufactured or, as a last resort, recycled back into a raw material or used as a source of energy.

EMBRACING THE CIRCULAR ECONOMY

Governments are encouraging—and, in some cases, requiring—the adoption of circular economy principles that would lead to more resource efficiency and less waste. At the global level, the Sustainable Development Goals, adopted by the United Nations Member States in 2015, include many related ambitions.

At the country and regional level, in 2008 China was among the first to adopt a circular economy law promoting the recovery of resources from waste. In that same year, the G8 environment ministers agreed on an action plan for the 3Rs: reduce, reuse and recycle. It mentioned the Japanese concept of “mottainai”, which expresses that it is a shame for something to go to waste without having made use of its potential in full—something that happens with regularity in a linear economy. Following on that, the 2015 G7 Summit Leaders' Declaration underscored the need for “sustainable supply chains” that protect workers and the environment.

Then, in late 2015, the European Union adopted an

ambitious Circular Economy Package, including goals for food, water and plastics reuse. “The message is that while you are protecting the environment you can boost your economic development and provide new growth and new jobs,” said then European Commissioner for Environment Janez Potočnik in support of the EU Circular Economy Package in 2014. This package not only sets ambitions and prioritizes approaches, but also facilitates national and international exchanges, for example by defining standards for the exchange of goods other than pure resources and new products.

UNIDO'S MANDATE: INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT

- **Advancing Economic Competitiveness:** Advancing rapid economic and industrial growth by fostering entrepreneurship, building trade capacities, ensuring all countries benefit from global trade and technological progress, applying modern policies, standards and norms
- **Creating Shared Prosperity:** Advancing poverty eradication and inclusiveness by building productive capacities, increasing opportunities for all women and men across social groups
- **Safeguarding the Environment:** Advancing environmentally sustainable growth by greening industries through cleaner production technologies and resource efficiency, creating green industries including via waste management and recycling, supporting energy transitions, implementing multilateral environmental agreements

Indeed, there is a strong business case to be made for the circular economy. For example, Dutch technology company Philips refurbishes medical equipment such as MRI systems, and Chilean pump technology company Neptuno Pumps remanufactures energy-efficient pumps from reused and recycled pump material. Mexican brewer Cuauhtémoc Moctezuma Heineken México and American computer company Dell, as well as smaller companies such as Serbian rolling-element bearing manufacturer FKL Temerin (see page 22) are also leaders in adopting circular economy principles.

By designing products with resource recovery in mind, they can protect themselves from price changes in the raw-materials market by creating another source of raw materials, as well as maintain longer-lasting relationships with consumers by ensuring contact throughout a product's life cycle.

There are also efficiency gains: According to the Ellen MacArthur Foundation, by 2025 about \$1 trillion per year of materials cost savings could be generated from circular business models. National economies, entrepreneurs and employees will benefit, as they form new businesses and create new jobs to fill niches created by the circular economy, such as resource recovery and remanufacturing.

INCLUDING EVERYONE

We find this vision of the future compelling, but we also see reason for concern. While the circular economy takes into account two pillars of sustainability—environmental and economic performance—it risks leaving out an essential third pillar: inclusiveness. Simply put, the circular economy could cut poorer countries out of the global supply chains they’ve worked so hard to enter.

How? First, as wealthy countries learn to extend their resource use, they will reduce their dependency on imported raw materials as well as other products manufactured abroad. For example, the Netherlands recently announced that it aims to cut in half its use of primary raw materials from minerals, fossil fuels and metals by 2030, with the ambitious goal of a fully circular economy by 2050.

