UNOSD
UNITED NATIONS OFFICE FOR SUSTAINABLE DEVELOPMENT

United Nations | Department of Economic and Social Affairs

2020-2021 Sustainable Development Transformation FORUM:

Building Back Better and Greener – Sustainable, Low-Carbon Industrialisation

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Acknowledgements

This book is inspired by the 2020/2021 Sustainable Development Forum (SDTF) held virtually from 22-26 February. Colm Foy, Co-Convenor of the 2020/2021 SDTF, is the lead author of this publication.

The United Nations Office for Sustainable Development (UNOSD), which is part of the UN Department of Economic and Social Affairs (UN-DESA), would like to thank the following contributors to the 2020/2021 SDTF, without whom this volume would not have been possible:

Chapter One – Fatima Denton (Director, UN University Institute for Natural Resources in Africa), Louis Meuleman (Founder of "Public Strategy for Sustainable Development" and vice-chair of the UN Committee of Experts on Public Administration [CEPA]), and Natasha Santos (Vice-President of Global Stakeholders Strategy and Affairs for Bayer Crop Sciences);

Chapter Two – (David Horan (University College, Dublin), Parasto Hamed (Field Coordinator, *AgResults-Pay for Results*), Daniel Platz (Economic Affairs Officer, Financing for Development Office, UN DESA), and Håvard Halland (Senior Economist, OECD Development Centre);

Chapter Three – Ambul Sagar (Head of the School of Public Policy, Indian Institute of Technology), Edward Mungai (CEO, Kenya Climate Innovation Center), Andrew Mold (Chief, Regional Integration and the African Continental Free Trade Area [AfCFTA] Cluster, Sub-Regional Office for Eastern Africa, UN Economic Commission for Africa [UNECA]), and Helen Hai (UNIDO Global Ambassador for Sustainable Industrialisation);

Chapter Four – Antonio Carrillo, (Head of Climate and Energy/Sustainable Development, LafargeHolcim), Nicolas Maennling (Principal Advisor - Regional Cooperation for the Sustainable Management of Mineral Resources in the Andean Region, GIZ), Santiago Alba-Corral (Director, Climate-Resilient Food Systems, International Development Research Centre, Ottawa), and Clemens Grünbühel (Senior Research Fellow, Stockholm Environment Institute);

Chapter Five - Seung-Whee Rhee (Kyonggi University, Republic of Korea), David McGinty (World Resources Institute and Global Director of the Platform for Accelerating the Circular Economy [PACE]), Grażyna Puławska (Senior Project Manager, Asia-Europe Foundation [ASEF]) and Jen Fraser (Manager of Project Development & Communications, Synergy Foundation).

The contribution of David O'Connor, Co-Convenor of the 2020/2021 SDTF was invaluable.

The 2020/2021 SDTF and this volume would have been impossible without the support of the Asia Europe Foundation, the encouragement of UN-DESA and the Head of the UNOSD, Mr Chun Kyoo Park. Jean D'Aragon, Senior Sustainable Development Expert at UNOSD, leader/responsible of the Sustainable Development Transformation Forum for many years, was the instigator of this publication and its constant guide. Mr. D'Aragon has also made a substantial contribution to the publication by providing substantive inputs in all the chapters, and as editor of the whole publication.

Grateful thanks are also due to the 2021 cohort of UNOSD interns for their work in facilitating the technical aspects of the SDTF and recording the details that facilitated this publication.

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Preamble

This book is based on the interventions and deliberations of the 2020/2021 Sustainable Development Transformation Forum (SDTF), jointly organised by the United Nations Office for Sustainable Development (UNOSD) and the Asia Europe Foundation (ASEF). The Forum was held virtually, using third-party software, Cisco Webex©, monitored and managed by UNOSD in Incheon, Republic of Korea.

This publication, however, is not a verbatim record of the proceedings of the Forum, nor is it an official report. Hence, most the chapters are unsigned, the only exceptions being those items submitted specifically by guest speakers or officials for inclusion in the book.

The Forum benefitted from an opening session in which representatives of the United Nations Department of Economic Affairs, UNOSD and ASEF presented their thoughts on sustainable industrialisation, which was the theme of the Forum.

Assistant Secretary-General for Economic Development and Chief Economist, Elliott Harris, opened the Forum on behalf of the United Nations Department of Economic and Social Affairs. He emphasised the importance of endeavouring to support countries to "build back better and greener", in the context of the transformations needed – and identified in the 2019 Global Sustainable Development Report – to put countries on a truly sustainable and inclusive development path to shared prosperity. For many low- and lower-middle income countries, this means supporting their structural transformation towards more productive activities and sectors – including through industrialisation – and doing so while also contributing to tackling global challenges like climate change, biodiversity loss, and degradation of the world's oceans.

The Forum, stressed Mr Harris, comes in the context of the COVID-19 pandemic that has struck the globe at the same time as the international community is striving to meet the Sustainable Development Goals (SDGs) that were agreed by the General Assembly in 2015 as part of the 2030 Agenda. He, therefore, reminded the Forum that, "The first order of business for the international community is to work together intensively to bring this pandemic under control everywhere, which means a stronger push to provide access to vaccines for all people, and in all countries, as soon as possible." Although the G7 countries agreed in February to devote over USD 10 billion to COVAX – the international coalition to provide funding for vaccination supplies to poorer countries – this sum represents only a third of what is likely to be needed. The rest of the money will need to be found if the planetary objective of mass vaccination is to be achieved.

Only then would it be possible to repair the economic damage wrought by COVID-19, supporting as rapid a recovery as possible, but a recovery that also drives progress towards sustainable development, making up for the lost ground resulting from the pandemic. It is an unfortunate fact that not many countries have the fiscal space to allow them to indulge in deficit spending for income support and investment to overcome the effects of the pandemic, so they will need help, which means that the international community has to come together in a spirit of solidarity to provide support for them.

Many developing countries were already suffering from financial crises before the pandemic struck, so their situations are particularly dire. The international financial institutions (IFIs), such as the World Bank, the IMF, and the multinational, regional and national development banks, will have a particular role to play in facilitating economic recovery in those countries in the unprecedented conditions of post-pandemic recovery.

Noting that, “An educated and skilled labour force will be crucial to success, as will conducive investment climates to promote innovation and foster technology acquisition,” ASDG Harris emphasised the need for “North-South, South-South and triangular co-operation.” “All countries,” he said, will face the challenge of how best “to diversify away from fossil fuels and fossil-fuel-intensive industries and processes towards the new low-carbon industries and activities that will experience rapid growth in the course of decarbonisation and into the future.” As development continues in low-income countries, there will be higher demands on the construction and materials industries, and we must encourage countries to “incorporate cleaner, low-carbon technologies and processes in their materials-processing industries from the (very) start.”

Hence the emphasis on sustainable, low-carbon industrial transformation as the centrepiece of the 2020/2021 edition of the SDTF. We need to give more consideration to SDG 9 - Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation – which is a high priority for many low-income countries – particularly, but not only – in sub-Saharan Africa. One challenge that all countries will face is how best to diversify away from fossil fuels and fossil-fuel-intensive industries and processes towards the new low-carbon industries and activities that will enjoy rapid growth into the future.

Nations and international institutions – both developmental and financial – are embarking on a massive investment programmes to achieve decarbonisation over the next several decades. These investments, said Mr Harris, will open up enormous opportunities for countries. Sustainable production, for example, entails countries around the world providing the many goods and services of the future sustainable global economy. These items include many things, from solar panels and wind turbines to electric vehicles and batteries, to new construction and building materials made with net zero emissions, as well as the software that will drive the sustainable industrial and other systems of the future.

Historically, late industrialisers have benefited in a number of ways – by taking advantage of latest generation technologies, avoiding technological dead-ends. Educated and skilled people will be crucial to success, as will conducive investment climates to promote innovation and foster technology acquisition from abroad, including through foreign direct investment, North-South, South-South and Triangular co-operation.

“The opportunities that lie ahead for grabs” are immense, said Assistant Secretary General Harris, but they will only be available to “those willing to take the risk and invest in clean energy solutions.”

Echoing Mr Harris’s sentiments, Mr Chun Kyoo Park, Head of the UNOSD, said that it was timely and appropriate to devote the Forum to recovery and building back better. The pandemic had come when people were already facing other challenges, including rising inequalities, persistent and widespread hunger, and the impacts of climate change. With only a decade to reach the SDGs, it is essential to tackle these pressing problems, especially in the poorest countries. Industrialisation – sustainable industrialisation – offers a path to end enduring poverty and underdevelopment. Indeed, there is no evidence, as yet, of any other viable path forward for humanity. This is the reason why sustainable industrialisation was included by the leaders of the world in the SDGs, specifically in SDG9, where it is meant to be inclusive, supporting employment and gross domestic product, particularly in developing countries, using infrastructures that are resource efficient and resilient and fostering innovation.

Since these components are intertwined, there is a need to shed light on SDG 9, with particular attention on how to launch or accelerate the process of sustainable industrialisation in the low-income countries that aspire to go along this path but have had limited success so far.

"What will it take and how can such countries ensure that their industrial development will be green, low-carbon and sustainable?", enquired Mr Park, "We simply cannot afford to have a whole new cohort of countries newly embarking on carbon-intensive industrial development."

Ambassador Toru Morikawa, Executive Director of the Asia Europe Foundation (ASEF), also drew attention to the destabilising effect of the COVID-19 pandemic on the world economy and its disruption of progress towards the SDGs. He had a positive approach in that he preferred to highlight the opportunities opened by the Pandemic and the efforts at reconstruction in its wake. COVID-19, he said, " … offers us an opportunity to advance the transition to a greener, low-carbon future."

Mr Morikawa specifically mentioned the role of the circular economy in achieving sustainable, low-carbon, sustainable development. ASEF's work had concentrated on the major, global problem of single-use plastics. He said that, while ASEF would draw inspiration from the totality of the Forum, he hoped that the session devoted to the circular economy might provide new insights for participants and policy makers, generally. He ended by pledging ASEF's continued support for the SDTF in the future.

These remarks closed the formal opening session of the 2020/2021 SDTF.

Foreword

As the flagship activity of the UN Office for Sustainable Development (UNOSD), the Sustainable Development Transformation Forum (SDTF) is held annually in Incheon, Republic of Korea. However, because of the COVID-19 pandemic, the 2020 edition was postponed and combined with the 2021 edition in February 2021.

The pandemic has changed the status quo and introduced a 'New Normal' that affects all levels of society and every aspect of our daily lives. The 2020-21 SDTF focused particularly on SDG-9 (Industry, Innovation and Infrastructure) with an overarching theme on "Building Back Better and Greener: Sustainable, Low-Carbon Industrialization" in the context of the pandemic. UNOSD will continue to explore and share the lessons learned, best practices, strategies and measures in tackling global challenges posed by the pandemic, fostering a rapid yet sustainable recovery, and implementing the 2030 Agenda for the Sustainable Development Goals (SDGs).

Elliot Harris, Assistant Secretary-General for Economic Development and Chief Economist of the UN Department of Economic and Social Affairs, emphasized in his opening remarks to the Forum that the impacts of the pandemic are more apparent in least developed countries (LDCs) where the pandemic has hit hard and disproportionately. The recovery process is more daunting in these countries as they lack sufficient capacities and resources. The situation is further exacerbated by the global challenges of persistent poverty and hunger, worsening effects of climate change, and stark inequality.

Collective action to explore pathways to recovering and rebuilding sustainable and inclusive development leading to shared prosperity have never been more critical, especially in the context of the Decade of Action to attain the SDGs. For the LDCs, alleviating extreme poverty is the absolute priority.

Industrialization has allowed selected countries to reduce poverty and drive development. This path, however, is no longer able to satisfy the demands and expectations of a world dominated by the reality of climate change and awareness of its unsustainability. We are faced with achieving a rational balance between industry, innovation, and infrastructure development to support the long-term sustainability of supplies and demands of resources and technologies.

The COVID-19 pandemic has further deepened the uncertainties in market trends. Remote working and learning, bio technologies, and related goods and services, will continue to be major factors, even after the pandemic. Tackling climate change, decarbonization, innovation in consumption and production patterns, reforms of industrial structures, and changing investment trends will be the imperatives of the future, with consequences for substantial changes in technologies, education, and labour markets.

We must find more resilient, sustainable, low-carbon, and inclusive pathway to development while "leaving no one behind". This is the direction we must pursue to achieve shared prosperity by 2030 and reconcile our aspirations for high standards of living and well-being. Most importantly, we must safeguard the sustainability of our planet for future generations. The international community, particularly financial institutions and entities should streamline their efforts in realizing the ambitious, yet imperative goals enshrined in the SDGs.

This publication, based upon and inspired by the 2020-21 SDTF, will provide an opportunity to rethink our approaches to creating a better world in the context of the 2030 Agenda and the Global

Sustainable Development Report 2019. I take this opportunity to thank all the speakers, participants, consultants and UNOSD staffs for their invaluable inputs and contributions in making the 2020/2021 SDTF into a success that will resonate with all those who depend on sustainable development, which, of course, is all of us.

Chun Kyoo Park
Head of Office
United Nations Office for Sustainable Development
Incheon, Republic of Korea
December 2021

Message

On behalf of the Asia-Europe Foundation (ASEF), I would like to congratulate the United Nations Office for Sustainable Development on the successful organisation of the 2020-21 Sustainable Development Transformation Forum.

The COVID-19 pandemic offers an opportunity to develop green recovery plans for a more sustainable, low-carbon future. The lack of impact on the concentrations of greenhouse gases in the atmosphere, despite the 2020 global economic slowdown, highlights the importance of advancing the transition towards a greener, low-carbon economy.

One recurring aspect in the recommendations from the 2020/2021 SDTF – from low-carbon industrialisation to financing – refers to the need of partnerships and cross-sectoral collaborations at the local, national, regional and global levels. Goal 17: "Revitalize the global partnership for sustainable development" plays an integral role in fulfilling the pledge contained in Agenda 2030, to ensure that no one will be left behind and to see all goals and targets met for all nations, peoples, and for all parts of society. The ambitious goals set forth by 2030 Agenda tackle transboundary and complex issues and challenges. As such, it cannot be achieved with countries working independently – it requires the partnership of governments, private sector, civil society and the public.

In terms of financing, the pandemic presents a bleak outlook for global economy, thus questioning the sustainability of public domestic sources of financing. Countries should increasingly tap into private resources, more specifically businesses and investments, to finance the SDGs. This is particularly necessary with the declining Official Development Assistance (ODA) levels, and the fact that SDGs do not have a dedicated international funding mechanism, such as the Green Climate Fund.

However, there is insufficient incitement for the private sector to invest in the implementation of the SDGs. This is a fundamental issue because businesses function according to the logic of the market. Non-business actors, particularly governments, have a role to play in translating and formulating the SDGs into demands that are actionable and attractive to the private sector.

The year 2020 marked the start of the Decade of Action that calls for accelerating sustainable solutions to deliver the Sustainable Development Goals by 2030. Although the Decade of Action was overshadowed by the COVID-19 pandemic, the dire cross-cutting implications from the pandemic made it imperative to deliver the 2030 Agenda pledge to leave no-one behind. The vibrant contributions to this year's Forum and the contents of this publication inspired by the SDTF testify to the unwavering commitment from stakeholders despite current circumstances.

Ambassador Toru MORIKAWA
Executive Director
Asia-Europe Foundation

Preface

This book is inspired by the Sixth United Nations Sustainable Development Transformation Forum, held virtually and worldwide from 22 – 26 February 2021.

That event, which is normally held annually in Incheon, Republic of Korea, reaches out to the practitioners whose job it is to implement policies designed to move their countries and their institutions towards the Sustainable Development Goals. In that sense it is probably unique, since most international meetings on the SDGs are either intended for technicians or the people who make the policies the practitioners are expected to implement.

This publication, which is not an official record of the SDTF, is designed to appeal to practitioners, giving them an approachable resource to help them understand the challenges and, we hope, some of the solutions that lie ahead, as we move towards the end date of 2030. The chapters here follow the basic structure of the 2020/2021 SDTF without being bound to it in an effort to provide a narrative suitable for consumption by all those responsible for the SDGs and anyone interested in learning more about their relevance to the business of industrial development.

Jean D'Aragon
Senior Sustainable Development Expert
United Nations Office for Sustainable Development
Incheon, Republic of Korea

Executive Summary

The year 2020 saw the outbreak of the COVID-19 virus, spreading worldwide. Its effects were disastrous for the entire globe. Not "just" a medical emergency, the COVID-19 pandemic has had, and still has a devastating effect economically and socially, interrupting travel and commerce, business and government, economic and social progress.

The pandemic has been putting at risk or even reversing the progress made on delivering the SDGs and further exacerbating the unresolved issues and keeping us off track to achieve the 2030 Agenda. Besides exposing weaknesses in health systems and other social issues and the tremendous disruption of economic activity, the pandemic also revealed the urgent need to build our resilience regarding the environment – the third pillar of sustainable development, and particularly to address the threat of climate change.

The traditional pattern that places industrial development at the base of economic and social development no longer holds; it is simply too costly in terms of natural – and non-renewable – resources. That means that new forms of growth and sources of prosperity need to be found.

The 2020/2021 Sustainable Development Transformation Forum – the SDTF – set out to explore how alternative forms of industrial development and retrofit could contribute to building back better and greener, and to sustainable low-carbon industrialisation.

A major outcome is a new question: how can we arrive at inclusive mitigation and adaptation or, in the words of the UN's 2030 Agenda, how can we "leave no one behind"? This complex question seems to be resolving itself. The assumption has often been that the influential groups – including in the private sector – that stood to "lose" from adaptation and mitigation would hold out to resist such measures. This seems to no longer be true, at least, not overall.

Partnerships and alliances for sustainable development may be more important than narrow, short-term self-interest leading to real and effective change. If there is one outcome from this publication that stands out it is the propensity for (successful) corporate entities to recognise their self interest in adapting to the present and future needs of the market. Indeed, rather than resist change and invest in short-term advantage, the private sector – be it in crop science, construction or the extractive industries, often aided by research from institutions like the Stockholm Environment Institute – is finding ways to support sustainable development. In this sense, are we living a particular moment in history where there is a convergence of interest between small local communities and multinationals? This could be reflected in this publication by the

relationship between, for example, Bayer Crop Science, the mining companies in the Andes, or the cement giant LafargeHolcim with local communities.

At the same time local rural communities, aided by international organisations and institutions, such as Canada's International Development Research Council (IDRC) and the Stockholm Environment Institute, are helping local agricultural producers adapt to the changing markets by emphasising organic, high-quality production to capture global markets and move away from high-input, unsustainable production.

Incentives to engage in sustainable practices are becoming more common, however, and industries are following the trend. Where initiatives like AgResults are offering "prizes" for fostering innovation in sustainable agricultural practices, industry is increasingly taking up the challenge, so that industrial development becomes a partner in agricultural development.

For entrepreneurs in developing countries, however, the obstacles are considerable, despite support from organisations like the Kenya Climate Innovation Centre, it remains extremely difficult for innovative entrepreneurs in developing countries to obtain financial and regulatory support. There is an urgent need to find ways to support innovation in the burgeoning private sector in developing countries, for that is where the essential potential for change resides.

Multinational companies are acknowledging that they have to adapt to become sustainable and public authorities are increasingly willing to partner with them. Despite the sometimes contradictory messages, the overall major revelation of this volume is the willingness of communities, public authorities and private sector organisms to unite in a common goal: survival.

Introduction

David O'Connor, Co-Convenor, SDTF 2020/2021

The specific focus of the 2020/2021 Sustainable Development Transformation Forum that informed this publication was on Sustainable Development Goal 9, hence the reference to "sustainable, low-carbon industrialisation". Countries and continents have confronted the COVID-19 pandemic from very different starting points, even though they have all suffered serious economic shocks.

North America, Europe and parts of Asia and the Middle East were already characterised by high levels of income and economic development, which has given them some means of absorbing the economic shocks; they were able, for example, to launch massive fiscal packages for income and business support. In much of the developing world, where countries were starting from much lower income levels, there was far less fiscal space to offer such support. Moreover, the virtual shutdown of large sectors of the global economy has had a massive and negative impact globally, but especially on small-island, African and other developing countries. Sectors dependent on cross-border travel, face-to-face interactions or people convening in close proximity have endured the most serious setbacks.

Globally, the pandemic has set back, progress towards the SDGs (see Figure 1)[1]. Almost all countries had been making progress towards at least some of the SDGs when the pandemic hit. Its impact on output was sudden and sharp. Overall, the IMF estimates that the global economy contracted by 3.3 per cent in 2020, and it is projected to grow by 6 per cent this year before slowing somewhat in 2022[2].

[1] SDSN (2021), *Sustainable Development Report*: https://s3.amazonaws.com/sustainabledevelopment.report/2021/2021-sustainable-development-report.pdf

[2] IMF, World Economic Outlook, April 2021: https://www.imf.org/en/Publications/WEO/Issues/2021/03/23/world-economic-outlook-april-2021

Figure I.1:

Source: SDSN (2021), *Sustainable Development Report*, figure in Executive Summary[3]

The pandemic has highlighted and risks exacerbating inequalities both within and between countries and regions. Nowhere is this more evident than in differential access to vaccines and therapeutics. As of 11 June 2021, some 2.3 billion vaccines had been administered worldwide. While 55 countries reported 50 or more vaccines administered per 100 population, 96 countries reported 10 or fewer doses administered per 100 population[4].

The digital divide has never been more evident than during the pandemic, when educational institutions around the world shifted to remote learning.

[3] https://s3.amazonaws.com/sustainabledevelopment.report/2021/2021-sustainable-development-report.pdf
[4] https://www.nytimes.com/interactive/2021/world/covid-vaccinations-tracker.html

Building back better from COVID-19 must necessarily address these inequalities while seizing the opportunity to invest in the infrastructure and industries of the future – ones that will supply and use clean energy efficiently, ones that produce goods and provide services that economise on energy and resource use and minimise waste streams. Irrespective of level of development, countries have little choice but to accelerate efforts at decarbonising their economies to hope to be able to tackle climate change in the coming decades.

We are truly in a time of major transformations, which can threaten those invested in the status quo, but can open up tremendous opportunities for those willing and able to take risks in order to seize them. Whole new industries are being born and growing to maturity, including solar and wind energy, energy and resource efficient buildings and building materials, electric vehicles, high-capacity, high-performance batteries for such vehicles as well as for storing excess renewable energy to address intermittency. Other industries are almost surely waiting to be discovered. We can observe many service industries and companies that did not exist a few decades ago but have seized the opportunities offered by new information and communications technologies (including Uber, GrubHub, and M-Pesa). The Austrian economist, Joseph Schumpeter, has characterised this process as "creative destruction". Elsewhere in the economy, some industries and firms will not survive in their present form; oil and gas companies will need to evolve into clean energy companies; construction materials industries need and have begun to reinvent their production processes. Assets will be stranded, but enormous growth potential resides in new technologies, new industries, and in new markets.

Who will be best positioned to benefit from, capitalise on those growth opportunities? What about countries which so far have been largely left behind by industrialisation? Are there entry opportunities here for them?

There may well be opportunities for a whole range of countries – including developing ones – in this set of transformations that are necessary to tackle climate change. Indeed, there is reason for an optimistic view that may be on the cusp of a process of sustained and sustainable industrialisation in many countries.

