

Driving Sustainable Consumption and Production at the Local Level:

Education for Sustainable Development Projects from the Global RCE Network

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Raphael Rychersky | unsplash

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Foreword by UNU-IAS

Sustainable consumption and production (SCP) is a critical aspect of sustainable development that addresses the negative environmental and social impacts of human activities that deplete natural resources and produce waste. This can help to ensure that the needs of the present generation are met without compromising the ability of future generations to meet their own needs. It also creates a more resilient and equitable world by reducing poverty, promoting economic growth, and improving human wellbeing. Therefore, it is something that we should all care about as it affects not only the environment but also quality of life – both for ourselves and for future generations. The United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) has been actively working to advance SCP through several initiatives.

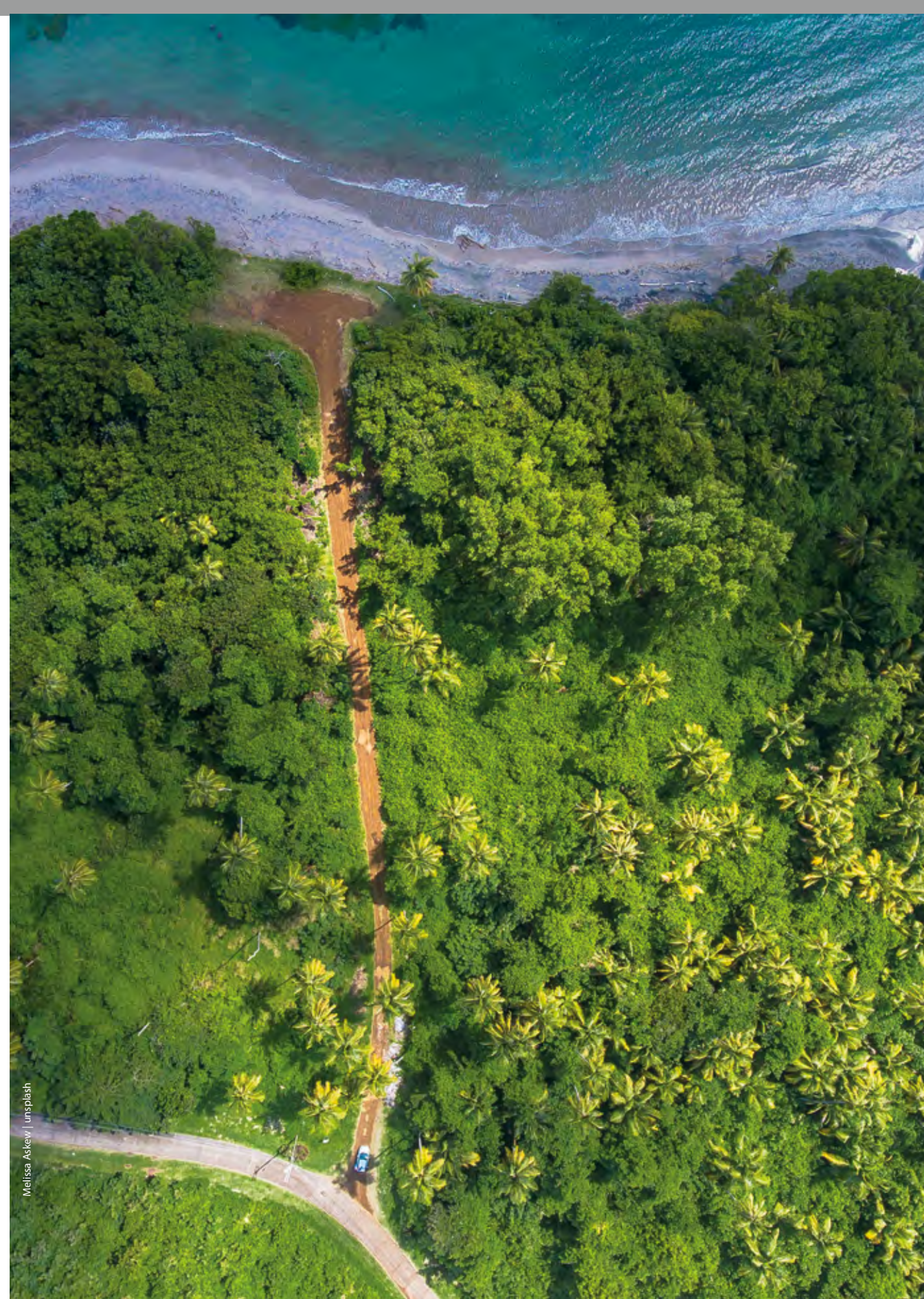
One of these is a multi-stakeholder approach through Regional Centres of Expertise on Education for Sustainable Development (RCEs). RCEs are a network of organisations and individuals working together to promote sustainable development through education. They work to integrate SCP principles into both formal and non-formal education systems and support the development of education initiatives that raise awareness, understanding, and effective implementation. By engaging a wide variety of stakeholders – including schools and universities, local businesses, government agencies, and community groups – RCEs demonstrate the benefits of SCP and encourage practical action. In formal education, RCEs are helping schools to integrate SCP into the curriculums for subjects such as geography, science, economics, and social studies, to raise awareness and understanding of the issue among students. RCEs' activities are also

going above and beyond knowledge transfer in schools, by engaging a wider range of stakeholders in formal education and encouraging practical action across society. Through RCEs, schools and universities are working with local businesses, government agencies, and community groups to promote SCP and demonstrate its benefits across communities. This multi-stakeholder approach can encourage learners from a broader cross-section of society – including organisations in the private, public, and civil society sectors – to take practical steps to reduce waste, conserve energy, and increase use of public transportation.

UNU-IAS is proud to support the development of innovative education initiatives such as this action-oriented, whole-of-society approach, which goes far beyond raising awareness and understanding on SCP. It inspires learners to think critically about their own consumption patterns and their impacts in their household, neighbourhood, and region, and to make positive changes. UNU-IAS is committed to ensuring that education is inclusive of all, regardless of gender, geographical challenges, disabilities, and/or socio-economic status. RCEs have been working for the past 18 years to promote education for all, including those lacking access to formal schooling. Through our partnerships with RCEs and their work with a wide range of innovative modalities and diverse communities, UNU-IAS will continue to play a vital role in promoting SCP and contributing to a more sustainable world for all.



Shinobu Yume Yamaguchi
Director
United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS)



Melissa Askew | unsplash



Foreword by the One Planet Network

Decades of unsustainable consumption and production practices are at the very root of our triple-planetary crisis of climate change, biodiversity loss, and pollution. Today, only 7.2% of the global economy is circular (with virgin material extraction and use rising every year) (Circle Economy, 2023); our food systems alone contribute to 29% of global greenhouse gas emissions (WWF, 2022); and the amount of e-waste disposed is projected to reach an alarming 74 million metric tonnes by 2030 (United Nations Institute for Training and Research, Sustainable Cycles Programme, 2020). However, this state of emergency also represents an opportunity.

The solutions for a global shift towards circular approaches to tackle the interlinked crises of climate, nature, and pollution exist. So, how can they be effectively implemented? This comprehensive publication by Regional Centres of Expertise on Education for Sustainable Development (RCEs) showcases that Education for Sustainable Development (ESD) is a crucial component to achieving long-lasting, systemic change. Therefore, the UN Environment Programme and the 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP) are well positioned to join forces with the Global RCE Network to mainstream sustainable consumption and production patterns, including in the areas of agriculture, waste management, and recycling.

Given the planetary boundaries we operate in, one essential aspect for achieving Sustainable Development Goals is to ensure an efficient use of resources and minimisation of waste. Shifting our mindset about wasteful consumption and inefficient production methods is not an easy task – but it can and must be done. As laid out in the recently adopted United Nations General Assembly resolution

“Promoting Zero Waste Initiatives to Advance the 2030 Agenda on Sustainable Development” (United Nations, 2022), we must “amplify the role of education and awareness-raising in reducing and recycling waste following the sustainable consumption and production and circular economy approaches, by informing and engaging consumers, businesses, and other stakeholders about the benefits of sustainable practices”. Using education and providing scientific and accurate information, we can counterbalance prevalent greenwashing and disinformation strategies, and in turn, change consumer behaviour and strengthen transformative action.

Besides, education and knowledge exchange have the great potential to foster economic and social inclusion. We need to listen to those voices that have been left out of the conversation and include marginalised people and communities in our path to a green and just future – for example, as illustrated in the Electronic Waste Project in Kenya in this publication, through engaging unemployed youth, women working from home, and retirees.

There are reasons to be hopeful. We have a once-in-a-generation opportunity to launch a just and inclusive global movement for sustainable consumption and production. Given the wealth of innovative ideas, technologies, and knowledge available across the world, it is imperative that we use these resources to our advantage. Harnessing digital technologies for a circular economy is a crucial route to take. Through knowledge sharing and the power of networks and communities, we can implement this shift together, both on a global and local level.

**Jorge Laguna-Celis, Veronika Cerna,
& Ginger Lou Billows,
One Planet Network (10YFP)**

The One Planet Network is a global community of practitioners, policymakers and experts, including governments, businesses, civil society, academia and international organisations, that implements the 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP) and works towards achieving SDG 12: ensuring sustainable patterns of consumption and production.



Featured RCE Sustainable Consumption and Production Projects

A Regional Centre of Expertise (RCE) is a network of existing formal, non-formal and informal organisations that facilitate education for sustainable development (ESD) in local and regional communities. RCEs bring together institutions at the regional/local level to jointly promote ESD. They aspire to use education as a mechanism to translate global objectives for sustainable development into the context of the local communities in which they operate.

RCEs build innovative platforms to share information and experiences and to promote dialogue among regional/local stakeholders through partnerships for sustainable development. An RCE can involve local school systems, higher education institutions, environmental NGOs, museums, zoos, botanical gardens, local governments, local enterprises, volunteer groups, media, civic associations and/or individuals who work in the spheres of sustainable development such as economic growth, social development, and environmental protection.

RCEs Worldwide

As of December 2022, 188 RCEs have officially been acknowledged by the United Nations University worldwide.

Africa & Middle East

- Cameroon:**
 - Buea
- Egypt:**
 - Cairo
- Eswatini:**
 - Eswatini
- Kenya:**
 - Central Kenya
 - Greater Nairobi
 - Greater Pwani
 - Kakamega-Western Kenya
 - Mau Ecosystem Complex
 - Mount Kenya
 - North Rift
 - Nyanza
 - South Rift
- Lesotho:**
 - Lesotho
- Malawi:**
 - Zomba
- Namibia:**
 - Khomas-Erongo
- Nigeria:**
 - Greater Yenagoga
 - Ilorin
 - Kano
 - Lagos
 - Minna
 - Ogun
 - Port Harcourt
 - Zaria
- Senegal:**
 - Senegal
- South Africa:**
 - Gauteng
 - KwaZulu-Natal
 - Makana and Rural Eastern Cape
- Tanzania:**
 - Dar es Salaam
- Uganda:**
 - Greater Eastern Uganda
 - Greater Kampala
 - Greater Masaka
 - Greater Mbarara
- Zambia:**
 - Lusaka
- Zimbabwe:**
 - Harare
 - Mutare

Europe

- Albania:**
 - Middle Albania
- Austria:**
 - Graz-Styria
 - Vienna
- Belarus:**
 - Belarus
- Czech Republic:**
 - Czechia
- Denmark:**
 - Denmark
- Finland:**
 - Helsinki Metropolitan
- France:**
 - Bordeaux Aquitaine
 - Paris Seine
- Germany:**
 - Hamburg
 - Munich
 - Nuremberg
 - Oldenburger Münsterland
 - Ostwürttemberg
 - Ruhr
- Italy:**
 - Euroregion Tyrol
- Lithuania:**
 - Vilnius
- Netherlands:**
 - Fryslân
- Poland:**
 - South Poland
 - Warsaw Metropolitan Area
- Portugal:**
 - Açores
 - Creias-Oeste
 - Porto Metropolitan Area
- Regional:**
 - Basque Country - Navarre
- Russia:**
 - Nizhny Novgorod
- Samara:**
 - Samara
- Serbia:**
 - Vojvodina
- Spain:**
 - Galicia
- Sweden:**
 - North Sweden
 - Skane
 - Uppsala-Gotland
 - West Sweden
- Switzerland:**
 - Zurich
- United Kingdom:**
 - East Midlands
 - Greater Manchester
 - London
 - North East
 - Scotland
 - Severn
 - Wales
 - Yorkshire & Humberside
- Southern Black Forest:**
 - Stettiner Haff
- Greece:**
 - Central Macedonia
 - Crete
- Ireland:**
 - Dublin
- Sweden:**
 - North Sweden
 - Skane
 - Uppsala-Gotland
 - West Sweden

The Americas

- Argentina:**
 - Cuenca del Plata
- Brazil:**
 - Curitiba-Paraná
 - Rio de Janeiro
- Canada:**
 - British Columbia
 - Greater Sudbury
 - Mauricie/Centre-du-Quebec
 - Peel
 - Peterborough-Kawartha-Haliburton
 - Saskatchewan
- Colombia:**
 - Bogota
- Guatemala:**
 - Guatemala
- Mexico:**
 - Borderlands Mexico-USA
 - Western Jalisco
- Peru:**
 - Lima-Callao
- Puerto Rico:**
 - Puerto Rico
- United States of America:**
 - Detroit Windsor
 - Georgetown
 - Grand Rapids
 - Greater Atlanta
 - Greater Burlington
 - Greater Phoenix
 - Greater Portland
 - Hawaii
 - North Texas
 - Salisbury
 - Shenandoah Valley
- Venezuela:**
 - Gran Caracas

Asia-Pacific

- Australia:**
 - Gippsland
 - Greater Western Sydney
 - Murray-Darling
 - Tasmania
 - Western Australia
- Bangladesh:**
 - Greater Dhaka
 - Sundarbans
- Cambodia:**
 - Greater Phnom Penh
- China:**
 - Anji
 - Beijing
 - Greater Shangri-la
 - Hangzhou
 - Hohhot
 - Kunming
 - Qingdao
 - Suzhou
 - Tianjin
- India:**
 - Bengaluru
 - Chandigarh
 - Delhi
 - East Arunachal Pradesh
 - Goa
 - Jammu
 - Kodagu
 - Kozhikode
 - Lucknow
 - Greater Phnom Penh
 - Mumbai
 - Srinagar
 - Thiruvananthapuram
- Indonesia:**
 - Bogor
 - East Kalimantan
 - Yogyakarta
- Japan:**
 - Chubu
 - Greater Sendai
 - Hokkaido Central
 - Hyogo-Kobe
 - Kitakyushu
 - Okayama
 - Omuta
 - Yokohama
 - Kyrgyzstan:
 - Kyrgyzstan
 - Malaysia:**
 - Greater Phnom
 - Central Semenanjung
 - Greater Gombak
 - Greater Kuala Lumpur
 - Iskandar
 - Kuching
 - Melaka
 - Penang
 - New Zealand:**
 - Otago
 - Waikato
 - Philippines:**
 - Bohol
 - Cebu
 - Davao
 - Ilocos
 - Northern Mindanao
 - Regional:**
 - Pacific Island Countries
 - Republic of Korea:**
 - Changwon
 - Dobong-gu
 - Gwangmyeong
 - Incheon
 - Inje
 - Tongyeong
 - Ulju
 - Thailand:**
 - Cha-am
 - Maha Sarakham
 - Sakon Nakhon
 - Trang
 - Viet Nam:**
 - Southern Vietnam



Markus Spiske | unsplash

Education for Sustainable Consumption and Production

Dr. Jonghwi Park, Academic Programme Officer and Head of Innovation and Education, UNU-IAS
Dr. Philip Vaughter, Research Consultant, UNU-IAS

The data tells us: unsustainable patterns of consumption and production that we have practised for decades are the root causes of climate change, biodiversity loss, and pollution. For example, an estimated 17% of all food that was available to consumers was wasted, with the majority of this waste coming from individual households, while around 13% of the globe's food supply was lost in 2020 before reaching markets (United Nations Department of Economic and Social Affairs, 2022). Every year, as much as 12.7 million tonnes of plastics are discarded into the ocean and the vast majority of electronic wastes are not managed safely with less than 20% recycled. Pollution is the largest environmental cause of disease and premature death globally, causing three times more deaths than AIDS, tuberculosis, and malaria combined. With the current speed of extraction and heavy reliance on natural resources, our planet will need 183 billion tonnes of material annually by 2050, which is three times today's amount (United Nations Environment Programme, 2018).

While the data tells the grim reality of what we have done to our planet, there is hope – we can turn it around if we act now to reduce/manage waste, increase resource efficiency, and change our consumer behaviours. Goal 12 of the Sustainable Development Goals (SDGs) is to address this urgent issue and ambitious goal, ensuring sustainable consumption and production (SCP) patterns. In

particular, it is linked to how we consume water, food, fuel, and other resources, and to how we produce efficiently to satisfy the needs and desires of consumers around the globe, including the effective and equitable deliveries of the resources.

As such, SCP refers to a pattern of using resources in an efficient and responsible way to meet the needs of both present and future generations. The goal of SCP is to ensure that human well-being is not undermined by environmental degradation, while at the same time ensuring that economic growth does not damage the environment. SCP is therefore a key component of sustainable development and is essential to achieve a more sustainable future.

Achieving SCP, however, requires strong and urgent commitment from all sectors. It needs a systems-level approach, integrating economic, social, and environmental considerations into decision-making at all levels of how societies consume and produce. Addressing these factors requires multiple groups of stakeholders, including governments, businesses, civil society organisations, and individuals. And the entry point for empowering all of these stakeholders is *education*.

Education for SCP is a component of education for sustainable development (ESD). The goal of education for SCP is to empower individuals to make informed decisions and take actions that contribute to a more sustainable future.

It focuses on raising awareness and providing knowledge and skills on how to use natural resources more efficiently, reduce waste and environmental impacts, and promote sustainable lifestyles. Education for SCP can be integrated in formal school and university curriculum, but the opportunity for education for SCP should be provided beyond the formal schooling throughout one's life. Such non-formal and in-formal learning is critical in education for SCP as an effective SCP education often requires collaboration and cooperation between different stakeholders to create an enabling environment for education on sustainable consumption and production practices.

In this regard, Regional Centres of Expertise on Education for Sustainable Development (RCEs) offer a promising platform for multi-stakeholder networks with this variety of actors from different sectors of society uniting to educate their communities on sustainable development. RCEs are established through a partnership between various stakeholders, including governments, civil society organisations, businesses, and education institutions, to promote ESD within a specific region. RCEs work to promote education for sustainable consumption and production at all levels, from formal school systems, to community education centres, to workforce training programmes. RCEs typically focus on local or regional sustainable consumption and production issues, which allow for them to tailor and contextualise their education initiatives in this area to be both topical for their learners, as well as nuanced in their understanding of the systems at play in a given issue. As a flagship initiative of UNU-IAS

and with the generous support of the Ministry of the Environment, Japan since 2005, RCEs have been engaging with education on SCP at locations around the world for over fifteen years.

This publication introduces twelve promising cases from RCEs around the world that showcase the impact of multi-stakeholder community-based education on SCP¹. They present RCE cases which pivot around three critical factors of SCP: 1) resource efficiency; 2) waste management and minimisation; and 3) consumer behaviour.