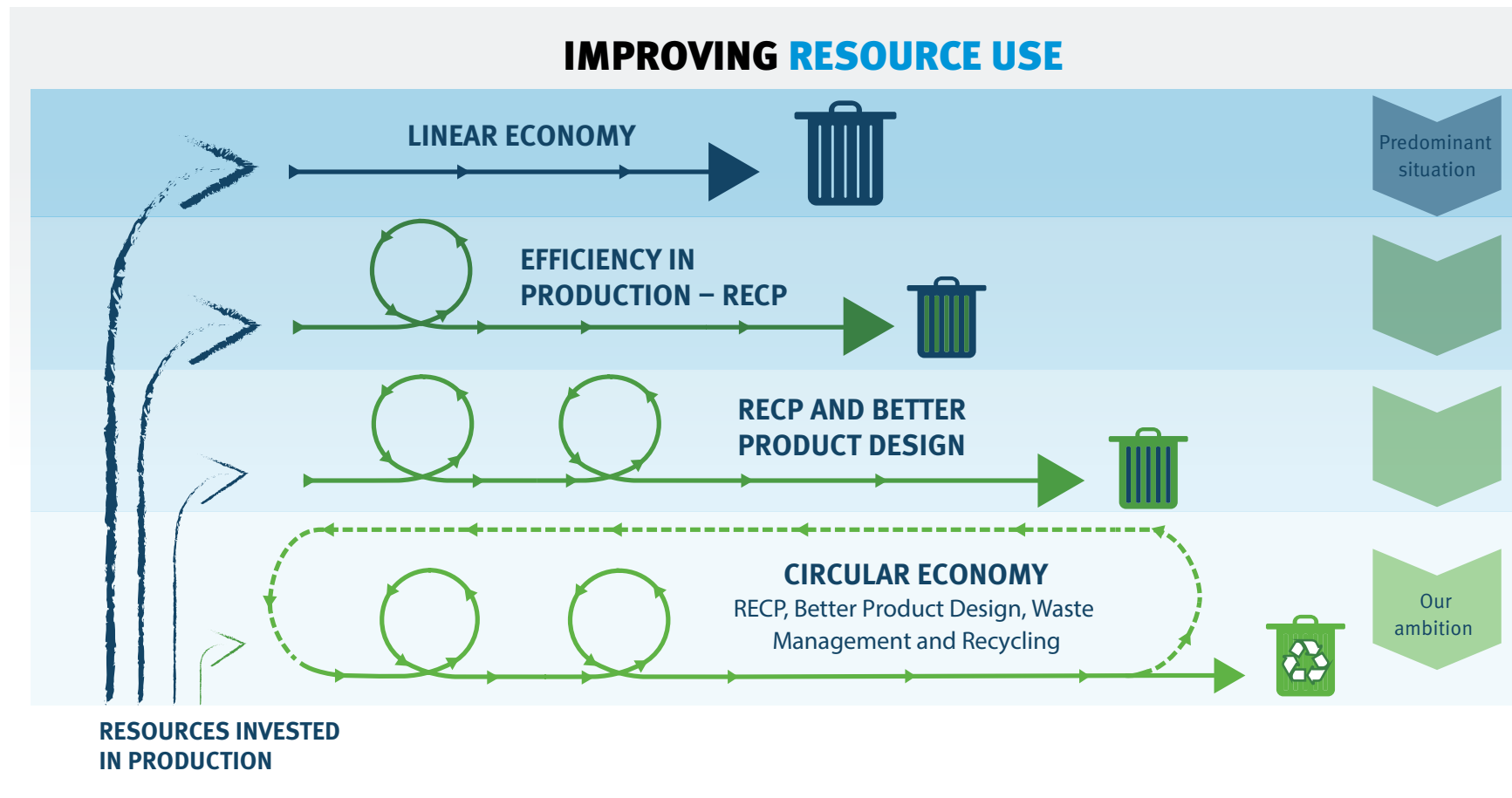
Second, developing countries—especially least developed countries—may struggle to access the knowledge and new technologies that make the circular economy possible. They will be less able to fill the demand for products that meet increasingly stringent circular economy standards in their export markets, as well as for circular economy services such as reclamation and remanufacturing.

Yet, developing countries stand to profit immensely from a circular economy. There is a growing need for material, water and energy because of both population growth and increased demand by infrastructure, industry and consumers in developing countries. Circular economy activities have the potential to replace a significant share of this need—dampening or, possibly, reversing the rise in resource use by developing countries, and in turn reducing resource depletion, climate change and the pollution of natural areas. In fact, a report from the McKinsey Global Institute estimates that up to 85 per cent of opportunities to improve resource productivity lie in developing countries.

As we think back on 50 years of environmental work at UNIDO, our conviction grows that we can help advance circular economy models in particular in developing economies. Indeed, many of our projects—including those featured in these pages—already address various building blocks of circular economy. Some support cleaner manufacture of products, others help develop safe, easy-to-recycle products with longer lifetimes and still others deal with the recovery or safe disposal of resources at the end of a product’s life. And, since economies are still far from phasing out the need for raw materials extraction altogether, some of our projects work to make parts of the mining process, like processing of ores and other extracted materials, safer and more environmentally responsible.