Some countries in Africa and Asia, including a number of low-income countries, have been among the fastest growing economies in the world. From 2013-18, for example, Ethiopia topped the list at 9.4 per cent, with Côte d'Ivoire and Djibouti not far behind. Other high performers include Bangladesh, Cambodia, China, India, Laos and Turkmenistan, all growing at over 7 per cent a year. Ireland was the only developed country in that group.

This phenomenon is to be expected and is known as “catch-up growth”. Indeed, it is entirely plausible that some of these countries plus another tier of African and Asian (and perhaps some Latin American and Middle Eastern) countries will outperform the world growth average for several decades to come.

Living standards will rise in many of these countries, with a growing African and South Asian middle class, just as we have witnessed in China and other dynamic Asian economies.
These growing economies will be magnets for investment to supply increasingly prosperous populations. What is not yet cast in stone is what kinds of goods and services these people will demand and how those goods and services will be produced. For newly industrialising countries with emerging middle classes, there is an historic opportunity to ride the wave of global transformation to low-carbon, sustainable industries and economies. Economies of scale and learning have been driving down costs in several of the key technologies – such as solar and wind power, and high-capacity long life batteries – and will continue to do so for these and new product fields yet to come to prominence. Thus, it is entirely possible that the middle classes of the newly emerging economies will enjoy affordable, greener, more sustainable goods. Producers are also moving to decarbonise industrial processes albeit at different rates in different sectors, but it can be expected that as industries grow in these newly emerging economies they will employ the latest low-carbon, low-emissions, low-waste processes.

This book contains realistic if optimistic assessments of the opportunities as well as the challenges for newly industrialising economies to acquire competitive mastery of these new, cleaner, low-carbon technologies as they go about building their industrial bases. What sorts of skilled human resources and technological competencies need to be in place to avail of these opportunities, and how can governments and private businesses best work together in partnership to create or enhance them?

We do not have all the answers but the directions in which we need to move are becoming clearer.

Chapter One: "Inclusive Adaptation and Mitigation"[5]

Addressing climate change and striving towards the Sustainable Development Goals as absolute priorities is no longer in any doubt. While this book is being written in mid-2021, an unmanned rover is scouring the surface of Mars to determine where all the lives (if there was any) went; it is a poignant foretaste of what might befall planet Earth if we do not act now. Meanwhile, entrepreneur and activist, Bill Gates, has published, *How to Avoid a Climate Disaster*[6], in which he outlines practical steps for both governments and individuals to save our planet. In a demonstration of what can be done financially to help developing economies take steps towards addressing the challenges of reaching the SDGs, the G7 countries have pledge to cover almost a third of the total cost of supplying COVID-19 vaccines to the poorest countries. by Bill Gates, the multi-billion-dollar pledge of aid for vaccines in developing countries by the G7, and the Mars space missions.

The urgency is now recognised and the economic solutions, at least, can be available. If only it were so simple. Industrialisation has, historically, lifted nations and peoples out of poverty and onto the path of development. In the distant and recent past, we now appreciate that such industrial development was not only unsustainable, it was also often toxic for future generations, since it was based on fossil fuels, increasingly intensive and chemicals-based agriculture, generational short-sightedness, and linear production methods that generate huge amount of waste that can neither be recycled or reused, nor absorbed by the environment.

A New Approach is Needed

Economic growth in the developing countries has been – and still is, to a large extent – based on extraction and natural resources. In predominantly agricultural economies, industrial crops have replaced food crops for which processing industries are often far away. Nonetheless, although growth and poverty reduction has often been sluggish, this economic model was providing some development and relief, and so it was seemed to be the inevitable model to follow.

COVID-19 changed all that.

Among the lessons from the COVID-19 experience is the possibility of reducing carbon emissions, and the inevitable decline in the use of fossil fuels. Hence, African countries that are currently dependent of fossil-fuel exports will be obliged to restructure their economies and think again about their growth strategies. Such countries have seen their economies contract and run up high levels of debt, while facing the prospect of a hesitant rebound. The urgency to develop sustainably is becoming obvious. However, there is a need for different "speed lanes" and departure points when embracing green

[5] This chapter draws heavily on presentations at the 2020/2021 Virtual Sustainable Development Transformation Forum by Fatima Denton, Natasha Santos and Louis Meuleman.
[6] Penguin Random House, 2021.

industrialization, depending on the circumstances and the development stage of each country and region.

The pandemic has made it abundantly clear that the economic future for Africa is one in which reliance on extractive industries is severely curtailed. This, however, is a very hard lesson, for it means that several countries have "stranded assets", which are infrastructures dedicated to the extractive industries or closely associated with them, that are operating at sub-par levels or, indeed, not at all as a result of the slowdown in the world economy and the reduced demand for oil and minerals in many fields. Some of these assets are human – people trained for industries that are doomed to contraction – while others are physical – mining equipment and services, for example. Part of the cost of adapting to sustainable development and green growth will be in retraining and retooling such stranded assets to redirect them to the new development opportunities.

There is reason for optimism: innovation is not new to Africa, although it may have been overshadowed by the race for rapid growth and development. For example, the concept of green industrialization itself is established in the perspectives of several African countries. Ethiopia has built a number of industrial parks powered by hydro-generated – hence, renewable – electricity, and this is being offered as an incentive to entrepreneurs and businesses to come to the parks. The idea is to stimulate and nurture innovation and seek new ways forward to development that rely less or not at all on unsustainable practices.

Ethiopia is not alone. Countries including South Africa, Rwanda, and Cote d'Ivoire all have similar initiatives under a sustainable-energy industrialization strategy, which is part of Agenda 2063, set by the African Union in 2013[7]. The circular economy, also, is no stranger to African countries, albeit on a fairly artisanal level.

One advantage that many African countries are learning to exploit is their later development, which means they may be able to reorient their economies towards more sustainable practices without having to deconstruct existing models. Late-blooming Africa can take advantage of new technologies and has already done so in many respects, but the temptation to try to "accelerate" industrial development by using old, unsustainable technologies remains, especially if those technologies carry lower initial prices. There is, therefore, an urgent need to manage the recovery without recourse to fossil fuels and that means seeking and accessing secure sources of renewable energy to build infrastructure and drive industrial development in a sustainable manner.

The challenges for sustainable development in Africa are many. As elsewhere, there will be winners and losers and how the latter are handled could be key to avoiding disruption on the road to sustainable industrialisation. The transition will be complex and there are no simple solutions. As African economies grow and develop, supporting the growth of the new middle class, consumer demand will inevitably grow and may do so impatiently. This will impact materials industries and a whole range of other activities.

[7] See https://au.int/en/agenda2063/overview

There will be a strong temptation for countries to revert to cheap hydrocarbons, especially coal, because they face difficulties with fiscal space and revenue loss. Many of African countries' development priorities will be in energy-intensive sectors, such as infrastructure and construction. Especially in the aftermath of the pandemic, Africa will need stable and secure sources of energy without reverting to the old way of doing things. Coal may not be cheaper than renewables, but it is familiar and existing infrastructures are still adapted to it. Installing solar panels or wind-power generators may be cheaper in the long run, but such technologies need to be managed differently from coal and oil. When countries are in a hurry to develop, their time horizons may be so close that they cannot "afford" to learn how to use and maintain renewables without significant capacity building and human-capital investment. This could also be seen as an opportunity to build such skills and create quality employment in the process.

Meanwhile, what place can be found for the informal sector that currently provides employment for 86 per cent of the work force? The informal sector in Africa, particularly in the sub-Saharan region, has not been fully taken advantage of as a source of economic development and sustainable change. Though seen a vulnerable – and even disloyal because of its tendency to avoid taxes – by some in power, the informal sector is nonetheless a laboratory of innovation. It makes sense, therefore, to encourage green innovation in the informal sector and encourage even more risk-taking than currently takes place. Taking the informal sector through green industrialisation will be beneficial to test new approaches and technologies, particularly in the field of energy, as renewable energy technologies become increasingly more affordable.

Managing a transition that is complex and messy will not be politically neutral. Africa has always been seen as an enclave economy, where the winner takes all. Newcomers coming onto the scene, such as multinational companies, may have advanced knowledge with which countries are unfamiliar. The public authorities in developing countries need to recognise their shortcomings in terms of expertise and knowledge when faced with new foreign entrants to their markets. They also need to appreciate that climate-change mitigation is only part of the answer, the other part is adaptation. There is some damage that simply cannot be repaired in the foreseeable future, and this means adopting new ways of doing things, perhaps cultivating new crops better suited to changed conditions and adjusting lifestyles to the new reality.

In all and every scenario, there are "losers": those whose livelihoods, social or cultural attitudes, and even political influence change in unexpected and sometimes negative ways. These groups will see themselves as "victims" of policy changes and their resistance to change has to be anticipated. However, if they are taken into consideration within policy making, "Green can be and must be equal to Just."[8]

Technology to the rescue?

One source of optimism is the recognition within multinational enterprises that "business-as-usual" is no longer possible in the light of the sustainability crisis. In areas such as

[8] This formulation is attributed to Dr Fatima Denton in her presentation to the 2020/2021 SDTF.

livestock, for example, companies like Marfrig, in Brazil, are actively – and financially – discouraging exploitation and further spoliation of the Amazon forests. Even market actors including Walmart and McDonald's are stepping in to ensure sustainable sourcing of beef, making it more profitable for actors along the value chain, starting with farmers, to practice sustainable agriculture The same is true of industry groups like the World Cocoa Foundation that is supporting efforts to end deforestation by providing incentives to farmers to discontinue the process.

Bayer, a company often thought of as a pharmaceuticals company, with 100,000 employees and investments of 5.5 billion Euros in research and development, is dedicated to finding ways of "Feeding the world, without starving the planet", which translates as "increasing production while avoiding the use of chemical pollutants". In this process, the company recognises that it must combine agricultural innovation with a sustainable business model. Fulfilling this vision requires them to fundamentally reimagine what it means to be an agricultural company.

Bayer carries out research in co-operation with farmers and thus takes a "real-world" approach, offering innovations that are sustainable and effective, as well as affordable, so that farmers can produce more with less potential harm for the environment. This approach builds upon the traditional role of farmers – especially small and subsistence farmers, forest dwellers and herders – to innovate in seed and animal development and the management of genetic diversity while protecting existing ecosystems.

Innovative approaches to sustainable agriculture must be executed with farmers in mind. A farm environment is an ecosystem in itself, with its own soil composition and climate conditions, which may or not contribute to the sustainability of the whole ecosystem. Even within a farm, there are subtle differences in soil vegetation that create unique micro-environments that can require different crop management strategies. Farmers face increasing complexity and need to make more than 40 important decisions every season conditioned to weather, climate, and economic challenges. These needs and decisions require solutions that go beyond single products – it requires a systemic approach that delivers tools allowing them to bring the crop to harvest and a system that delivers the harvest to the table.

Hence, Bayer is deeply involved in crop research and is constantly on the lookout for sustainable varieties that have the characteristics that farmers are looking for, especially profitability. Instead of simply using more and more agricultural chemical inputs to increase yields – which, in any case, is a short-term strategy – Bayer trains farmers in sustainable, value-added practices in partnership with local agri-businesses and the public authorities. In this way, sustainability goals become identified with financial objectives – both for the farmers and for agri-business, including Bayer.

At the same time, the company encourages the abandonment of harmful practices such as overuse of herbicides and pesticides to which modern farmers have been introduced and "addicted" in the name of modernity, in order to replace them with more adapted and more productive ones. This means, among other things, integrated weed management, cover crops, conservation tillage, and crop rotation, which are in reality rediscovered and

improved traditional and ancestral agriculture practices supported by newly developed technology and tools. This allows the farmers to preserve natural resources, maintain natural habitats, and protect the environment. It also allows them to improve land use to grow food using resources more rationally. All of this makes cropping systems more resilient to climate change over scale and time. For example, farmers are the most impacted by climate change, but they are also willing to integrate adaptation strategies in their agricultural practices to face the reality and limit their own climate impact. To do so, they need access to the best practices and digital tools. It is also of utmost importance that the farmers are rewarded for their sustainable practices.

In 2019, Bayer was committed to three major areas of transformation, working with farmers to advance change and promoting a carbon-zero future for agriculture by reducing field greenhouse gas emissions. The three areas are: focusing on transformational topics; maintaining a farmer-centric approach; and ensuring that sustainability goals are equal to financial goals. All three are deigned to embed sustainability into both crop science and the implementation of innovations in the farming world. Included in these commitments is an initiative to reduce greenhouse gas emissions, while another linked area of transformation aims at reducing the use of pesticides. The objective is not solely to reach for sustainability, but to do so with concrete benefits to farming households through raised incomes, access to education and improved methods, and partnerships formed along the value chain.

Among the company's projects are the Carbon Initiative, which pursues the objective of a zero-carbon future for the sector.

Indeed, climate-neutral agriculture can offer a triple win for the world and society, and for the farmers, themselves: a reduction in greenhouse gas emissions; food security, better yields, and more predictable harvests; and additional sources of revenues for farmers. For example, an average corn farmer in the Midwest of the United States, maximizes the revenue generated on a fixed piece of land through a combination of increased yields and more efficient use of inputs (such as seeds, crop protection, fertilizers water, etc.). In future, that same farmer could deploy other tactics, such as enhancing water efficiency, to remove greenhouse gases from the atmosphere and sequester carbon in the soil, for which she or he will be compensated through carbon credits.

Bayer is working in the United States, Brazil, Europe, India, and Southeast Asia, in field crops to create science-based economically viable and scalable initiatives to help unlock the business case for soil carbon sequestration, including reducing costs and creating a financial opportunity for farmers through the generation of carbon credits by adopting climate-smart agronomic practices. In Brazil and the United States, Bayer is already providing farmers with assistance in implementing climate-smart agriculture practices and compensates participating farmers directly for adopting such practices, currently at the rate of USD3.00 per acre of reduced tillage and USD6.00 per acre of cover-crop planting. There is no obligation to use Bayer or Bayer-partner products in exchange for enrolling in the programme.

The second Bayer initiative is the development of different varieties of short stature corn using the most advanced biology innovation, which includes gene editing, biotech or even traditional breeding such as the variety under the name VITALA. This is a new generation of a traditionally bred short stature maize hybrid that can withstand harsh winds thanks not only to its root system but also its short and sturdy stalks. This is a conventional technological advancement that shows that the future value of crops will have environmental outcomes embedded in them. This improved maize variety, which demands fewer nutrients, water, care and management, and can be sown in higher density, can ultimately transform corn production as it allows to reduce the need for agricultural inputs, water, and labour while, at the same time, potentially resulting in better yields without necessarily increasing the need for arable land.

The benefits, compared to other maize varieties, according to Bayer, are as follows: Reduced crop loss, more precise use of crop protection, and the potential to reduce farmland use, water, and nutrient requirements combined with higher plant density, thus enabling intensification of corn production that would be more sustainable, Bayer claims. Additionally, the low canopy of this maize variety allows late season (thus more efficient) nitrogen application with wheeled equipment, which would help reduce costs as well as the environmental impacts of the entire corn production system.

Short stature maize varieties can potentially better withstand drought. Research has shown that under limited water conditions, some varieties of this improved maize show reduced signs of stress like leaf rolling and wilting, thus demonstrating the potential for improved yields under drought conditions. The deeper root system in some of these improved maize varieties, enables more water uptake in the soil, thus requiring less irrigation and showing better performance under drought conditions compared to other varieties. In addition, the improved varieties seem to enjoy higher photosynthetic efficiencies, i.e., increased CO_2 uptake, as the leaves stay greener for longer.

A third example of Bayer's initiatives towards sustainable agriculture is the *Better Farms, Better Lives* programme. Smallholder farmers are essential to providing food security to billions of people, but the on-going COVID-19 pandemic is placing extra challenges on their ability to produce food for their communities and beyond. With the Better Farms, Better Lives initiative, additional support and partnerships with local and global NGOs will not only result in resiliency for smallholders but will also ensure the current health and economic crisis does not turn into a hunger crisis. This is part of Bayer's commitment to empowering 100 million smallholder farmers in developing regions by 2030. Access to affordable technology, information, and markets are some of the company's current initiatives to deliver on the commitment. In Asia, Bayer is kick-starting projects on drones that enable precision application for crop protection, done through the introduction of safety protocols and standards. They also began pilot projects on safety training for companies on mechanization and drone application. Other examples include farming alliances to support seed planting precision, irrigation, crop protection, and finance for farmers in rural India, Bangladesh, and Indonesia. Also worth mentioning are the food value chain initiatives, helping smallholders to comply with value chain certification and purchase requirements in India and Mexico.

Private-sector initiatives, such as those offered by Bayer and others, emphasise partnerships, perseverance, and creativity through concrete action. The future of agriculture will be defined by the ability to partner with farmers, policy makers, and across the food chain. Transformational innovation, a new business model that has a strong focus on sustainability, is necessary to feed the world without starving the planet. To this end, collaboration at a large scale needs to be implemented on the ground. Policy makers can contribute to this process by setting a science-based framework for transition, supporting the creation of centres of excellence and expertise, and hubs of innovation and implementation which, in turn, can make a significant, positive impact on countries' sustainability objectives.

Inequalities and governance failures

Low- and middle-income countries (LMICs) not only face difficulties of insufficient finance, infrastructure, expertise and services development, they are also often held in thrall by the developed economies that make up the bulk of their markets. Apart from the obvious dependence of commodity exporters on the developed-economy markets, the downturn caused by COVID-19 has severely impacted LMICs in other areas, too. For example, based on the World Trade Organization (WTO) Data, The United Nations Conference on Trade and Development (UNCTAD) reports that, "As merchandise exports of LDCs are concentrated in a few markets, including those worst affected by the COVID-19 health crisis (China, France, Germany, the United States of America), it makes them even more vulnerable to decline in demand in these countries. At the individual country level, LDCs are even more exposed to COVID-19 related economic disruptions. For example, in 2018, Angola exported around 57 per cent of its merchandise to China, Benin around 41 per cent to India, Burkina Faso around 54 per cent to Switzerland, Haiti around 82 per cent to the United States of America and Rwanda around 65 per cent to the United Arab Emirates."[9]

This is important because it goes against the trend required to meet SDGs 17.11 - "Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020" – and 17.12 – "Realize timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries, consistent with the World Trade Organization's decisions, including by ensuring that preferential rules of origin applicable to imports from least developed countries are transparent and simple, and contribute to facilitating market access"

However, the COVID-19 pandemic crisis has somehow contributed to exacerbating recent resurgences of economic nationalism in the economically advanced countries, most of which have been caught off guard by the disruption of the global supply and value chains that promote and rely so heavily on international trade liberalisation. Crises, be they social-, financial-, or health-related or all of them at the same time, like the COVID-19 crisis,

[9] See, *International trade in developing economies*, UNCTAD, 2020, available at https://sdgpulse.unctad.org/trade-developing-economies/#Ref_Unctad2020a and *The COVID-19 Pandemic and Trade-Related Developments in LDCs*, WTO, 2020, available at https://www.wto.org/english/tratop_e/covid19_e/ldcs_report_e.pdf

often trigger fears and inward-turning reaction. At the individual level, we all have in mind images of consumers having the most irrational selfish reactions at the supermarket in rich countries during the early moments of the pandemic. At the state level, we also witnessed highly developed countries showing selfish COVID-19 vaccine nationalism rather than fairness and multilateral solidarity towards developing countries.

The COVID-19 crisis is nevertheless an opportunity — some would say a wake-up call — to re-examine the sustainability and resilience of the world economic system, including the global supply and value chains and, unsurprisingly, of our food system in particular. While there are opposing views on the topic, the reflection on the current crisis is generally leaning towards more sustainable and circular food systems and where the "local" figures predominantly, in response to both food security and environmental concerns.

The COVID-19 pandemic has destroyed economic, social, and environmental systems globally, affecting SDG implementation. Inequality and poverty are on the rise, and this impacts industries in all countries. Some local industries are winners as they rethink business models to replace supply shortages from overseas sources with locally produced inputs, leading to an increase in buying from local businesses. However, this has also contributed to the rise of economic nationalism, exacerbating a major problem for developing countries and leading to even more narrowing of developing countries' fiscal space. This at a time when more fiscal space is needed to deal with the twin emergencies of responding to the COVID-19 pandemic and striving to reach the SDGs.

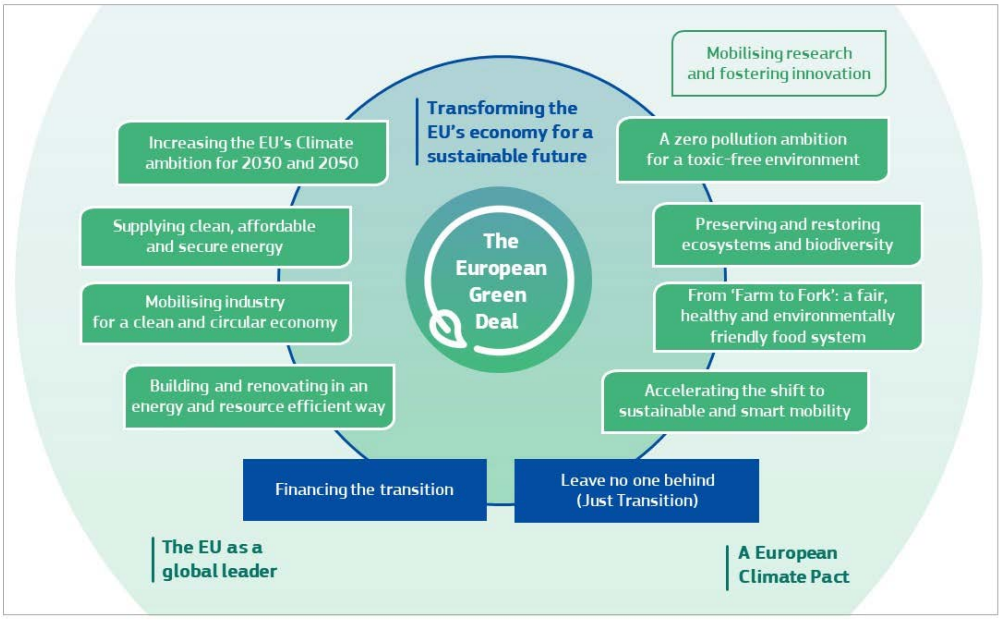
State institutions and governance have difficulty coping with the many challenges. Economic forces have often resulted in small and weakened government agencies resulting from the belief that the "invisible hand" of the market would solve all problems and that "big government" was an imposition on the popular will and market freedom. Hence, part of this ideology asserts that governments should not have industrial policies to steer and control development because that would interfere with innovation and economic dynamism. The polar opposite of this point of view is that government does have a major role in steering the market, industrial policy and economic growth, controlling the way the market functions. Hence, it was deemed desirable to establish state-owned enterprises on the commanding heights of the economy, subsidising them where necessary to protect them from the market.

The so-called "invisible hand" of the market is not the right tool to bring about sustainable development or industrialisation, nor is state-run capitalism. Indeed, neither economic theory will resolve the current crises and sustain progress towards the SDGs. Instead, the institutions of the state need to be rewired to adapt to the needs of implementing sustainable industrialisation and advancing towards the SDGs. Green growth has been recognised by many public bodies – both national and international – as the only real option, but it has also become clear that economies will not rewire themselves by themselves. They need a supportive and encouraging structure from the state or quasi-state.