Specifically, in terms of *resource efficiency*, RCE Southern Vietnam and RCE Ilocos in the Philippines show how RCEs contribute to improving resource efficiency in agricultural sectors while RCE Kano in Nigeria illustrates community education for locally-created cooking stoves to enhance energy efficiency. RCE Southern Vietnam has created an agricultural extension programme to educate the local farming community on organic farming. RCE Southern Vietnam uses the site to teach sustainable agricultural practices that avoid the use of synthetic chemicals, fertilisers, and pesticides and instead rely on natural methods for soil fertility, pest management, and crop production. RCE Ilocos, on the other hand, worked with a rural community on sustainable agri-forestry, focusing on teaching individuals about the principles of sustainable forestry and how to apply them to bamboo forests. A distinctive output from this project by RCE Ilocos, among many, is that it did not only reforest the once denuded land with sustainable bamboo farming, but also economically empowered the community by creating employment, especially

¹ This publication is the fourth publication of the series, *Education for Sustainable Development Projects from the Global RCE Network*. For the other publications, please see <https://www.rcenetwork.org/portal/resources-publications-and-others>.



Nareeta Martin | unsplash



Eugeny Karchevsky | unplash

Editorial

among out-of-school youth. Finally, the project from RCE Kano is a great example where a global issue can be tackled by a local solution. Given the persistent issues of the traditional wooden cook stove in a rural area of Nigeria, RCE Kano took action to educate community members to design and produce more fuel-efficient cookstoves locally in the villages, using locally available materials. The project significantly contributed to improving cooking efficiency, reducing the amount of wood required for cooking, and allowing women and girls, who usually spent a great deal of time on collecting wood, for more agency over their time.

Waste management and minimisation take centre stage in SCP education projects heralding from RCE Buea in Cameroon, RCE Greater Nairobi in Kenya, RCE Kuching in Malaysia, and RCE Tasmania in Australia. RCE Buea worked with youth in the local coastal communities to educate them on recycling plastic waste discarded into the Atlantic Ocean from the fishing industry and turning them into 3D printing products that they could sell. In Nairobi, the RCE worked to create a job training programme targeting youth, women, and seniors to safely refurbish discarded electronics which could be sold rather than end up in landfill as dangerous and undecomposable e-waste. Given that e-waste management is still overwhelmingly left to unskilled, informal workforces in many countries around the world, including Kenya (Bimir, 2020), these type of SCP education initiatives are essential not only for empowering workers, but for protecting the health and safety of workers, their communities, and the surrounding environment from improper management of e-waste. Both RCE Kuching and RCE Tasmania showcase successful public awareness campaigns on reducing, recycling and reusing waste in close collaboration with primary and secondary schools and universities.

When it comes to *consumer behaviour*, RCE Bogota, RCE Czechia, RCE Galicia, and RCE Lusaka champion SCP education involving various media. The first two RCEs noticed that as households were gaining wealth in their respective regions, waste of resources was also increasing – notably water in the case of Bogota and material goods in the case of Czechia. RCE Lusaka, on the other hand, faces acute food insecurity due to lack of green spaces while the number of food-related diseases such as obesity, diabetes and high blood pressure has been increasing due to the heavy consumption of cheap processed and packaged food. Responses that these RCEs made to address their respective local issues are remarkable: RCE Czechia developed a research-based toolkit to train teachers on the whole-institutional approach to change student consumption behaviours which has been now used by more than 400 schools in Czechia. RCE Bogota worked with non-formal education to educate consumers (general public) through webinars, workshops, and targeted social media campaigns. And RCE Lusaka, led by the local youth, utilised the local radio station to raise awareness on the connection between food consumption and health and educate local communities to grow fresh vegetables in the gardens. In addition, RCE Galicia's use of children's books and documentary films was extremely innovative and timely in that it raised awareness on the impact of local mining businesses beyond the economic benefits (and on their health and wellbeing), and helped local communities take agency in the conservation of their land, their health, and their future.

Finally, collaboration within the Global RCE Network itself is a groundbreaking initiative that deserves a distinction beyond the three critical factors as SCP is a systems-issue and promoting SCP indeed requires the involvement of both

production and consumption sides. RCE Greater Burlington in the United States of America and RCE Puerto Rico in the Caribbean both wanted to teach their communities how to make supply chains to and from farms more sustainable during the height of the COVID-19 pandemic. The two RCEs worked together on research in order to gain a comprehensive understanding of the current state of sustainability in the supply chains, including the social, environmental, and economic impacts. In order to carry out this research, the two RCEs had to connect with experts, organisations, and industry leaders in both regions who were already working on food supply chain issues during the pandemic. This regional exchange of SCP education has allowed for farmers to collaborate with suppliers, customers, and each other to share knowledge and best practices.

The SCP projects and cases documented in this publication have been instrumental in empowering communities to adopt sustainable practices, conserve natural resources, reduce their carbon footprint and improve their quality of life. They are a testament to the fact that community-based education can play a vital role in promoting sustainable practices and fostering a culture of sustainability.

As the UN Secretary General António Guterres once put it, “the climate emergency is a race we are losing, but it is a race we can win” (Guterres, 2019). It is our hope that the cases in this publication can serve as sources of inspiration for your own action in your community, using education as a mechanism for enabling change and keeping our consumption and production within the planetary boundaries. Let us seize the last chance to turn around the race to limit global warming below 1.5°C.

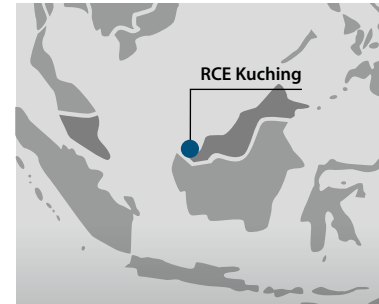


Jonathan Kemper | unsplash



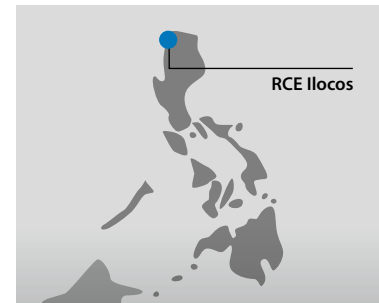
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Chapter Asia-Pacific



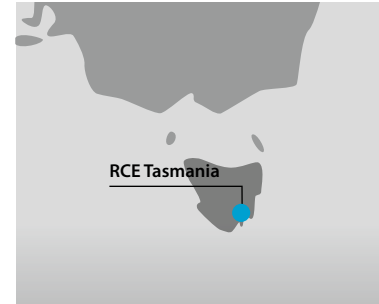
The 5Rs (Refuse, Reduce, Reuse, Recycle, Re-purpose) Campaign

RCE Kuching 18



Bamboo Production, Rehabilitation, and Processing: Sources of Food, Livelihood, and Environmental Protection

RCE Ilocos 22



Turning Discarded Filing Cabinets into Recycling Walls

RCE Tasmania 26



Building Capacity of Farm Owners for Promotion of Sustainable Farming in Southern Viet Nam

RCE Southern Vietnam 30





RCE Kuching Youth Ambassadors

Students from St. Paul Primary School (in Bunuk Village) re-purposing recycled materials to produce arts and crafts items such as cards and scrapbooks. This activity empowered students not only to recycle materials, but also to make new things of value from them.

Chapter Asia-Pacific

The 5Rs (Refuse, Reduce, Reuse, Recycle, Re-Purpose) Campaign

RCE Kuching



Situation

The Bengoh Region is adjacent to Kuching in the State of Sarawak in Malaysia. The area has a tropical rainforest climate, bordered by the Kuching Wetlands in the west and the Kuap River estuary in the east. Bengoh lies along the Sarawak River, and is home to several small villages that rely on farming and fishing from the river. The Sarawak River is the primary source of freshwater for Kuching, a dense urban area with a service economy that is located downstream from Bengoh. Rapid urbanisation and increasingly intense consumption patterns are characteristic of both Bengoh and Kuching.

Issue/s

While this region of Sarawak has undergone extensive economic development in the last decade, a major sustainable development challenge for the region is waste disposal, particularly outside of urban areas. Although municipalities have taken initial steps at addressing waste issues, many people in the region still practise open burning, the use of chemical pesticides and fertilisers that are washed into waterways, and often dump rubbish directly into the Sarawak River. This is particularly problematic for cities like Kuching, which have to deal with not only their own waste, but also the waste

of neighbouring communities that gets washed downstream and into their water supply.

Responses/Actions Taken

RCE Kuching recognised that in order to address waste entering the Sarawak River, it had to not only address waste issues within Kuching itself, but also in communities upstream from the city. The RCE began to design a project that would raise awareness about the impacts of agricultural runoff and solid waste entering the Sarawak River. The first phase of the project which started in August 2019, a public awareness campaign, was also paired with the second phase, which began in October that year, of developing a curriculum that would educate young people on how to reduce waste in the region, giving actionable lessons on the 5Rs (Refusing, Reducing, Reusing, Recycling, and Re-Purposing) in their schools and villages. One example of the 5Rs showing up in school curriculum was that students in schools worked with re-purposing waste to create a variety of arts and crafts projects. The curriculum not only stressed cognitive learning by stressing the concepts and benefits related to reducing waste, but also stressed socio-emotional and behavioural learning as learners

A student from SMK Siburan Secondary School (in Siburan Town) re-purposing recycled materials to produce arts and crafts items such as cards and scrapbooks.



RCE Kuching Youth Ambassadors



Region:
Asia-Pacific

Country:
Malaysia

SDG(s):
Quality Education, Clean Water and Sanitation, Sustainable Cities and Communities, Responsible Consumption and Production

Theme(s):
Curriculum Development, Waste

Target audience(s):
Community, Primary, Secondary

Ecosystem(s):
Agricultural, Freshwater

GAP / ESD for 2030 Priority Action Areas: 4, 5

Language(s) of project:
English/Bahasa Malaysia

Contributing organisation(s):

- UCSI University – Sarawak Campus
- WormingUp
- Kuching Chefs' Association
- Government, Arts, Marketplace, Education, Social/Sports Private Limited (G.A.M.E.S. PLT)
- Kuching Water Board

Linkages to education and/or sustainable development policies:

- ESD for 2030 Roadmap

Duration of project:
August 2019 – ongoing

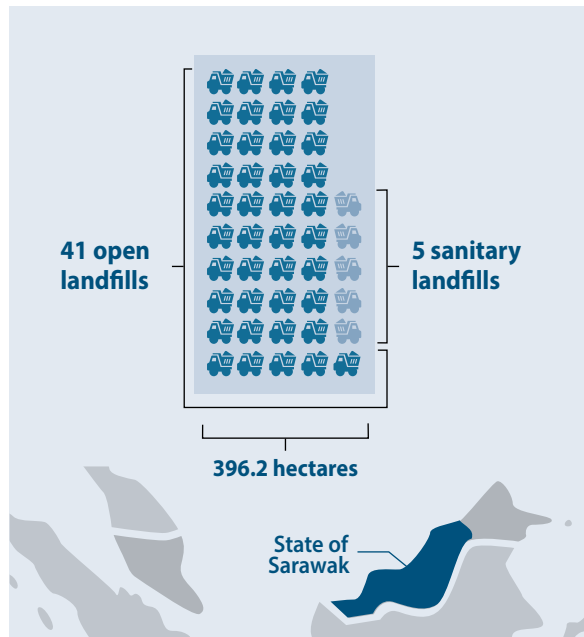


Figure 1. There are 46 landfills with a total area of 396.2 hectares actively operating in the State of Sarawak, of which only 5 are sanitary landfills and 41 are open landfills. (Source: Natural Resources and Environment Board Sarawak, 2022).

participated in pilot waste management projects within the local community. Finally, in the third phase, the behavioural component was due to be replicated at the institutional level by having learners plan, implement, evaluate, and replicate their own 5R activities within their schools and local communities. This phase had to adapt to an online modality due to the COVID-19 pandemic, meaning students had to switch to household activities. The project had to switch to home learning, and whilst this worked for some learners, lack of digital infrastructure in rural schools made it an obstacle for many.

Gender equality was also addressed in this project in that equal opportunity was given to University College Sedaya International (UCSI) staff, RCE Youth Ambassadors and student volunteers to be involved in the planning and implementation of activities that were held in the participating schools. Moreover, school teachers and students, regardless of their gender were also welcomed to join the

project, which served to empower both men and women, as well as boys and girls.

Results

So far, a public awareness campaign has been launched on waste and the 5Rs using a variety of teaching methods, such as discussions, videos, games, and hands-on group activities. The second phase is also being implemented – a ‘Recycling Mania’ competition has been launched at schools in the Bengoh Region, and used cooking oil has been collected from households and restaurants for soapmaking workshops. The project works across four schools within the region, providing in-class training to approximately 250 students annually. The eco-friendly practices that are being instilled in learners in the region through the project will be a foundation that will better equip all residents in the region to reduce waste and better protect the Sarawak River and its surrounding watershed.

RCE Kuching members at the Tagang Festival, in Semadang Village, promoting the 5Rs Campaign project.

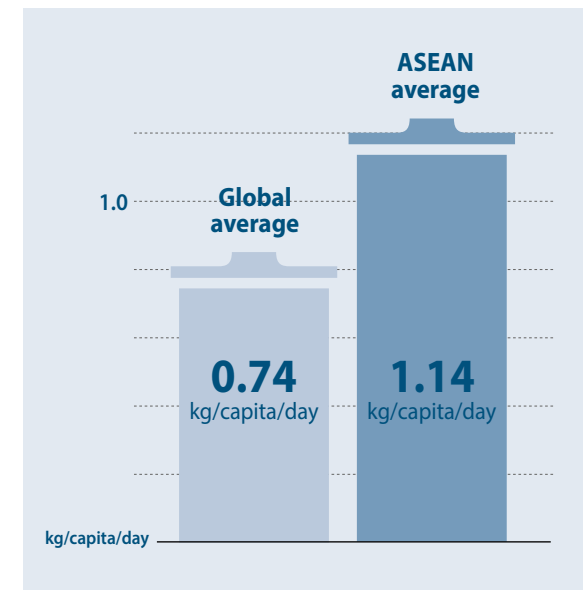


Figure 2. The global average of waste generated per person per day is 0.74 kg, whereas the ASEAN region's per capita MSW (municipal solid waste) generation is 1.14 kg/capita/day. (Source: Malaysian Investment Development Authority, 2021).

Recycling rates in 2020

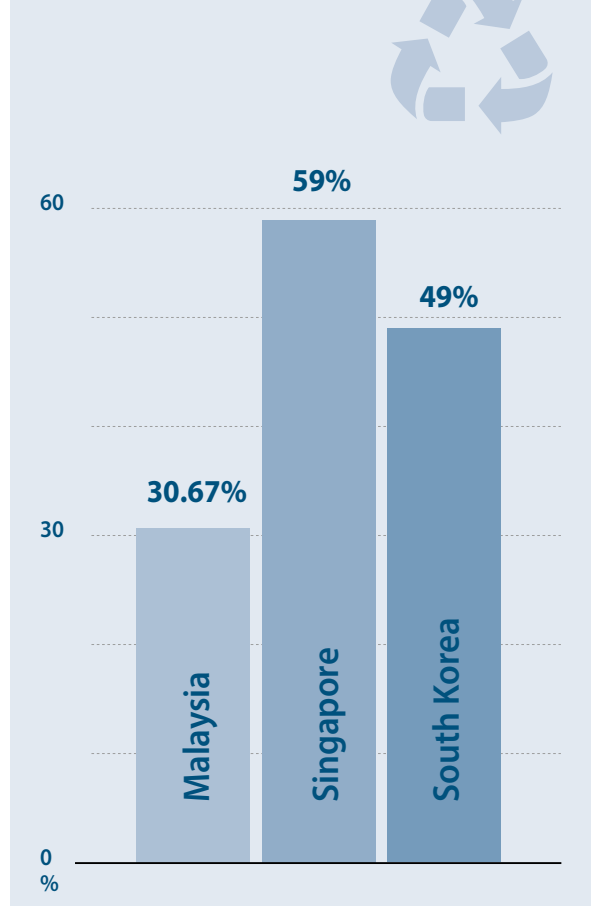


Figure 3. The Solid Waste Corporation (SWCorp) reported that the recycling rate achieved in Malaysia during 2020 was 30.67%, lower than other highly developed countries in Asia such as Singapore (59%) and South Korea (49%). (Source: Malaysian Investment Development Authority, 2021).

Lessons Learnt:

When working with schools in community education projects, it is critical to meet with school administrators and discuss projects early on in the process. Given the busy schedule of teachers, and limited amount of flexibility in curriculum, it is often advantageous to prepare waste reduction education projects before the start of a given academic year.



RCE Ilocos

Region:
Asia-Pacific

Country:
Philippines

SDG(s):
2 Zero Hunger, Quality Education, Sustainable Cities and Communities, 11 and Communities, 12 Responsible Consumption and Production, Climate Action, Life on Land

Theme(s):
Disaster Risk Reduction, Traditional Knowledge, Agriculture, Curriculum Development, Ecotourism, Forests/Trees, Plants & Animals, Waste

Target audience(s):
Community, TVET, Youth (Non-Formal)

Ecosystem(s):
Forest, Urban/Peri-Urban

GAP / ESD for 2030 Priority Action Areas: 4, 5

Language(s) of project:
English

Contributing organisation(s):

- Mariano Marcos State University
- 11 Local Government Units of Ilocos Norte Province
 - City of Batac
 - Municipality of Bacarra, Ilocos Norte
 - Municipality of Badoc, Ilocos Norte
 - Municipality of Currimaoy, Ilocos Norte
 - Municipality of Dingras, Ilocos Norte
 - Municipality of Nueva Era, Ilocos Norte
 - Municipality of Paoay, Ilocos Norte
 - Municipality of Solsona, Ilocos Norte
 - Municipality of Pasuquin, Ilocos Norte
 - Municipality of Vintar, Ilocos Norte
 - Municipality of San Nicolas, Ilocos Norte

Duration of project:
February 2020 – January 2021



Rehabilitated *Bambusa blumeana* Plantation.

Chapter Asia-Pacific

Bamboo Production, Rehabilitation, and Processing: Sources of Food, Livelihood, and Environmental Protection

RCE Ilocos



Situation

The Ilocos region is on the north-western coast of Luzon Island in the Philippines. The region has direct access to international sea lanes, as it is bound in the east by the South China Sea and the Central Cordillera Mountain range in the west. It has a developing export-oriented agri-forestry economy with an increasing amount of tourism activities due to its proximity to major East Asian markets. The region is composed of towering mountains, thick forests, and narrow coastal plains. Many communities in the region are active in bamboo farming as an agri-industrial activity.