PRODUCTION GETS EFFICIENT

A key tenet of the circular economy is improving resource efficiency during production. A major way we do this in our Department is through programmes related to Resource Efficient and Cleaner Production (RECP). RECP means applying preventive environmental strategies to processes, products and services to increase efficiency as well as reduce risks to humans and the



TAKING RESPONSIBILITY

We help companies that want to do the right thing beyond immediate economic benefits, such as a construction company in China that provided loans to communities in Myanmar. (See page 14.) Under our Chemical Leasing programme, Serbian beverage producer Knjaz Miloš and their chemical supplier EcoLab worked together to come up with a mutually beneficial arrangement that reduced the amount of lubricant they used in a factory. (See page 22 for more on Chemical Leasing.) Recently, the brewing company Heineken partnered with us to help fulfill its commitment to reduce its water consumption in water-scarce regions, including Algeria, Egypt, Ethiopia, Indonesia, Mexico, Nigeria and Tunisia. And we’re also exploring more systematic approaches to greening individual companies—for example, by helping to establish the GreenCo rating system in India. (See page 23.)

environment. Thanks to these programmes, individual companies—such as a confectioner we worked with who figured out how to use wastewater it had once dumped down the drain to make marmalade—and entire industrial sectors—like the leather industry in Tunisia which now turns previously discarded animal products into resources for manufacturing soap and other products—have profited. (See pages 21 and 37.)

Unfortunately, many countries lack expertise in re-

source efficiency strategies. To remedy that, since the mid-1990s UNIDO and the United Nations Environment Programme (UNEP) have been working together to support the development of national service providers. Today, these have grown into a global network, called RECPnet, with over 70 members specialized in providing RECP services to industry in developing and transition economies. (See pages 24 and 29.)

Our resource efficiency efforts also span whole regions, such as the European Union’s Eastern Neighborhood and the South Mediterranean region; both areas which might face particular challenges in adapting to the European Union’s rapidly developing circular economy policies. Helpfully, our colleagues in UNIDO’s Department of Trade, Investment and Innovation also assist companies to provide quality products, including those that conform to international environmental standards, so they can enter global value chains.

In other cases, UNIDO is extending resource efficiency beyond the borders of one company to groups of industries; a prime example of such approaches is the establishment of eco-industrial parks. Here, companies wanting to go beyond compliance in their environmental performance find the means to do so, not only by sharing environmental services and receiving targeted RECP advice, but also by taking advantage of each other’s by-products, such as heat and water. For example, in an industrial zone in China, a UNIDO-supported programme helped generate synergies yielding over \$10 million in savings and an over \$16 million revenue increase, as well as 167,000 tons of reduced carbon dioxide and 1.4 million tons of reduced landfill. Other ongoing UNIDO

projects—in China, Colombia, Ethiopia, India, Indonesia, Morocco, Peru, Senegal, South Africa and Viet Nam—all show the great potential of the eco-industrial park model. Eco-industrial parks could make important contributions in the move towards the circular economy, both in industrialized and developing countries. (See page 36.)

A crucial component of resource efficiency is, of course, energy efficiency. In promoting RECP, our programmes advise companies on means to increase energy efficiency. Projects replacing or retrofitting equipment such as industrial boilers not only reduce the emissions of hazardous pollutants such as dioxins, but also frequently improve energy efficiency. (See page 27.) In UNIDO’s Department of Energy, our colleagues go beyond simply acquiring energy-efficient equipment by optimizing energy systems in industries and developing international energy management standards and by bringing clean and sustainable energy solutions to industries, helping to reduce reliance on non-renewable natural resources.

Our colleagues in UNIDO’s Department of Agri-Business Development are working to increase the proportion of produce consumed to what is actually being harvested; currently, the share stands at only 50 per cent. Interventions include optimizing of storage and cold chain, but also waste reduction through improving technology, optimizing processes and making use of by-products.

BETTER PRODUCTS WITH LONGER LIVES

We aim not only to eliminate toxic substances from products as early as during their design phase; if we find them contaminated, we also treat them post-production, at the same time expanding their lifespans and enabling easier recycling and reuse.



One set of examples for designing products to contain less harmful substances before these products are even manufactured are the projects under the Montreal Protocol. (See pages 25 and 26.) There, production of refrigerators or insulation foams—often on a large scale—is converted to new technologies, so the products no longer contain ozone-depleting substances. Leaking of such substances into the environment can thus be avoided, and the products are also much easier to dispose of.