Remedies?

A prime example is the European Green Deal that sets out not only targets but also pathways. The Green Deal is comprehensive, containing advice, regulation and integration across all economic sectors, calling for partnerships with private actors, as well as with the public sector. While the Green Deal is is a model that was developed in and for the European context, it could possibly be applicable to other contexts as far as it is adapted to local conditions and circumstances.

Figure 1.1: The European Union's "Green Deal"



Source: European Commission, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640&from=ET

However, initiatives like the Green Deal still need strategies of implementation, which is where the concepts of governance come in. "Policy" is what you should do, "Governance" is how you do it, and currently governance structures are not responding as they should. Awareness of this concept is not new, and it has led to the idea of "silos", in which different parts of the state (or public or private corporations) operate completely isolated from each other as separate fiefdoms and little communication between them. A simple remedy for this situation might be to "break down the silos", but this would be simplistic and ultimately counter-productive.

The silos contain a wealth of experience and knowledge that needs to be explained and shared, not disbanded or destroyed. On the contrary, innovation in governance should

lead to adapting structures to work together because to do so carries dividends that are shared between all the parties. This is especially true of a global objective, such as the SDGs. Indeed, attaining the SDGs will be impossible without such a reform governance structures.

One outcome of linking the silos will be to raise the quality of governance and enables the organs of the state to face the challenges of sustainable development in an optimal manner. It enables government to identify the "good" things, which should be supported, from the "bad" ones, which should be taxed, for example.

The crises have shown that there is a desperate and urgent need to revitalise industrial policies, but in a "green" manner. Drawing another example from the European Union, the 2020 Industrial Strategy, which is part of the European Green Deal, promotes investment in clean technology and innovation. The strategy is based on three key priorities: maintaining European industry's global competitiveness and a level playing field, at home and globally, *making Europe climate-neutral by 2050*[10] and shaping Europe's digital future. Industrial policies, such as this one, adds micro-economy to long-term and macro-economic dominance into economic policy making. It enables policies that mandate participation in the circular economy and zero-waste objectives, without discriminating between large medium- and small-sized industrial units, with a grasp of the entire economic ecosystem.

However, sound, inclusive and sustainable industrial policies will not emerge on their own. The response of governments during the pandemic has shown the power and importance of the state during a crisis, but it has also brought into focus the consequences of failing to act accordingly. This should not have been a surprise; good governance is one of the four levels of sustainability transformations noted in the 2019 Global Sustainable Development Report. Unfortunately, the road to good, innovative governance is strewn with obstacles and potholes that can impede progress.

Innovative governance requires fast evolution and reform to create adequate rules and tools, liberate resources, and skills. The traditional, common silo-driven model of public governance tends to be hierarchical. It is centralist, legalist, and takes a top-down approach within its silo mentality. It is neither inclusive, nor is it geared towards partnerships or co-production. There needs to be a shifting balance between instructions, tools, and mindsets. Innovating public governance should become a strategic policy area. Governance itself is essential for creating the conditions for all the SDGs, particularly for SDG 17, but also for SDG 16 – "Promote peace, justice and strong institutions." – which is also an essential building block of sustainable development.

Innovative governance must, therefore, be embedded in mission-oriented public administration and governance reform in order to achieve the SDGs by 2030. Policy makers need to create space for creativity, experimentation, collaboration across all sectors for public administration and governance. This will require bold and inspirational missions with the involvement of business and civil society that focuses on the ends

[10] Author's emphasis.

rather than the means. However – and this is a crucial point – the end result must also be just and equitable with as few "losers" as possible and the provision of adequate compensation for any economic or social sectors that may be disadvantaged.

There is, hence, an urgent need to change mind sets and innovate in governance in line with UN DESA's eleven principles of effective governance to create the necessary capacities and mindsets for innovative governance. The principles are grouped into three modules:

effectiveness: i) competence; ii) sound policy making; and iii) collaboration;

accountability: iv) integrity, v) transparency and vi) independent oversight; and

inclusiveness: vii) leaving no one behind, viii) non-discrimination, ix) participation, x) subsidiarity and xi) intergenerational equity.

Under these principles seven areas can be considered as priority areas for reforming governance to advance towards the SDGs:

1. Digitise government and integrate multiple public services;
2. Improve access through multi-channel service delivery;
3. Open government data to public scrutiny;
4. Simplify administrative processes;
5. Decentralise public services;
6. Make partnerships with private sector and civil society ; and
7. Change the mindset and behaviour of civil servants.

Of particular importance is changing the mindset and behaviour of civil servants in order to tackle the challenge of "siloisation", which is the main cause of ineffective governance of the SDGs. In the private sector, encouraging the silos to co-operate can also be profitable and achieve corporate financial as well as societal goals. Hence, when companies add social targets, such as degrees of outreach to small-holder farmers, as part of Board member compensation packages, they are also demonstrating the links and synergies of internal structures.

Chapter Two: Partnerships for Sustainability[11]

Institutional investors - key partners for the SDGs

Filling the SDG financing gap calls for innovative strategic partnerships, for instance, between multilateral financial institutions (MFIs) and institutional investors (pension funds, insurance consortiums, sovereign wealth funds etc …) where MFIs could help create an environment that encourages the latter to invest in the measures needed to meet the Sustainable Development Goals (SDGs). There is a pressing need to increase SDG funding, especially since the estimated funding gap between the available funding and that needed has widened by 70 per cent over the past year, from USD2.5 trillion to USD4.2 trillion.

Yet, there is no shortage of capital available. Global financial assets amount to almost USD380 trillion, but most of this money – 81 per cent – is in the developed economies, while 15 per cent is in China, which leaves barely 4 per cent for the developing world. Even more striking is that the value of public international development assistance, or ODA, is equal to only 0.04 per cent of total global assets. Hence, if the SDGs are to be fully funded, more financial assets must be transferred to developing economies from private sources. Private-capital investments in development countries can build upon funding from governments and other public sources, including ODA – the "multiplier effect" – but the overall multiplier figure for institutional investors in terms of monetary value and percentage of development investment flows is very low (perhaps 0.4 per cent) and certainly under one per cent, which means for every USD of public money engaged, the private sector mobilises under one cent. This is despite efforts by the Multilateral Development Banks (MDBs) and Development Financial Institutions (DFIs) to mobilise capital from private investors in support of development in general and the SDGs in particular. According to the OECD, mobilising "just" 2 per cent of the total assets (4.2 USD trillion) held by institutional investors would close the SDG financing gap.

As a measure of efficiency in attracting finance for the SDGs and for development, in general, this multiplier effect is useful insofar as it gives an idea of the "pull effect" of public investment. It is an indication of the attractiveness for private financing of publicly funded projects and operations. A multiplier is helpful, as currently the best instrument to estimate private capital mobilisation. Sometimes, however, a high multiplier might be observed, but the capital might not be additional to what would have been invested without public involvement. The situation differs from fund to fund as to what exactly those multipliers represent and how additional the financing might be. Still, pretty much all green banks mobilize more capital and it is a model that is very much worth looking at for development finance institutions.

[11] This chapter draws heavily on presentations to the virtual 2020/2021 Sustainable Development Transformation Forum by Håvard Halland, David Horan, Parasto Hamed, and Daniel Platz.

Figure 2.1: The COVID-19 effect on financing for the SDGs

Source: OECD

International development Financial Institutions appear to have very little organic connection to institutional investors, which limits their ability to mobilise capital from those sources. This situation might be remedied by including local investors, (strategic investment funds (SIFs) and Green Banks) in a three-way dialogue and partnership with institutional investors development finance providers. The SIFs and Green Banks raise private capital for infrastructure investment and development financing. Indeed, they have been quite successful in mobilising private capital, including from institutional investors. When measured using the "multiplier" metric, Green Banks, for example can demonstrate a rate of up to 10 per cent of the value of public capital deployed, compared to MBDs, at 0.04 per cent. Some 20 countries have established strategic investment funds, and several others have established green banks. These institutions focus on infrastructure; they have a double bottom line of financial and development returns. They are set up with the specific purpose of mobilising private capital for their objectives and appear to have been quite efficient at doing this.

Meanwhile, multilateral climate funds have a very low multiplier effect, in contrast to strategic investment funds. Why is there a difference? One answer is that multilateral financial institutions have governance structures that are ill-adapted to working with institutional investors. The former act like government departments staffed by officials, whereas the latter depend on more private-sector-oriented governance structures that mesh more easily with those of institutional investment funds. They recruit their staff from the private sector, whereas the MDBs and other IFIs recruit their personnel from within the public sector and may include people in senior positions who have no experience of working in the financial sector. In addition, because of their international character, they have certain reliance on country representation and generally are operated by management structures that draw staff from ministries – often of foreign affairs, development or finance. The Directors of the Board are not independent of their home governments and are thus constrained in their margin of manoeuvre.

Strategic investment funds and Green Banks, hence, are more efficient and more effective than the multilateral climate funds because they are locally based, understand the local market better and are more able to respond to local needs, even when they change. As independent and professional investment bodies, they can fund their projects from a wide variety of sources including developers, partner institutions, and government. To increase the volume of financing, however, blended funds linking all three types of financial institutions are essential, as long as they make sense and as long as the multilateral financial institutions can adapt to the needs and structures of the private marketplace. This means that the governance structures of the MFIs will have to change to behave more like a private institution. It also means that they need to form strategic partnerships with the more local development funds in order better to communicate and co-operate with institutional investors and release some of the capital they control for development and realising the SDGs.

The SIF model offers some scope for reforming the international finance governance system, since it can consist of a form of public-private partnership (PPP). Such a structure can be flexible and dynamic, making partnerships with the MFIs more attractive.

An outstanding example is the Indian SIF (National Investment and Infrastructure Fund Limited - NIIFL). In this fund, the Indian government owns 49 per cent, which means that private investors have a majority on the seven-member board – five members out of seven. The arrangement gives the private sector a significant measure of control that reassures other potential investors in the fund and attracts co-investment from other private sources. The structure is so successful that it has managed to mobilise capital worth several billion dollars from Canadian and Australian pension funds, including the Ontario pension plan, and the Australian super fund, as well as from sovereign wealth funds. Another example is the Danish Climate Investment Fund (KIF) established by the Danish development finance institutions and private sector institutions in Denmark. As with the Indian model, it is also jointly capitalised. Establishing new structures under legal structures with which investors are familiar and with forms of representation where they have a majority and have control can create a climate in which private sector actors can have a sense of security and encourage their participation.

Greenfield investments generally need more public capital and/or more risk mitigation either at the fund level itself or at the project level to attract private investors. The *Fonds Souverain d'Investissements Stratégiques* (FONSIS SA.), Senegal's strategic investment fund, for example, has invested in renewable infrastructure in partnership with private investors, including Meridiam, a private-equity firm, and the French government's private-sector support agency, PROPARCO, among others, so for infrastructure and other greenfield operations there will always be a major role for public capital but that role can include attracting or guaranteeing private finance. Risk mitigation should be at the fund level with legal structures that private investors will recognise as being in their favour, especially where the funds are large and the timeline long.

Collaborative partnerships to mobilise finance for the implementation of the SDGs have identifiable advantages. They can draw upon the locational relevance of SIFs and Green Banks, using their local knowledge for due diligence, research and monitoring to pool knowledge and base investment decisions on sound principles to avoid excessive risk. They offer diversification opportunities to all the partners and can short-circuit cumbersome systems and conventional financial intermediaries, relying on the local partner to mitigate political and headline risk. A collaborative structure can bring down barriers between two large sets of long-term investors: the institutional investors and the MFIs, thus redirecting important capital flows towards sustainable development and the SDGs. In particular, a blended, collaborative approach can more easily identify financing opportunities that will be attractive and feasible for private investors.

Countries with significant overseas populations can use the diaspora to leverage private equity from abroad. To increase investor confidence further, a country can draw on its diaspora to fill important skilled positions at home. The diaspora networks can be critical. For example, the Nigerian Sovereign Investment Authority, which includes an infrastructure fund, is staffed by people from the diaspora who bring a great deal of experience from global financial centres and they have. They have set up some fascinating structures to mitigate risk for local pension funds and other strategic investment funds that are also staffed with Nigerians from overseas. There are many

ways of using diaspora returnees to engage foreign capital and reassure institutional investors from their networks, but such returnees need to be offered good terms.

The diaspora can supply experienced professional for newly established green banks and SIFs, as they build a successful track record. A team consisting of professional who already have proven their value will find it easier to attract private capital. As a team gathers experience and projects get up and running, albeit with public funding in the beginning, there will be a growth in the confidence that the markets need. India's national infrastructure and investment fund, for example, despite its obvious stability and viability, took some years to attract capital from the foreign pension funds it needed to get going properly. In the small island developing States (SIDS) the problem of attracting private finance for the SDGs is particularly acute, given their lack of diversification opportunities and scarcity of skilled financial professionals. The recruitment of diaspora professionals can help, but the real answer is for SIDS to combine their offers over several countries and jurisdictions. Competing for private development capital with large countries like India and Nigeria is an enormous challenge, but needs not be an insurmountable one. The alternative is to fall back on public and international development funds, but, as we have seen, such sources are woefully inadequate to respond the challenge of reaching the SDGs.

The key is to find the right mix of opportunities to attract institutional investors, whatever the national priorities. There is a growing movement to encourage companies to adopt a net-zero environmental impact of their operations. This applies to institutional investment funds, such as pension and insurance funds, as it does to manufacturing companies. In 2020, the number of corporations pledging to reach net zero doubled to 1,500, including giants like Morgan Stanley, AT&T and Walmart. Their combined revenues amount to USD 11.4 trillion.[12] There is, therefore, a growing incentive for corporate capital to flow towards SDG funding, provided they can extract guarantees from the beneficiaries and expect a reasonable rate of return, albeit over a longer-than-usual period. From their side, however, countries in the global South will have to improve their reporting requirements and data-collection mechanisms, and will need help to measure the real impact of the investments they receive in the context of SDG funding.

What could have the most significant impact in attracting blended finance is the creation of a global platform that would bring together all types of investors: green banks, strategic investment funds, institutional investors, development banks, and national and international aid agencies. Some interaction between local managers with boots on the ground and private investors do exist, but they have not resulted in large-scale, continuous investment flows and there are few, if any, representatives from the MDBs. Hence their effectiveness is muted.

There needs be a change in the international institutional environment to facilitate the mobilisation of institutional investment funds into SDG-related investments. Without it, it may be impossible to achieve the SDGs. The current strategies for private capital

[12] *Forbes* magazine, "Net Zero Is the New Business Impertive",23 September 2020.

mobilization are not working at this necessary scale; therefore, it is time to think anew. If financing for the SDGs is to move from the current USD billions to the necessary USD trillions, impediments to co-operation between the multilateral financial institutions and institutional investors will have to be overcome.

Partners – with whom?

There is considerable evidence that industrialisation can happen quite quickly, though this is not always the case, and many factors can intervene to slow its progress. Early modern industrialisers – including France, Germany and England, for example – were also basic innovators that developed new processes, built their own infrastructures including canals, railways and roads, and opened new markets for their goods and services. Later industrialisers – the cases of Japan, China and the United States – built upon the work of their predecessors and, hence were able to industrialise more quickly. Indeed, the latest industrialisers – the Asian "Tigers" – have been able in some cases to modernise and advance their industrial sectors at seemingly breakneck speed.

In all cases, policy decisions taken early on the process to facilitate economic development based on industrial growth have had often unforeseen long-term consequences that have been difficult to overcome. Energy supply based on coal or petroleum, supported both by private investment and government policy, has had disastrous implications for the climate and human health, as well damage to the environment overall. The exploitation of natural resources, both in the local economy and abroad – in some cases through imperial expansion that has left its mark to the present time – was carried out with little regard to future sustainability. Such policies, perhaps based on the best of intentions, are unsustainable and need to be replaced or updated. This, in a nutshell, is how a sustainable industrial policy can be achieved. In the developed economies, dismantling corrosive or unsustainable industrial policies has been slow, but is gaining momentum. In the developing countries, progress has been less obvious, and the sacrifices demanded can seem much harsher. After all, industrialisation comes with risks for the planet, but it also comes with a promise of jobs, improved lifestyles and enhanced quality of life, at least in the short term. The aim of sustainable industrial policies is to make those improvements in the human condition permanent and ongoing.

Any policy change, especially ones radical enough to support progress towards the SDGs, will create winners and losers and different shades of each, depending on the impact of those policies. The late industrialisers – countries that have not enjoyed sustained, long-term growth in their industrial sectors – are often in an understandable hurry to get on with the process and provide the economic benefits it generates to their peoples. There are several advantages in industrializing after others: leapfrogging, avoiding previous mistakes, and establishing more inclusive institutions. These countries are in different stages of industrialisation and there is no single solution to their developing compatible, sustainable policies that will support their economic and social progress. Moreover, political pressures can militate against policies that appear to slow down "progress" and governments that wish to stay in power – or to attain it – are wary of alienating groups within their societies that can influence public pressures and electoral outcomes.

Alliances and partnerships

There is a pressing need to identify and mobilise allies for governments and corporations that aim to introduce policies that favour sustainable practices; the same applies, indeed, to any economic "experiment". Coalitions and partnerships that share similar aspirations and goals – for whatever reason – are essential to support the introduction of innovative policies. In the case of government, experience indicates that partnerships need to be established *before* innovative policies are implemented. That means that potential partners need to be identified in advance. Partnerships help to initiate, smooth, and accelerate sustainable transformations. They bring different levels of experience and expertise, as well as varied relevance in space and in time, contributing to an effective policy environment by harnessing diverse means of implementation.

An inventory of current partnerships in an economy can reveal which can be useful for sustainable progress and which are not – even to the point of identifying those that are "toxic" to the concept of sustainable industrial development. The creation of such an inventory is not an option, but an obligation, and there are cases that demonstrate that neglecting to establish one can lead to the failure of policies because the authorities do not know where to look for their allies. Once the inventory has been established, it is necessary to fill in the inevitable gaps as soon and as efficiently as possible in order to establish an ideal "portfolio" of partnerships to underpin the transition to sustainable industrial development and to sustain it. Removing unsustainable or toxic partnerships can be achieved by using economic compensation to decommission them. However, as that might not be economically feasible in some cases, supporting alternative technologies within a sector could weaken the power of the coalitions. Each specific situation will require its own solution.

In the context of partnerships, the case of Ireland is instructive. Ireland's economic take-off – the "Celtic Tiger" – of the mid-1990s to 2007/2008 – was made possible through a whole range of partnerships. The Social Contract between the trade unions and the public authorities kept down wages in return for a longer growth horizon, steady job creation, high levels of growth and enhanced social wages. The role of the Irish diaspora, which is some 70 million strong, was important as a source of investment, know-how and skills, while the European Union was a source of development funding and expertise. At the local level (and, in some cases, nationally, as well), community partnerships played a vital role in welcoming new economic activities and the workers who came with them.

However, the lack of partnerships in certain economic sectors and local administrations contributed to the "Tiger's" downfall. That led to recession and partial return to net emigration, as the building and construction bubble burst, the banking sector imploded, employment rates plummeted, and a financial and political crisis engulfed the country. In the wake of the collapse, the government formed new partnerships in order to secure co-operation for implementing often harsh recovery measures. The recovery, which is underway but appears to be successful, is also built on sound partnerships, with the diaspora again paying an important role in attracting and maintaining investment, often from outside the European Union.

Low- and middle-income countries can use partnerships to achieve sustainable industrialisation, especially when they can benefit from international support. United Nations agencies have a key role in orchestrating partnerships aligned to transformation. The main steps include assisting countries in constructing a current portfolio of desired partners by sharing databases, using roadmaps to build a shared vision, and investing in essential components such as brokering partnerships. Sharing good practices should be a guiding principle to advance the portfolio approach, and some of the most interesting work regarding partnership frameworks is happening in countries like Kenya and Ghana. For example, the African Center for Disease Control successfully developed partnerships to bring in and distribute medical equipment to different African countries in the COVID-19 pandemic. Using international assistance, such countries may be able to form partnerships with groups based on accords like the Dutch Energy Agreement, the Just Transition Fund, the German Coal Exit Commission, the Nordic Transmission Grid, and the International Solar Alliance, as well as partner with international leaders to access technology and finance, and with universities to build the capacity of an environmentally sustainable workforce.

Public authorities everywhere need to recognise the importance of partnerships for the feasibility of policies, which means that they should be flexible in order to widen the spectrum of partnerships and broaden their appeal. This is an essential element in getting policies right, including industrial policies and especially those policies promoting inclusive and sustainable industrialisation that call for wide consensus and possible compensation for groups who may be affected negatively during the transition period.

Securing partnerships with the necessary groups – be they inside or outside the country or target area – has been made much easier by the development of digital technologies. Information Technology now makes it possible to talk to different partners simultaneously, to supply them with relevant information and to take account of their concerns and advice. Hence, the introduction of sustainable industrial policies and practices can be facilitated through technologies that also support policy makers in the search for relevant partners. In this sense, late industrialisers in the low- and middle-income countries can digitally “leapfrog” their more “advanced” counterparts to form partnerships with both local and distant partners who can facilitate the effective implementation of policies to support sustainable industrialisation.

In all cases, effective partnerships can only be formed if there is a reliable portfolio of ideal partners, with their respective interests and advantages, drawn from an overall partner registry sourced from the partnership inventory. Where there are gaps in the ideal portfolio, there will be a need to establish a consensus among policy makers about how to broker new relationships with the missing entity so that a shared vision of the mutual benefits can be established. In the final analysis, it should be possible to establish an idea of the current portfolio and the optimal portfolio, so that the gaps can be filled on the basis of evidence, rather than conjecture. It will also always be important to recognise the value of partners in distance and in time, so that they can be geographically local, regional, national and international, as well as different in size and constituency.

A different kind of partnership

AgResults is a USD152 million multi-donor initiative active in a dozen countries throughout sub-Saharan Africa and Asia that uses pay-for-results prize competitions to encourage private operators to invest in high-impact agricultural innovations that contribute to reducing food insecurity, improve household nutrition and health, and increase livestock productivity. Hence, this kind of partnership brings farmers, manufacturers and value-chain actors together to foster effective innovation in the countryside. The initiative conceives of its mission as identifying new technologies, encouraging the private sector to overcome market barriers, facilitating wide adoption and scaling, and creating sustainable markets as the final result.

The prize competitions encourage new partnerships along the value chain that drive scaleup, leading to more sustainable and resilient market systems. The prize system incentivises private actors to enter new markets with new solutions to problems. Firms compete to adapt their business models to increase product take-up and create new partnerships that eventually expand to render new solutions, including when markets change and demands evolve.

The AgResults model offer a uniquely different approach, compared to traditional “push” grant funding, in that it is *selective*. There is no global, overall payment to target populations based on their profiles, nor is there a “middle-actor” involved, since the prize donor deals directly with the competitors. Though the initial funding comes from donors, most of which are using public funds, there is no involvement – and therefore no influence – by the local authorities. The approach seeks to heighten awareness and educate around neglected issues, and to inspire and mobilise the private sector. Waste and leakage are eliminated because the system only pays for results, using fixed targets and ensuring a level competitive playing field, whereas the solutions each competitor adopts to solve the problem concerned depend only on them and are best suited to their existing business practices. The nature of the competition, perhaps paradoxically, leadsto the formation of new strategic alliances and partnerships between value-chain actors that can be extended into the future for further innovation in the target areas and beyond.