Issue/s

Bamboo forests play a vital role in the region's ecosystems by preventing erosion and thereby decreasing the risk from flooding, stabilising river banks, and absorbing massive quantities of CO₂ which mitigates climate change. However, a major economic activity in the region is the harvesting of bamboo for a number of products, including food, fertiliser, and building material. This has led to extensive deforestation in the area, leaving much land eroded. Thus, an approach to bamboo harvesting was needed which preserves the region's bamboo forests and fosters livelihood opportunities for communities in the region. The region has many economically depressed farming communities, with a large amount of unemployed youth. Although there is a long history of bamboo harvesting within Ilocos, few farmers have systematic knowledge of the entire product lifecycle of bamboo crops, from propagation to processing finished products. This has resulted in bamboo being harvested unsustainably, with many farmers also being

underpaid for their crops. With training however, they could add value to the products they are producing.

Responses/Actions Taken

From April-June 2020, RCE Ilocos trained bamboo farmers and those interested in bamboo farming on all of the uses of bamboo, in addition to training them on the newest bamboo cultivating and processing technologies. This provided a better knowledge base for the communities on what potential markets they could enter, as well as how to add value to their crops through sustainable propagation measures and by learning certain processing techniques. The project aimed to enhance the production and commercialisation of quality bamboo products, while still protecting the ecological integrity of the bamboo forests. The region's remaining bamboo groves were rehabilitated and allowed to expand and regrow. Then, propagations from these groves were used to create a series of bamboo nurseries

Bamboo planting conducted as part of the project.



on abandoned farmland around the province. Propagations from these nurseries were then planted in what was formerly eroded farmland in a series of bamboo plantations around the region. While these nurseries and plantations were growing, farming communities were receiving training in diversifying and adding value to their economic activities while maintaining the ecological integrity of the new agri-forestry landscape.

Results

As a result of the RCE project, over 500 farmers in the region have been trained in sustainable

propagation and production techniques. Furthermore, over 13 hectares of bamboo plantations and nurseries now exist in the once denuded landscape, and the surviving original bamboo groves continue to grow and expand. The project paved the way for the creation of increased employment among community members, especially for out-of-school youth. An increase in income has been noted in many of the households that received the training as a result of marketing bamboo planting materials and bamboo poles to consumers from both the public and private sector at reasonable prices.

Newly emerged bamboo shoots after rehabilitation.



Bamboo plantations can create 15 times more wood per hectare than tree forests



Figure 4. Bamboo plantations serve as a **carbon sink**. Due to **rapid growth** and continuous annual recurrence of shoots and bamboo stems (culms), over time bamboo groves can **sequester more carbon than tree forests**.

Traditional wood requires **20 to 50** years to reach its full height, while new bamboo stems often only need **one year** to grow to full height.

Once the plantation reaches maturity it creates **15 times** more wood per hectare than tree forests. (Source: Friederich, 2021).

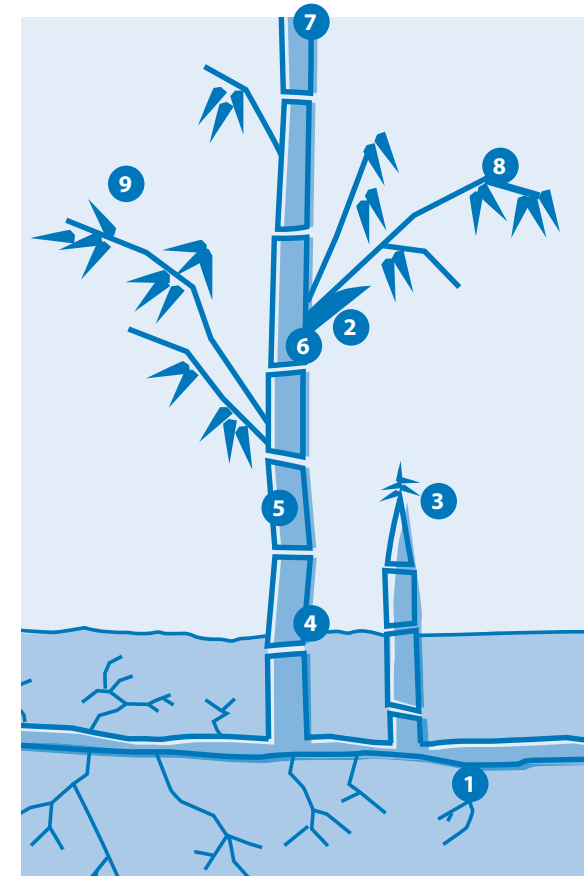


Figure 5. The utilisation of different parts of bamboo:

- 1** Leftovers & processing waste → Fiber Boards, Lumber
- 2** Sheath & Rhizome → Handicrafts
- 3** Shoots → Eaten as vegetables
- 4** Base → Charcoal
- 5** Lower-Middle → Laminated Furniture, Flooring
- 6** Upper-Middle → Mats, Handicrafts, Woven Products
- 7** Top → Scaffolding, Bamboo Poles
- 8** Twigs → Brooms, Cloth
- 9** Leaves → Fertilizer, Fodder, Pigments

(Source: Adapted from image from RCE Ilocos, 2021 – from Zhu & Wei, 2011).

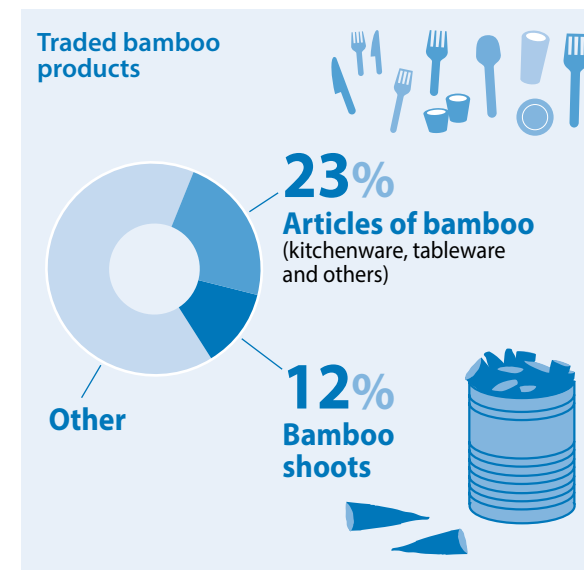


Figure 6. Articles of bamboo (kitchenware, tableware and others) are the most traded type of bamboo product (23%) followed by bamboo shoots (12%). (Source: Food and Agriculture Organization, 2018).

More Information:

- [Poles of Hope: Empowering farmers through bamboo technology](#)
- [Bamboo Caretakers Earn Extra Income in Ilocos Norte](#)

Lessons Learnt:

The increase in income of bamboo farmers in Ilocos Norte is attributed to the active participation and involvement of the community, support from Local Government Units, bamboo manufacturers, and the technical expertise provided by higher learning institutions. These stakeholders all played a critical role in the success of this project. Meaningful engagement with all stakeholders is necessary for successful agri-forestry projects.



A recycling wall being used.

Chapter Asia-Pacific

Turning Discarded Filing Cabinets into Recycling Walls

RCE Tasmania



Situation

Tasmania is an island state in Australia, located 240 km to the south of the Australian continent. Tasmania has a unique natural heritage with almost 45% of the state protected in reserves, national parks, and World Heritage Sites. It is the most mountainous state in Australia with dense old-growth temperate forests and a high level of species endemism.

Issue/s

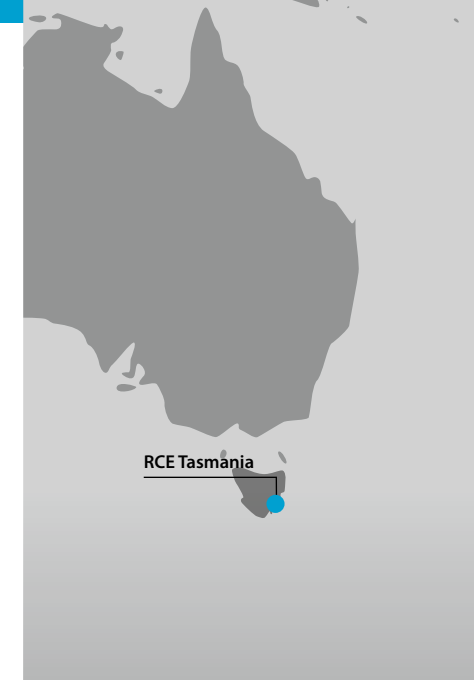
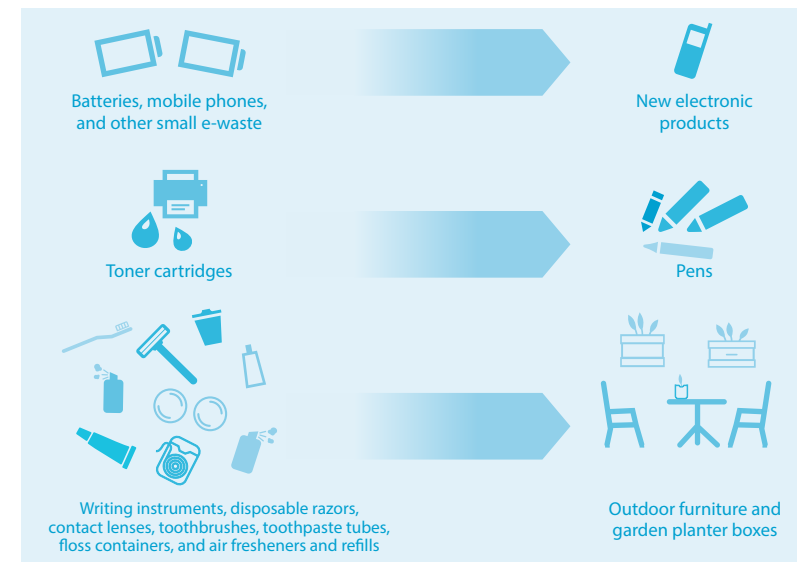
While Tasmania does a lot for protecting its natural environment, research shows that at the current rate of production, Tasmanians generate over 900,000 tonnes of waste each year. Most of this waste ends up in landfill, which is the least favourable waste management option. This waste can prove hazardous for local wildlife and whole ecosystems as waste breaks down over time and

pollutants leach into the surrounding water, air, and soil. A lot of this waste can be reused, or treated differently to be reduced, recycled or even avoided altogether (Rethink Waste, 2022).

Responses/Actions Taken

Part of any effective waste management strategy is waste sorting paired with effective education on correct sorting. This allows materials to be collected for recycling/reuse and diverts these materials from landfills. While many Tasmanian municipalities have recycling collection points and processing facilities for glass, aluminium, and paper waste, many other items (especially plastics) end up as general waste that is sent to landfill. In 2019, RCE Tasmania researched which types of hard-to-recycle and commonly discarded items could be recycled by facilities within Australia. The University of Tasmania, a member of RCE Tasmania, then converted discarded filing cabinets sourced from the University's Re-Use Programme into twenty 'recycling walls' at all University campuses in the state over an 18-month period. The drawers of the filing cabinets became collection points for various commonly landfilled items, such as old pens and markers, toothbrushes and toothpaste tubes, and used ink cartridges. The materials get turned into new items such as garden furniture and recycled stationery. Posters, online content including an [interactive map](#) and a [user's guide](#), and webinars are used to share information with the University and local and regional communities on the recycling walls.

Figure 7. Everyday items can be transformed into new products. (Source: University of Tasmania, 2021).



RCE Tasmania

Region:
Asia-Pacific

Country:
Australia

SDG(s):
4 Quality Education,
11 Sustainable Cities and
12 Responsible Consumption and Production,
15 Life on Land

Theme(s):
Forests/Trees,
Plants & Animals, Waste

Target audience(s):
Primary, Secondary, Higher
Education, Teacher Education,
Community

Ecosystem(s):
Urban/Peri-Urban

GAP / ESD for 2030 Priority
Action Areas: 3, 5

Language(s) of project:
English

Contributing organisation(s):
• University of Tasmania
• City of Hobart

Duration of project:
December 2019 – ongoing



The first recycling wall was installed at the Social Science foyer of the Sandy Bay (Hobart) campus before switching to reused filing cabinets.



Attaching signage to drawers of the repurposed filing cabinets.

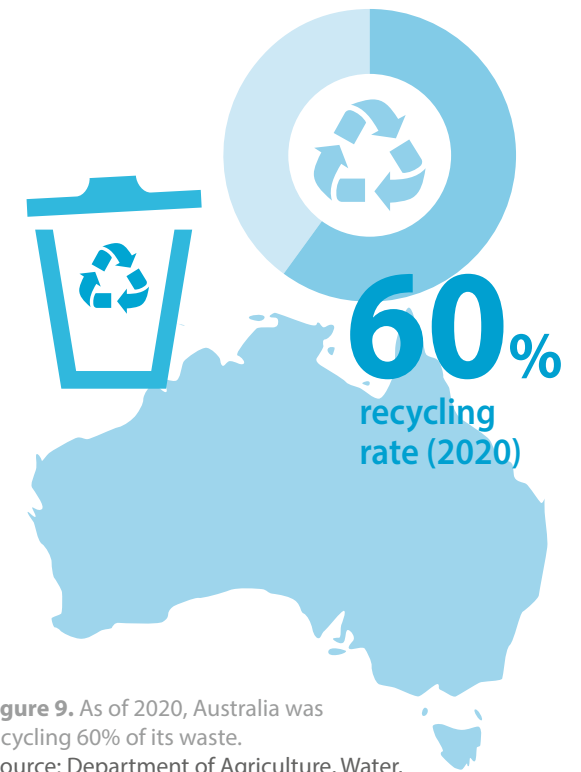


Figure 9. As of 2020, Australia was recycling 60% of its waste. (Source: Department of Agriculture, Water, and the Environment – Australia, 2020).

Reduce your waste to landfill by:

- Reusing shopping bags
- Buying products with minimal or recyclable packaging
- Composting your kitchen scraps
- Repairing your electronic devices rather than replacing them
- Using your curbside recycling bin properly – visit [Rethink Waste](#) for tips on what can and can't be recycled.



Results

There are hundreds of users of the recycling walls at the University of Tasmania. Since their implementation at the University, the recycling walls have diverted over 1,300 kg of waste from landfill. While they may seem a small contribution, feedback about the recycling walls has been positive as they demonstrate how products can have a life beyond the initial use. It also highlights that people can reduce their overall consumption in addition to recycling, especially for products where there is no recycling option readily available to them.

The engaging and interactive online content and webinars have facilitated the explanation of the initiative and presented resources and recommendations for translating the initiative to other institutional settings. The webinar participants have since reported that they have implemented recycling walls within their own institutions and communities.

Recycling walls are placed in high-visibility locations.



Figure 8. Tips to reduce your waste going to landfill. (Source: Rethink Waste Tasmania, 2022).

- More Information:**
 - Webinar: 'Recycling Walls from Filing Cabinets at the University of Tasmania' (2021)
 - Map created by Efs Tasmania for users to find their nearest recycling wall at University of Tasmania campuses in Tasmania, Australia.

Lessons Learnt: Beyond knowledge exchange and sharing innovative ideas, this project demonstrated the impact that a virtual user guide paired with effective graphic design and on-site posters can play in effecting behavioural change. It is important in any recycling initiative to present the audience with opportunities for tangible sustainability educational outcomes.



Region:
Asia-Pacific

Country:
Viet Nam

SDG(s):
2 Zero Hunger,
4 Quality Education,
12 Responsible Consumption
and Production

Theme(s):
Agriculture

Target audience(s):
Community

Ecosystem(s):
Agricultural

GAP / ESD for 2030 Priority
Action Areas: 5

Language(s) of project:
Vietnamese

Contributing organisation(s):
• International University
• Can Tho University
• Phan Thiet Aroma Company

Duration of project:
February 2018 – ongoing



Survey and field assessment of growing conditions on farms.

Chapter Asia-Pacific

Building Capacity of Farm Owners for Promotion of Sustainable Farming in Southern Viet Nam

RCE Southern Vietnam



Situation

This south-west region of Viet Nam, which includes the Mekong Delta, is the biggest agricultural production area in the country. The region supplies agricultural products for the whole country, as well as for export internationally. The region's flat flood plains

support the high yield of agricultural activity, with key products from this region being rice, vegetables, fruit, and aquaculture products. Intensive cultivation within the region has led to environmental degradation, which in turn has affected agricultural productivity.

Issue/s

Agriculture in the region is heavily dependent on synthetic fertiliser as well as herbicides and pesticides. The use of these chemicals reduce the products' value, create obstacles for export, and affect the health of surrounding ecosystems. The issues at hand are the need to maintain high productivity of agricultural crops while ensuring food safety, as well as increasing the value of products while at the same time maintaining the well-being of these farming communities. This needs to be done within the context of protecting

the surrounding environment to ensure the long-term survival and benefit of both people and nature. In addition, farmers within southwestern Viet Nam lack knowledge on organic farming practices.

Responses/Actions Taken

One of the obstacles that farmers encounter in trying to gain knowledge is the piecemeal nature of educational content on organic farming practices in tropical flood plains. Therefore, RCE Southern Vietnam's first step was to compile a comprehensive database on organic farming best practices for the types of crops these farmers were growing. Next, a field survey was conducted across the region to assess the current condition of farming practices within southwestern Viet Nam. The RCE then evaluated the current practices and worked with experts in different areas of agriculture to provide alternative practices that would ensure

Training and distribution of automatic monitoring equipment to farmers in Tien Giang province.



the income of farmers while at the same time reducing the environmental impact of various crops. These alternative practices were then developed into training material, and training workshops organised for local authorities and farmers to upskill on organic and less intensive farming techniques. Finally, support was given to one farm within the field to create a working model of an organic rice farm, which could serve as a learning model for farmers within the region. This ensured the farming community was able to observe a working farm using sustainable farming practices in addition to receiving training via the workshops.

Results

From November 2018 to October 2019, over 300 farmers were trained via the workshops and through on-site participation at the model farm. They have now replicated these practices in their own farms, and the workshops and model farm remain popular. By using one model farm, the community of farmers reduced a costly trial period of having each farm undergo a change in production patterns without a proven working model. By connecting experts in relevant agricultural crops to farmers, the material produced was more applicable and thus more widely accepted by the farming community.

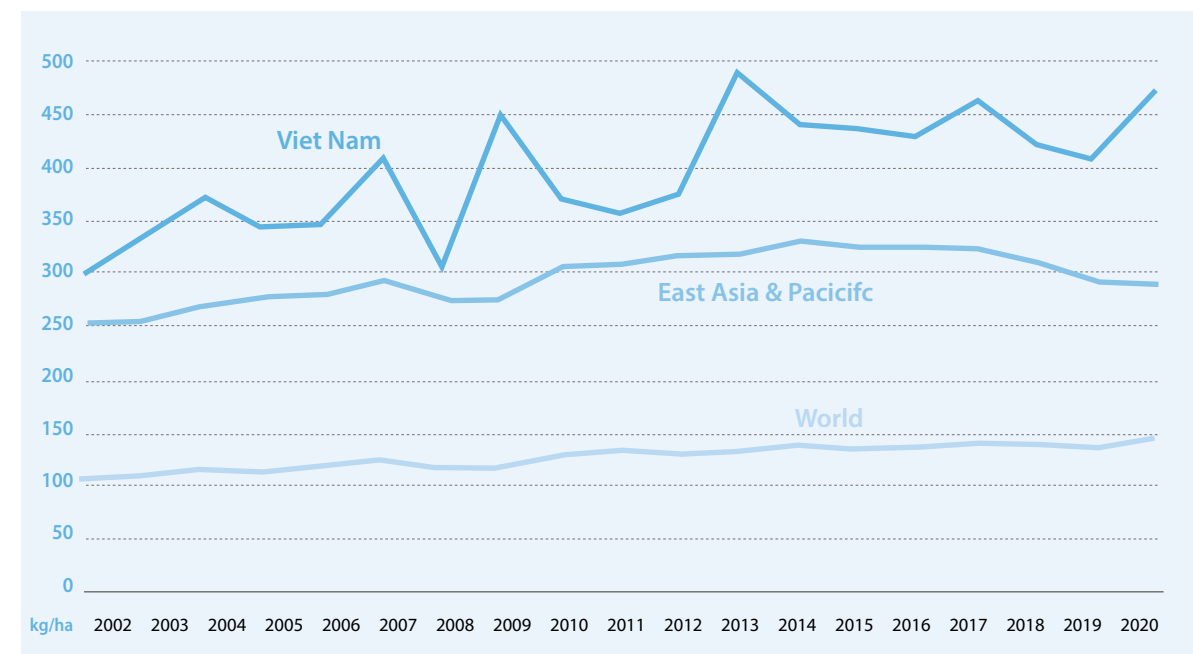


Figure 10. Fertiliser consumption (kilograms per hectare of arable land) (2002–2020). (Source: Food and Agriculture Organization, electronic files and web site, 2020).