An example of improvement during the use of the product is when our projects help countries remove toxic substances from electrical transformers and put the transformers back into use. (See page 15.) Other projects promote recovery and reuse of refrigerants to avoid their deliberate venting to the atmosphere.

Most simply, perhaps, we can also increase a product's lifespan by designing it for longer life, as well as making sure that quality technicians are available to repair it. That's why we encourage companies to take the opportunity to improve their products' overall quality at the same time that they convert their production lines away from ozone-depleting substances. We've also set up regional training centres and facilitated large-scale technician and student trainings in the refrigeration and air-conditioning sector. This ensures that the appliances will work as well as they should for as long as they can. (See pages 31 and 34.)

In China, we are just beginning with a project that will redesign products to make them easier to reuse, remanufacture and recycle; a concept called "cradle-to-cradle". We are co-operating with industries that are looking into the requirements and process of remanufacture, disassembly and recycling. After establishing this know-how, they will redesign products to simplify disassembly and recycling, and to prolong the useful life of the product.

GIVING WASTE NEW LIFE

Products contain valuable resources, which usually go unused once the product reaches the end of its life. This is particularly true for electric and electronic products, which are rich in copper and many other scarce metals and materials that can also pose some environmental and health risks. According to a study conducted by the United Nations University, more than 40 million tons of e-waste was generated globally in 2014, and very little of that is collected in an environmentally sound manner, or treated. New industries that provide e-waste services will protect the environment from contaminants such as mercury and cadmium, recover raw materials, provide affordable refurbished products and create new green jobs. We are supporting electric and electronic waste recycling industries in developing countries such as Cambodia, Ethiopia, Uganda and the United Republic of Tanzania, and are working to extend our projects throughout the Economic Community of West African States (ECOWAS) and the Southern African Development Community (SADC), as well as regionally in 13 countries in Latin America.

Similarly, we have projects that create solid-waste management industries in places where none existed, such as Labé, Guinea. These industries bring health to the whole community, as well as jobs—in this case, largely to youth and women. In order to create more value from the waste they collect, the workers compost organic waste and sell plastic waste to recyclers. (See page 12.)



And returning to our cradle-to-cradle project in China: It does not only aim to change product design for longer life and better recycling, but also more generally to learn how to design good products without using what might become later hazardous substances, as well as how to use more bio-degradable plastics. Both changes in the product design will help to reduce risks that any remaining waste poses to the environment.

OUTSIDE THE CIRCLE

Although the circular economy would ultimately dramatically reduce the need to extract non-renewable resources, at least some extraction will no doubt continue for many years to come. That's why some of our focus must remain on making those existing extraction industries safer and cleaner for the people who work in them and live around them. Take artisanal and small-scale gold mining, which is responsible for approximately 37 per cent of global anthropogenic mercury emissions. According to UNIDO estimates, practically 100 per cent of the mercury used to extract gold is released into the environment, putting miners, communities and nature at risk. Fortunately, we are not only bringing mercury-free technologies to often-informal gold mining communities; we are also working to develop these into more formal, higher-income small-scale industries, ensuring their long-term viability. (See pages 18 and 19.)

A circular economy will drastically reduce waste, but will not eliminate it. The remaining waste becomes particularly problematic when harmful substances are present. Under the Montreal Protocol (ozone-depleting substances) and the Stockholm Convention (persistent organic pollutants) we have worked with countries to help them phase out harmful substances in products ranging from refrigerators and transformers to fish and tomatoes. (See pages 11 and 16.)

We have supported developing countries' industries to replace ozone depleting substances—frequently having a very high global warming potential—resulting in avoiding the use and potential emission of 338 million tons of carbon dioxide-equivalent per year. According to the US Environmental Protection Agency, this equals the annual carbon dioxide emissions of 99 coal-fired plants or 71 million passenger vehicles in the United States. We have also helped countries to find ways how to destroy any of these substances that were remaining behind as waste, to ensure that they will not cause any harm in the future. (See pages 13, 32, 33 and 35.)

FORGING AHEAD

Our vision for a truly sustainable industry is drawn from the possibilities we see all around us in our daily work. The building blocks of a circular economy do not need to be invented; they already exist, and we have been putting them in place in industries all around the world for the last 50 years.

The case for industry to buy into the circular economy is remarkably compelling. A circular economy reduces resource dependency and resource use, thereby reigning in production costs, narrowing market exposure and limiting costs stemming from resource extraction and generation. It additionally leads to the introduction of economically viable methods of reducing pollution, and separating harmful from reusable waste material.