Prize competitions may end up producing long-term partnerships that drive scaling up and the transformation of market systems to become more sustainable and resilient in the future.

The AgResults initiative is or has been engaged in 10 projects, of which six are continuing. Some of these, like the anti-Aflatoxin project in Nigeria or the on-farm storage project in Kenya, are country-specific, while others are regional (the East African foot-and-mouth disease vaccination project) or global, like the Brucellosis vaccine development project. All of them are based on the principle that the private sector can be encouraged to enter or expand into innovative practices or products that they may not have considered previously. The prize mechanism offers an often substantial return on some modest risk-taking in a new sector or extension of an industrial activity that is already part of a company’s portfolio. This approach can be seen as good practice to foster innovation and productivity growth through collaboration – rather than competition – between

manufacturers or distributors, and which can potentially have a tremendous positive impact on rural households.

This approach is significantly different since it does not require significant engagement by the local public authorities except insofar as the innovation will require local licensing and possible infrastructural support. Any further support – from public extension systems, for example – will have to be negotiated between by the manufacturers on their own behalf, individually, and not by the organisers of the competition, as they compete for the prize.

The initiative to support hermetic storage of grains in Kenya illustrates the case for AgResults.

Hermetic storage is very important for farmers because it preserves grain crops – and possibly others – from insect damage post-harvest. Grain farmers have been suffering post-harvest losses of up to over 50 per cent, despite using chemicals to treat their harvests in storage. Until the introduction of a simple, user-friendly hermetically sealed bags technology, there seemed to be no option but to continue to use chemicals, even though many rural households blamed pesticides for family illnesses, especially among children. The relative novelty of the hermetic bags meant that the companies producing them had to tour the countryside introducing them to smallholders and persuading farmers to invest in them, often using the expenditure originally destined for purchasing chemicals, which was a considerable risk for farmers.

Producers in the manufacturing industry for the bags, were pitted against each other to reach a distribution and implementation goal (21,000 tonnes) that would entitle them to claim a very substantial prize of USD 750,000 and to participate in a final prize of one million USD, distributed proportionately depending on sales. This encouraged them to seek clients/customers in the countryside, to run educative workshops and to locate distributors along the value chain. Once they reached a set number of bags sold and distributed, they received an injection of cash. As a result of the competition, in which nine companies participated, almost 1.5 million units were sold to some 300,000 farmers, representing additional storage capacity of almost 4.2 tonnes.

The outcome was, therefore, a vast increase in the use of the bags, with a concomitant reduction in insect damage as well as in the use of pesticides. In addition, prices on the market were smoothed, since all the grain farmers were not obliged to sell their harvests at the same time and could wait to go to market when the price had risen to reasonable levels. In turn, farmers' quality of life was enhanced through higher and more reliable revenues from grain sales, as well as their being able to consume their own grain long after they had been able to in the past, thus reducing their overall purchases of food and retaining more cash for other uses, such as education for their children and the purchase of health supplies and services

Aflasafe – a safe natural solution to aflatoxin – is made in Africa, initially in Nigeria, but now also in Kenya and Tanzania, and is being distributed across the continent increasingly as it is approved for use by the local national authorities. It uses a relative of

the Aflatoxin fungus to eliminate the toxin with no harmful effect on the consumer of the treated grain. Aflatoxin is important in tropical African countries because it is widespread in maize, carcinogenic and has been found to cause stunting in children. The use of *Aflasafe* to reduce aflatoxin contamination on groundnuts would add USD 281 million to export income in Senegal, alone, while its use on maize fed to chickens would reduce their mortality by up to 40 per cent[13].

Aflatoxin-free grain is considered to be of higher quality and fetches a higher price, so it is a premium product for farmers. However, awareness of the product and access to it needed to be increased and the natural conduit for that awareness-raising were the aggregators of the product and the grain traders who were already reaching out to rural communities.

Hence the prize competition valued at USD12.68 million to increase uptake of the product via aggregators and grain traders to work with smallholder farmers to adopt *Aflasafe* and thereby increase the quality of their maize. Competitors worked with farmers, providing them with value-added services (including access to and training on using *Aflasafe*) and market linkages. They received a premium payment of $18.75 per MT of aggregated maize with a higher than 70 per cent prevalence rate of the product. As a result of the impact of the competition, smallholder farmers benefited from higher yields, linkages to premium markets for aflatoxin-free maize, and consumption of Aflatoxin-free maize. Some 35 companies participated between 2013 and 2019, which was the life of the project, and 213,210 tonnes of *Aflasafe*-treated grain was aggregated, with 75,788 farmers involved.

The project used monetary rewards to demonstrate to private actors the potential benefits of delivering a biocontrol agent to smallholder farmers, while the prize incentive motivated competitors to test out the innovation and prove its effectiveness to smallholders through demonstrations and extension services. As companies built initial trust and credibility, they coordinated with others on the value chain to formalise delivery and technical assistance to smallholder farmers, driving changes in competitors' business models while delivering a range of key inputs. Aggregators also developed partnerships along the maize value chain with input providers, processors, and extension agents to create value-added and increase market demand for higher-quality maize, bringing farmers into formalised, premium markets.

With an interconnected value chain and high demand for a premium product, the maize sector is poised for continued growth – making the entire market system more resilient and sustainable.

In Kenya, competitors created partnerships to build out distribution channels and reach previously inaccessible smallholder farmers. In Nigeria, competitors partnered on value-add activities to drive up market demand and prices.

[13] These figures are provided by the Aflasafe company through its web site (aflasafe.com) and have not been independently verified for this publication.

In both cases, mutually beneficial partnerships increased access, trust, and the delivery of technological solutions, strengthening market systems so that they are more sustainable, inclusive, and resilient.

Where the international community is a partner: Asset management

One of the major challenges faced by all countries, and especially low- and middle-income countries (LMICs), managing the stock of infrastructure assets to keep infrastructures operating to their maximum capacity and in the best condition possible, replacing elements where and when necessary. This can be a costly, wait-and-see procedure in which assets are assumed to be working properly until they are not. Adding new infrastructure creates a further set of problems including prioritising specific areas and installations, replacing obsolete or non-functioning elements, and innovating with new technologies. All this takes place in a context of competition for resources and balancing national with sub-national and local needs. Yet, managing infrastructure assets wisely and efficiently is key to remaining on a sustainable development path. For this reason, two United Nations entities – the Department of Economic and Social Affairs (DESA) and the Capital Development Fund (CDF) – have joined forces to produce the United Nations Handbook for Infrastructure Asset Management for Sustainable Development. This manual is not supposed to provide all the answers for every situation – which would be a top-down approach – but to inform managers of the tools and procedures that will help them maintain and replace infrastructures in a sustainable and optimal manner. It recognises that infrastructure asset management is a collaborative affair, building upon partnerships between all levels of government, with a broad base of interaction.

Infrastructure assets are all physical assets that are essential to realising sustainable development, including traditionally thought of infrastructure (roads, services etc), as well as the land that these are built on, the buildings that house essential services (schools, health facilities, government) and the equipment, including IT facilities, needed to operate and maintain them. While only some 15-30 per cent of the cost of an asset is its acquisition or construction, the rest is accounted for by the cost of maintenance and running expenses. Significantly, underinvestment in asset management may be costing some developing countries some 2 per cent of GDP growth per annum.

The subject of infrastructure asset management has not been fully explored or understood until recently. In 2017, UN DESA and the department's partner in the CDF decided to undertake a review of municipal asset management for sustainable development in a selection of least developed countries (LDCs). The project included on-site workshops to explore, learn and enrich the experience of participants in four pilot countries: Bangladesh, Nepal, Tanzania and Uganda, with the intention of training individuals who would become instructors for their colleagues.

Since efficient and fully operational infrastructure is essential for implementing 92 per cent of the actions needed to reach the SDGs, management of these assets is vitally important. Hence, the unavoidable and basic first step is to establish an inventory of what assets are available, which continue to be relevant, which of them need attention, and which assets are lacking. From there, on, it is necessary to establish priorities for

developing and/or expanding relevant assets. At the base is the creation of relationships that can feed information into relevant areas, which are defined by the handbook, allowing for a co-ordinated and effective management approach at the appropriate level of administration.

The handbook is a comprehensive tool kit of practical knowledge for asset managers presented in a manner that is accessible and relevant for all national and local contexts. It includes a wide range of examples taken from the real world and selected as a result of extensive consultations with stakeholders in a number of national and regional environments. The handbook is structured with four parts: Introduction, with a technical glossary and list of abbreviations; Fundamentals, where the foundations of effective infrastructure asset management are detailed; Focus, where more complex, but critical aspects of asset management are dealt with; and Annexes, where real life experiences, action plans and the nature of UN system capacity development support is outlined.

In order to enhance access and reach non-specialists who are responsible for infrastructure asset management, the handbook uses a very visual approach, with clear diagrams and graphical material highlighting key aspects of asset management. It uses the "six 'Whats' of asset management": what and where is the asset? what is it worth? what is its condition; what is its remaining service life? what service does it require? and what should be fixed first – setting priorities. These are the six questions that the team that created the handbook asks at the beginning of the implementation workshops. After the assessment, the process moves to establishing an action plan and the steps that will constitute such a plan.

The core of the handbook – and its essential product – is in parts two and three. Here, in part two, the basic information on which management is founded is outlined and explained. This section aids practitioners to identify infrastructure asserts within their purview and outlines how to identify those assets that are vital to sustainability. Part three gives some guidelines about managing assets in the context of specific national need and establishing a national enabling environment. It uses a diagnostic tool based on field experience to reach an asset management plan in five steps: policy definition; stakeholder identification and contributions to maintenance; review of current management methods; identify where improvements are needed to meet identified goals; and formulation of strategies to maximise asset contribution to reaching the SDGs.

The handbook was created after 30 rounds of consultation with experts and practitioners in the areas of asset management, climate resilience, disaster risk reduction, urban development, and related fields. The project conducts on-line training including a three-part Online Solutions Dialogue, at the end of which those who successfully complete the courses are awarded a certificate in infrastructure asset management. This is ongoing and over 800 people from Africa, the Asia Pacific region and Latin America and the Caribbean have participated in the first two of the three workshops of the dialogue. An offline workshop – a Massive Online Open Course – MOOC – allows self-paced training for a wider audience. Future activities of the project will be a widening of the workshops, targeting of individual countries, training of trainers and partnering with institutions both

inside and outside the UN system to increase impact, scale and sustainability. The handbook, itself, is intended to be available in several languages some of which will be local languages in a number of countries.

In future development, the Handbook is intended to support the training of trainers in central and municipal government in the application of asset management tools over a wide area of LMICs. From there, the team is expecting to provide field support to local governments in the implementation of asset management action plans and related tools, as well as workshops targeting Ministries of Finance and Ministries of local governments on building an enabling regulatory policy, and legislative environment for asset management. To facilitate expansion of asset management strategies, there will be a need to create strategic partnership within and outside the UN system (UNCDF, UNOPS, UNDP, GIZ, regional development banks).

Chapter Three: Policies for Sustainable Industrial Development[14]

The role for the right policies

Proceeding towards the Sustainable Development Goals (SDGs) will present policy challenges to jump start a process of sustained – and sustainable – industrial development in low-income countries, which is enshrined in SDG 9 ("Industry, Innovation and Infrastructure"). In addition, a range of policies – including those pertaining to trade, labour market, infrastructure, education and training, and technology – have a bearing on the prospects for successful industrialisation. These policies also come within the orbit of SDG 8 ("Decent Work and Economic Growth"). Attracting foreign investors may be possible in certain sectors, depending on comparative advantage and given a conducive investment climate. Policies can be designed to provide incentives to private actors, helping them to reach investment decisions, while others can fill gaps and remove bottlenecks that may be holding back desired transformation. Achieving structural change – which may include inadequate and inefficient infrastructure, inappropriate protections for national investors and innovators, insufficiently skilled workers, poorly trained engineers and managers, rudimentary or inappropriate technological capacities – can be a serious challenge for developing economies. However, strategic industrial policy and institutional support for certain industries or activities may be appropriate, where potential exists to create domestic technological capabilities and build strong domestic competitors. Building strong domestically owned industries is a challenging proposition that depends on strengthening domestic technological innovation and adaptation capabilities. Hence, policies and institutions crucial to steering the economic transformations will need to be implemented and nurtured throughout the 2020s if there is to be any hope of achieving the SDGs and the Paris Agreement target of 1.5 degrees centigrade.

Building scientific and technological capabilities for industrial development

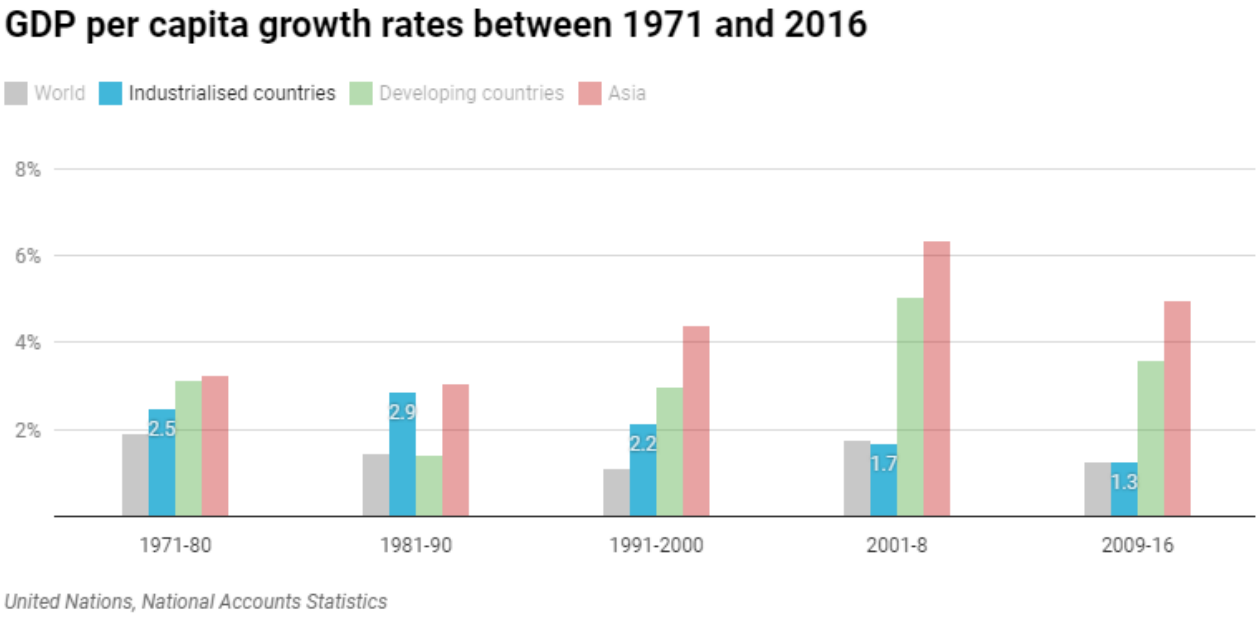
Building a strong and broad industrial base has been a process that has eluded all but a few countries, but it has allowed the populations of those countries to achieve high standards of living and constantly improving livelihoods. Europe and North America dominated the global industrial scene up until the end of the Second World War, in the wake of which industrial development and catch-up occurred in Japan, the Asian Tigers were the outstanding example in the post-WWII period. Most recently, China has joined the ranks of successful, broad-based industrialisers, with India also moving in that direction.

[14] This chapter draws heavily on presentations to the virtual 2020/2021 Sustainable Development Transformation Forum by Ambuj Sagar, Edward Mungai, Andrew Mold, and Helen Hai.

Explanations for the raid growth in Asia – especially that of the four "Tigers" – vary, but, although the growth took place more or less at the same time, from the 1960s to the present day, these economies all have different profiles, policies and populations. They also exhibit differing degrees of openness and these change over time. To take the South Korean example, early in the country's industrialisation it was a fairly closed economy but, as growth and industrialisation gathered pace, it became more open. Not only was South Korea relatively closed, it was also a directed economy, with government's having a very close relationship with the private sector.

So, there is no "blueprint" to follow for other countries in drafting their own industrialisation policies. In addition – and this is of the greatest concern today, in contrast to the 1960s and 1970s – we can no longer accept the notion of "industrial growth at any price". In the 21st century, we need policies that can drive *sustainable* growth. The "Tigers" and China, along with other high-growth economies and the countries of Europe and North America, are grappling with this problem; new or potential industrialisers will need to confront it head-on.

Figure 3.1: Per capita rates of growth across country groups



Source: Nayyar.D,in Resurgent Asia

While policy makers and their advisors seeking answers to the challenges of sustainable industrial development is desirable, it is already clear that science and technology development hold many of the keys. The difficulty (and the merit) of science and technology is that they are fast evolving. Advanced areas such as material science and nanotechnology are big game changers, and we have the extreme example of the race for a vaccine against COVID-19, which has been incredibly rapid based on remarkable progresses in biology. The rapid movement in this field of biology in the last few decades poses a challenge for newcomers, especially developing countries. To keep up with these

and other developments, a country needs a critical mass of science and technology human capital. That is, a cadre of educated and trained people capable of interpreting new information and implementing change that is beneficial both to industrial development and to sustainability. Thus, creating a strong scientific and technological base is crucial, including through investing in education at every level to ensure a regular output of qualified people who will enter the economy with the skills necessary to recognise and implement relevant innovations.

Those skills will be on a much broader spectrum of capabilities than has traditionally been the case, even to achieve what may seem like fairly narrow industrial goals. Education policy must go hand-in-hand with industrial policy and be based on an understanding of the needs of the particular trajectory of industrial development that has been selected. Education policy should, therefore, be in line with industrial policy and aimed at broad and long-term prospects.

No country has so far been particularly successful in low-carbon, zero-emissions industrial development, but some are advancing more rapidly than others, thanks largely to strong signals from government policies influenced by the urgency of reaching the SDGs. In principle, today's late industrialisers are able to benefit from adoption of the latest and "greenest" technologies being developed, assuming relatively free flows of goods, services and capital. To absorb and adapt such technologies, however, will depend on the same domestic technological capabilities needed for domestic innovation. Embarking on sustainable industrialisation is to become part of an enormously large and complex process that must be approached with the right perspective. The objective of self-sustaining sustainable industrial development will not be achieved overnight, which is why so few countries have had any success in doing this. The Republic of Korea is something of an exception, but, even there, the concept of sustainability and green growth came well after the industrialisation was underway.

Special attention needs to be paid to areas such as energy and transport, where capital stock is long-lived, and policy choices get "locked-in" for decades with the risk of premature obsolescence, or stranded assets. Countries with sizeable fossil-fuel endowments face this risk acutely, especially oil- and gas-exporting countries, since global oil and gas markets will be significantly impacted in coming decades as countries move to decarbonise their economies. Policies need to be based on realistic scenarios derived from actual experience. From there, careful and strategic planning and policy making are needed to design and implement a sustainable industrial policy. The one, clear lesson from the experience of the Asian Tigers is that countries have to make choices that are aligned with their national development objectives, their national context, and their national capabilities.

From this perspective, heavily resource- and extraction-industry-dependent countries have some hard choices to make, but they are necessary. Until recently, in some African countries, for example, exploitation of their oil and gas resources was seen as their path to industrial development. In pursuit of the SDGs, such resource-based development can no longer be acceptable because of its impact on climate change and sustainable

development. There are only two ways of stopping the rise in carbon emissions from fossil fuels: reducing emissions and carbon sequestration, which means either leaving it where it is, or putting it back in the ground. On the face of it, neither option for resource-dependent countries seems particularly attractive.

Compensation for countries that decline to exploit their fossil fuel reserves is one option – perhaps the only one – for supporting industrial and social development in such countries. However, compensation is a very sensitive subject, and the amount of compensation is remarkably difficult to assess. It is sensitive because it can appear to hit industrialised countries with a double blow: the cost of providing compensation to carbon-exporting countries, and bearing the cost of reducing their own dependence on fossil fuels. Assessing the rate of compensation for a *potential* rate of extraction depends on so many factors and unknowns that arriving at a just value acceptable to all is uncommonly difficult, perhaps impossible.

The "bottom line" is that hydrocarbon-dependent economies will continue to extract fossil fuels for the foreseeable future to support national development. Their national development policies, however, will eventually have to contain measures to wean them off such dependence.

It is absolutely clear that governments have a responsibility and a duty to pursue policies that support the economic and social development of their populations. That includes people's right to breathe clean air and have access to electricity that is produced from renewable resources. The welfare component of policy is also a part of industrial policy; there can be no trade-off between growth and well-being, even if, early on in industrialisation, there can be welfare costs, as in the case of the Asian Tigers. Temporary setbacks in terms of social development cannot be extended indefinitely in the name of industrial development. No developing economy wants to be living in a climate disrupted world, because the costs of a climate disrupted world are enormous and are likely to undo any gains from economic development. The impact of climate change and unsustainable development on sectors such as agriculture, for example, are significant and real. Industrial policy, development policy and social policies are, thus, intertwined and there is no option to consider one to the exclusion of the other.

Private-sector innovation for sustainable development

Policies designed to promote and sustain sustainable approaches to development cannot exclude the private sector. While governments fund universities and research institutes, innovation still comes from private actors, including privately funded research and development. Public policy and private initiative should co-exist in symbiosis to produce optimal outcomes. Yet, such mutual support is too often lacking in low- and middle-income countries.

African entrepreneurs are becoming more active in developing low-carbon climate-friendly innovations that can contribute to the continent's sustainable industrialisation and climate change adaptation. There seems to have been a recognition that new technologies can offer possibilities that did not exist in the recent past. The classic example of this innovative dynamism in Africa is the M-Pesa system of small-scale

payment transfers through the cellular phone network. It effectively bypasses banks and even has a micro-finance scheme to deliver small amounts of loan to rural households. Originally developed in Kenya, the system has been exported to Tanzania, Mozambique, Democratic Republic of Congo, Lesotho, Ghana, Egypt, Afghanistan and South Africa. The idea of innovating with new technology has been gaining a lot of traction in industrial development using low-carbon technology. The African continent is beginning to see more people-oriented solutions that can cope with challenges of climate change. However, while innovative technology and green solutions continue to develop and attract adherents, the lack of policies and appropriate financial infrastructure continue to hobble sustainable industrialisation.

In Kenya, for example, public policies – or the lack of them – create obstacles that any entrepreneur has to overcome. In a specific area that impacts sustainability and carbon reduction – the replacement of propane by biogas – the lack of standards and appropriate regulations and tax policies means that biogas cannot compete on the market for portable gas supplies, even though the technology has been proven and the product a viable alternative to propane gas. It is left to civil-society organisations like the Kenya Climate Innovation Centre to lobby for changes to government policies and argue for measures and policies that militate in favour of sustainable development innovations and identify unsustainable practices and industrial activities.

In every situation, including that concerning adaptation and innovation to support sustainable industrial development, entrepreneurs and innovators require an enabling, rather than a restrictive regulatory environment. There is vast room for policy makers and regulators to come to the aid of innovative entrepreneurs through dialogue and communication to create and maintain an enabling environment and liberate the forces of innovation in the service of sustainable development.