High-tech green house for vegetable and lemon farm accredited by GLOBALG.A.P.

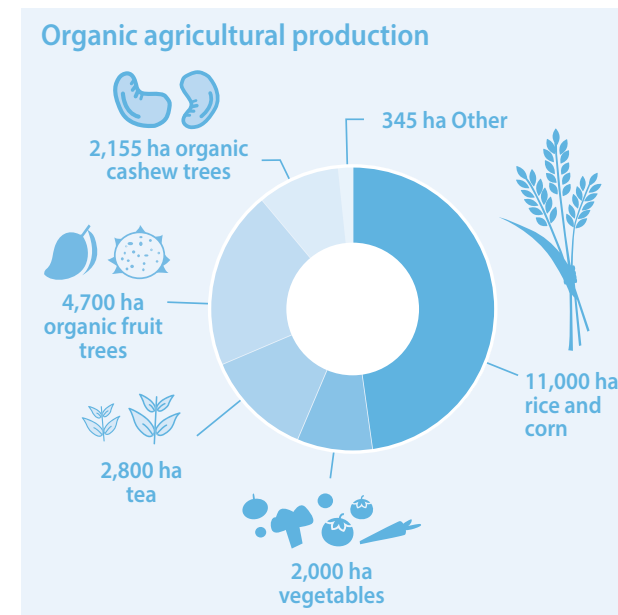


Figure 11. According to the Ministry of Agriculture and Rural Development - Vietnam, the total area of organic cultivation is currently just over 23,000 ha, including 11,000 ha for rice and corn, more than 2,000 ha for vegetables, 2,800 ha for tea, 4,700 ha for organic fruit trees and over 2,155 ha of organic cashew trees. (Source: Vietnam News Agency, 2021).

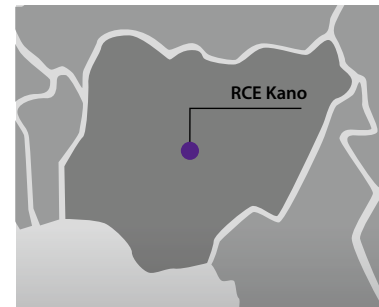
Lessons Learnt:

When working with sustainability in agricultural production, it is critical to note that the problems with sustainable farming vary from crop to crop in addition to region to region. Therefore, material provided has to address not only the specific crops a farmer is working with, but the regional context in which they are being grown. Targeted material that provides practical solutions to complex problems will generate more support from a target community than generalised guidelines that make recommendations for crop management out of context.

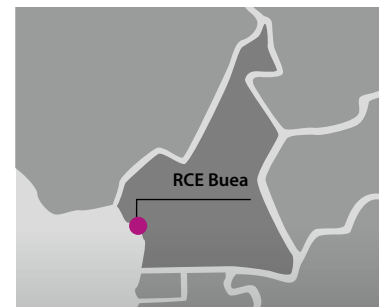


Annie Spratt | unsplash

Chapter Africa



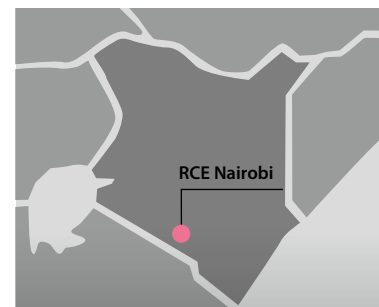
Design and Production of Clean Cookstoves to Reduce Households' Indoor Air Pollution
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Electronic Waste Management
RCE Greater Nairobi 48



Design and Production of Clean Cookstoves to Reduce Households' Indoor Air Pollution

RCE Kano



Situation

Zamfara State in north-western Nigeria is characterised by a tropical savannah eco-region, which is bordered by the Sahara Desert in the north. The Sahara Desert is currently encroaching southward at pace at 0.6 km per year from the northern border with Niger, engulfing approximately 350,000 hectares of savannah per year (Ibrahim et al., 2022). This expansion of desert is exacerbated by overharvesting of trees within the region for fuel. Indeed, millions of households across Nigeria use traditional biomass such as wood for energy and cooking (see figure 13 on page 38). Recent research suggests that forests in northern Nigeria are only effective at combating desertification when they are still standing, and that attempts to combat desertification with reforestation may not be effective once the desert has advanced (Ezeh & Omotayo, 2022). Therefore, maintaining the thin green line between the Sahara and the savannah may be the region's last best hope at stopping desert encroachment. In order to achieve this, wood for fuel needs to be harvested at a sustainable rate, and efficiency in the energy produced from burning fuel needs to be increased. However, deforestation continues to increase both across the continent and in Nigeria in particular (see figure 14 on page 39).

Issue/s

People in the rural areas of northern Nigeria fell trees without knowing the full implication of what they are doing to their communities or to the

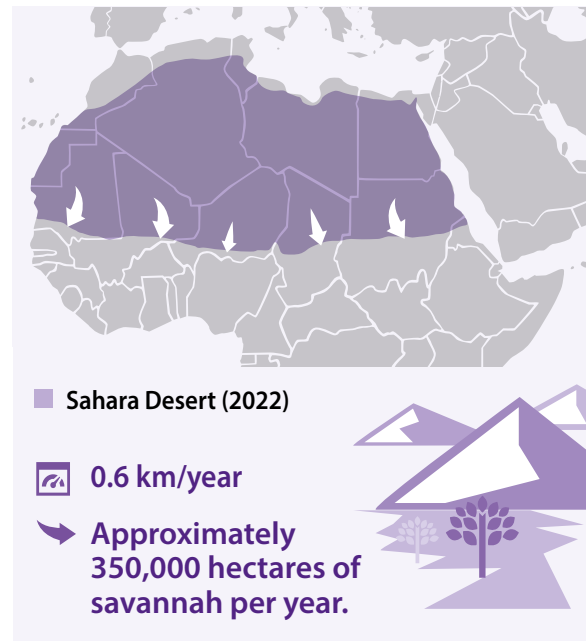


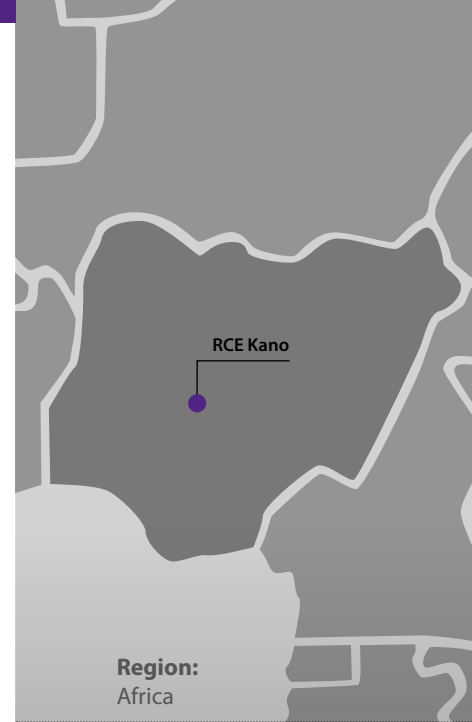
Figure 12. The Sahara Desert is currently encroaching southward into Nigeria at pace at 0.6 km per year from the northern border with Niger, engulfing approximately 350,000 hectares of savannah per year. (Source: Adapted from Ibrahim et al., 2022).

wider eco-region. If forests are to be protected in the region, the efficiency of fuel usage from harvested biomass should be increased. However, traditional wood cookstoves (3-stone, chulhas, etc.) are inefficient because they do not allow air to circulate under the fire, they do not concentrate the heat in a small area to burn off smoke, and they direct too little heat to the pot itself. Therefore, it takes more fuel to cook a meal with this traditional stove design than an alternative design. Commercially sold “rocket stoves” correct these problems and are much more efficient. Unfortunately, rocket stoves are too expensive for most households in the region. Furthermore, the responsibility for collecting wood for fuel overwhelmingly falls to the women of these communities, meaning the more fuel these women have to collect, the less time they have for other activities within their communities.

Responses/Actions Taken

RCE Kano worked with communities within Zamfara State to design and produce more fuel efficient cookstoves locally in the villages within the project site, using locally available materials. In order to launch the project, 100 women were selected from communities across Zamfara State. First, RCE Kano provided a knowledge base for the participants on how changing consumption patterns not only helped the women and their communities, but also helped environmental sustainability in the

RCE Kano volunteers working on production of new cookstoves through bricklaying. Behind them are open fire stoves which are used for cooking.



Region:
Africa

Country:
Nigeria

SDG(s):
1 No Poverty, 3 Good Health and Well-Being, 4 Quality Education, 5 Gender Equality, 7 Affordable and Clean Energy, 12 Responsible Consumption and Production, 13 Climate Action

Theme(s):
Forests/Trees, Waste

Target audience(s):
Community, TVET

Ecosystem(s):
Dryland, Forest

GAP / ESD for 2030 Priority Action Area(s): 4, 5

Language(s) of project:
English

Contributing organisation(s):
• Centre for Renewable Energy and Action on Climate Change
• Bayero University – Kano

Duration of project:
March 2019 – ongoing



A group of women learning how to make '2 Bricks Cookstoves' for domestic uses in Gusau, Zamfara State, Nigeria.

region by decreasing the need for fuel and allowing forest tracts to remain intact. This learning period helped to inculcate a sustainability paradigm that connected social, economic, and environmental sustainability among the participants and in turn the communities they heralded from. Next, RCE Kano worked with the women in the training programme to design and then mass produce a cookstove model that was more fuel efficient, reducing the use of firewood while also reducing the amount of smoke produced during cooking, and shortening cooking times. The most important principle in the design was to elevate the firewood in order to allow air to flow under the fuel source, which also allowed for the fire to burn more efficiently.

Results

These fuel efficient cookstoves not only reduced fuel consumption per meal in the households and businesses that used them, but had the added benefit of reducing the exposure of households to smoke from cooking fires. Furthermore, women who learned how to design and build these new cookstoves have reported less of their time is spent

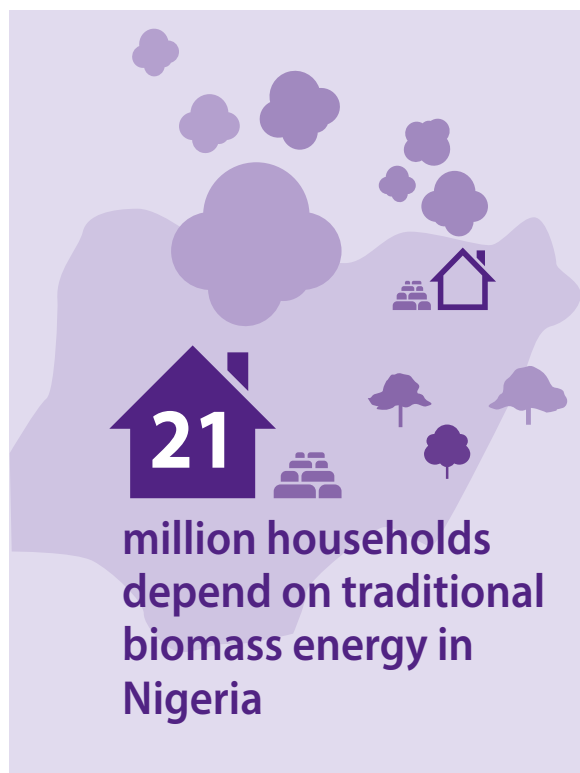


Figure 13. In Nigeria, about 21 million households depend on traditional biomass energy resulting in 79,000 deaths annually. (Source: Clean Cooking Alliance).

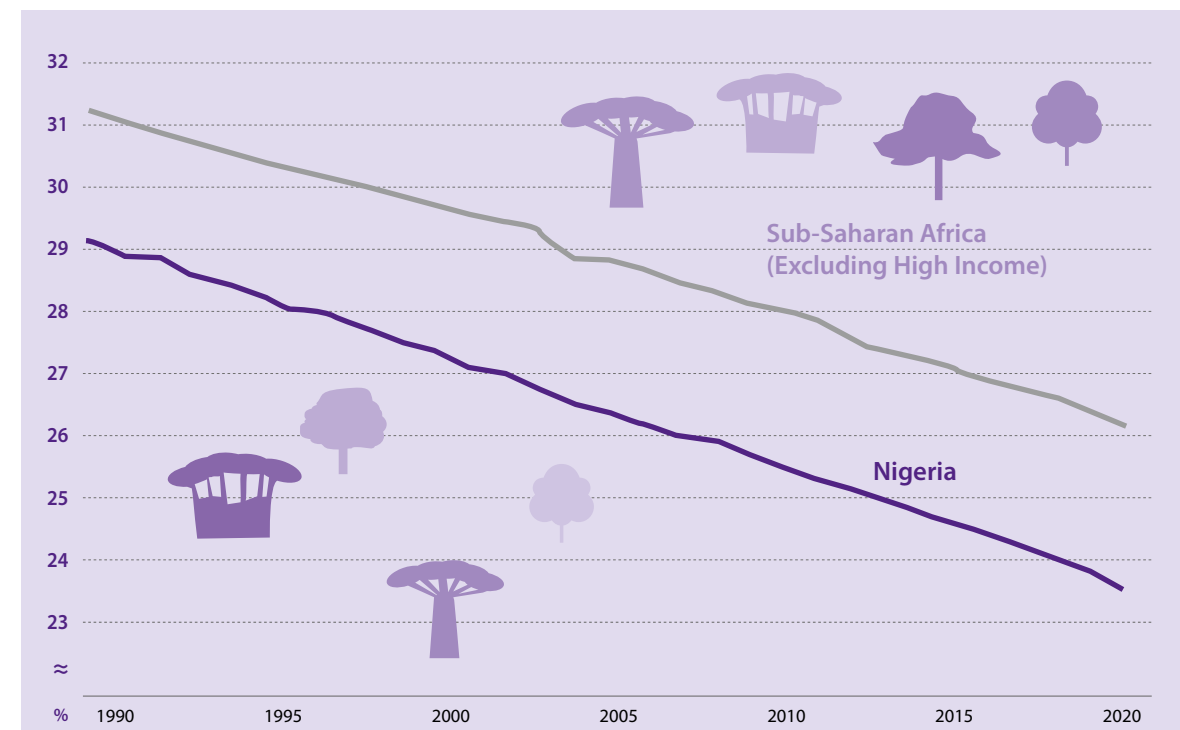


Figure 14. Decrease in Forest Area (% of Land Area). (Source: Food and Agriculture Organization, electronic files and web site, 2020).

The Centre for Renewable Energy and Action on Climate Change replacing traditional open fire stoves with an improved '2 Bricks Cookstove' in Jangebe village of Zamfara State, Nigeria.

collecting firewood, allowing them for more agency over their time. With more time and a new skill set, many of these women have been able to turn to local production of the cookstove model as a product for market, creating an income-generating activity for these women in their communities.



Lessons Learnt: SDG 7 (Affordable and Clean Energy) is a critical entry point in working with rural communities on a number of topics in the broader sustainable development agenda, including health, gender equality, sustainable production and consumption, and climate change. Both non-formal and informal education can be used when teaching about the design and production of innovative products, especially those that are more efficient, and allow for more sustainable consumption and production cycles at the local or regional level.



A selection of 3D printed items, produced from the plastic waste from discarded fishing gear and other plastic waste.

Association of Linux Friends, Limbe, Cameroon

Chapter Africa

Using 3D Printing to Address Youth Unemployment and Plastic Pollution in the West Coast of Cameroon

RCE Buea



Situation

The West Coast District is located within Fako Division in the South-West Region of Cameroon, one of the two anglophone regions in the country. The municipality of the West Coast District includes ten villages (Bakingili, Bebunde, Enyenge, Etome, Isobe, Kosse I, Kosse II, Makala, Njonji, and San Je) and eight Cameroon Development Corporation camps (Debundscha, Ideanau, Isongo, Njonji, Rechtsfluss, Scipio, Soden, and Wete Wete). With a population of over 50,000 inhabitants, this coastal region is made up of a conglomerate of ethnic groups, comprising both

indigenous inhabitants as well as a significant proportion of immigrants from other regions. The region is burdened with a high unemployment rate, especially among youth, as well as low living standards and general economic hardships. The primary economic activity of these inhabitants is fishing, both for local consumption as well as export. However, as the population and economy of the region have grown, so too has the amount of plastic waste produced for various activities including fishing, shipping, and household uses.

Issue/s

While fishing has been a traditional form of sustenance and trade for generations within these communities, unsustainable exploitation practices are beginning to take their toll on local marine life. A vast amount of abandoned, lost, or otherwise discarded fishing gear (ALDFG) can now be found both along the coast and in marine environments.

This ALDFG is largely made of plastic, and slowly degrades within marine environments, introducing micro-plastics into food webs. Additionally, pieces that have not yet degraded might be ingested by or entangle marine life, creating further hazards. Adding to the problem, the coastal zone has also become an informal dump site for all kinds of waste (especially plastic waste) from inland communities. Because of prevailing ocean currents, the coast also receives a constant inflow of plastic maritime waste from regions further afield. The amount of plastic waste along the coast is impacting not only the local ecology of the region, but the communities along the coast as well.