Beyond individual enterprises, these benefits further extend to entire industrial sectors, or even national economies. The circular economy encourages inter-company exchanges and synergy-building, leading to better economic, social and environmental performance. This in turn helps raise the overall performance of national economies and opens up new markets and jobs.

On an international level, the circular economy facilitates the exchange of goods across borders by introducing standards to new raw materials that were previously considered waste. Improved product characteristics such as extended lifetime, recyclability and serviceability further help ensure that products can be used and sold on the global market. By helping overcome international trade barriers in this way, the circular economy offers new possibilities by which countries can prosper.

Countries today stand at a turning point. On the one hand, the pursuit of unsustainable, linear patterns of consumption and production threatens the well-being of future generations, while on the other hand, a restorative approach to increased prosperity is opening itself up to the world. Together with our global partners, and in service to our Member States, UNIDO will continue to advance economic competitiveness, create shared prosperity and safeguard the environment in the world's developing and transition countries.





63%



31%



4%



2%

How we get to work



Fun things we do with our colleagues (besides work)



Number of languages we speak



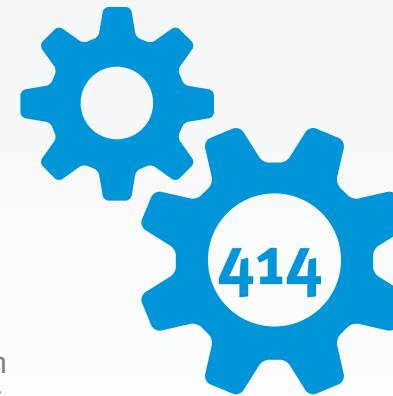