However, none of this will be possible without access to appropriate forms of finance for innovative entrepreneurs (nor, indeed, innovators of any kind). Financing for innovation in developing countries is rarely adapted to entrepreneurs' needs and purposes, which are viewed by banks and other financial institutions are supremely risky in an environment that is habitually risk averse. Other sources of funding – such as seed funds, "angel" funding for proof of concept, economic development grants from different levels of government, etc – that can be found in the industrialised countries are generally unavailable in low- and middle-income countries. The financial architecture is one where there are few, if any private investors, willing to risk investing in early-stage innovation such as prototype production and the public sector has not filled the gap.

There is little business advice in many countries from the financial sector to guide innovative entrepreneurs towards financing that is adapted to their needs, even if such financing is outside the national jurisdiction or potentially partnered with the traditional lending institutions. The public authorities are also not prioritising this kind of advice and it is not seen as a priority function of government. There seems to be an attitude fixated on traditional, short-term results rather than looking at long-term gains. There is not enough pressure on governments to see alternative solutions.

It is widely believed that natural progression in new ideas leads to a stage where a promising innovation will eventually find access to venture capital. However, the opposite seems all-too-often to be true. Even impact investors need to "broaden the pipeline", so that they can finance the value chain early on, from education to innovation to proof-of-concept to commercialization. This calls for a mix of public finance, risk capital, and social capital funding. Such blended public-private risk capital may be the only real option to support such start-ups.

In many developing economies – especially those that face the challenge of late industrialisation – there is a lack of the intellectual and skills capacity required to bring new ideas to the table. Levels of technical and business skills hinder the emergence of new, marketable ideas and their arrival on the market. Innovators may represent a wellspring of ideas for new products and services, but they are often not able to produce the items they have conceived due to lack of technical knowledge preventing them to enter into production. When innovators do possess the necessary capabilities to produce their innovation, they often have no experience of setting up and running a business, dealing with the financial sector or coping with the regulatory environment. The case of biogas in Kenya is a perfect illustration of this set of obstacles.

Moreover, since there is a shortage of training facilities in business, start-up innovative entrepreneurs have difficulty separating their business from their personal life. The concept of a limited company or a corporation is often foreign to them and, even if they are aware of the existence of such solutions, they have no idea how to go about creating the necessary structures. Indeed, the range of options and obstacles may be so complex as to deter a – possibly young – innovator from setting up an enterprise at all, which, of course, starves the economy of new ideas.

Supposing that a young entrepreneur with an idea of a product or service that would contribute to sustainable development actually reaches the stage where she or he has enough support to produce a prototype, the product will have to meet market and regulatory standards. However, there are very few places where products can be tested and very few protocols governing the products that can be manufactured for the home or international market. This is a government responsibility where – as in low- and middle-income countries – there is little incentive for the private sector to take it on. Even where such facilities do exist, there is a culture of distrust that discourages innovators from sharing their ideas; this is particularly true where intellectual property rights are ill-defined, difficult to obtain or, simply, disrespected. There can be a belief that innovations will be purloined through unscrupulous officials or by competitors' copying models and designs.

Price differentials can add to an innovator's woes. As Bill Gates argues in *How to Avoid a Climate Disaster*, most sustainable products still command a "green premium", meaning that they are more expensive than their 'brown' competitor products[15]. Of course, the

[15] Gates gives this example of a Green Premium: "The average retail price for a gallon of jet fuel in the United States over the past few years has been around $2.22, while advanced biofuels for jets cost around $5.35 per gallon. The Green Premium is the difference between the two, which is $3.13, or an increase of more than 140 percent." (https://www.gatesnotes.com/Energy/Introducing-the-Green-Premiums)

prices of the 'brown' products normally fail to include their full costs, including the external costs to the environment (for example by contributing to climate change). Fiscal policies can change relative prices by taxing pollution or subsidising 'green' products, for example, but few countries employ these on a scale that would make a material difference. The fact is that, in a low-income country where many people lack access to any electricity, making fossil-fuel-generated electricity more expensive is often seen as politically self-defeating, and governments lack the fiscal space to provide adequate subsidies for 'green' energy. So, progress happens only slowly, if at all, towards cleaner energy.

Still, the problem of climate change is worsening not improving, so countries will be confronted with hard choices. The expectation is that the developed world will accelerate innovation and deployment of low-carbon technologies, driving down their prices rapidly to the point where they become an attractive option for low-income countries. This is happening already with solar power and wind power, but needs to happen more widely to enable sustainable, low-carbon industrialization in low-income developing countries.

Meanwhile, the innovative entrepreneur in Africa, Latin America or Asia remains confronted with obstacles that only public policy can lower, aided by private actors, in the realisation of improving the economic, social and regulatory environments. Good governance means not only being transparent and honest, it also implies adapting policy to support sustainable economic growth. To do that, innovation for sustainability should be supported and encouraged. A multi-linear approach is called for, in itself innovative. The financial sector should be encouraged to invest in innovation, rather than falling back on its legendary risk-averseness. Education policy should move beyond basic skills and take on board the responsibility to train young people for life in the real economy, which includes running a business or supporting one. Familiarity with new and up-coming technologies within an educational context should be fostered and offered equally to all students irrespective of gender or socio-economic background.

In Kenya, innovation centres have been supporting entrepreneurs by advising them on how to deal with government, especially to effect supportive policy change. Such centres must also lead by example, which means they are self-sustaining, even if they needed seed finance to begin with, often from international development agencies, such as the World Bank. Their major advantage is that they are able to attract talent locally, but also from the diaspora, so that they can counsel and advise actual or potential entrepreneurs on their dealings with the public authorities, as well as with the market. Since they are run by experienced and proficient staff, the innovation centres can support innovators in the very early, upstream stages that are the least attractive to investors on the open market. Even impact investors need to think about how to widen the investment pipeline, rather than investing in what it already contains. Hence, there is a need to increase the flow of financial resources back along the value chain to reach innovative entrepreneurs and increase their impact on sustainable development.

State institutions will need to be reformed to acknowledge the reassessed responsibilities of the state in fostering innovation for sustainable development. That

means that the regulatory environment and standardisation framework will need to be adapted to the needs of innovative entrepreneurs ready to contribute to sustainable goals and allow them to establish a reputation for quality and to access export markets. Registration of patents and other intellectual property rights should be streamlined and ring-fenced to avoid unscrupulous "leakage" of ideas and new products. The "green premium" needs to be decreased and eliminated, while the true costs of unsustainable production must be imposed on "brown" industries to pay for closing the gap.

Only when such reforms, which includes a wider definition of "good governance", have been implemented will innovative entrepreneurs be persuaded to place their trust in the policy environment and bring their full contribution to sustainable economic growth.

Trade agreements and sustainable industrial development

Trade and trade liberalisation inevitably impact on the environment and sustainable development through enlarging demand greatly beyond the domestic market, which allows for the scaling up of production. To the degree that production activity pollutes, one would expect adverse environmental impacts. On the other hand, freer trade should allow greater access to imports of the latest technologies, which theoretically are less polluting than older technologies. There are other possible effects that cannot be comprehensively explored here including, for example, growth in profits and the possibility of market domination by stronger enterprises in the largest or more advanced economy or economies in a trade agreement.

In terms of human living standards, to the extent that trade expansion stimulates economic growth, and to the extent that income increases are relatively equally distributed, trade liberalisation should have positive social and economic impacts. If that is to be the case, with higher education levels and raised awareness, public pressure for sustainable development should play a positive role in supporting progress towards the SDGs. The experience of most advanced democracies would tend to bear this out. However, there is also evidence of resistance to sustainable practices in some quarters because of a perceived threat to livelihoods or living standards – the extractive industry presents some examples of this push back. However, trade agreements can present an opportunity to break free of the subordinate relationships that low- and middle-income countries have long experienced in the global economy.

The African Continental Free Trade Area (AfCFTA) is one such attempt. This new agreement can be understood against the backdrop of Africa's historical experience of trade integration into the global economy and value chains. It has long been understood that African economies can present significant complementarities that have been ignored in favour of international trade, often because of trade barriers erected by the countries, themselves. In countries in which the informal economy plays a large role and provides incomes for a considerable proportion of the population. Indeed, the International Labour Organisation estimates that 89 per cent of employment in sub-Saharan Africa in 2016 was in the informal sector; with 71 per cent in the Asia Pacific region and 68 per cent of workers in the Middle East and North Africa employed in the informal economy. This predominance of informal sector jobs and enterprises presents

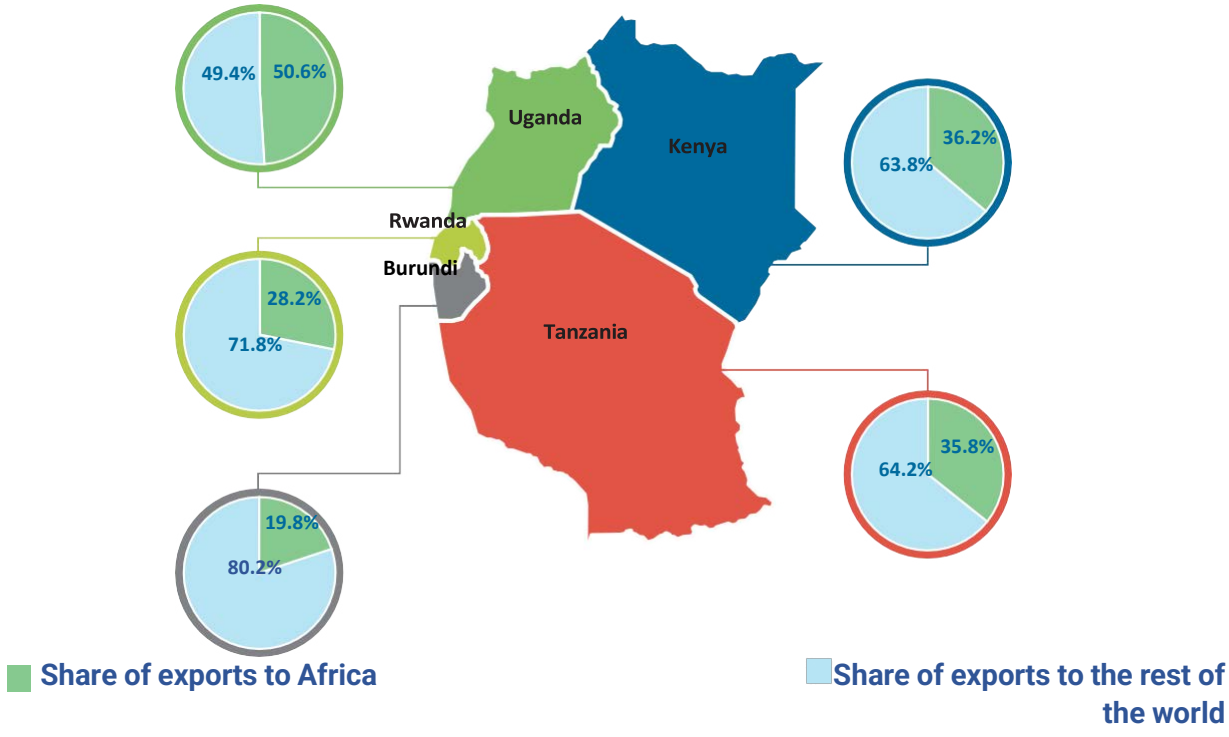
a particular problem for tax collection. Border tariffs, however, though there is "leakage" through corruption, do present an opportunity for fiscal revenues that governments are unwilling to abandon. Open borders, therefore, are prima-facie unpopular both because they deprive governments of tax revenue and because they may seem to invite foreign domination of the local market, which also has an impact on fiscal balances.

The patterns of trade in Africa, which have evolved partly as a result of colonialism and enduring post-colonial cultural and economic ties are not only generally unfair – because they tie the terms of trade to specific levels without offering access to more developed and lucrative sectors of the dominant economy – they are also far from being environmentally sustainable. For example, "French" beans from Kenya are sold in supermarkets in Djibouti via France. The extent of such indirect transhipment of goods is wide, involving large volumes of needless carbon emissions from the burning of fuel for aircraft and diesel for ships, as well as fuel for ground transport. In terms of economic and social benefits of trade, traditional preferential trade agreements involving African countries with non-African economies – like the African Growth and Opportunity Act (AGOA) – can have a distorting effect that may well have been not their proponents' initial intention. For example, such agreements have created some jobs in countries like Kenya, but had a devastating effect on the domestic garment industry through stiff competition from the flood of cheap imported second-hand clothing. If the aim of policy is to stimulate economic growth through local sustainable industrial development, sacrificing a labour-intensive industry, such as clothing, is counter-productive. Besides, it is simply bizarre to hear that Africans export new clothes to the US, only to re-import them, after Americans have worn them, as second-hand clothing. It would obviously make more sense to produce clothes for the domestic market.

When more advanced industrial development is concerned, the effects can be even more negative. An example is the hesitancy of vehicle manufacturers to build new production facilities closer to their market because they see the market inundated by used vehicles that are also major polluters, in addition to being sold on the market at prices that cannot be met by new vehicle producers. As a result, automobile manufacturers such as Volkswagen that were considering expanding production to other parts of the continent from their South African base have placed such plans on hold.

Africa's integration into global value chains can often be lop-sided. It can mean market access for niche products and tropical produce, but run counter to plans for sustainable industrial development. It also tends to prolong African countries' isolation from each other in trade. East Africa provides a clear snapshot of this isolation. In the region, only Uganda has a trade share where intra-African trade and trade with the rest of the world approach comparative levels. Elsewhere in the region, some two thirds of trade is with countries external to the African continent and in the case of Burundi non-African trade is four times that of trade with other African countries.

Figure 3.2: Share of intra-regional trade in East Africa



Source: ECA calculations for the 2016-2018 three-year average, using UNCTADStat (2019).

The response from African countries has been to consider the lowering and eventual removal of barriers to trade between them through the AfCFTA. Such a comprehensive economic agreement based on reciprocal, rather than on preferential arrangements, is expected to result in the largest free trade area on Earth when it reaches maturity. It will shift trade patterns and result in a much higher proportion of intra-industry trade in African countries' imports and exports including automobiles and parts, textiles and clothing, and increasing rates of industrial products as domestic industries become established protected from overwhelming non-African competition. In addition, the growth of regional markets for manufactures should diversify African countries' trade away from the continued heavy reliance on primary commodity exports which, for a long time, has disincentivised diversification. The growth of regional and continental markets and facilitation of regional trade should also improve food security, as localised negative environmental crises, such as crop failures, can be compensated more easily by emergency imports from neighbouring countries.

Africa has low carbon emissions but suffers disproportionately from the consequences of climate change, which is particularly affecting the most vulnerable populations. People in the different regions of the continent are very aware of the urgency of adopting measures of mitigating climate change as they witness dramatic changes in their daily lives. More volatility in climate patterns means often catastrophic impacts on agricultural activity, food insecurity, stress on water resources, thus aggravating latent conflicts and

population displacement. Localised environmental problems are increasing. African natural sites and cultural heritage assets are increasingly affected by the effects of climate change. Urban centres are experiencing problems of congestion and pollution that were largely unknown three decades ago. This growing awareness of climate change at the local, national and continental levels lets foresee potential for the free trade ushered in by the AfCFTA to trigger concerted action for environmental sustainability and contribute positively to reducing Africa's carbon footprint and global efforts to reach the SDGs.

One area in which free trade can contribute positively to sustainability and development is energy. The biggest project in East Africa is the Grand Ethiopian Renaissance Dam, for which the reservoir filling started in 2020, will be able to produce up to 6,000 Mw of electrical power. While the stated primary purpose of the – albeit controversial[16] – dam-building project is to supply the Ethiopian national grid, surplus energy will be exported to neighbouring countries, including Kenya that already purchases electricity from smaller existing hydroelectric installations in Ethiopia. Hence, some of the necessary infrastructures have been put in place. There is huge potential for investment in extending power sharing – including hydropower and complementing and/or back-up alternatives such as solar and wind power – throughout the East African region and similar opportunities elsewhere in Africa. Since energy supplies are vital to economic development, especially in industrial projects, developing regional and, eventually, continental grids can give a major boost to growth. If those grids are based on renewable resources, such as hydro power, wind and solar infrastructures, the contribution to sustainable industrial development can be considerable. This fact has been recognised by African countries and contributed to the thinking behind the AfCFTA.

Another area that can benefit from regional trade liberalisation is transport. Reducing the need for polluting conventional fossil fuel-powered vehicles is important and steps are underway already in East Africa to reach the goal of clean transport through projects such as the Northern and Central Corridors designed to provide road and rail access to landlocked countries like Burundi and Rwanda. From the other side of the continent, the Lobito Corridor runs from the port of Lobito on the Atlantic Ocean across Angola to the Democratic Republic of Congo and Zambia, while in West Africa a combination of road and rail is planned to link the coast of Côte d'Ivoire with Burkina Faso and Mali. Indeed, the total length of the 448 large-scale transport projects in Africa is over 110,000 km at a cost of USD 430.4 billion. The impact, however, will be considerable, opening new horizons for trade and the movement of people, and giving a dynamic thrust to economic and social development regionally and in Africa, as a whole.

Table 3.1: Selected sub-Saharan African transport corridors

[16] The Grand Ethiopian Renaissance Dam (GERD), which will be the Africa's largest hydropower plant, when operational, built on the Blue Nile river, has raised political tensions with downstream countries – Sudan, where the Blue Nile merges with the White Nile, and Egypt where the White Nile river flows northwards, feeding Egypt's High Aswan Dam (HAD), and irrigating a major part of its agriculture lands downstream.

Selected transport corridors in SSA, routed from major port cities to inland destinations		
Corridor	**Distance**	**Transport mode(s)**
Central Africa		
Douala Corridor: Port of Douala, Cameroon, to the Central African Republic to Chad	1,800 km	Road, some rail
Lobito Corridor: Port of Lobito, Angola, to Lubumbashi, Democratic Republic of the Congo (DRC), to Lusaka, Zambia	1,345 km	Road, some rail
South Africa		
Walvis Bay Corridors: (1) Port of Walvis Bay, Namibia, to Lusaka, Zambia, to DRC; and (2) Port of Walvis Bay to Botswana to DRC	(1) 2,100 km to Lusaka (2) 1,800 km	Road
West Africa		
Port of Abidjan, Côte d'Ivoire, to Burkina Faso to Mali	1,200 km	Road, some rail
Lagos to Niger	1,500 km	Road
East Africa		
Central Corridor: Port of Dar-es-Salaam, Tanzania, to Rwanda to Burundi to Uganda to DRC	1,600 km to Kampala, Uganda	Road, rail, inland waterways
Northern Corridor: Port of Mombasa, Kenya, to Rwanda to DRC	2,000 km	Road, rail, inland waterways
Source: Economic Commission for Africa, "The Development of Trade Transit Corridors in Africa's Landlocked Countries," in *Assessing Regional Integration in Africa (ARIA IV)*, 2014, 248, Table 7.1: Main Corridors in Africa.		

There is still room for improvement and green sustainability needs to be promoted through more investment in sustainable forms of transport, such as standard gauge railways, water transport and, eventually, electric vehicles. Transport corridors connect

inland countries to ports, but they also connect African countries with each other and, thus, stimulate trade within the continent and, by reducing costs, can help to grow the continental market in sustainable ways, while reducing dependence on exports.

Structured sustainability

There is growing evidence that African countries are seeking to embark on a sustainable development path, even if they are progressing slowly. One method is the creation of business parks that will eventually benefit from locally produced energy from renewable resources, such as the Great Ethiopian Renaissance Dam and solar and wind electricity-generating capacity.

As China and the Asian Tigers mature and the costs of production increase, there is room for developing countries to move into manufacturing that was previously dominated by the rapidly industrialising economies. This movement can be seen in Viet Nam, for example, but also in the low- and middle-income countries of Latin America and Africa, with the transfer of labour-intensive industries to where labour costs are lower and the proximity to markets closer.

Forward-looking, pro-active governments can take advantage of the opportunities this presents to attract Chinese manufacturing investment, create jobs and build a domestic manufacturing base. The progress in regional and continental integration of energy and transport infrastructure supports the development of sustainable industrial bases in African countries. The industrialisation process is partly motivated by the example of China that has encouraged African entrepreneurs and the public authorities to see industrialisation as a sustainable goal for development and growth. Ethiopia has been in the vanguard of the movement, partly because of advice in 2011 from the World Bank's then Chief Economist, Justin Yifu Lin, who recommended the "demonstration" approach of establishing working examples of what could be achieved, with the objective of encouraging entrepreneurship, creating mass employment and reducing poverty.

The process of sustainable industrial development is not without its challenges and some entrenched biases will have to be discarded. The supremacy of the customs officer is one; there will be no place for zealotry and holding up the transport of manufactures, as has too often been the case in the past. All departments of the state will need to follow the same path of facilitating entrepreneurial activity that follows the sustainable principles of the SDGs. Challenges remain, but solutions exist. Strong directives from the central government accompanied by effective enforcement can minimize problems, including providing adequate compensation to customs officials to reduce the incentive for corruption.

The manufacturing world is changing, evolving with the advance of technology and what were once labour-intensive industries – like shoemaking, for example – may become more automated and, thus, reduce the attractiveness for investors of countries where labour is less expensive. For many industries, however, automation has not yet rendered manufacturing jobs redundant, and it is important for developing countries to use the current window of opportunity to create a skilled and educated workforce that can successfully evolve into the new technological age.