Responses/Actions Taken

RCE Buea has sought to incentivize the collection of plastic waste through an education project that focuses on turning plastic waste into resources for the community. Teaching communities how to build, operate, and maintain 3D printing technology allows them to transform themselves from consumers of imported disposable plastic products into producers of durable plastic products in the region. This removes waste plastic from the marine environment and puts useful products in people's homes. 3D printing using recycled ALDFG and other plastic waste can be used to produce everything from food containers, to car components, to building materials for housing. Taking into account which products were likely to be the best items to focus training around, the RCE identified relevant stakeholders and partners for the training activities. These stakeholders included plastic collectors, traders, and manufacturers in the region, youth groups that were focused around seeking employment, and local investors and entrepreneurs that were interested in starting businesses in the region. Next, a business plan was developed in consultation with the stakeholders and a 3D printer was built. Sensitisation tours of the 3D printing facilities were held so community members could become aware of what could be done with 3D printing with ALDFG and other plastic

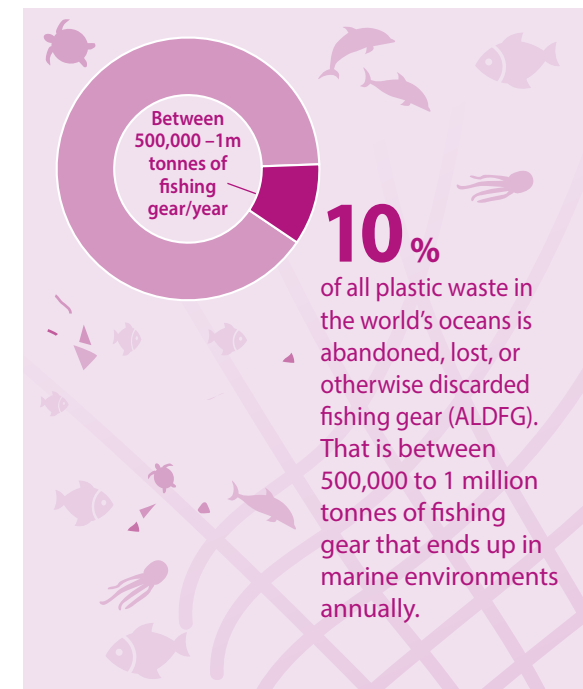


Figure 15. Percentage of plastic waste in the world's oceans ending up as ALDFG. (Source: World Wildlife Fund, 2020).

Country: Cameroon

SDG(s):
 1 No Poverty, 4 Quality Education,
 6 Clean Water and Sanitation,
 8 Decent Work and Economic Growth,
 12 Responsible Consumption and Production,
 14 Life below Water, 15 Life on Land

Theme(s): Waste

Target audience(s): Community, Youth (Non-Formal)

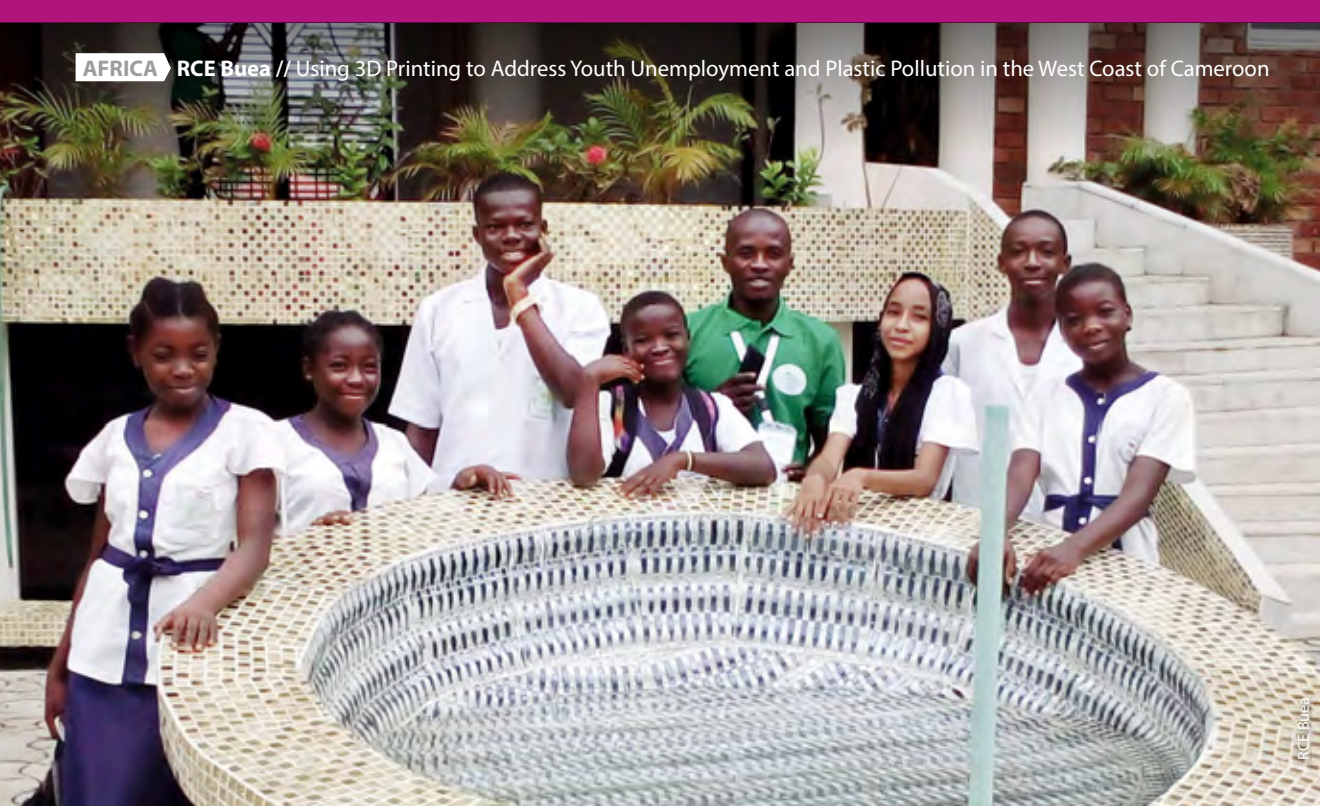
Ecosystem(s): Coastal, Forest, Mountains

GAP / ESD for 2030 Priority Action Area(s): 2, 4, 5

Language(s) of project: English

Contributing organisation(s):
 • Green Cameroon
 • Association of Linux Friends

Duration of project: January 2019 – ongoing



A trainer and youth participants at a training session.



A toy frog printed by a 3D printer, utilising the plastic waste from discarded fishing gear and other plastic waste.

waste (as well as what could not). Following this, workshops and seminars were held in order to train those community members who indicated they would like to receive training in 3D printer usage.



A phone case printed by a 3D printer, produced from the plastic waste from discarded fishing gear and other plastic waste.

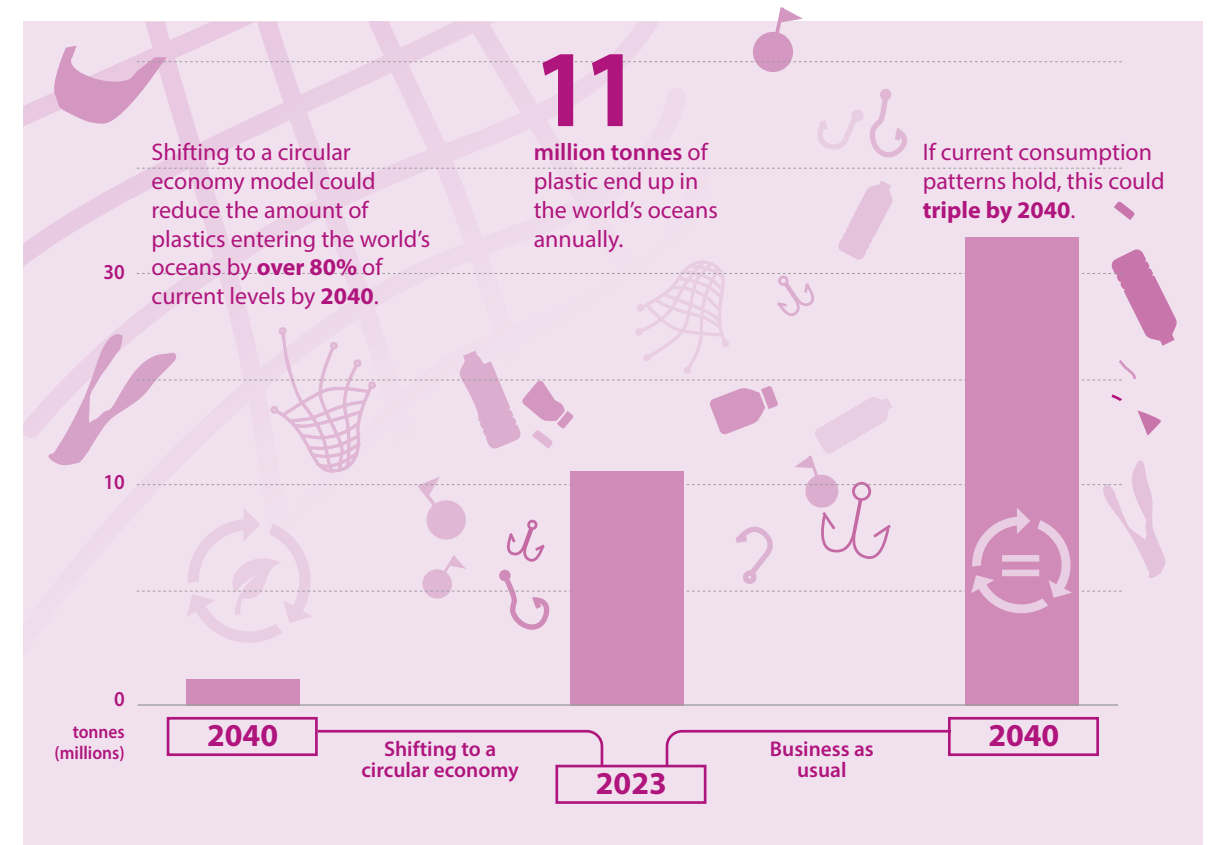


Figure 16. Amount of plastic ending up in the world's oceans annually, based on two scenarios: shifting to a circular economy, and business as usual. (Source: United Nations Environment Programme, 2022).

Results

The training provided by RCE Buea has led to the creation of a 3D printing guild within the region, in addition to five more 3D printing facilities around the municipality. Through the project, the community members trained were able to transform the abundant plastic waste from ALDFG around them into a diverse array of items, which in turn provided a boost to design and manufacturing industries in the region. These activities contributed to a drop in the unemployment rate in the region as these entrepreneurs have entered the market, and the economy has been able to develop while decreasing the amount of waste along the coast.

Lessons Learnt:

When working with new technologies such as 3D printing, it is important to keep in mind you may face credibility challenges around a new concept. Many people RCE Buea worked with in the communities produced tools and objects by hand, and were not familiar with manufacturing practices in general, let alone 3D printing. Many community members found it difficult to imagine a machine producing a new and useful object in a matter of minutes. Therefore, it was important to demystify the entire process for them. The capacity building team from RCE Buea had to bring a 3D printer with them on tours of the community to explain how the machine worked and demonstrate the printing process. Demystifying new concepts and technologies is a key first step in teaching sustainable development solutions such as 3D printing.



Vegetables (rape/collard greens) growing in a sack.

Mavis Siame

Chapter Africa

Sustainable Gardening for Improved Student Health

RCE Lusaka



Situation

Lusaka is Zambia's largest city, serving as the country's centre of commerce and government. The city sits at the crossroads of Zambia's highway and railway systems, and holds most of the country's public infrastructure, higher education

institutions, and international gateways for both travel and trade. Some of Lusaka is built on former wetlands that were converted into agriculture and then into urban areas. While agriculture and mining are the largest contributors to Zambia's

economy as a whole, Lusaka itself is dominated by the service sector. This means much of the population within the city is employed in the financial, construction, and manufacturing sectors and has little experience with agriculture or food production.

Issue/s

The region's humid sub-tropical climate means that the area (like the rest of Zambia) is good for growing fruit and vegetable crops, but the proliferation of grey space in Lusaka has prohibited this possibility for many. Despite Zambia being seen as a 'breadbasket' economy for Africa, exporting many agricultural products, Lusaka itself is characterised by a predominance of processed and heavily packaged food in its stores and markets. This is compounded by the presence of many 'food deserts' in the city, due to the long distance to markets and the high prices of fresh produce. This phenomenon has led to a number of food-related non-communicable diseases among the population within Lusaka, such as obesity, high blood pressure, and increased cases of diabetes. These consumption patterns are affecting all age groups within the city, from the very young to very old, including university students and working youth with busy work schedules.

Responses/Actions Taken

The idea for this project began with a weekly radio programme on the local radio station (UNZA Radio) when a youth coordinator working with Hivos International on a project called 'Youth for Sustainable Foods Zambia' highlighted the need to Lusaka's citizens to re-evaluate their food consumption patterns in relation to their health. Members of RCE Lusaka who were listening also noted that food consumption patterns were related to environmental issues the city was facing, such as lack of green space and the long distances between residential and commercial areas of the city that necessitated vehicle transportation. RCE Lusaka began to raise awareness on these issues by using the same local radio station from the original broadcast. Once an audience of radio listeners had been established, RCE Lusaka, working with Hivos Zambia started offering workshops/talks to students on sustainable consumption for healthier diets. Hivos Zambia, as a stakeholder in the project also provided materials needed for gardening on balconies, so that residents



Region:
Africa

Country:
Zambia

SDG(s):
2, 3, 4, 12
Zero Hunger, Good Health and Well-Being, Quality Education, Responsible Consumption and Production

Theme(s):
Agriculture, Plants & Animals

Target audience(s):
Community, Higher Education, Primary, Secondary, Youth (Non-Formal)

Ecosystem(s):
Agricultural, Freshwater, Urban/Peri-urban, Wetlands

GAP / ESD for 2030 Priority Action Areas: 2, 4, 5

Language(s) of project:
English

Contributing organisation(s):
• University of Zambia
• Umodzi Network of Environmental Education Students

Linkages to education and/or sustainable development policies:
• National School Health and Nutrition Policy (2006)

Duration of project:
July 2018 – 2019



Lweendo Mbokoma

A youth member in the process of planting vegetables.

First harvests from the garden: bell peppers (green and red), eggplants, and pumpkin leaves locally known as chibwabwa.

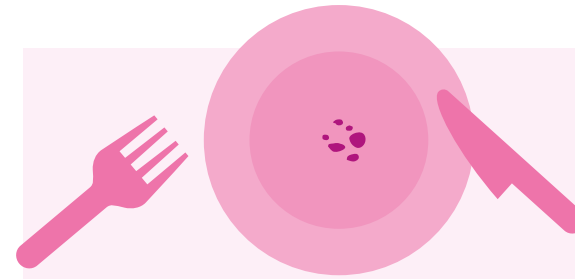


Sopani Muzumara

living in the city's many apartments and hostels could grow fresh produce in their different spaces such as on balconies or in window boxes.

Results

The workshop training provided by Hivos and RCE Lusaka allowed participants to learn about the connections between food, health, and the environment, in addition to enabling them to grow their own produce in limited spaces. The time spent by university student participants commuting for errands has decreased, as they have been able to grow produce in their residence halls. Over the long term, it is hoped that this initiative will be able to improve the health of Lusaka's many residents



Between July and September 2021, approximately **1.18 million** people in Zambia faced high levels of **acute food insecurity**, with most being affected in Luapula, Lusaka and Western provinces (IFRC, 2021).

This was attributed to:

-  • flooding
-  • high maize prices
-  • pest infestation

despite the good harvest experienced in the 2019/2020 agricultural season.

Figure 17. Causes of food insecurity experienced in the 2019/2020 agricultural season in Zambia. (Source: ReliefWeb, 2021).

by not only growing their awareness of health issues related to food, but by providing the training needed to grow their own fresh produce in the urban landscape of the city.

Potatoes grown from peels which have taken root and growing healthily in sacks.



Sopani Muzumara

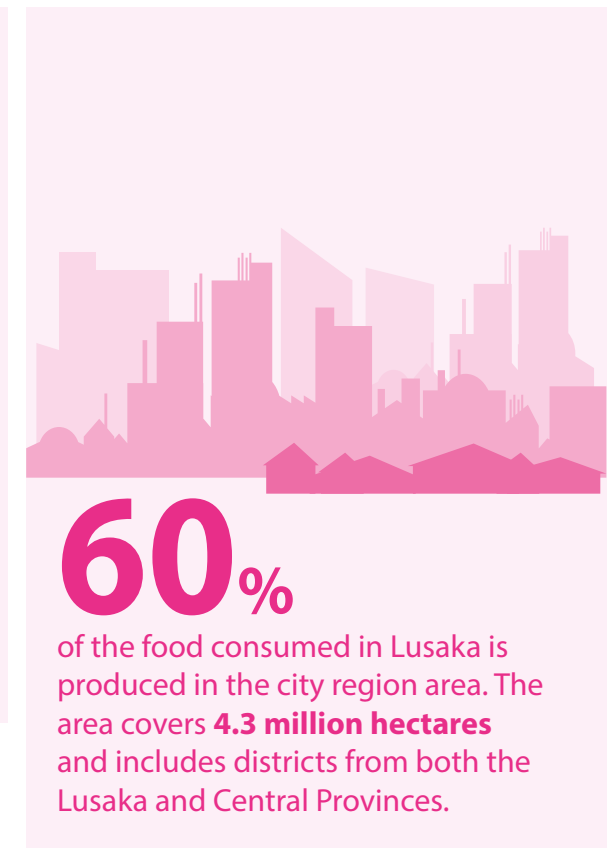
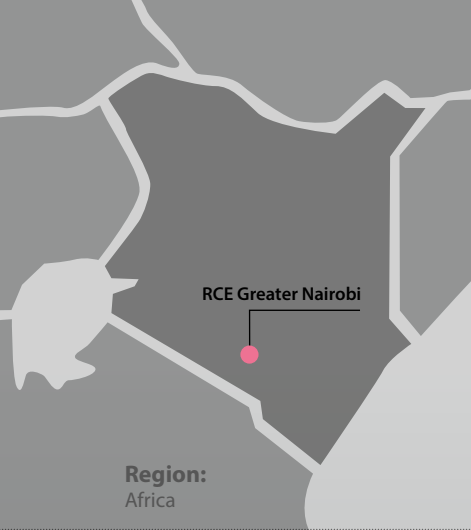


Figure 18. Percentage of food consumed in Lusaka produced in the city region area. (Source: Food and Agriculture Organization, 2018).

 **Lessons Learnt:**

It is possible to tackle multiple sustainable development challenges at once through the use of education on food production and consumption. The training provided not only addressed the link between food and health, but also took into account affordability and accessibility issues for the city. The agricultural training provided allowed university students to take agency over their own diet as well as their own finances. This lesson is applicable to other economically marginalised communities in urban settings.



RCE Greater Nairobi

Region:
Africa

Country:
Kenya

- SDG(s):**
- 1 No Poverty
 - 3 Good Health and Well-Being
 - 4 Quality Education
 - 5 Gender Equality
 - 8 Decent Work and Economic Growth
 - 9 Industry, Innovation and Infrastructure
 - 11 Sustainable Cities and Communities
 - 12 Responsible Consumption and Production
 - 13 Climate Action
 - 15 Life on Land

Theme(s):
Curriculum Development, Waste

Target audience(s):
Community, TVET, Youth (Non-Formal)

Ecosystem(s):
Forest, Freshwater, Urban/Peri-Urban, Wetlands

GAP / ESD for 2030 Priority Action Areas: 1, 3, 4, 5

Language(s) of project:
English

Contributing organisation(s):
Platypus project:
• E-waste Initiative Kenya

Linkages to education and/or sustainable development policies:
• [E-Waste Guidelines \(NEMA\)](#)

Duration of project:
October 2016 – ongoing



E-waste sorting at Juja Polytechnic in Kiambu county with trainee students. Ewik staff guided how to group ICT equipment for dismantling, refurbishment, and repair, in addition to grouping by second market value.