Number of countries we are citizens of



Number of languages we are learning



Number of countries we visited on mission in 2015

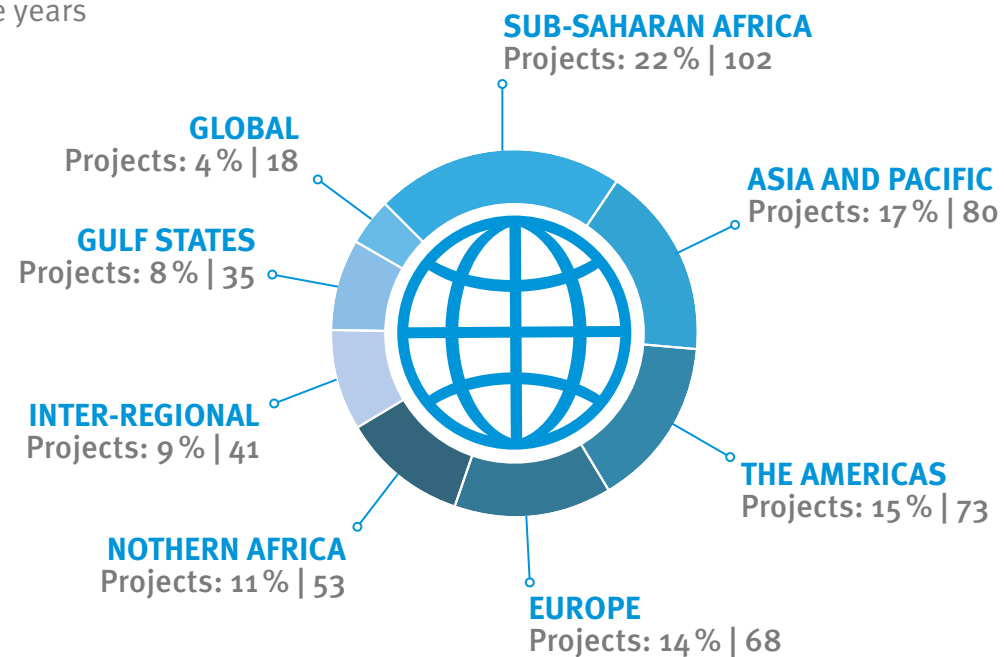


Number of projects we have undertaken in the last five years



Number of colleagues working in our field offices

Our regional balance of projects in the last five years



Number of us working at headquarters



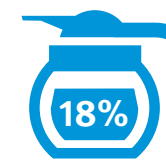
Number of countries our projects are in



Coffee



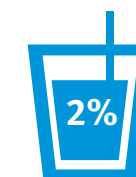
Water



Tea



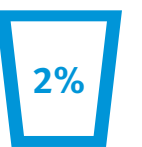
Soda water



Soft drinks



Mate

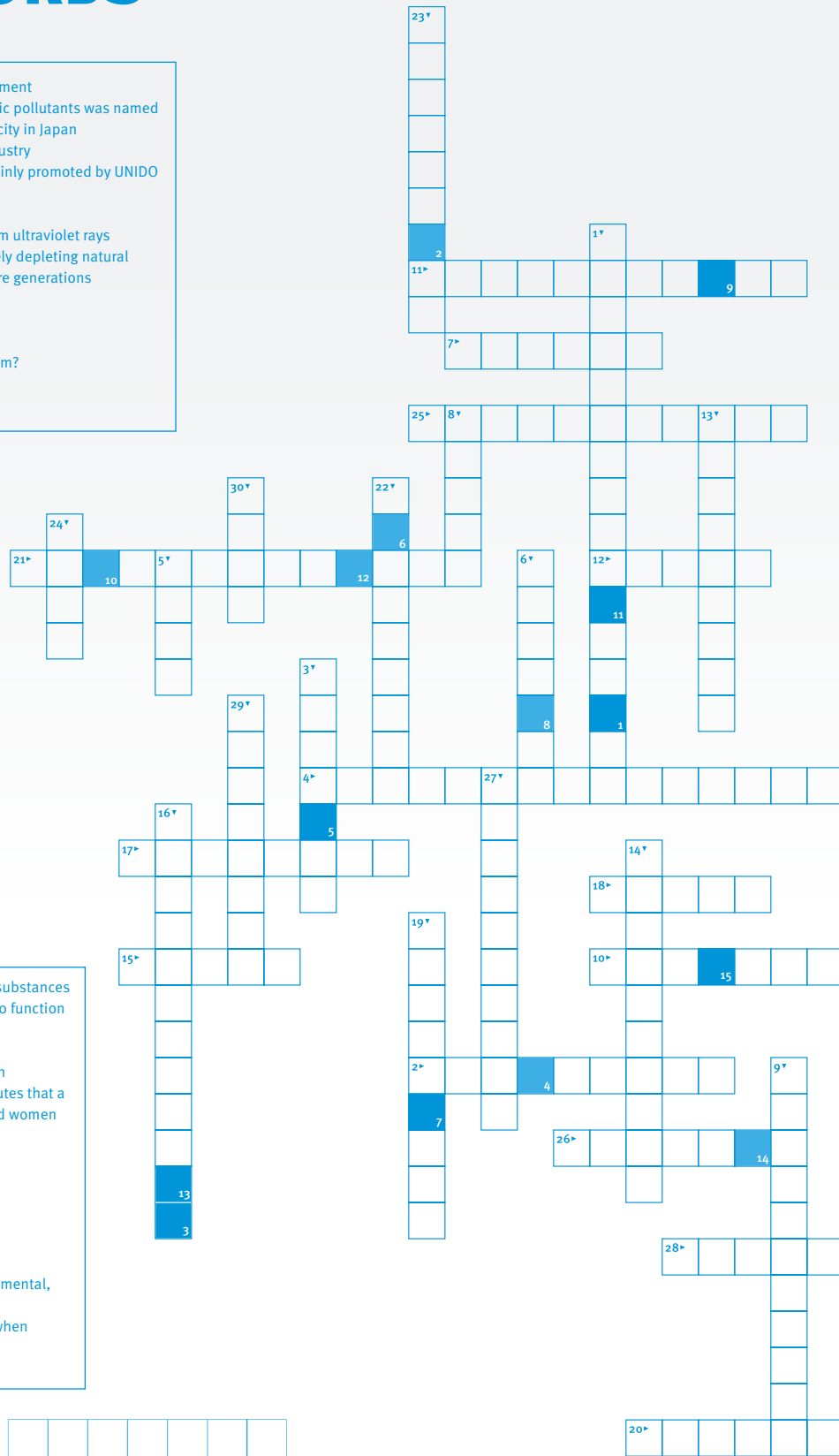


Nothing

What we drink for energy at work

WORK IN WORDS

1. Most successful multilateral environmental agreement
2. City after which a Convention on persistent organic pollutants was named
3. A Convention on this element was named after a city in Japan
4. A service-based business model for chemical industry
5. Number of the Sustainable Development Goal mainly promoted by UNIDO
6. Country where UNIDO's Headquarters is located
7. Your computer or smartphone, once discarded
8. Chemical in the stratosphere protecting Earth from ultraviolet rays
9. Able to continue for a long time without completely depleting natural resources or compromising the well being of future generations
10. Convert into reusable material
11. Everything around us
12. Use again and again
13. Produce them, release them, why not reduce them?
14. Gases that contribute to climate change
15. Age of UNIDO in 2016