Chapter Four: Building local sustainability

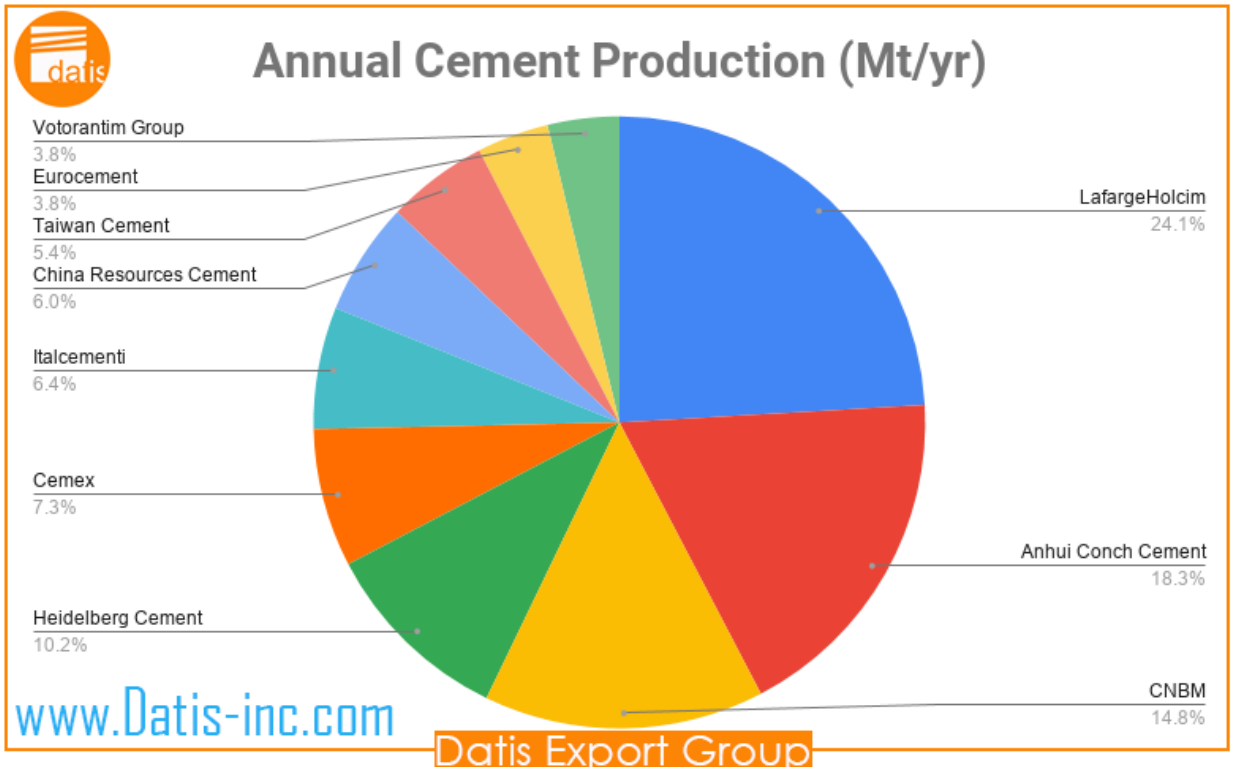
Agriculture and agro-processing represent the largest share of the economies of almost all African countries and employ major proportions of the labour force. As agriculture becomes more sophisticated and efficient – especially by using new, sustainable methods requiring less energy and fewer environmentally corrosive inputs – prosperity in the countryside will grow, new agro-industries will be created, and existing ones will expand. That process will create demand in low- and middle-income countries for consumer goods, improved infrastructure, and housing and construction. In the process of urbanisation that can be seen in virtually all developing countries there will be more pressure on both land and on the housing market, which, in turn, will drive demand for construction materials. Hence, the construction-materials industry can be expected to be a sector of rapid growth. However, the sector traditionally includes some of the most carbon-intensive industries. The opportunity for developing countries, especially in Africa where the industry is still underdeveloped, to foster sustainable approaches to construction materials industry development is considerable and offers the potential to leapfrog advanced economies as low-carbon process options are developed and deployed.

Cementing sustainability

As Africa can be expected to enjoy some of the fastest growth in building and housing construction over the coming decades, the construction sector in Africa should aim to "get in on the ground floor with new low- to zero-emission construction technologies and materials. Joint ventures with world industry leaders may be one way to acquire state-of-the-art technology, even as African countries build up their own domestic R&D capabilities.

As a fundamentally "heavy" industry, the cement business is obliged to have a local presence in the markets it serves. With the exception of a few historical outliers, concrete is not an economically viable importable commodity. Hence, the market is supplied either by local firms or by the local subsidiaries and affiliates of multinational companies. The largest of these is the Swiss-based group LafargeHolcim with almost a quarter of the world cement market and affiliates in over 60 countries, including 14 in Africa.

Figure 4.1: Annual cement production by producer (percentage)



Globally, concrete is the most widely used construction material including for housing. However, despite its flexibility and the relatively easy availability of concrete, 1.6 billion people, many of them in rural areas or recently moved to the cities, are inadequately housed. They need to be provided with decent housing, but in an environmentally sustainable manner, while building structure and infrastructure demands will continue to increase and they, too, will require solutions that comply with the principles of the SDGs. The adoption of the SDGs, together with the global realisation that climate change and the threat of unsustainability are real, has prompted new thoughts and approaches to the production of construction materials, as well as their use. LafargeHolcim is one of the companies that has adopted a programmed evolution towards net zero carbon emissions by 2050. A significant portion of the industry's carbon footprint comes not from the type of energy used for heating but from the actual "sintering" chemical process that produces clinker. The company is working to re-engineer the cement-making process while seeking adequate zero-carbon substitutes.

Given its global dominance and, significantly, its skeins of affiliates, the company is a definitive actor in the search for construction materials that comply with the sustainable approach to economic and social development, as expressed in the SDGs.

LafargeHolcim has opted for using a portfolio of approaches to shrink its carbon footprint, including carbon capture, green alternative building materials, newer technology, use of renewable sources of energy, maximising the efficiency of existing fuels, and recycling/reusing waste. It is developing new products such as "EcoPact" green concrete

enabling carbon-neutral construction and Susteno, a new "circular" cement with at least 20 per cent recycled material. In 2019, one third of all LafargeHolcim's sales were generated by "green" solutions.

One of the first steps in reducing CO_2 emissions was to substitute other energy sources for coal and oil – notably biomass – to provide heat for the cement-making process. Also, the composition of cement – essentially by lowering the clinker content – evolved to meet environmental regulations in Switzerland. This could have been a high-risk move, but comprehensive testing proved that the mechanical properties of low clinker cement compare favourably with those of plain cement, depending on the process used, so other cement producers will be able to emulate the LafargeHolcim experience and contribute to reducing the carbon footprint of the industry globally.

For innovations to be sustainable, they have to be cost-effective and accessible. While LafargeHolcim and other cement and concrete manufacturers are working to reduce the carbon footprint of the production process, there remains the challenge of making a product that is affordable and accessible without compromising its sustainability. That is, a product that is both "green" and cheap". Initiatives like the one in which LafargeHolcim is engaged in Malawi, Kenya and Côte d'Ivoire, offer some promise in bringing affordability to housing and social construction, though still not bringing the cost of quality, durable housing within reach of the vast majority of the inadequately housed.

The *14Trees* Programme, which is a joint venture with the United Kingdom's development finance organisation, the Commonwealth Development Corporation (CDC Group), aims to reduce the carbon footprint of low-cost housing and public amenities. It uses a proprietary technology to produce *Durabrics*, which are compressed stabilized earth blocks made with local red soil, sand and cement and water, compressed at high pressure into a mould and then left to cure for about two to three weeks. These blocks offer an interesting alternative to conventional concrete blocks and fired clay bricks in either loadbearing or non-loadbearing masonry walling systems. Thanks to the low percentage of cement, low water content, use of natural soil as well as low embodied energy involved in its fabrication, these blocks can contribute to substantially reduce environmental impacts of the housing and building sector.

The company can sell the carbon credits it receives from saving one tonne of carbon for every 120 bricks sold. The earnings thus realised are not ploughed back into general income or counted as offsets against carbon emissions elsewhere in the company but used to support further research and manufacturing of the bricks.

These bricks can then be used in place of traditional burnt-clay bricks. Besides shrinking energy consumption and the carbon footprint, the use of these bricks can also help ease environmental degradation, particularly in developing countries where traditional fired clay brickmaking is responsible for illegal clay mining – mainly along the river banks – and deforestation due to the significant amount of fuelwood necessary in the process. For homes, the resulting houses are still quite expensive at just under USD 20,000, which is three times the median salary in the formal sector and clearly beyond the reach of most small-scale farming households. Nonetheless, initiatives, such as *14Trees*, are bringing

down prices in a sustainable way and can be supported by separate grants and concessional loans. The costs of the blocks should fall as soon as mass production is reached. Offering the product to large and small-scale construction enterprises as well as to self-builders would be a step in that direction. Furthermore, the fact that the building technique is very similar to conventional masonry work confirms that very limited investments in training and technology transfer would be needed before it can be used at large scale.

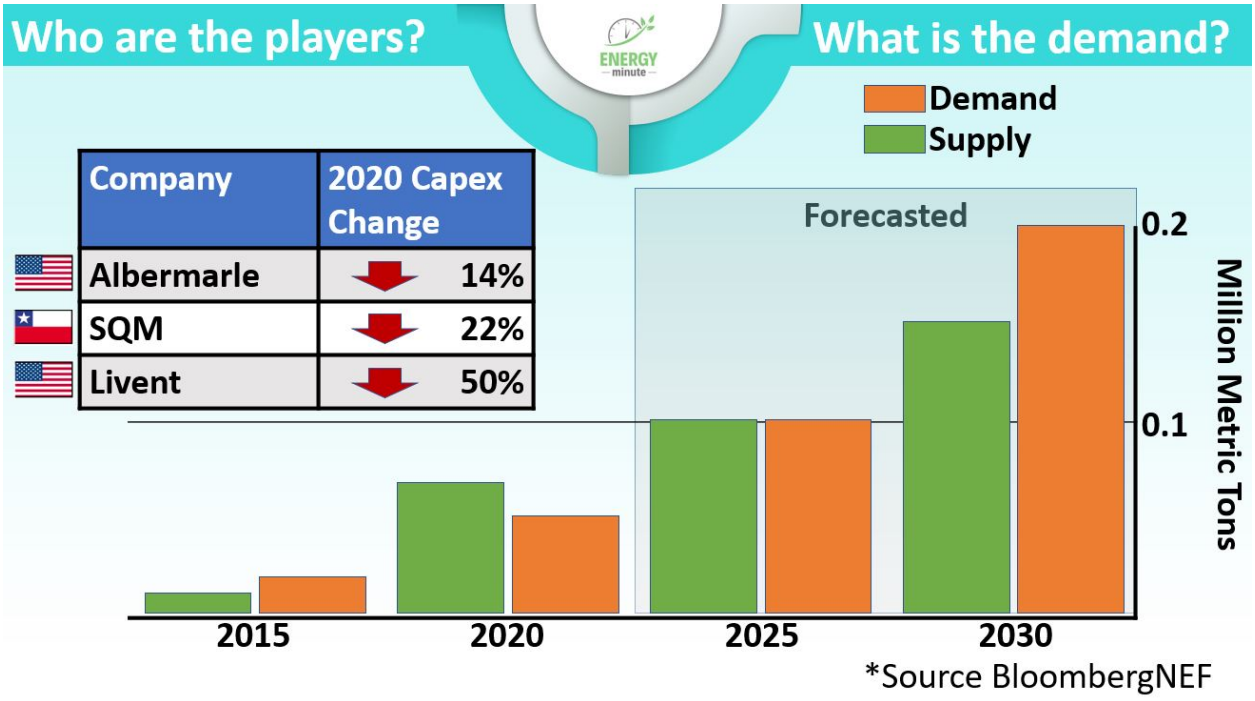
Technological progress can also help to increase accessibility to construction. Once the realm of experimentation and small projects, 3D printers can now be used to produce buildings on the spot, which not only reduces transport costs associated with prefabricated building components but also introduces more flexibility and efficiency, which reduces costs. Using such technology, LafargeHolcim estimates that it can produce a 36m^2 house in under 12 hours at a cost of USD9,000, while a school can be built in about 18 hours and with a price of USD25,000. On top of this, the technology reduces CO_2 emissions by up to 70 per cent, compared to building a house with conventional methods and materials.

The construction-materials industry has clearly recognised the inevitability of adaptation and moving from high-energy, fossil-fuels-driven technologies to more sustainable ones. As LafargeHolcim is the largest producer of cement, its example is one the industry will be obliged to follow as a whole to remain competitive in this expanding market. At the other end of the scale, the extraction industries are also having to adapt to the requirements of sustainability and the principles at the foundations of the SDGs.

New approaches to sustainability in mining

Innovations in technology and, especially, communications and energy technologies has led to increased and increasing demand for rare elements. These include copper and lithium, which together with graphite and other elements, are used heavily in new technologies, from cell phones to batteries to wind turbines. Most substantial deposits of these elements are located in developing countries. In fact, Chile alone has most of the world's reserves of lithium, estimated at 8.6 million tonnes, and the Andean region is home to significant deposits of the other materials needed to power and connect our communities, as well as feed the needs of industrial development worldwide. The demand for these elements is expected to grow, as seen in the projected demand for lithium in the figure below.

Figure 4.2: Major lithium-mining companies and projected output vs demand



The damage caused to the environment by mining is legendary and cases abound of entire regions – including some islands – being devastated by extractive industry. Recovery can be difficult or even impossible. In the case of copper and lithium, extraction can be so impactful that there is often resistance to scaling it up, especially when something goes wrong and, for example, tailings – the waste slurry left behind when the ore has been extracted – has been allowed to escape. However, the demand for minerals is high and, as the Figure above indicates, is expected to increase so that new approaches to mining and minerals treatment are being found. The effort by the industry is supported internationally by development-assistance agencies, such as Germany's *Gesellschaft für Internationale Zusammenarbeit* (GIZ), working with governments and other stakeholders in the Andean region to promote responsible mining through policies and strategies, stakeholder engagement, technology transfer and innovation.

The GIZ project is an example of providing support to governments to react positively and proactively to cleaner and more productive trends. The mining industry has traditionally lagged behind in the adoption of new technologies and new technologies for extraction were infrequently adopted at scale. While there are examples of new technology adopted in the transport of the mining products, it was sometimes with some unfortunate results, as in the case of iron ore mining in Sierra Leone[17].

The pressures brought about by COVID-19 have accelerated the adoption of labour-saving technology by the mining industry, which has had a negative effect on employment

[17] The two major mining operations in Sierra Leone – African Minerals and London Mining – both went bankrupt. The former in 2015 and the latter a year earlier. The railway lines that they had constructed and promised to make available for public use, which they never were, fell into disuse.

within local communities that fear straight job losses and/or changes in the demand for skill sets by the industry. The benefits to local communities dependent on mining has overshadowed their concerns about water quality and general fears about the impact of the operations on the local environment. That may change, as the benefits of being close to such operations become less evident and the disadvantages become more starkly revealed.

Meanwhile, internationally, consumer and investor groups are exerting pressure on mining companies to reduce their carbon footprints by, in part, weaning themselves off fossil-fuel generated energy. For Chile in particular, there is a move towards the adoption of cleaner, renewable sources of energy that are abundant in the country in the form of wind and solar electricity generation plants. In Chile, these concerns are being addressed through growing use of renewable energy to power mining operations, with the country rich in wind and solar energy. The advantage to Chile is clear: with a vast and developing market for its natural resources and the need to transition from fossil fuels to clean energy, the extractive industries' investments in clean energy provide a degree of predictability about supplies and help to scale up the country's renewable-energy base. There is, however, some way to go to reach a stage of clean mining with positive impacts on the country and on the communities most directly concerned by their proximity to the mines.

The GIZ project is helping Andean public authorities to understand the links between mining and other parts of the economy, as well as the wider community, so that impacts – positive and negative – can be managed to produce optimal outcomes. The focus has traditionally been on upstream activities, i.e., extraction. However, the downstream linkages, such as transport, water infrastructure, power distribution, services, employment, that can serve both mining operations and neighbouring communities had barely been addressed up until now. Working with government at different levels, the problem of displaced employment opportunities can be solved by providing new opportunities in sectors on which the extractive industries depend or have an interest, such as transport. The main point is that joint public/private approaches to the issues presented by changes and development in the mining industry can result in positive change and gains for all sides.

One approach to developing the industry in a positive manner for the national and local community is in the extent of downstream processing and retaining some of the value-added from mineral extraction. Here, the problem becomes rather complex and the approaches have been different from one Andean country to another. In the case of lithium, Bolivia has taken a public-sector-led approach, Argentina a private-sector-led one, and Chile a mixture of both. Argentina produces some lithium-based products (e.g., batteries), while Bolivia is at the very early stages of locally making products from the mineral extracted there. A signal problem is the fact that the main producers of the end products (cell phones, automobiles, etc.) are abroad and the production of key components needs to be closely coordinated with end product design and production, as well as updating due to technological innovation. Despite the high value-to-weight ratio

of lithium and copper, that long-distance transport of the materials is not uneconomical. Other factors, such as chemical expertise, are more important than transport costs.

Whether the changes in the methods and technologies of the extractive industries will lead to more sustainability for the sector remains to be seen. In some countries affected by the petroleum industry, the environmental damage has gone on unchecked to the point where local communities are literally drowning in waste. Even if the entire planet abandons fossil fuels, that damage will take generations to be undone. Meanwhile, what options exist for the affected populations?

The approach taken by the GIZ and others offers an opportunity for the industry to work with communities, rather than against them and, in the interests of planetary sustainability and their own profit margins, they can do so while continuing to operate and while contributing to the quest for sustainable energy and industrial operations. The world will continue to need the minerals involved in new technologies – new, cleaner technologies – and demand for them will continue to rise, as prosperity levels increase. Working with outside agencies, national and sub-national governments, the mining industry is beginning to see that it can be a part of the solution, rather than the problem. The same could be said of agro-industry.

Building sustainability in the agro-industries

Despite the rapid growth seen in many developing economies, and in Africa, especially, agriculture remains at the base of the economy. The sector provides 55 per cent of African jobs and 86 per cent of them are occupied by women. As food production is responsible for roughly half of Africa's greenhouse gas emissions and for up to a third of global emissions, changing agricultural production methods will be crucial to eventually achieving carbon neutrality. At the same time, with the increase in the world population and prospects for enhanced prosperity, the demand for all agricultural products – including cash crops – is growing. Already, over 850 million people are food insecure; as climate change progresses, that figure is bound to rise, at least temporarily. Hence, the agro-industry is facing a similar problem to the extractive industries sector, in that it has to produce more, but sustainably and in line with the SDGs. Unfortunately, the agricultural sector is both a contributor to – albeit unwillingly and in some cases unwittingly – and a major victim of climate change impacts. On the positive side, agriculture is the only sector that can put significant amounts of carbon back into the ground.

Agro-industries are part of the strategy of increasing the food and agricultural products supply to meet demand, while doing so sustainably. International assistance can help. For example, Canada's International Development Research Centre (IDRC) has helped researchers in developing countries study the agricultural sector and determine routes for emerging from the looming crisis of demand and sustainability, especially in African countries. Some of the findings pointed towards the need to adjust agricultural production to meet the qualitative and quantitative demand for food required by an ever-growing urban population. There challenge is not, however, just a matter of progressively producing more and higher quality outputs.

Farmers increasingly face unpredictable climatic conditions over which they have no control and without the means of forecasting changing weather their crops are vulnerable to damage or destruction. Climate change also brings changes in biodiversity, although they are not always positive. For example, the mosquito was once inexistent in the high plateaux of Ethiopia, but is now present. The tse tse fly is now found in regions of West Africa where it never was before, and invasive weeds and wild plants are destabilising crops. Nor should we ignore the desert locust plague that recently hit East Africa. Research into these challenges and others is conducted in order to give farmers some degree of defence against them but local research facilities are often ill-equipped to carry out research on their own. They need help from specialised institutions to learn how to deal with these other effects of climate change.

Agro-industry has a role to play. Until recently, they saw their role as selling inputs and/or moving products to market. Some of those inputs, however, are now understood to be part of the problem, since they consist of polluting and non-degradable chemicals. Research now shows that most of these products are unnecessary, but farmers believe they are dependent on them. This applies both to the crops in the ground and to their storage and transport. The industry has a responsibility to educate farmers about other ways of preserving and protecting their crops and livestock that do not imperil the future of humanity. In order to do that they can draw on research and innovations from research and development institutions like IDRC or on their own research and development. The perceived short-term loss can be transformed into long-term gain. Partnerships between the private sector on the ground in developing countries and in the advance economies with research institutes would result in a formidable battery of scientific ammunition to fight the effects of climate change and fuel the drive towards the SDGs.

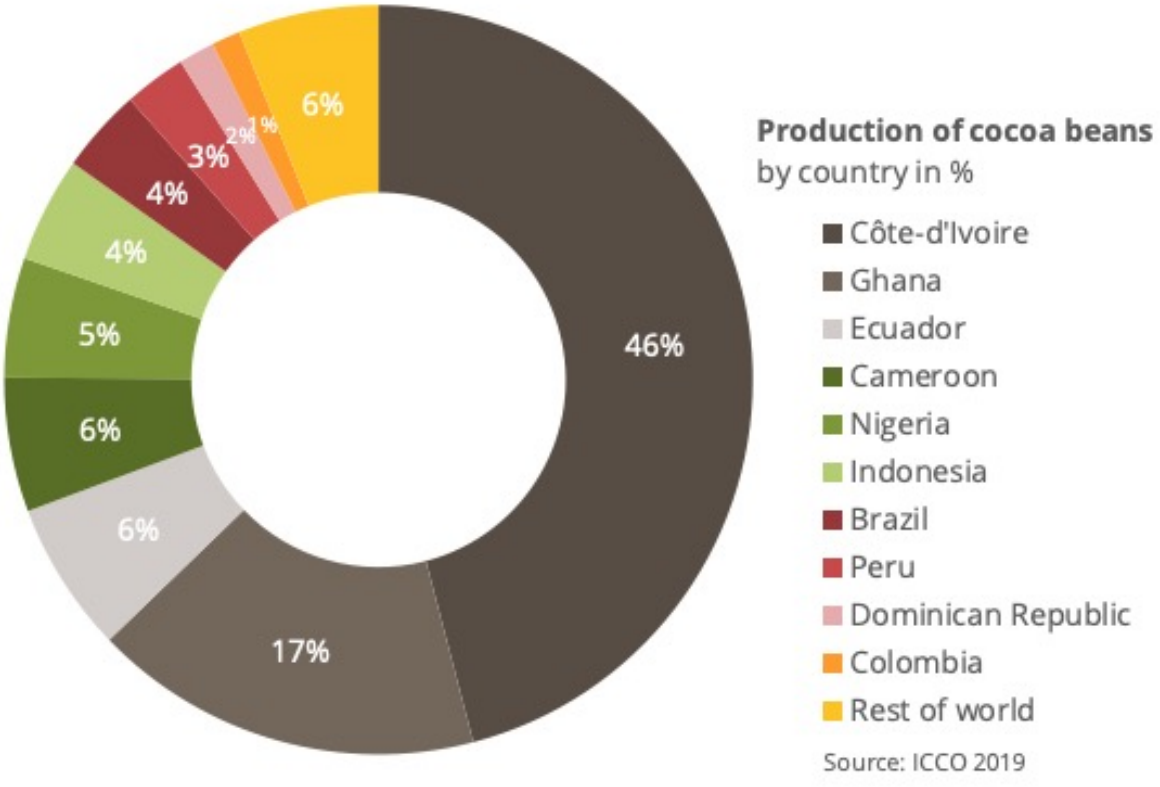
Farmers and farming families need to be in possession of relevant information in order to meet the needs and demands of markets that might be very far away. Growers of cash crops like cocoa and coffee are often both socially and physically distant from the consumer, so they are unaware of how and why markets fluctuate. However, smallholder farmers are resilient and adaptable. With the right information, they are capable of making changes to meet the needs of their customers. Farmers growing cash crops may not even know what they are for. In a famous 2014 documentary, a film crew went to Côte d'Ivoire and shared a bar of chocolate with a cocoa farmer who had never tasted it before, despite having grown the crop for years. Unfamiliarity with the consumer is not the only challenge. Cash-crop farmers are often at the mercy of the agro-industry and are paid very low prices for their crops.

IDRC and others have been working to educate farmers about their options, including their options over which crops to cultivate. This is increasingly important as climate change is impacting meteorological conditions throughout the world, tending to render once ideal crops marginal or seasonally at risk. Coffee growers are a prime example. As coffee moved from its birthplace in the mountains of Ethiopia to places as far away as Brazil and Colombia, varieties were produced that were perfectly adapted to the new habitats. When cocoa "migrated" from equatorial South America to more easily cultivable regions of Africa and elsewhere, the plant was also bred to be comfortable in its new

home. These adaptations were so successful, however, that as the climate changes they become less well-adapted. Hence the race to find new varieties or, in some cases, exploring the avenue of abandoning their cultivation, altogether. Where the decision is to continue with coffee or cocoa – or, indeed, other cash crops – research supported by IDRC on means of increasing resilience by producing better varieties while, at the same time, advising farmers on how to understand climate information, educates them about disease control and how to deal with pests.