Chapter Africa

Electronic Waste Management

RCE Greater Nairobi



Situation

The Greater Nairobi area covers four counties within Kenya – Nairobi County, which is the major urban metropolitan area of the nation's capital city, the more rural Kiambu County, which is characterised by hills, plateaus, high elevation plains, and high population density with a bimodal type of moderate rainfall, and Kajiado County and Machakos Counties which are semi-arid lands. While the city of Nairobi is the largest urban area within the region, all counties have a number of towns and agricultural areas in addition to forests and wetlands which are shaped by the numerous rivers flowing through the region. While the Greater Nairobi region is Kenya's major economic hub, unemployment remains high in the region, especially among youth.

Issue/s

As average household income has grown within the Greater Nairobi region over the past two decades, more and more people have purchased electronics such as smart phones, computers, and televisions. However, these items are rarely recycled when they are broken or are replaced with an updated model, and end up as solid waste in landfills around the area. Because this e-waste is unprocessed, many of the hazardous chemicals from its various components begin to leach into the surrounding soil and groundwater, creating health hazards for surrounding communities and environmental hazards for the region's ecosystems.

Responses/Actions Taken

E-waste Initiative Kenya (Ewik) has engaged in the following three programmes to bring a solution to e-waste management in the highly urbanised Greater Nairobi area.

Awareness-raising: In order to address the growing hazard of e-waste in landfills as well as the region's high unemployment, RCE Greater Nairobi launched an ongoing initiative to raise awareness on the impact of e-waste on health and the environment within the region. This is done through e-waste games, e-waste clean-ups,

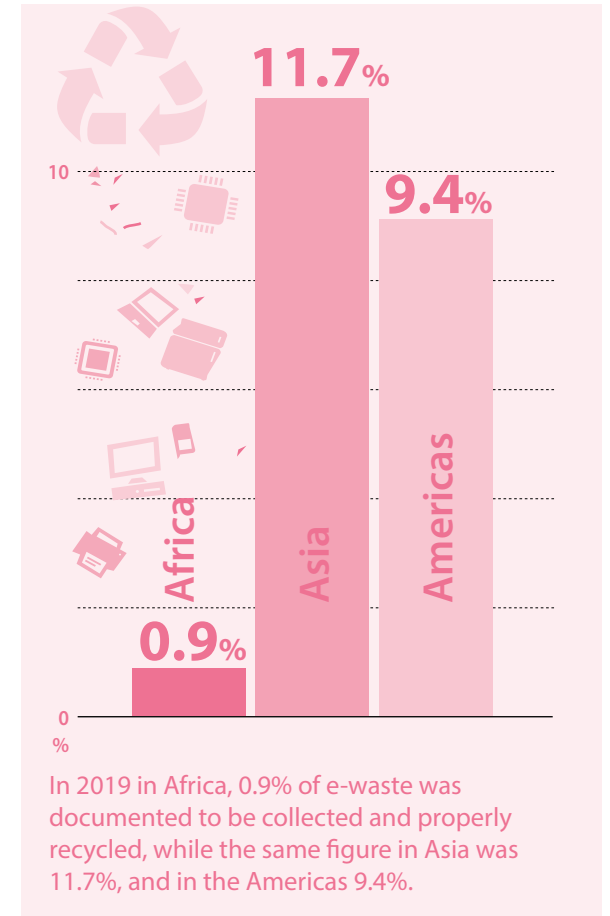


Figure 19. Percentage of e-waste documented to be collected and properly recycled by region in 2019. (Source: Forti et al., 2020).

The scrap yard in Nairobi, Ngara. A news agent works on a story on efficiency and sustainability of metallic fractions recovered through manual dismantling in developing countries.



and showcasing of waste to product and mobile repair clinics among others.

E-waste management training: An e-waste curriculum was developed in partnership with the National Industrial Training Authority (NITA). This initiative was paired with the launch of a training program for green jobs to teach safe and smart disposal and recycling options for e-waste to youth, women, and retirees within the region. The job training program taught these different audiences circularity approaches on how to refurbish, reuse, and repair, which when refurbished, could be sold to the less privileged at an affordable price, bridging the digital divide with the rural and poorer communities within the region. The training focused on the importance of segregation at source, dangers caused by mixing e-waste with wet waste, and the high market value for e-waste that is not mixed with municipal waste. The job training not only diverted waste from landfills, but also allowed trainees from marginalised communities the opportunity to earn income through this new skill set.

E-waste circularity: One of the first steps was to establish an e-waste collection and transfer system,

A trainer leads a session for garbage collectors and scavengers in landfills on how to separate municipal waste and electronic waste.



A training session on best practices in handling off-grid solar e-waste, health and safety, PPEs, and tools in e-waste management in the Lake Victoria region, which covered Kisumu, Kakamega, Homabay and Bugoma counties in Kenya.

where e-waste from all around the region could be collected and sorted at given collection points. Collections systems include vehicle collection in some neighbourhoods, door-to-door collection in

E-waste team showcasing the conversion of waste to products, such as DC/AC power inverters during an International E-waste Day. The inverters are assembled using recovered parts and components from collected e-waste.



others, and drop sites in some communities with sufficient infrastructure to maintain a drop site facility. From here, different products were taken to different technicians who had agreed to take on the training of apprentices during the training program. Through a series of trainings, learners developed more sustainable solutions in repair, refurbish, reuse and material recovery. RCE Greater Nairobi worked to provide on-site training for the apprentices at the businesses where they would be working so they could transition into their apprenticeships more easily once they had completed the training modules.

Results:

From 2018 to date, the project has trained 3,200 youth (aged 18-35 years) in the regions of Mombasa, Lake Victoria region (Kakamega, Kisumu, Homa Bay and Siaya), Kiambu, and Nairobi. This project has alleviated the challenges of disposing e-wastes in landfills adjacent to water bodies and agricultural land, and has therefore helped address the environmental and health impacts of e-waste in the region. The public awareness campaign has reached well over 100,000 citizens, utilising a combination of outreach forums, print media, and electronic messaging. With more people diverting e-waste from landfills to collection points, more youth, women, and retirees in the region have been able to generate income for themselves and their households by repairing, maintaining, or updating discarded electronic products such as computers, smart phones, and televisions. In addition, in order to generate income, some students have begun to manufacture new products from e-waste materials, such as power inverters, battery chargers, amplifiers, and welding machines. These products have in turn further diverted waste from entering landfills in the region while offering new tools for households and businesses alike. Through repairing rather than discarding electronic equipment, there has been a slight decrease in demand for new production from this region, leading to a more responsible consumption pattern for electronics emerging.

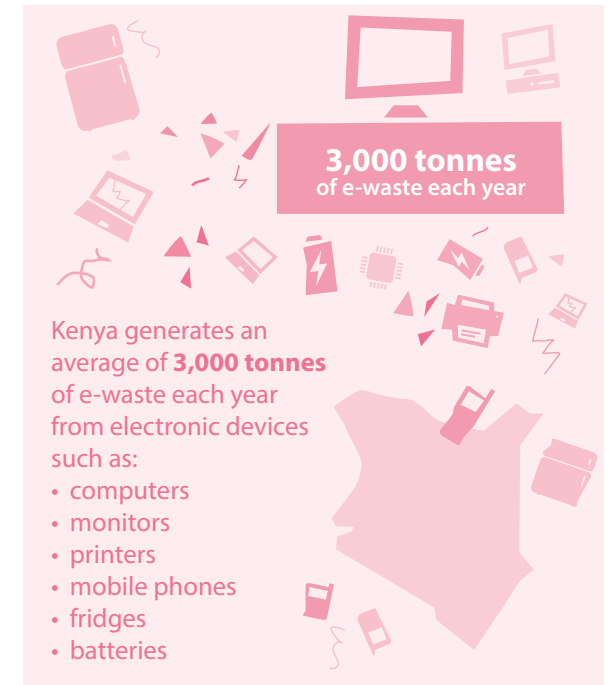


Figure 20. Examples of electronic devices which are sources of e-waste in Kenya. (Source: Kenya Climate Innovation Centre, 2019).

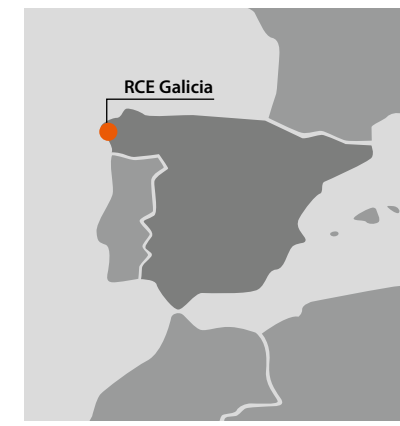
Lessons Learnt:

Public awareness about the hazards e-waste pose to health and the environment were generally low within the communities RCE Greater Nairobi worked with, so it is necessary to build a knowledge base as a prerequisite for action. The target group of learners for the training program and apprenticeships – unemployed youth, women working out of their homes, and retirees – had no capacity to undertake the cost of the training, so external funding had to be used to target these specific groups. However, providing these stakeholders skills to support themselves was much more cost effective than leaving them unemployed with no skills for the labour market. At the beginning of the project, it was necessary for RCE members to spearhead collection and clean-up programmes for e-waste to provide a working model for community members to replicate.



Christian Mackie | unsplash

Chapter Europe



A Mina Contamina (The Mine Pollutes) RCE Galicia

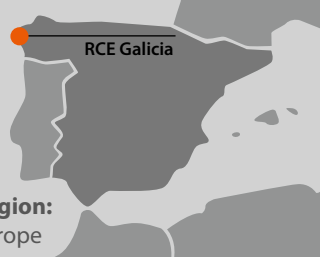
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Education for Sustainable Consumption (ESC) RCE Czechia

58





Region:
Europe

Country:
Spain

- SDG(s):**
- 2 3 Zero Hunger, Good Health and Well-Being, Quality Education, Clean Water and Sanitation,
 - 4 6 Industry, Innovation and Infrastructure, Sustainable Cities and Communities, Responsible Consumption and Production,
 - 9 11 Life below Water, Life on Land, Peace, Justice and Strong Institutions
 - 12 14
 - 15 16

Theme(s):
Disaster Risk Reduction, Curriculum Development, Plants & Animals, Waste

Target audience(s):
Community, Primary, Secondary, Higher Education, Teacher Education, Youth (Non-Formal)

Ecosystem(s):
Agricultural, Coastal, Forest, Fresh Water, Mountains, Wetlands

GAP / ESD for 2030 Priority Action Areas: 3, 4, 5

Language(s) of project:
Galician, Portuguese, Spanish, English

Contributing organisation(s):

- Fundação Montescola
- University of Santiago de Compostela
- Colexio de Educadoras e Educadores Sociais de Galicia
- ContraMINacción
- Escolas de Ensino Galego Semente
- Plataforma en Defensa do Mar de Muros-Noia (PLADEMAR)
- London Mining Network
- Guerrilla Foundation
- Ministry of Social Rights and 2030 Agenda
- Ecoloxistas en Acción

Duration of project:
April 2019 – ongoing



Portuguese edition of the children's book.

Chapter Europe

A Mina Contamina (The Mine Pollutes)

RCE Galicia



Situation

Located in the northwest of the Iberian Peninsula, Galicia is one of the 17 autonomous communities of Spain, within the first-level political and administrative divisions of the country. Galicia is one of the three recognised nationalities within Spain, with its own culture and language. The region has a total land area of 29,574 km² and a total population of around 2.7 million people. Galicia's landscape is dominated by low mountain ranges and many rivers with dense temperate forests. The traditional

livelihoods for communities in the region are agriculture, forestry, and fisheries, all of which rely heavily on its biocultural heritage.

Issue/s

Since 2009, a surge of new mining projects has taken place in Galicia and other parts of the Iberian Peninsula after a significant rise in demand and metal prices, leading to investment in marginal deposits in the region. Community members have been engaging with legal battles to control pollution from the mines and public information campaigns in an effort to combat the effects mining is having on the region's soil, water, biodiversity, and in turn their livelihoods. However, the mining lobby has been targeting schools in the region with an explicit focus on conditioning youth to become uncritical of mining activities. The mining lobby has released

curriculum guides, activity books, school agendas, and videos for kindergarten, primary, and secondary schools within the region, focusing on the economic advantages of mining, but not discussing other issues with mining, such as acid mine drainage, heavy metal pollution, and bioaccumulation. Much of the educational content being fed into the schools in Galicia has been promotional material from the mining lobby, as opposed to holistic curriculum that covered the topic in its entirety.

Responses/Actions Taken

RCE Galicia set out to create an ESD curriculum that addressed the environmental and socio-economic impacts of mining in the region, as opposed to a curriculum that only focused on economic development. The RCE partners set out to create a curriculum based on historical and scientific evidence on the mining sector both

The project has helped mobilise society in the region: action at the Varilongo mine.





RCE Galicia



RCE Galicia

'A mina contaminada', a curriculum guide for students aged 6-12 years old.

'A mina contaminada', a curriculum guide for students aged 12+ years old.

within Galicia and further afield. The idea was to create an education programme that emphasised critical thinking, trans-disciplinary awareness, and empowered learners to take agency in the conservation of their land, their health, and their future. The curriculum took on many modal forms, including curricular guidelines for teachers and parents, teacher training materials, a documentary film ("San Finx 1960"), a children's story book, a stage play and a puppet show. Before the curriculum was launched, pilot test interventions were held in different settings in order to incorporate criticism and improvements before the final versions were released to the public.

Results

Since its launch in early 2019, over 40 schools (kindergarten-secondary) within Galicia are using the curriculum developed by RCE Galicia, as well as

parents' associations, teachers' unions, environmental organisations, and community groups throughout the region. In 2021 the children's book and a video of the puppet show were translated into English as "Droplet & Wagtail's Tailings Tale" and in 2022 the book was translated into Spanish, Asturian, Catalan and Basque through the Iberian Mining Observatory (MINOB). After the initial print for the children's book of 2,000 copies was exhausted, new editions have been released and online versions made available. The documentary film detailing the history of mining in the region has been a huge success, aired on two separate television channels and seen at more than 30 community screening events (not counting screenings at schools or other educational institutions). The material developed has proven to be quite popular both in and outside of formal education settings, which was a pleasant surprise for the project!

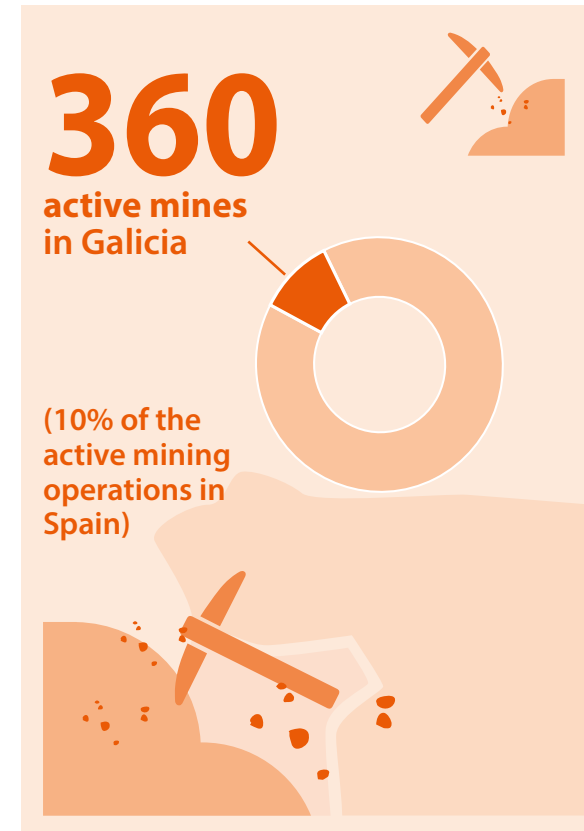


Figure 21. Galicia currently has 360 active mines, 10% of the active mining operations in Spain. (Source: Europa Press, 2019).

Scenery of the puppetry show.

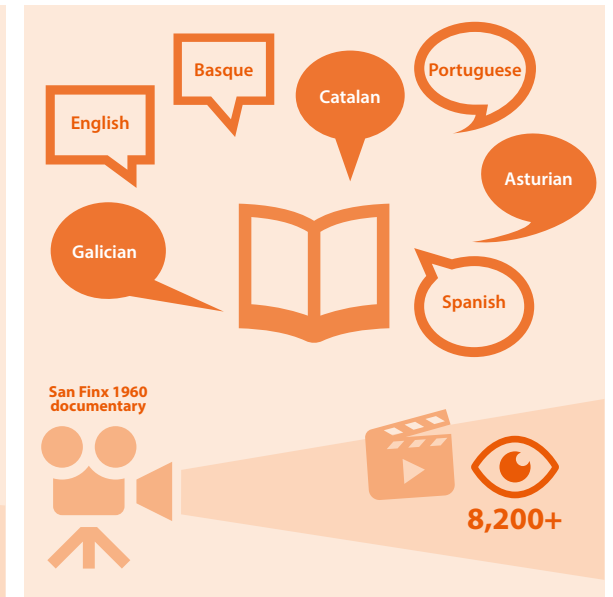
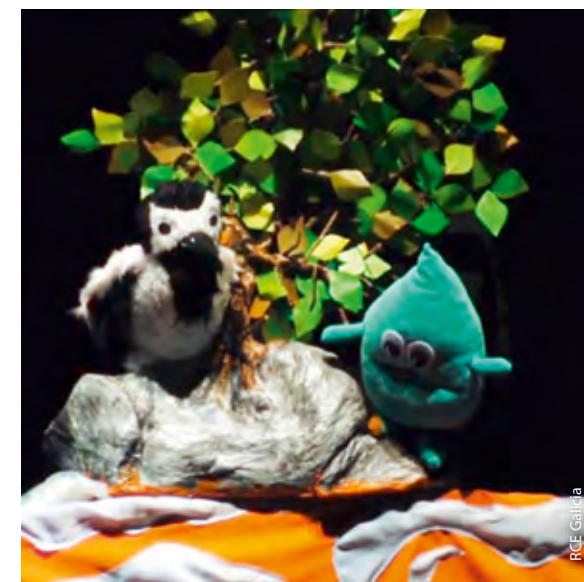


Figure 22. The "San Finx 1960" documentary has been viewed over 7,600 times. (Source: Vida e Ria ou Minaría?, 2019). The children's book, "A mina contaminada" has been published in 7 languages: Galician, Portuguese, English, Spanish, Asturian, Catalan and Basque. (Source: Vida e Ria ou Minaría?, 2019).

More Information:

- Centro de Saberes para a Sustentabilidade - Programmes
- Droplet & Wagtail's Tailings Tale - book
- Droplet & Wagtail's Tailings Tale - video available in English, Galician, and Spanish

Lessons Learnt:

Remember that ESD projects can be designed with multiple audiences in mind. While the focus of this project was to create educational materials for schools and families in the region, the curricular content has proven quite popular in educating a wider audience by institutional actors other than schools. Although it remains a challenge to reach out to the wider community in the region, the content generated helped facilitate growing interest and awareness of the topics in both formal and non-formal educational settings.