16. Kitchen appliance often using ozone-depleting substances
17. A stock or supply that can be drawn on in order to function effectively
18. Insert the root of a crop to the shoot of another
19. Non-mechanized, usually small-scale production
20. The set of roles, behaviors, activities and attributes that a given society considers appropriate for men and women
21. Neutralize dangerous substances
22. Watch out, that type of fluid can burn
23. Meets official requirements
24. Destructive animal or insect
25. A fake version intended to deceive
26. Department checking incoming goods
27. The process of burning something
28. An official examination, e.g. financial or environmental, typically done by an independent body
29. Add a component to a machine, different from when manufactured
30. An insulating material

1 2 3 4 5 6 7 8

9 10 11 12 13 14 15

MAKE ME GREEN! OR RED! OR YELLOW!



CHECK YOUR SOLUTION AT [HTTPS://WWW.FACEBOOK.COM/ENVIRONMENTDEPARTMENTUNIDO](https://www.facebook.com/EnvironmentDepartmentUNIDO)

WE MAKE IT GREEN

KEY MOMENTS FOR UNIDO'S DEPARTMENT OF ENVIRONMENT

UNIDO is established to promote and accelerate the industrialization of developing countries.

UNIDO and the newly founded United Nations Environment Programme (UNEP) agree on a joint environmental programme.

UNIDO's second General Conference adopts the Lima Declaration, which called for developing countries to contribute 25 per cent of world industrial output by the year 2000.

UNIDO becomes a specialized agency.

UNIDO becomes an implementing agency for the Montreal Protocol's Multilateral Fund. Over the next two decades, **UNIDO** helps 1,650 firms in 75 countries phase out the use of ozone-depleting chemicals, some of which also can contribute to global warming.

Following successful demonstrations in developing and transition countries, including China, India, Poland and the former Czechoslovakia, **UNIDO** and UNEP jointly establish the first batch of National Cleaner Production Centres. In 2015 the programme celebrates its 20th anniversary as an expanded Global Network for Resource Efficient and Cleaner Production (GECNet), which now has 74 members in more than 60 countries.

The Stockholm Convention on persistent organic pollutants (POPs) is adopted. Over the following years, **UNIDO** helps eliminate 1,775 tons of POPs and safeguard 1,593 tons of POPs contaminated material in more than 55 countries, as well as train more than 16,000 professionals worldwide in proper environmental management.

UNIDO becomes an agency of the Global Environment Facility (GEF), a partnership of 183 governments, international institutions, nongovernmental organizations and the private sector. The Environmental Management and Montreal Protocol Branches take on GEF-funded projects on cleaner and sustainable production, management and disposal of persistent organic pollutants and ozone-depleting substances, and mercury contamination reduction.

UNIDO adopts a new policy on gender and women's empowerment.

UNIDO is actively involved in intergovernmental negotiations that result in the signing of the Minamata Convention on Mercury. **UNIDO** continues work to control mercury emissions in small-scale artisanal gold mining and expands to other sectors, including zinc smelting and chlor-alkali production.

UNIDO's Member States adopt a new Lima Declaration, which sets the foundation for a new vision of inclusive and sustainable industrial development (SID).

UN Member States adopt the 2030 Agenda for Sustainable Development, including a set of Sustainable Development Goals (SDGs). Goal 9—"build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"—underscores the importance of **UNIDO's** mandate.

The new Department of Environment forms to serve as an umbrella for the Montreal Protocol, Stockholm Convention, Industrial Resource Efficiency, and Emerging Compliance Regimes divisions.

The Vienna International Centre—where **UNIDO** headquarters is located—achieves climate neutrality as **UNIDO** celebrates its 50th anniversary. As the agency responsible for building management, **UNIDO** is able to practice at home the techniques and principles it has helped spread around the world.

1966

1974

1975

1985

1988

1989

1992

1995

1997

2001

2006

2007

2009

2013

2014

2015

2016

Scientists discover a hole in the ozone layer above Antarctica. Two years later, countries agree to the Montreal Protocol, which imposes restrictions on ozone-depleting substances.