One option that is being explored in Ghana and Côte d'Ivoire, for example, is repatriating the cocoa industry and reducing reliance of foreign buyers. The two countries created a cartel in 2020, known as "COPEC" to regain control of the industry for which they together produce 70 per cent of the raw material. The idea is to produce a "quality" label that is backed up by a transparent, local production system. By taking control from the field to the table, such initiatives are seeking to tap into the growing preference for "quality", including organic, products, especially in the developed economies but also increasingly among the rising middle class in the developing world.

Figure 4.3: Cocoa bean production by country, 2019 (percentages)



Similar strategies are being pursued in other countries. In the Lao People's Democratic Republic (LPDR) in Southeast Asia, the Stockholm Environment Institute is supporting the country's national Green and Sustainable Agriculture Framework strategy. As a centrally planned economy, the LPDR had been setting production targets for agriculture that were over time deemed to be unrealistic. Part of the reason for this is the relatively

undeveloped nature of the country, as a whole. Modern farming methods were rare, and efficiency was very low. The country was unable to meet its own food needs and was obliged to import the rice deficit from its more agriculturally efficient neighbours, Viet Nam and Thailand to the tune of an average of a quarter of a million tonnes per year. The World Food Programme has had an operation in the country for a number of years.

Faced with the challenge of feeding its population and utilising the agricultural sector efficiently, with 73 per cent of the labour force engaged in agricultural activities, the authorities decided to abandon the idea of production targets and replace them with a complete reconstruction and overhaul of the sector. The country is characterised by small villages whose livelihoods depend on farming but that are often food insecure and 90 per cent of farmers are on fewer than 5 hectares. Therefore, the new agricultural policy was based on the Food and Agriculture Organization's "good agricultural practice" (GAP) and is the standard to be adopted across the entire country. Within the GAP, the policy includes a "Green Sustainable Agriculture Framework" (GSAF) that aims to identify products from Laos as of high quality through a transparent marketing strategy that allows traceability to the place of origin.

Once considerable advantage of GSAF is that it falls within the context of the national green growth strategy and is, therefore, aligned with other programmes and strategies such as the National Socio-Economic Development Plan, the Agricultural Development Strategy 2025 and Vision 2030, the National Nutrition Strategy to 2025 and Plan of Action 2020, the National Agro-Biodiversity Programme and Action Plan 2025, and the Intellectual Property Law. The last of these is important because it underpins the country's option to invite private sector investment to support the GASF with a view to exporting Laotian quality products worldwide. Based on the "green" aspect of development and in line with the SDGs, private investment is being sought alongside international development assistance for green innovation and technologies, green extension services and skills development, and the development of green markets and value chains.

A large project, supported by the Swiss Development Agency STC is studying green extension services in in LPDR. It has found that a substantial amount of research and training is needed to determine what types of production systems are suitable to what types of conditions and what types of skills are required of extension workers. There is also a need for a mind shift to move away from the focus on productivity and production growth towards a more balanced approach and focusing on resource conservation. One of the major elements of the green extension programme is, therefore, building local and individual knowledge. It is promising that this is being recognised and integrated into the strategy.

One immediate beneficiary of the GSAF approach is the coffee sub-sector. With a poor policy framework and ineffective implementation, much high-quality Arabica Lao coffee was bought by Vietnamese traders and mixed with lower quality Robusta Vietnamese coffee and exported as "Vietnamese". So, the new strategy is to identify Lao coffee, as high-quality, "Lao Coffee" with a verifiable regional origin that would attract a higher price.

The Vietnamese traders can still access the Lao coffee, but henceforth sell it on specialised markets ready to pay the premium price for high-quality. This approach still benefits the traders because they actually make higher margins form Lao coffee, but it also raises the incomes of the farmers who are able to reinvest the profits and scale up their operations.

Same boards, different games, one objective

Climate change and the international community's reaction to it embodied in the SDGs has revealed the need for a new paradigm in the relationship between extraction of the earth's resources and the uses to which they are put. From the chemicals involved in the manufacture and application of cement and concrete, to the mineral mines of the Andes, to the fields of Africa and Asia, the emphasis is on sustainability amid a growing recognition that "business-as-usual" not only is no longer appropriate; it no longer exists.

The first step in effecting change is to recognise that it is possible; the second is to accept that it is desirable; and the third is to understand that it is not something that needs to be done alone. In the 2020/2021 instalment of the Sustainable Development Transformation Forum, the objective – "transformation" – was accepted as a necessity, not a choice. The debate was not about that reality; it was about how we get to transformation. For the construction-materials industry, it was based on new technologies and new partnerships with public international organisations, as well as with people on the ground in developing economies. For the minerals extraction sector, it was again about new technologies and partnerships with the communities affected by mining activities. In agriculture, it was focused on research institutes in partnerships with local governments and international agencies. The strategies were different, but the elements of partnership and mutuality were an intertwined, continuous thread.

Chapter Five: Towards a circular economy?

Colm Foy and Seung-Whee Rhee

There will be no sustainable development without a circular economy. The concept, therefore, is enshrined in SDG12 (Sustainable Consumption and Production).

As long as industry continues to remove resources from the earth to manufacture goods and provide energy for industrial processes, sustainable development will remain a distant mirage. The concept requires intensive co-operation between all actors in the supply chain including the final consumer to ensure that every stage of the production process defines and determines how items used in the process will be recycled and/or reused. The Ellen Macarthur Foundation defines it thus:

… a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources, and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital.

Put simply, that means for the average consumer and for industry, "reduce, reuse, re-cycle – the three 'R's".

A circular economy will be impossible without public support, which will only be forthcoming through innovative policy messages and incentives. Unless all stakeholders – and, in this context, that means everyone – can be convinced that a circular economy is urgent and necessary, its implementation will be nearly impossible.

The Platform for Accelerating the Circular Economy (PACE), which was initially set up at the World Economic Forum in 2018 and brings together leaders who are committed to creating a circular economy, sees it as a mindset and a tool kit, rather than an end in itself. PACE is uniquely placed to foster progress through its membership of CEOs, government ministers, and the heads of civil society organisations who have a clear vision and the power to make things happen. Faced with the clear and present danger of unsustainable industry and development policies, decision makers like those associated with PACE see the circular economy as the basis for a drive towards a just, inclusive and sustainable global economy, rather than a burden imposed on the private sector. Among the G20 countries and, especially in Latin America but also in other parts of the world, the movement towards a circular economy continues to build.

Business on both the individual company level and the industry level is coming to recognise the good sense of the circular model. The endless extraction of the earth's resources clearly cannot continue *ad infinitum*. Indeed, one of the characteristics of the linear economy is its inefficiency and, while it was possible for a long time to achieve economic and social growth by plundering natural resources, changes in the global economy and, particularly, expected increases in global prosperity that will generalise

consumer demand, mean that this is no longer feasible or practicable. Adopting a circular approach, in fact, can generate savings to firms, as well as protecting the environment.

PACE estimates that the cost of a "business-as-usual" approach to economic development is some USD 13 billion from treating plastics waste, alone, while adopting a circular economy strategy could generate a USD 4.5 trillion business opportunity. Often criticised as being a recipe for job losses, the dynamism of a circular economy approach could produce an extra net 6 million jobs by 2030. Not only would the volume of jobs increase but so would the quality of such employment. Currently, recycling outside of the "formal" stream is carried out by individuals without a structure or any prospect of security. Within a circular economy the whole process of recycling is central to the economy, hence the workers driving it will no longer be consigned to the unregulated, poorly paid and insecure informal sector but brought into the realm of regular work.

However, this is still not an easy transition. Countries newly entering the cycle of increasing prosperity will make new demands on the global supply chains that supply goods to global markets and those supply chains will need to be reformed in advance, if the linear economy is to be made extinct. It is worth noting that no country currently considered as "developed" with a high level of human development operates a sustainable economy. In that sense, the concept of a "developed" country is erroneous: there is no sustainably "developed country". The current challenge is how to get to the point where industrial processes are both sustainable and equitable.

PACE has rated countries based on their proximity to a circular economy, which is very different from ranking them according to GDP or other traditional metrics. This helps in determining the direction in which countries are going in relation to the circular economy and, hence, their sustainability. This is important for measuring progress towards the SDGs and, in particular, SDG 12.

It is become clearer and clearer that a movement towards a circular economy has to happen on an international level or it will not happen at all. Individual countries will define their own paths, but they will need to be aligned with a general movement that involves setting global standards, agreed metrics for measuring progress, global trade "green lanes" and mutually agreed subsidies and incentives for companies to transition to a circular model.

The concept of the circular economy is not new, although it has not always been described as such, and advanced countries have known for some time that there was a need for circularity in the economy. As awareness of the threat to the planet from unsustainable practices became clearer, cities and countries the world over instituted consumer-recycling programmes of greater or lesser extent. These succeeded to raise awareness in their communities, but they also led to some disappointment, especially since they are perceived as if they were imposing a new cost on the consumer and on businesses. Because systems were inefficient, the public were not well-informed and could remain sceptical about the results, and there was an impression that recycling was an imposition rather than an opportunity. However, public and corporate recycling must

be at the base of the circular economy. The approach taken by the Republic of Korea is exemplary, in that it demonstrates how systemic recycling can be achieved.

Recycling in the Republic of Korea

Korea is poor in natural resources and energy. In 2018 it imported 93.7 per cent of its primary energy, at a cost of USD 145.9 billion, making the country highly dependent on energy imports which constitute 95 per cent of its needs. The total cost of imported goods in 2020 was USD 467.6 billion, of which raw material made up 52.0 per cent, or some USD 206.3 billion. Energy consumption, moreover, has been high as Korea developed its industries and infrastructure and, in 2018, it ranked 5th in terms of energy consumption among the major OECD countries with 301 million tonnes of oil equivalent (TOE), while its energy consumption per capita was ranked 6th with 5.96 TOE/capita.

Hence, waste management and energy conservation are very important issues for Korea, a country that takes the SDGs very seriously. The amount of waste generated in Korea increased from 346,669 ton/day in 2007 to almost half a million ton/day in 2019. The urgency of securing resources from waste was recognised by the Framework Act on Resources Circulation that was enacted in 2018 to promote recycling. Municipal solid wastes including packaging and plastic have been managed through resource circulation and directed towards the supply chains.

Even though renewable resources are produced by recycling processes, they may be useless if the market for renewable resources is not working properly. Hence, food waste, E-waste and recycling wastes are promoted based on the Framework Act not only as inputs to the circular economy but as economically viable elements in the supply chain.

Since the passage of the Act, in terms of “reduce”, there are restrictions in Korea on single-use and excessive packaging, and the putting into place of a waste-charge system alongside a Volume Based Waste Fee (VBWF) system. The waste-charge system is designed to prevent the generation of waste at the production stage by obliging the manufacturer (or importer) to bear the cost of treating of waste derived from products, materials, and containers that are difficult to recycle or may cause waste-management problems. The VBWF system is intended to change patterns of consumption and disposal so as to reduce waste from the stages of production by charging fees according to the quantity of waste generated. This system resembles the "Polluter Pays” principle that requires the person who discharges waste to pay the treatment cost according to the quantity of waste deposited.

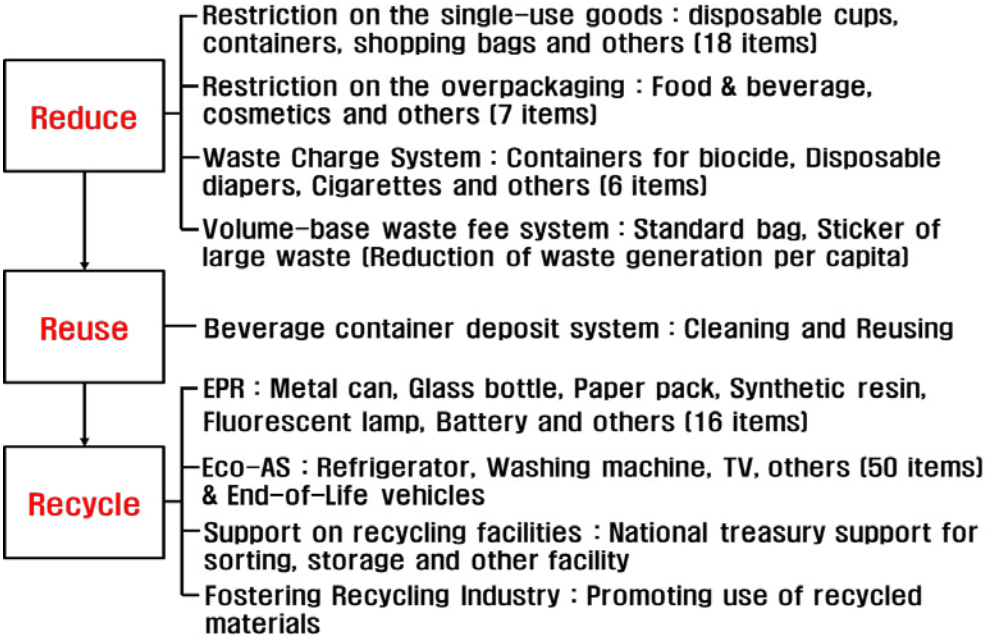
In an example of the requirement to “reuse” waste, Korea operates a deposit system for beverage containers where the deposit is refunded to the consumer on returning a container to the retailer. Such containers are cleaned and reused.

For “recycling”, several systems have been adopted, such as Extended Producer Responsibility (EPR) and the Eco-Assurance System (Eco-AS). EPR is a method of giving producers a quantitative obligation for recycling of waste such as packaging materials, batteries and fluorescent lamps. Eco-AS is applied to E-waste and End-of-life Vehicles (ELV), similar to the European Union’s Directives on ELV, Restriction of Hazardous

Substances (RoHS) and Waste from Electrical and Electronic Equipment (WEEE). By the Eco-AS, the use of hazardous substances in the manufacture of E-products and vehicles is restricted, and producers of E-waste and ELVs are subject to collection and recycling obligations.

In addition, public institutes and local governments are supporting the national treasury in installing recycling facilities to expand capacity, while emphasising recycled products and components in their procurement strategies.

Figure 5.1: Resource circulation in the waste stream

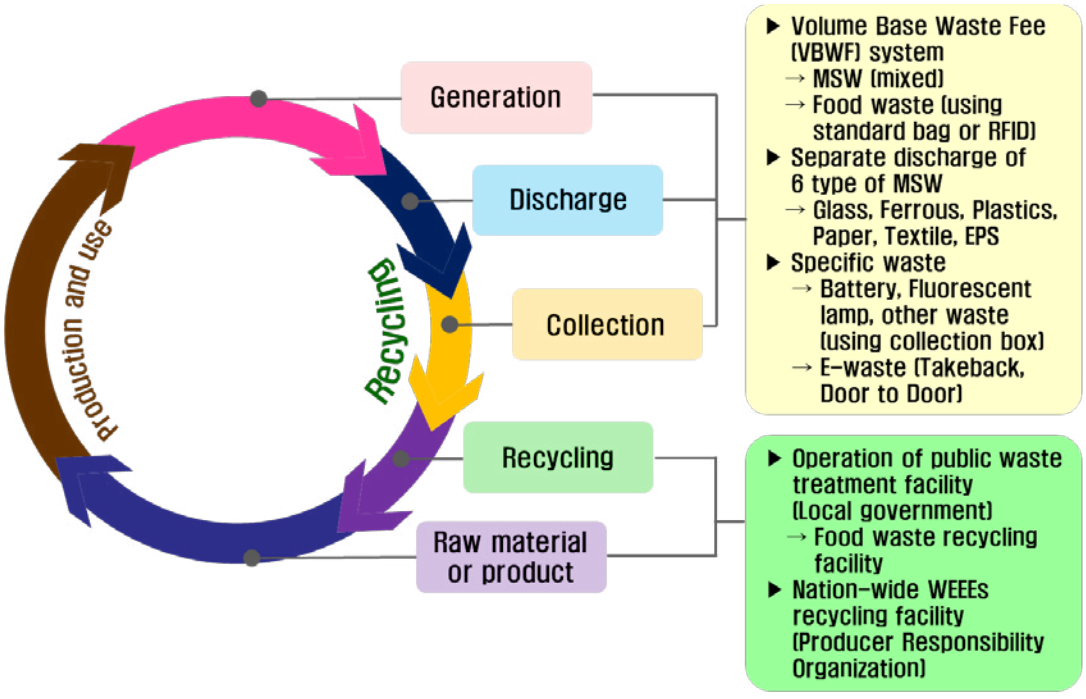


Source: Rhee, S-W. (2021) *Sustainable Practice of Waste Management towards a Circular Economy - A case study in the Republic of Korea* (unpublished)

Sustainable resource circulation in Korea

Resource circulation can be represented Generation-Discharge-Collection-Recycling-Raw material (Figure 2). Wastes fall into different categories that require appropriate procedures of discharge, collection and recycling, as applied to Municipal Solid Waste (MSW), food waste and E-waste in compliance with the legislation and regulations relative to the site.

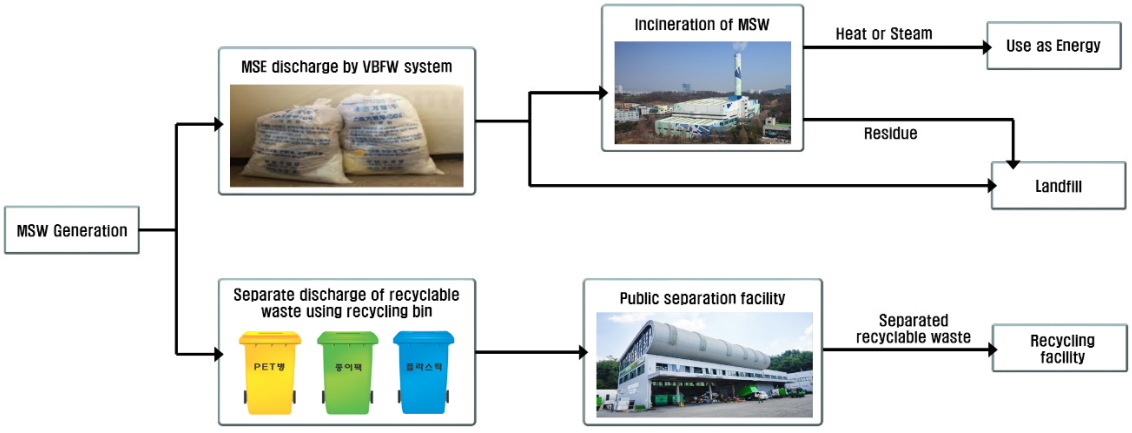
Figure 5.2: Resource circulation in practice



MSW discharge either goes through the VBWF system, for non-recyclable items or a separated discharge system for recyclable waste. Under the former, the costs involved in collecting, transporting and disposing of waste were used to determine the price of the standard waste bags, which are manufactured according to standards of size, capacity and quality. In the case of large items (such as furniture), discharge stickers must be purchased and attached to the waste prior to collection. Recyclable materials such as paper, glass, plastics, metal cans, textile and expanded polystyrene are separated by residents into recycling bins that are emptied according to a fixed schedule.

MSW collected by the VBFW system is usually treated in an incinerator with heat recovery or disposed of in landfill. Collected recyclable waste is sorted at public separation facilities and then sold to recycling companies.

Figure 5.3: Waste stream of MSW



The VBWF system is also applied to food waste in households and restaurants in Korea via three application methods: standard food waste bag, chip inserted into the items, or a sticker attached to the food-waste container for the radio-frequency identification (RFID) method (Table 5.1). Local governments review the advantages and disadvantages each method and select the most appropriate method for their region. According to the Ministry of Environment (MoE), local governments showed a reduction effect for food waste from 0.71kg/day/household in 2016 to 0.45kg/day/household in 2017.

Table 5.1: Method of application of VBWF system on food waste (MoE, 2016)

Method	Standard food waste bag	Chip or sticker attached on container for food waste	RFID
Characteristics	Discharge of food waste putting it in a standard food waste bag Prepayment method to purchase standard food waste bag	Use a container for food waste Prepayment method to purchase chip or sticker	Use a container with an RFID tag attached and a weighing function Measure the weight in real time and charge a fee according to the weight

Advantages	Convenient to use Low cost	Less of an eyesore Collection of containers is convenient because they are standardised.	Can be discharged frequently Easy to manage statistics Less of an eyesore
Disadvantage	Difficult to create statistics Odour concerns in the home Eyesore Disadvantages for recycling (removing the standard bag)	Difficult to monitor statistically Requires periodic container cleaning Risk of container loss.	High installation cost Continuous maintenance required

Food waste is collected separately and recycled using basic environmental treatment facilities installed in each region. Depending on the regional situation, food waste can be converted to compost/fertilizer, soil conditioner or animal feed. In some areas, food waste is used to produce biogas as a renewable energy source using anaerobic digestion facilities.

Figure 5.4: Waste stream for food waste (MoE, 2016; Uijeongbu-si, 2021; SL Corp., 2021)

Under Eco-AS, both collection and recycling need to be managed carefully either by a Producer Responsibility Organisation (PRO) or producer, or by local governments. The

take-back system requires the producer or retailer to collects a discarded product when consumer replaces it with a new one. E-wastes with large weight and volume, such as refrigerators and washing machines, are collected by the personnel delivering the new products, while e-wastes with small weight and volume are discharged to the retail store or discharged separately with recyclable products.

The door-to-door system is used when consumers want to discard existing home appliances without purchasing new product, and is operated by a PRO. The consumer makes a reservation for E-waste discharge through a dedicated call centre or website and collection can be free of charge if the item qualifies.

Local governments operating a WBVF system require consumers to purchase stickers and attach them to the E-waste surface. The items are then collected by local government crews along with large-sized waste such as sofas and tables.

Table 5.2: Collection system of E-waste

Type	Agent	Description	Remark
Take-back	PRO (or producer directly)	When purchasing a new E-product, the E-waste is discharged to the delivery personnel of the E-product.	Free of charge
Door-to-Door	PRO	E-waste discharge reservation by consumers using webpage or call centre Collection of E-waste by collectors on the scheduled day	
VBWF system with sticker	Local government	Consumers purchase discharge sticker from local government Discharge by attaching a sticker on the surface of E-waste Local governments collect E-waste with stickers	Charge

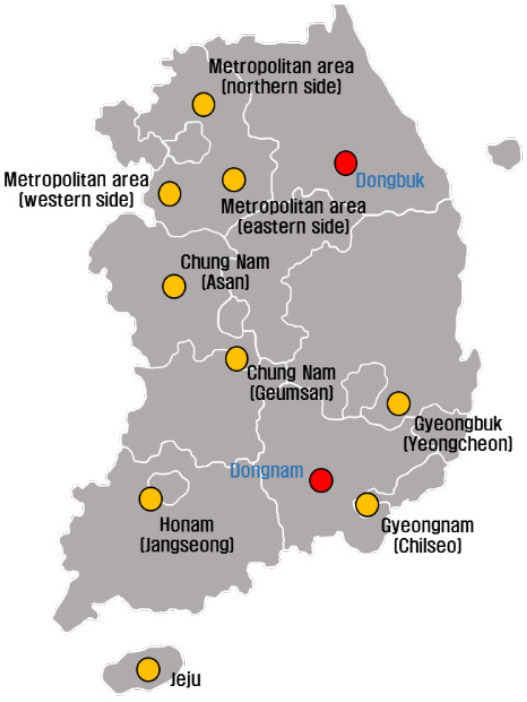
PROs that collect E-waste under the EPR system operate a joint nationwide network of E-waste recycling centres. Twelve of these centres have been established, two of them relatively recently, and have gone into operation. In addition, there are some 33 individual PRO E-waste recycling facilities (Figure 5.5). In these recycling facilities, almost all types of E-waste can be recycled including refrigerators and washing machines.