Education for Sustainable Consumption (ESC)

RCE Czechia



Situation

The Czech Republic (or Czechia) is a high-income country with a high standard of living. Located in Central Europe, the nation is landlocked and experiences a temperate climate characterised by warm summers and cold winters. Its transition to becoming a liberal market economy starting in 1989 facilitated a shift towards becoming a consumer-based society. These newer consumption patterns are often in accordance with economic

Students at Ratibořická Primary School working on an activity, 'Saving resources (in and outside) the school'.



policy priorities. Due to this specific economic environment, consumerist desire has manifested as quantitative expansion rather than a qualitative shift in lifestyles. In this fast transition process, environmental concerns and global solidarity have continuously decreased, resulting in a challenge for policy makers to follow European green policies without losing the support of voters.

Issue/s

Approaches to sustainable consumption are insufficiently developed to engage with individual consumers meaningfully, which is often an entry point for many education initiatives on the topic. Since little educational content has been designed to address individual consumption patterns, this makes tackling community consumption patterns all the more challenging. Consumers are thus not fully prepared to make informed decisions on everyday consumption of products and services, whilst alternative lifestyle models are almost non-existent. Therefore, knowledge and skills for qualitative lifestyle change at both the individual and community level are needed. Education is an important tool for changing consumer behaviour in order to minimise and reorient consumption and reduce its environmental impacts. However, in the Czech education system, the topic of sustainable consumption is virtually absent, appearing only sporadically in curricular documents and not as a fully-fledged part of the educational system.



Students at Ratibořická Primary School conducting an ecoteam planning session (analysis of the school environment).

Responses/Actions Taken

In order to create a knowledge base of which interventions have been proven effective, RCE Czechia conducted a literature review on consumer behaviour and how education can make their behaviour more sustainable. This step included consultations with researchers in this area to implement the most recent scientific knowledge in practice. Once the literature review was conducted, the researchers began a process of dialogue with teacher education institutions, teachers already working in the country's school system, and other actors involved with education on sustainable consumption. This interaction was essential to lay out which best practices were relevant to the Czech education system, what modifications were needed to make them more effective in a Czech context, and what potential barriers existed in implementing these measures. The dialogue between the researchers and the educators addressed not only what should be updated in curricular content, but how best to promote a whole-institutional approach as a tool to align the learning objectives from curriculum with the values and environment of the whole school. As the curricular documents are not supportive for these types of innovations, dialogue with policy makers has been initiated to update the curriculum.

Results

As a result of the RCE project, a [methodological toolkit](#) was developed in dialogue with teachers and teacher



Country: The Czech Republic

SDG(s):
3 Good Health and Well-Being,
4 Quality Education,
12 Responsible Consumption and Production,
13 Climate Action,
17 Partnerships for the Goals

Theme(s):
Curriculum Development,
Waste

Target audience(s):
Community, Primary,
Secondary, Higher Education,
Teacher Education,
Youth (Non-Formal)

Ecosystem(s):
Urban/Peri-Urban

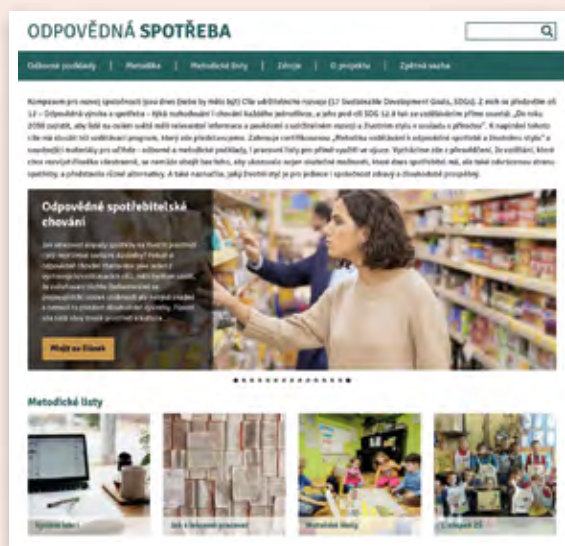
GAP / ESD for 2030 Priority
Action Areas: 1, 2, 3, 4, 5

Language(s) of project:
Czech

Contributing organisation(s):
• Charles University Environment Centre
• TEREZA, Educational Centre
• University of J. E. Purkyně (UJEP)
• Society for Sustainable Living

Linkages to education and/or sustainable development policies:
• Policy recommendations delivered through the Committee for Education of the Government Council for Sustainable Development.

Duration of project:
January 2018 – ongoing



The methodological toolkit, 'Odpovědná Spotřeba', featuring materials for educators.

trainers. This toolkit focused on sustainability values, competencies for education for sustainable development (ESD), creativity for innovation, critical thinking, and orientation to information in a high-information environment. This toolkit has been tested and reflected upon by educators from different levels of education (pre-primary, lower and higher primary, secondary), and its impact on pupils' attitudes and behaviour has been evaluated by an



Odpovědná Spotřeba

Students at Primary School Svatý kopeček using t-shirts creatively as they learn about upcycling.

independent expert. The material is currently being used within the EcoSchool network which includes over 400 schools and is disseminated to a number of other educational institutions. Furthermore, RCE Czechia made policy recommendations to the Committee for Education of the Government Council for Sustainable Development in regards to which curricular updates and best practices should be formalised going forward.

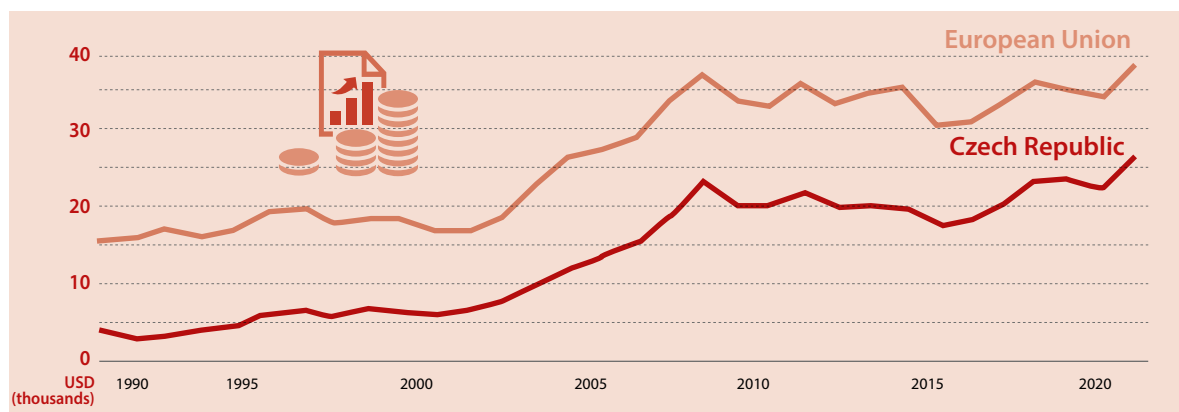


Figure 23. GDP per capita (current US\$) – Czech Republic. (Source: World Bank national accounts data, and OECD National Accounts data files, 2021).

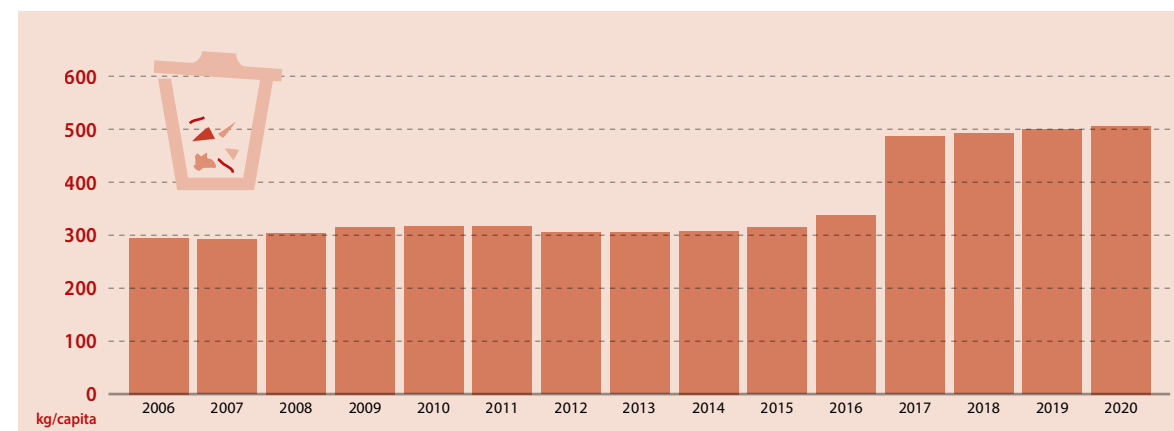


Figure 24. Municipal waste production in the Czech Republic between 2006–2020 (kilograms per capita). (Source: Organisation for Economic Co-operation and Development, 2020).

Lessons Learnt:

In the initial phase of a project such as this, transdisciplinary dialogue between key stakeholders is needed in order to bridge difference in understanding of basic terms and assumptions. While research into literature can provide the basic input to take to stakeholders, the active involvement of multiple stakeholders (teachers, teaching training institutions, administrators, policy makers, and other actors) is needed for the actual creation and implementation of a curricular toolkit and a

whole institutional approach to education for sustainable consumption. Reflection and research on the implementation is the basis for developing messages for policy makers. In addition, the project's focus is on household procurement, which may need to utilise a gender lens to better understand the consumption patterns of all genders. If consumption is more discussed as an opportunity for innovation and change of practices, engagement strategies for all genders will be essential.

More Information:

- [Odpovědná Spotřeba](#) (Materials for educators e.g. thematic and methodological resources, methodological sheets, feedback)
- [Enviwiki - Portál: Odpovědná spotřeba](#) (Portal for sustainable consumption)
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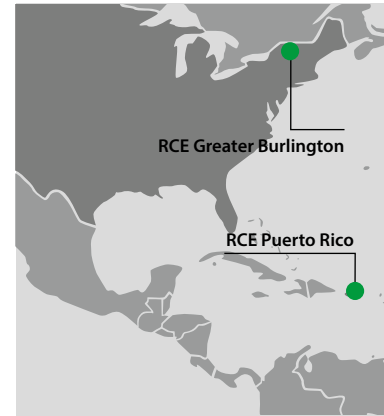
Tim Mossholder | unsplash.jpg

Chapter Americas



Sustainable Lifestyles and Water Footprint

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A Cross-Cultural, Participatory Approach for Measuring and Cultivating Resilience on Small and Medium-Sized Farms

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A social media post asks, 'When buying, always ask yourself, do I really need it?'

Chapter Americas

Sustainable Lifestyles and Water Footprint

RCE Bogota



Situation

Colombia is located in South America and has a population of approximately 51 million inhabitants spread across 32 departments, the nation's first administrative sub-divisions. The nation has a diverse cultural and natural heritage. It is influenced by the Indigenous Andean communities, enslaved African peoples, and European colonialism. In addition, it is one of the most bio-diverse countries in the world, with more than 9,000 endemic species. Colombia recently joined the Organisation for Economic Co-operation and Development (OECD), and its market economy and consumption patterns are beginning to parallel other OECD nations.

Issue/s

Colombia is extremely vulnerable to climate change, and that is why its policies and the actions of its populace must address mitigation of and adaptation to these negative effects. According to the Cambridge Sustainability Commission, households are responsible for 72% of global greenhouse gas emissions as a result of their consumption behaviours. In addition, while agriculture is the main reason for water extraction in the country, individual households are responsible for a growing percentage of water extraction in the country. This growing consumption is complicated by changing weather patterns that impact aquifers in the country and how much water is truly sustainable to extract. Household consumption is one of the biggest challenges that the country faces in implementing the Sustainable Development Goals, as household consumption has greatly changed and grown in recent years.

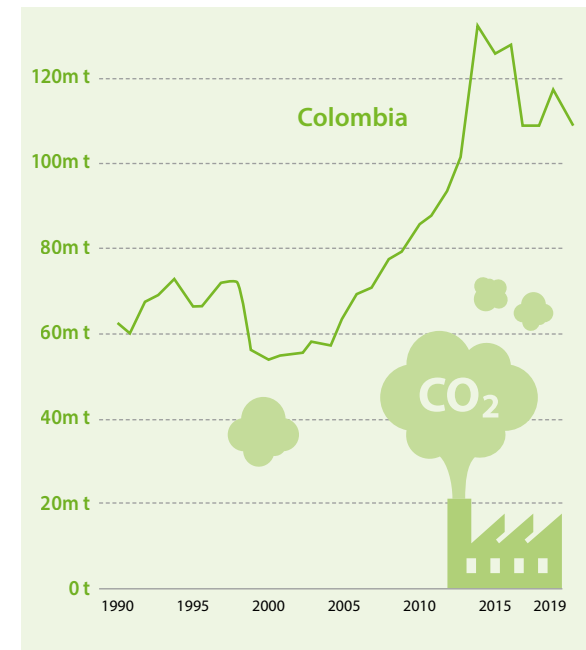
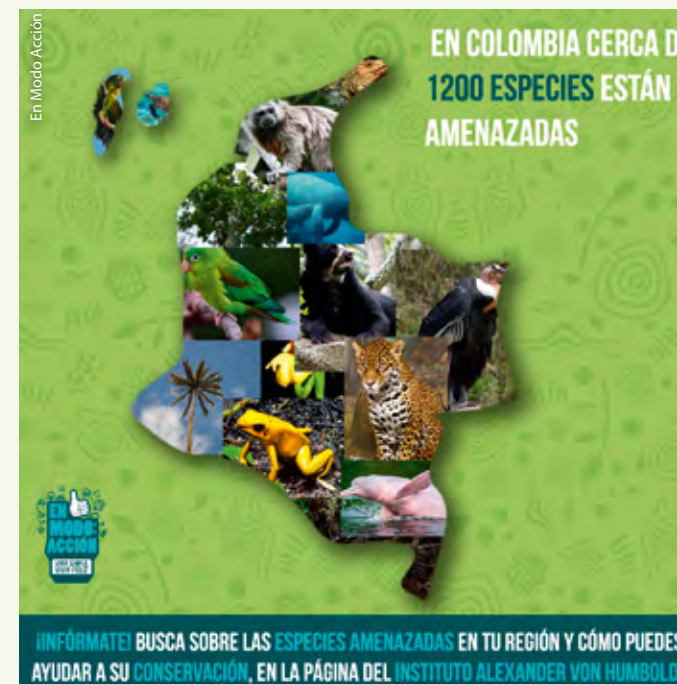


Figure 25. Consumption-based CO₂ emissions in Colombia. (Source: Global Carbon Project, 2019).

A social media post shows endangered species in Colombia.





A social media posts encourages the community to buy local.

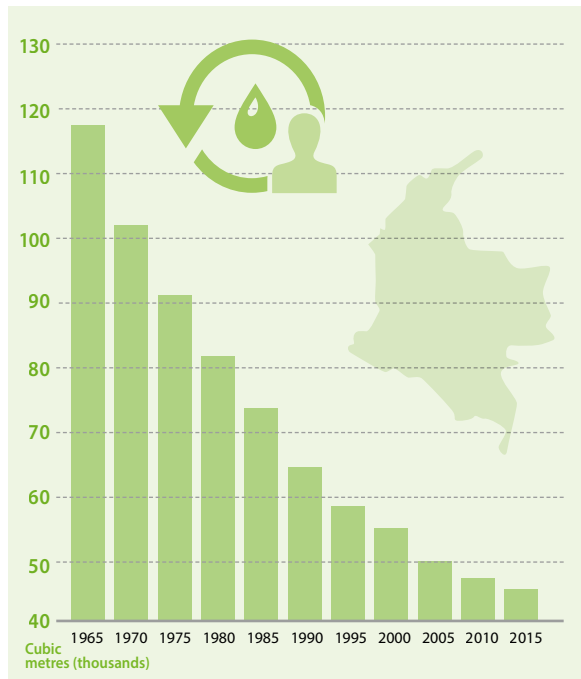


Figure 26. Renewable internal freshwater resources per capita (cubic metres) – Colombia. (Source: Food and Agriculture Organization, AQUASTAT data, 2018).

Responses/Actions Taken

RCE Bogota created an ESD project to empower individual consumers, including youth, to change their consumption habits towards more sustainable ones. The lens for resource use within the project was the concept of a ‘water footprint’ or how much water was used for various consumption and behavioural choices. While numerous metrics exist for monitoring individual and institutional impact on the bio-physical environment, the idea of a ‘water footprint’ was selected to provide an illustrative link between climate, the water cycle, and consumption patterns. RCE Bogota used a multi-modal strategy for engagement through its En Modo Acción platform by conducting in person events and workshops, as well as webinars and targeted social media messaging. The focus of this educational

platform was to develop awareness and inform the public on the negative environmental impact associated with current consumption patterns by emphasising ‘water footprint’ and to provide behavioural learning on how they could change consumption patterns to be more sustainable.

Results

As a result of the RCE project, 32 virtual events on using ‘water footprints’ as a means to examine sustainable consumption were held with more than

1,500 attendees. An additional 27,000 members of the public were reached through social media content that was developed out of the workshops and other online events. Seventy-five publications on water footprints have been created, including how the topic links to biodiversity within Colombia and other aspects of sustainable lifestyles. Furthermore, the RCE formed alliances with more than 50 different enterprises in the Bogota region for the dissemination of these publications and other online content. The RCE discovered that informed consumers are potentially responsible consumers, but motivation must accompany information to achieve long-lasting behavioural changes.

More Information:

[En Modo Acción Instagram](#)



Figure 27. Municipal waste for Colombia (kilograms per capita) from 2004–2018. (Source: Organisation for Economic Co-operation and Development, 2018).

Lessons Learnt:

The pandemic presented an opportunity to develop virtual events that allowed RCE Bogota to increase the scope of the project from the municipal to nation-wide, engaging people from all over Colombia. Promoting sustainable behaviour among households and individuals is essential for achieving SDG 12. While people must be informed about the negative impacts of their consumption patterns, this must be paired with empowering messages about agency and providing alternative behaviours that are more sustainable. People must be convinced that actions matter to contribute to a more sustainable society, so ESD projects on consumption must walk a fine line between structuralism and individual agency.



Vegetable production at Ananda Gardens in Vermont, the United States.

Chapter Americas

A Cross-Cultural Participatory Approach for Measuring and Cultivating Resilience on Small and Medium-Sized Farms

RCE Puerto Rico and RCE Greater Burlington



Situation

The focal communities of this project were in Vermont – a state in the north-east continental United States – and in Puerto Rico – an archipelago of the Greater Antilles in the eastern Caribbean. Vermont’s climate is temperate while Puerto Rico’s is sub-tropical. Communities within the two regions span urban, peri-urban, and rural areas in coastal, forested, and mountain ecosystems with diverse socio-economic characteristics. However, both regions are typified by numerous small to medium-sized farms. There are approximately 6,800 farms in

Vermont, averaging 71 hectares in size, with almost 60% having annual sales values of less than 10,000 USD per year. In Puerto Rico, there are more than 8,200 farms averaging 24 hectares in size, with 67% having annual sales of less than 10,000 USD per year (United States Department of Agriculture National Agricultural Statistics Service, 2019; 2020).