Concerns about global warming as a result of greenhouse gas emissions lead to the establishment of the Intergovernmental Panel on Climate Change.

The Berlin Wall falls, heralding the end of the Soviet Union. In the years following, a series of policy prescriptions for developing countries, called the Washington Consensus, emerges, leading to more than a decade of free-market policy toward industrial development.

An international conference produces the Kyoto Protocol, setting targets for industrialized nations to reduce greenhouse gas emissions. It enters into force, but loses momentum.

A global financial crisis hits. The growth of emerging and developing economies overtakes that of advanced economies.

War, persecution and economic forces cause the number of migrants and refugees worldwide to rise to the highest levels since World War II.

In the Paris Agreement, nearly all nations pledge to set their own targets for greenhouse gas cuts.

The Kigali Amendment to the Montreal Protocol restricts hydrofluorocarbons, refrigerants that are greenhouse gases, preventing up to 0.5°C of global warming by the end of the century.

PHOTO CHALLENGE



SHOW US WHAT SUSTAINABLE INDUSTRIAL DEVELOPMENT LOOKS LIKE – AND WE’LL SHARE IT WITH THE WORLD

For this booklet, we spent a long time searching for images that embody the values of UNIDO’s Environment Department: inclusive and sustainable industrial development, circular economy, green industry and gender mainstreaming. But we want even more! Send us your original images—and we’ll share the ones we like on our Facebook page, alongside your name, of course. Who knows? Yours could go viral!*

OUR VIDEOS



WATCH THE ENVIRONMENT DEPARTMENT’S TOP 10 VIDEOS ON THE UNIDO YOUTUBE CHANNEL:

<https://www.youtube.com/UNIDObeta>

- ▶ 1. Chile: Helping farmers, protecting the ozone layer
 - ▶ 2. Protecting the environment and securing palm dates industry in Tunisia
 - ▶ 3. Montreal Protocol and ODS Destruction Project in Mexico
 - ▶ 4. UNIDO-Slovenia protecting a World Heritage Site of Montenegro
 - ▶ 5. A journey towards responsible gold in West Africa
 - ▶ 6. HEINEKEN and UNIDO Partnership, Tackling Worldwide Water Scarcity
 - ▶ 7. UNIDO helps Tunisian enterprises apply a resource efficiency and cleaner production
 - ▶ 8. Empowering females agribusiness workers in Mexico
 - ▶ 9. UNIDO POPs Programme - 3 projects funded by GEF
 - ▶ 10. Chemical Leasing
- ▶ **NEW for UNIDO’s 50th birthday! My Mum is My Hero**

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@SicarsUNIDO



HASHTAGS WE LOVE:
#UNIDO50, #MontrealProtocol, #StockholmConvention, #RECP

UNIDO IS 50!



WE’RE CELEBRATING IN VIENNA

What: UNIDO 50th Anniversary EXPO
Where: Vienna International Centre
When: 21-25 November 2016

FIND OUT MORE: <http://50.unido.org>



*Conditions:

1. Email your original image to environment@unido.org. Include your name, country and a suggested caption (about 25-50 words) describing the image and its relevance to the themes of inclusive and sustainable industrial development, circular economy, green industry and gender mainstreaming. Use the subject line “photo challenge.” 2. By submitting an image for consideration you attest that it is an original image made by you, that you hold all rights in the image and that you allow UNIDO to post the image, the caption (which may be edited by UNIDO) and your name and country to its web pages, Facebook page(s) and other social media platforms (including those of staff members), as well as in promotional and publicity items about UNIDO. Copyright remains with the image owner and does not transfer to UNIDO or its staff members. 3. Images will be selected for posting by UNIDO Environment Department staff based on quality and relevance to the themes. There is no limit to the number of submitted images that UNIDO may post, but UNIDO may refuse to post images for any reason. 4. UNIDO staff cannot commit to responding to questions about the challenge or selected photos. 5. Neither UNIDO nor its Member States assume any responsibility for consequences which may arise from this challenge or the use of submitted material. 6. This challenge is not a contest and therefore will have no winner(s); owners of selected images will not receive any prizes, awards or payments. 7. This challenge will run until June 2017, but UNIDO reserves the right to extend or end this challenge at any time without notice. 8. UNIDO staff, their immediate family members and staff of institutions sponsoring or associated with the challenge ARE eligible to participate in the challenge!



TOGETHER
for a sustainable future

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