The role of PROs in E-waste management is very important in fulfilling the collection and recycling obligations required under the EPR system. Producers can establish a PRO or

join an existing one, and pay the collection and recycling cost to the PRO that handles the actual recycling and repurposing of the items. The PROs represent a useful tool to drive towards reaching set recycling targets through their E-waste recycling centres that keep the collection system in the formal sector where its safe management is possible. In addition, the PROs monitor whether the obligations of Eco-AS are fulfilled through their management of overall information on the generation, discharge, collection, and recycling of E-waste.

Figure 5.5: Nation-wide E-waste recycling centres

Catchment area	Annual capacity (ton/yr)	Remarks
Metropolitan area (eastern side)	33,768	Operated by PRO
Metropolitan area (western side)	54,992	
Metropolitan area (northern side)	35,940	
Chung Nam (Asan)	23,816	
Chung Nam (Geumsan)	30,000	
Gyeongbuk (Yeongcheon)	44,700	
Gyeongnam (Chilseo)	36,600	
Honam (Jangseong)	49,269	
Honam (Nonsan)	19,860	
Jeju	7,200	Operated by PRO
Dongbuk	13,125	New facility (2018)
Dongnam	9,700	
Other 33 recycling facilities	-	



Source: Park, J. (2018) "Recycling status and technology trend of WEEEs in the Republic of Korea", *Konetic report*, Korea Environmental Industry & Technology Institute

Note: The red circles designate newly built facilities.

The Korean case illustrates the need for careful planning from the beginning to the end of the recycling process. It is not enough merely to collect the material if there is no plan for its reuse. Also illustrated by the Korean case is the need to involve the producers of the materials that end up as waste in the first place. The combining of producers into specialised recycling organisations means that no single manufacturer of importer has to carry the burden of recycling alone. However, the Korean system operates on the basis of very clear and strict legislation that has evolved over several years as more and more sophisticate information has come to light. The country has innovated both in industrial processes to reduce and recycle materials, but also in the mentalities of the public authorities, the private sector and the general public, all of whom have come to understand the urgency of establishing as much circularity in the economy as possible.

The scourge of single-use plastics

Many countries, including Korea and most OECD member countries have recognised the need for immediate action to reduce waste and foster the three "Rs". Much has been written and much more has been said about the need to save our planet by supporting moves to sustainable practices and energy generation, reducing dependence on fossil fuels and seeking renewable sources of energy. However, fossil fuels are not only used to drive power stations, their by-products, in the form of plastics, create serious problems of pollution in the oceans, waterways and on the land. We all have images in mind of tropical beaches spoiled with plastic bags everywhere or of drowning of birds entangled in plastic sheeting, and the death of birds, turtles and cetaceans due to ingested plastic objects. One can also visit the poorer areas of the world to see trees "decorated" with discarded plastic shopping bags to get an idea of the extent of the problem. This might be why most of the countries that have blanket bans on plastic bags are in Africa (Figure 5.6).

Figure 5.6: Plastic bag bans worldwide

Such bans, however, only tackle a part of the problem; the rest of it is what do we do with the plastics that are still being produced for other items and that have already been

produced in former years? The overconsumption of single-use plastics and the mismanagement of its waste has led to an estimated 12 billion tons of plastic litter in landfills and the natural environment, creating local and transboundary environmental problems.

Part of the solution is rooted in people's practices. The idea of a plastic bag or cup as something that can just be "thrown away", while under threat, is still prevalent in many places in the world, despite the efforts of social organisations and the research community to alert populations and their governments to the looming disaster of plastics pollution.

There is no doubt that the problem is complex. We have become used to the idea that plastics are an essential part of our product line-up; they are cheap, malleable and resistant to many chemicals, sunlight and micro-organisms that would otherwise degrade them naturally in the earth or the oceans. There are certain kinds of plastic that can be broken down over time, but they are more expensive to produce and, in any case, their degradation is very slow. Turning plastic into fuels may show long-term promise. Meanwhile, burning plastic waste to extract the energy value is an option that is not without creating environmental, economic and societal problems..

As with any form of recycling, a systemic change is needed to support policies and legislation that enable and empower companies, social organisations, research institutions and citizens to develop and implement solutions to move towards circular economy approaches. Applying the concept of circular economy to single-use plastics requires innovation and redesign of products to reduce, or altogether eliminate, their consumption in different applications. Where plastics are unavoidable, they should be reusable, recyclable or compostable, and free of hazardous chemicals. Single-use plastic consumption needs to be decoupled from the use of non-renewable resources.

The IMF estimated that 6.5 per cent of global GDP (USD 5.2 trillion) was spent on fossil subsidies (including negative externalities) in 2017, a half trillion dollar increase since 2015. Reducing these subsidies would have lowered global carbon emissions by more than a quarter, reduced deaths from air pollution from fossil fuels by almost half, and increased government revenue by 3.8 per cent of GDP. Fossil fuel subsidies, which indirectly support the plastic industry, could be redirected towards the greening of supply chains to contribute to green recovery and the narrowing of SDG financing gap in developing countries.

The Asia-Europe Meeting (ASEM), whose civil-society arm, the Asia-Europe Foundation (ASEF) partners with the UNOSD to hold the Sustainable Development Transformation Forum, has sponsored research into single-use plastic waste reduction initiatives across ASEM member countries. The work was carried out under the auspices of the regular Environment Forum that tackles environmental issues across the ASEM's 53 partners in Europe and Asia.

The results of the research made for uncomfortable reading. Whereas the globality of the problem has long been recognised and it is obvious that only cross-border and

international approaches will have any hope of a significant degree of success in battling and eventually eliminating single-use plastics, barely 15 per cent of the initiatives identified by ASEM could be classified as “international”. Moreover, over half the initiatives were launched by small organisations with fewer than 50 people and only 15 per cent were managed by large organisations with more than 500 employees. While the majority of the initiatives concentrated on improving recycling and waste treatment, some also explored product design and options for using other types of materials to reduce or eliminate plastics at the manufacturing stage.

On the positive side, many of the initiatives associated with reducing the impact of plastics waste were involved in training and public awareness raising, in addition to their advocacy and recycling activities. Another finding points to the preponderance of private sector companies as actors in the plastics-recycling business. More than two thirds of the initiatives were managed by private companies.

Stopping the appearance of plastics that can neither easily be recycled or reuse nor biodegradable by developing and using less environmentally harmful alternative materials is quite different from recycling the products once they have been used. Recycling has become big business and there are undoubtedly profits to be made, but the level of subsidies from the public authorities is still an important element in the survival of recycling companies. While innovations abound among the over 30 projects surveyed by the ASEM researchers, a common theme was the drive for scalability. Many of the innovations were “pure”, as in completely new, and almost all were localised, with only a “theoretical” level of transferability to other locations and situations. Whereas many of the innovations were organisational – aimed at better management and enhanced public awareness – over half of them involved some form of technological change. That means they will need more investment going forward to reach scale. The question is, therefore, where will they find the investment they need?

Public policy plays a major role in the future of plastics recycling and innovation to eliminate plastics from industrial production processes. Without incentives, the recycling industry is on fragile ground, but recycling is only half the story. While the bans on single-use plastic bags have forced the industry to explore other avenues for making bags, the primary source of plastics entering the environment is from packaging. As prosperity increases worldwide, especially in the developing economies, demand for consumer goods is expected to grow. Those items will need to be manufactured, then packaged for safe transport to the point of sale. Currently, without even considering the plastic elements of the goods themselves, most of the packaging consists of single-use plastics. Even where there is a mandatory retailer obligation to retain the packaging, as, for example, in Germany with the *Grune punkt* policy, it still needs to be disposed of; and countries like Germany are still the exception.

Still, the role of public policy is primordial, both for education consumers to demand the elimination of plastics and for the companies involved in creating or treating it. The European Union adopted a “Single-use Plastics Directive” in June 2019 that includes a list of all the products to be eliminated throughout the EU and detailing who is to bear the

cost of cleaning up those that are already in circulation. According to the Directive, the motivation is, “In the Union, 80 to 85 per cent of marine litter, measured as beach litter counts, is plastic, with single-use plastic items representing 50 per cent and fishing-related items representing 27 per cent of the total. Single-use plastic products include a diverse range of commonly used fast-moving consumer products that are discarded after having been used once for the purpose for which they were provided, are rarely recycled, and are prone to becoming litter.” The Directive has the merit of giving prominence to the issue of single-use plastics and it does impose penalties for non-compliance, although they are not specified in the Directive. It encourages (but does not mandate) the replacement of plastics by “sustainable and non-toxic re-usable products and re-use systems”.

The EU Directive and other laws and regulations in force or being introduced elsewhere represent the writing on the wall for the continued production and marketing of single-use plastics. The reaction of the industry will be crucial. Will manufacturers simply “migrate” to jurisdictions where their activities are not restricted, or will they take the hint and move to different forms of production? In the advanced economies there are signs that the industry is moving away from producing single-use plastics and into recyclable, non-toxic materials.

There are certainly signs that the plastics industry has the potential for innovative approaches to their products and this innovative potential needs to be guided towards initiatives that reduce single use plastics altogether. The role of public policy in this context is to support and encourage such innovation by facilitating market access, using fiscal measures to incentivise “clean, green” products, and rewarding successful innovators through public procurement policies.

Above all, consumers need to be able to see that elimination of products like single-use plastics is a benefit for all in which everyone has a part to play. As can be seen in the Republic of Korea or in Germany, when the appropriate systems are in place – in this case, clear and easy-to-follow recycling requirement – the public will tend to follow, even if there is a supplementary cost involved. Whether the individual should continue to be obliged to pay for recycling, rather than the manufacturer, is something that will need to be explored further. In classical economics, cost is a disincentive, and it might have been expected that people would prefer to dump waste instead of paying to recycle it. So far, that does not seem to have happened but, if the financial burden becomes too heavy, it may come into consideration as a factor to be considered.

From the global to the local

Whereas it is clear that the circular economy cannot be sustainably created unless it happens on a global scale, the role of local initiatives is vitally important for providing examples of how it can be achieved. At the end of the value chain is the consumer. It is hardly important whether the consumer is in tropical Asia or one of the bustling cities of Europe; she or he has to decide – within a personal budget – which goods to purchase and on what basis. This applies just as well to enterprises. While price is a major factor,

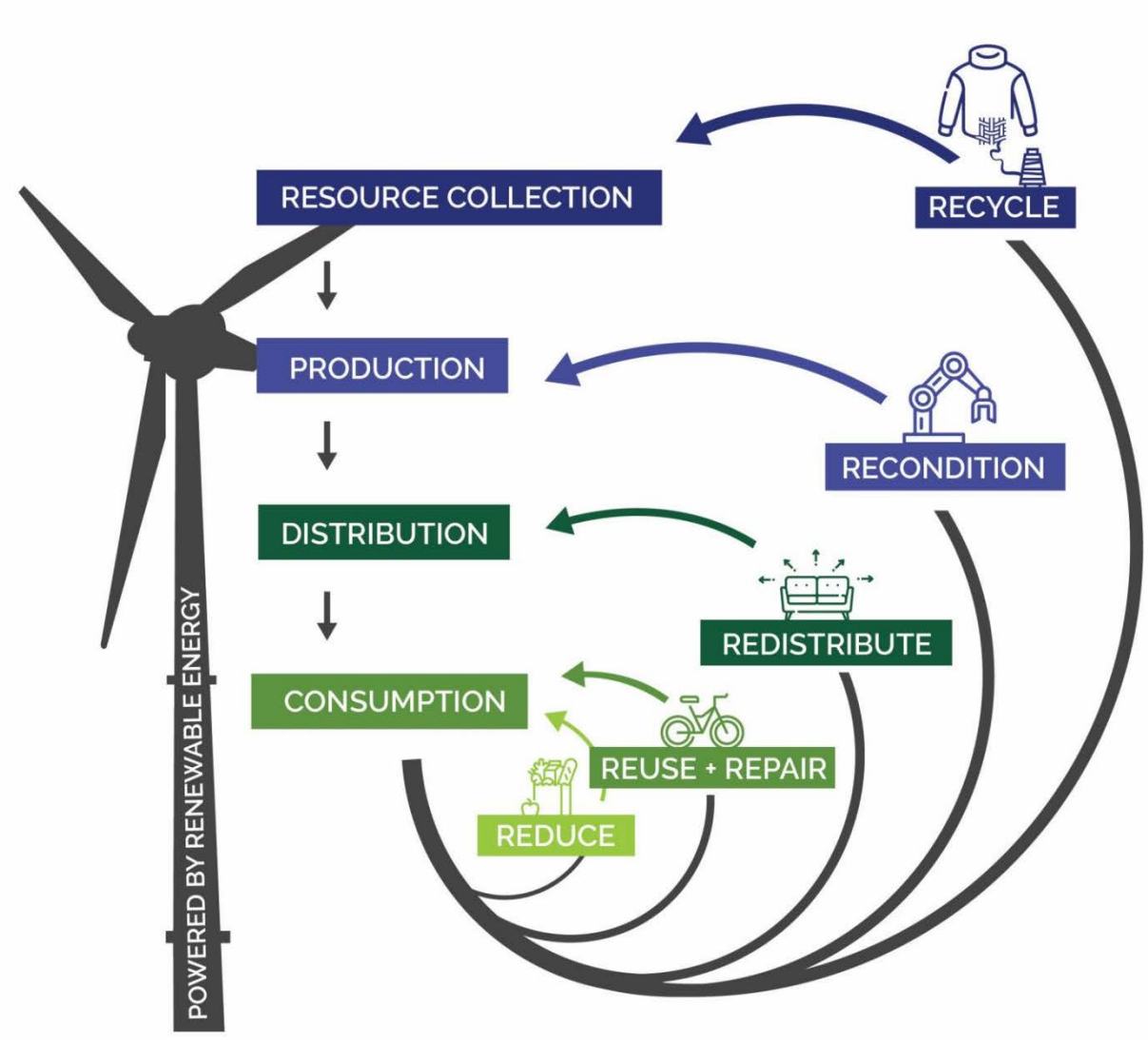
it has rarely been the only one. No two items are identical, and one might substitute for another, while the purchaser may have a whole set of priorities that defy “logic” or prediction. “Value” can have several meanings.

An enterprise may well prefer to source raw materials from a particular supplier because the market of that enterprise values some aspect of the production process: it matters to them. Similarly, purchasers may choose an item that might appear more expensive because they believe it has qualities that make it more desirable, such as durability, specific taste for a food item, place of origin, brand recognition, and so forth.

Convincing consumers and enterprises that sustainability is, in itself, a desirable attribute is part of the process of creating awareness leading to placing a premium on products from a circular economy. The consumer may be at the base of the pyramid, but without a base, the pyramid falls. If local initiatives spread and are mutually aware the results can be outstanding. A clear example is what has become the worldwide movement towards fair trade in certain products, notably, coffee and other commodities, as well as handicrafts. That movement was launched in the 1940s by the Mennonite church and has now grown to a global phenomenon, with multiple certification bodies grouped under the Fairtrade Labelling Organizations International. The same could arise with a “circular economy” label.

The first step towards a circular economy is establishing the concept at the local level. On Vancouver Island in Canada’s British Columbia province, the Synergy Foundation is producing a series of initiatives to encourage a circular economy through its “Project Zero”. Their approach is holistic, involving consumers, businesses, financial institutions and awareness-raising campaigns with, for example, chambers of commerce and community shops. They use a slightly extended and more sophisticated definition of the circular economy and use the model to define and determine their activities.

Figure 5.7: Synergy Foundation's model of the circular economy



Source: Synergy Foundation

The most controversial aspect of the Synergy model is the "reduce" element. This is based upon the idea that much consumption is unnecessary and only occurs because it can. The case of garments illustrates the point: if people in the economically advanced countries wore their clothes for just twice as long, greenhouse gas emissions from the textiles industry could be cut by 44 per cent. However, that implies that there would be fewer textiles produced, which reduces employment in places where quality employment is scarce and poverty levels high.

On the local level, however, the jobs lost to reduced production are more than compensated for by the rest of the model. A reuse and repair system creates jobs because of the labour involved in renovating used goods that are not simply abandoned and sent to the landfill. Before mass-produced goods became cheap, even in advanced

countries repair shops and artisan workers – such as cobblers – were common and offered an important service to people of modest means. From a circular point of view, it makes sense to bring those professions back into play and to invent new ones to maintain the items that still have years of service left in them.

Under “redistribute” Project Zero is about assisting companies and individuals to find destinations for items that have no longer any use to their original owners but that may be of value to someone else, especially if the items have been renovated, which is also part of the “recondition” part of the model. Finally, goods are recycled, when there is no longer any opportunity for them to be used as they are, and their constituent parts used to create new goods that can be sold to cover the costs of recycling. In this context, the case of a Vancouver metropolitan area initiative called “Unbuilders” is worthy of note. In a country where wood-frame housing is the norm, it has been normal to demolish older properties and either burn the waste or bury it. Unbuilders recover’s up to 80 per cent of the houses it demolished and re-employs it in new buildings. This principle is clearly one that could be adopted elsewhere.

The line of approach taken by the Synergy Foundation, and other initiatives like it, is to work with the local level, including organisations of consumers and chambers of commerce, to establish the idea of the circular economy as something real and feasible. While international co-operation and working agreements are indispensable for resolving the planetary problems posed by continuing with the linear model, without local buy-in the prospect of establishing a circular economy would be very dim. Hence, the solution is to continue working at all levels.

Conclusion

Industrial development lies at the heart of economic and social development. Or so it would seem, based on past experience.

In the light of the Sustainable Development Goals (SDGs) this model is not only being brought into question, but also being soundly debunked. The 2020/2021 Sustainable Development Transformation Forum (SDTF), on which this publication is based, focused on the new understandings of what "industrial development" really means in the context of climate change, the requirements of the SDGs and the legitimate objectives of private companies to continue to expand and make profits for their owners and shareholders.

To begin with, "industrial development" can cover a multitude of activities. Apart from the classical idea of an "industry" including factories and machines, the 2020/2021 SDTF heard from multiple experiences of agricultural industries on which rural populations in developing countries ultimately depend. Such industries include crop science, product specialisation and transformation in agricultural commodities like cocoa and coffee, and quality labelling.

It is no longer sufficient to produce undifferentiated goods (although they still constitute the vast majority of agricultural products on the market) the move is to high-quality – perhaps organic – products that can occupy currently "niche" markets from an evolving value chain that can extract additional value from such products.

Elsewhere, the extractive industries and the construction industry are adapting to modified value chains that have diverse elements and are inclusive of the demands and requirements of local communities. They need to do this in order sustainably to supply technologies and industrial processes that underpin the technological demands of societies that are growing in prosperity.

At the same time as prosperity is expected to grow across the developing world, recognition is growing that it cannot be on the same basis on which economic growth was built in the advanced economies. Socio-political models that were based on narrow intellectual specialisation produced "silos" of knowledge and expectations that are no longer realistic or even desirable. New forms of governance that are inclusive and interrogative are needed to cope with the challenges that have always been with us but that have only recently emerged.

Not only have they emerged, but their resolution has become urgent.

Climate change has not only produced questions about how to modify behaviours, it has forced us to think about whether some behaviours are acceptable at all. This includes questions about agricultural inputs, consumption patterns, plastics use, energy supplies, construction methods prices and, above all, the circular economy.

The answer to whether we can continue with our industrial development as it is today is, “Of course not!” That, however, is not enough. It is not enough to know what we cannot do, we need to know what we can.

The 202/2021 SDTF offered some answers or, at least, asked some of the right questions.

Postcript

Jean D'Aragon, Senior Sustainable Development Expert, UNOSD

The 2020/2021 SDTF had a particular focus on Building Back Better and Greener — Sustainable, Low-Carbon Industrialisation. Addressing this theme under SDG 9 made us slightly move out of our comfort zone, which, finally, was a good thing.

It was, indeed, a première for the Forum to address only one theme, and particularly this one. However, as the speakers and participants told us, it was very timely. Throughout, the excellent presentations and panel discussions brought to light ideas and experiences of low-carbon transition across the economy, with a strong emphasis on decarbonisation of the industrial sector, particularly in least developed countries.

Many of these ideas and experiences can also be implemented to help "build back better and greener" for a sustainable recovery from the COVID-19 pandemic.

As Assistant Secretary-General for Economic Development and Chief Economist, Elliott Harris, emphasised during the opening segment, the endeavour to support countries to "build back better and greener" means to ensure they are on a truly sustainable and inclusive development path to shared prosperity.

He also noted that many low- and lower-middle income countries will need support for their structural transformation towards more productive activities and sectors, while also contributing to tackling global challenges like climate change, biodiversity loss, and degradation of the world's oceans.

It was mentioned a few times, and particularly by Ms. Fatima Denton, Director of the UNU Institute for Natural Resources in Africa, that some developed countries that are greening their industries at home are also sometimes transferring their old, polluting, energy-intensive technologies to developing countries.

In our efforts towards sustainable, low-carbon industrialisation, we must remind ourselves that "leaving no-one behind" means that we also need to take informal sector with us because it is a major contributor to the economy, especially in times of crisis, where the informal sector is particularly innovative.

Innovations in industrialisation, including in housing, in agriculture, and even at the household, city, country and region levels, all the way up to Official Development Assistance (ODA), Foreign Direct Investment (FDI), diaspora investment and other forms of investments from within (the countries) and from abroad, are part of a holistic and essential approach to sustainable development.

Without these diverse sources of investment, we cannot move to “Zero Waste” circular economies, which are indispensable if we are to attain sustainable development and the SDGs.

In so short a time as we had in the virtual 2020/2021 SDTF, we could not possibly have examined deeply all the sub-themes of sustainable, low-carbon industrialisation.

Hence, we need to continue our conversation.

The next SDTF will be in person in Incheon City, once the COVID-19 pandemic has been vanquished. Meanwhile, this publication, inspired by the 2020/2021 SDTF, will drive the discussion forwards in anticipation of the next edition of the Forum.

We produced such a publication last year and I invite you to look for it on the UNOSD Website.

I would like to thank again all the presenters and panellists, who generously gave their time to share their ideas, knowledge, and experience on the themes explored.

I would also like to thank Mr. David O’Connor and Mr. Colm Foy, for their support as invited Co-Conveners of the SDTF – acting in turns as Moderators and Rapporteurs.

The Forum would not have been possible without the dedicated support and selfless dedication of the staff of the UNOSD and our interns who helped us master the technology, keep in touch with the presenters and participants, and supplied us with a constant stream of information, and support.

Finally, I would like to thank our long-time partner in the Sustainable Development Transformation Forum, the Asia Europe Foundation.

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