Issue/s

One of the greatest leverage points in fostering the transition to sustainability can be found in the realm

of food systems. The COVID-19 pandemic brought into sharp focus the critical importance of small and medium-sized farms, which often employ innovative and adaptative strategies for building economic, social, and ecological resilience. While larger agri-business floundered during the pandemic, smaller scale farms were able to innovate and provide for surrounding communities when supply chains were disrupted. The questions the project sought to address were: what bolsters resilience in smaller farms to sustain themselves during times of economic, geo-climatic, and socio-political unrest? And what indicators can be used to take the pulse of that resilience and track it through time?

Responses/Actions Taken

With funding from the Agricultural Research Service (ARS) Center for Food Systems Research at the University of Vermont, RCE Puerto Rico and RCE Greater Burlington set out on a seven-month research endeavour to explore the role of small farms in promoting sustainable agriculture in distinct geographical and cultural environments in 2020. The aims of this research were: (1) to investigate the diversity of ecological and social factors that impact farm vulnerability and resilience; (2) to incorporate farmers’ experience and knowledge into the academic literature on sustainable agriculture to enrich understanding of food systems sustainability; and (3) to develop an indicator tool for evaluating farm resilience that builds farmer capacity to assess their local farm system as well as implement and document change over time. A Participatory Action Research (PAR) framework was utilised to emphasise the inclusion and action of the farmers themselves in the research. Collaborating partner organisations from both RCEs organised the project into four phases: (1) identifying farmers to be participants; (2) selecting key resilience frameworks; (3) disseminating a preliminary list of indicators; and (4) validating these indicators through surveys, interviews, and online group discussions. Twenty farmers participated in the project, representing 14 farms (as shown in Table 1), with a roughly equal number of women and men.



Region: Americas
Country: Puerto Rico and United States

SDG(s): 2 Zero Hunger, 4 Quality Education, 12 Responsible Consumption and Production, 15 Life on Land

Theme(s): Disaster Risk Reduction, Agriculture, Plants & Animals, Forests/Trees

Target audience(s): Community

Ecosystem(s): Agricultural, Coastal, Forest, Freshwater, Mountains, Urban/Peri-Urban

GAP / ESD for 2030 Priority Action Areas: 2, 5

Language(s) of project: English, Spanish

Contributing organisation(s):

- Centro para la Conservación del Paisaje
- University of Vermont Extension
- University of Vermont Rubenstein School of Environment and Natural Resources
- Shelburne Farms
- USDA Caribbean Climate Hub
- Vermont Vegetable and Berry Growers Association
- Individual Farmers and their Families located in Vermont and Puerto Rico

Linkages to education and/or sustainable development policies:

- National – US Food and Drug Administration Food Safety Modernization Act
- Subnational – Vermont Agriculture and Food System Strategic Plan
- Subnational – US Department of Agriculture Northeast & Caribbean Climate Hubs

Duration of project: June 2020 – January 2021



Aquaculture farming of freshwater fish at Granja Ecológica Pescavida in Puerto Rico.



Apiculture at Hidrocultivos Carolinensis in Puerto Rico.

Results

The project culminated in the creation of a Farm Resilience Tool for conducting rapid assessments on sustainability using 20 indicators organised into categories of Growth Mindset, Strong Relationships, Sustainable Farming Practices, and Sustainable Business Management. This tool helps track farm resilience through time and evaluate potential tradeoffs and synergies that influence long-term sustainability. The project also built capacity among the participants through farmer-to-farmer

A hoop house at Trillium Hill Farm in Vermont, the United States.



Variable	Range	Average
Farm size (hectares)	0.4–145	39
Years of farming	4–47	12
Number of family members on farm	1–6	3
Number of non-family employees	0–40	7
Farm products grown/produced	mixed greens, root vegetables, ornamental flowers, medicinal plants, herbs and spices, berries, fruit trees (e.g. guava, avocado, papaya, bananas, cacao, citrus), coffee, honey, Christmas trees, livestock, (e.g., dairy cattle and goats), poultry, fish (farm raised and wild caught)	

Table 1. Summary demographics of 14 farms that participated in the project. (Source: Adapted from Estrin et al., 2021. Differences in values are due to combining Puerto Rico and Vermont data and unit conversions).

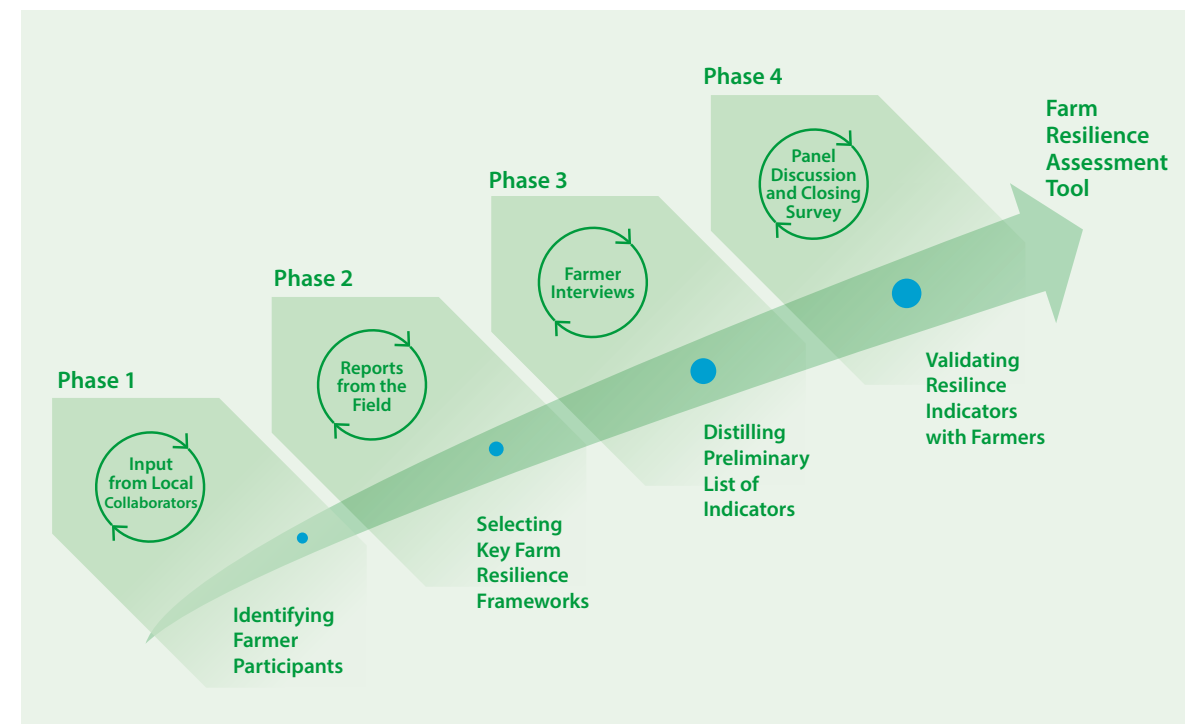


Figure 28. Research process showing four main phases (blue dots) and ongoing PAR interactions (green loops). (Source: Estrin et al., 2021).

knowledge sharing using an authentic and reciprocal inter-cultural PAR process to expand the range and depth of understanding beyond the academic literature on sustainable agriculture. While more research is needed on how to transition smaller-scale farm resilience to broader-scale

landscape planning and management, this first step has demonstrated the utility of using peer-to-peer knowledge sharing in the assessment and improvement of small to medium-sized farm resilience.

More Information:

More information about the project participants, methods, and outcomes, including additional details regarding the resilience indicators and descriptions to guide their scoring can be found in this white paper: Estrin, H, Poleman, W, Alonso-Rodríguez, AM, Gonzalez, E, Juncos-Gautier, MA, Nyth, C & Thompson, E, [‘A cross-cultural, participatory approach for measuring and cultivating resilience on small and medium farms.’](#) (2021). USDA Agricultural Research Service (ARS) Center. 1.

Lessons Learnt:

Food systems research must integrate both objective and subjective methods, as well as authentic reciprocity with farmers representing diverse geographies and cultures. This will help cultivate the knowledge base necessary to address the complex issues with food systems and their relationship to sustainable development, and facilitate the successful transfer of knowledge to practice.



Karsten Würth | unsplash

Next Steps

Dr. Philip Vaughter, Research Consultant, UNU-IAS

Dr. Jonghwi Park, Academic Programme Officer and Head of Innovation and Education, UNU-IAS

Sustainable consumption and production (SCP) is a key aspect of sustainable development and is gaining more attention from businesses, governments, and consumers worldwide. In the future, SCP will become increasingly integrated into the decision-making processes of these groups and efforts to promote SCP will only continue to grow. This will likely result in an increase in the use of renewable energy sources, more efficient use of other types of resources, and a decrease in waste and pollution. Additionally, there will likely be an increased focus on sustainable supply chain management and the development of new technologies that support SCP. The shift towards SCP will likely require collaboration and cooperation across all sectors, including government, business, and consumers, to ensure its success. And

education for sustainable development will be a critical implementing mechanism for transmitting knowledge and changing behaviours among producers and consumers globally.

Education for Sustainable Development (ESD) has a long history and is closely related to the concept of SCP. In 1992, the United Nations Conference on Environment and Development (UNCED) recognised the importance of ESD in achieving sustainable development and included it as one of the pillars of the Agenda 21 action plan. The Johannesburg Plan of Implementation, adopted in 2002 at the World Summit on Sustainable Development, further emphasised the role of ESD in promoting SCP in particular.

SCP is an important aspect of ESD, as it focuses on promoting sustainable patterns of consumption and production. By focusing on concrete knowledge and actions regarding how we produce and consume resources more sustainably, ESD on SCP enables learners to address other issues in sustainable development which are impacted by our consumption and production patterns. These issues may include responding to climate change, protecting the biosphere, and making sure social and economic systems are more equitable for all. An ESD approach to teaching and learning aims to raise awareness about the impact of our consumption and production choices on the environment, economy, and society to a multitude of different stakeholders and encourages individuals, organisations, and whole societies to adopt more sustainable behaviours. This includes reducing waste, using renewable energy, and reducing the use of finite resources such as fossil fuels and other minerals.

In recent years, ESD has become increasingly integrated into formal and non-formal education systems worldwide. This includes incorporating sustainable development into curricula, training teachers, and promoting community-based education programs. The objective of ESD is to equip individuals with the knowledge, skills, and values necessary to make informed decisions and take action to promote sustainable development. ESD and SCP are closely linked and share a common goal of promoting sustainable development. Education is a crucial tool for promoting SCP, as it helps individuals understand the impacts of their choices and encourages them to adopt more sustainable behaviours which it can model in action-oriented learning. Action-oriented learning on SCP is a pedagogical approach that emphasises hands-on, practical learning experiences to support the development of sustainable behaviors and practices. It aims to engage learners in real-world

activities and projects related to SCP, such as reducing waste, conserving energy, and promoting sustainable sourcing, and encourages them to take action in their communities.

This type of learning goes beyond traditional classroom learning by providing learners with opportunities to put what they have learned into practice. For example, students may participate in community-based projects that address local sustainability issues or develop sustainable products or services. They can also engage in research, advocacy, or awareness-raising activities that support SCP. Action-oriented learning has been shown to be an effective way to promote SCP as it helps learners understand the interconnections between the environment, economy, and society and the role they can play in promoting sustainability. By participating in real-world projects and initiatives, learners gain practical skills and experiences that can help them make informed decisions and take action to promote SCP in their own lives, industries, and communities.

As evidenced by the projects featured in this publication, Regional Centres of Expertise on ESD (RCEs) provide this type of action-oriented learning on SCP through different approaches that emphasise hands-on, practical learning experiences to support the development of sustainable behaviours and practices among many different stakeholders in a community. RCEs provide learners with opportunities to put what they have learned into practice and engage in real-world initiatives that support SCP, whether this be in their schools, their workplaces, or in their own households and communities. RCEs are explicitly multi-stakeholder networks that not only engage with students in formal education systems as seen with the projects from RCE Czechia and RCE Tasmania, but can engage with training working adults on SCP in their current employment sectors as we see with the ESD

projects on agriculture from RCE Southern Vietnam, RCE Greater Burlington, and RCE Puerto Rico. They can also reskill and upskill workforces to enter new and emerging work sectors, as we see with the ESD projects on SCP from RCE Buea, RCE Ilocos, and RCE Greater Nairobi. These types of projects can have the added benefit of empowering marginalised people with knowledge and skills on SCP in an ever-changing economy.

The development of education on SCP practices is likely to continue evolving in the coming years. Some of the trends and changes that are likely to shape the future of SCP education include:

- Increased emphasis on interdisciplinary learning: SCP education will increasingly incorporate interdisciplinary perspectives and approaches, drawing on knowledge and skills from fields such as environmental science, economics, and sociology (Marrucci et al., 2019).
- Greater use of technology: Technology will play an increasingly important role in SCP education, providing new tools and resources for students to learn about sustainability and engage in sustainable practices. This could include the use of virtual and augmented reality technologies, online learning platforms, and data visualisation tools (Rieckmann, 2018).
- Greater integration into the formal education system: SCP education is likely to become more integrated into formal education systems, with more schools and universities incorporating sustainable development into their curricula (Nguyen, et al., 2019).
- Greater focus on student engagement: SCP education will continue to place a strong emphasis on student engagement and participation, encouraging students to take

action and make a positive impact in their communities (Bedard and Tolmie, 2018).

- Increased collaboration and partnerships: SCP education will rely on greater collaboration and partnerships between schools, universities, businesses, governments, and civil society organisations to create more effective and impactful educational initiatives (Groulx et al., 2021).

In summary, the future of SCP education is likely to be characterised by a greater emphasis on interdisciplinary learning, the use of technology, integration into formal education systems, a greater focus on student engagement, and increased collaboration and partnerships between educational actors. These characteristics of learning are already embedded into the network structure of RCEs, illustrating that RCEs were enacting these best practices on education for SCP even before these trends were identified in academic research. Further developments like the projects featured in this publication will help to promote more effective and impactful education initiatives that support sustainable consumption and production and encourage individuals to adopt more sustainable behaviours in their approach to resource use.

Education for SCP can play a crucial role in helping us manage resources on a finite world by promoting sustainable behaviours and practices. SCP education aims to raise awareness about the impacts of our consumption and production choices on the environment, economy, and society and encourages individuals to adopt more sustainable behaviours, like the ones evidenced among these ESD projects. By providing individuals with a deeper understanding of the interconnections between consumption, production, and the environment, SCP education helps to build the knowledge and skills necessary to manage resources more efficiently

and sustainably. SCP education also promotes the development of critical thinking skills and the ability to make informed decisions, as seen in the projects from RCE Galicia and RCE Bogota. By providing students in formal education as well as learners in the wider community with the tools to analyse and evaluate the sustainability of their own consumption and production behaviours, these stakeholders can make more informed decisions that help to conserve resources and protect the environment. In addition, SCP education can foster a sense of personal and collective responsibility for the sustainable management of resources, as seen in the ESD projects from RCE Kano and RCE Kuching. By engaging learners in real-world projects and initiatives that address local sustainability issues, they can gain a deeper understanding of the impact of their actions and develop the motivation and skills necessary to take action to promote SCP in their own lives and communities.

Furthermore, education on sustainable consumption and production can help make societies more equitable and fairer by raising awareness and understanding about the interconnections between environmental, social, and economic sustainability. By teaching individuals, organisations, and publics at large about the impact of their consumption and production practices, they can make informed choices that can contribute to reducing environmental degradation, promoting social justice, and reducing poverty. Additionally, SCP education can help create a more informed and engaged citizenry that can advocate for policy changes that support sustainable development and address systemic issues in their own countries and communities, such as income inequality and discrimination. Furthermore, by promoting sustainable economic growth, SCP education can support the development of a green economy and create new job opportunities, particularly in marginalised communities, thus

contributing to reducing poverty and promoting equity.

RCEs will play a vital role in promoting SCP both now and in the future. First and foremost, RCEs can develop and implement educational programs, workshops and training courses to raise awareness and understanding of SCP among various stakeholders, including students, policymakers, and the general public, just as all of the ESD projects in this publication do with various stakeholder groups. Because RCEs are already networks, they can bring together various organisations and individuals working on SCP, and facilitate collaboration and the sharing of best practices and experiences. RCEs can also support research and innovation in SCP, mobilising their partners in higher education and the private sector to help bring new technologies, approaches, and solutions to the forefront. And with proven approaches and best practices, RCEs can play an important role in advocating for and supporting the development and implementation of SCP and SCP education policies at local, national and international levels. Through their education and training initiatives, RCEs can also support and implement practical SCP projects and initiatives, such as sustainable tourism, sustainable agriculture, green buildings, and green procurement, among others. The specific issues related to SCP in the cases presented in this publication may or may not be relevant for a given community in a given region. However, the best practices of multi-stakeholder engagement, action-oriented learning, and looking for co-benefits with other areas of sustainable development are a critical framework to examine how education can be applied to make any consumption and/or production system more sustainable.

List of Abbreviations

ALDFG	Abandoned, Lost, or Otherwise Discarded Fishing Gear	PLADEMAR	Plataforma en Defensa do Mar de Muros-Noia
ARS	Agricultural Research Service	PoPeYe	Poles per Year
ASEAN	Association of Southeast Asian Nations	PPE	Personal Protective Equipment
CRT	Cathode-ray Tube	RCE	Regional Centre of Expertise on Education for Sustainable Development
ESC	Education for Sustainable Consumption	SCP	Sustainable Consumption and Production
ESD	Education for Sustainable Development	SCYCLE	Sustainable Cycles Programme
EWIK	E-waste Initiative Kenya	SDGs	Sustainable Development Goals
FAO	Food and Agriculture Organization of the United Nations	TVET	Technical and Vocational Education and Training
G.A.M.E.S. PLT	Government, Arts, Marketplace, Education, Social/Sports Private Limited	UCSI	University College Sedaya International
GLOBALG.A.P	Global Good Agricultural Practices	UJEP	University of J. E. Purkyně
ICT	Information and Communications Technology	UNCED	United Nations Conference on Environment and Development
IFRC	International Federation of Red Cross and Red Crescent Societies	UN DESA	United Nations Department of Economic and Social Affairs
ILO	International Labour Organization	UNEP	United Nations Environment Programme
MINOB	Iberian Mining Observatory	UNFCCC	United Nations Framework Convention on Climate Change
MMSU	Mariano Marcos State University	UNITAR	United Nations Institute for Training and Research
MSW	Municipal Solid Waste	UNU-IAS	United Nations University Institute for the Advanced Study of Sustainability
NEMA	National Environment Management Authority	UNZA Radio	University of Zambia Radio
NITA	National Industrial Training Authority	USDA	U.S. Department of Agriculture
OECD	Organisation for Economic Co-operation and Development	10YFP	10-Year Framework of Programmes on Sustainable Consumption and Production
PAR	Participatory Action Research		

ESD for 2030 Priority Action Areas

Priority Action Area 1	Advancing policy
Priority Action Area 2	Transforming learning and training environments
Priority Action Area 3	Building capacities of educators
Priority Action Area 4	Empowering and mobilizing youth
Priority Action Area 5	Accelerating local level actions

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