Commonwealth of Learning (COL) and Open University of Mauritius (OUM)

Massive Open Online Course

INTRODUCTION TO SUSTAINABLE DEVELOPMENT IN BUSINESS
MOOC: Introduction to Sustainable Development in Business
Course Materials
The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to promote the development and sharing of open learning and distance education knowledge, resources and technologies.

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**MOOC: Introduction to Sustainable Development in Business**

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**ACKNOWLEDGEMENTS**

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ABOUT THE COURSE

Welcome to this MOOC on “Introduction to Sustainable Development in Business”. The aim of this module is to introduce you to SDGs and discuss issues related to sustainable development in business.

The first MOOC on “Introduction to Sustainable Development in Business” was offered the first time in June 2019. There were over 1,000 students from 50 different countries. You will find a short video on how feedback from the first offer has guided the team to review the MOOC for the second offer.

We hope that you will enjoy the second offer of the course and the team is looking forward to interact with you.

COURSE LEARNING OUTCOMES

On completion of this course, you are expected to be able to:

- Analyse the interrelationships between the SDGs.
- Discuss the complexities and challenges of achieving the SDGs.
- Explain the issues relating to the development of a sustainable corporate strategy.
- Identify the four different perspectives pertaining to the Traditional Balanced Scorecard.
- Discuss the issues which are integrated in the Sustainable Balanced Scorecard.
- Define a sustainable business model.
- Explain the concepts of economic growth, sustainable development and sustainable trade.
- Discuss about the case for sustainable trade and its drivers.
- Identify opportunities related to sustainable trade in different sectors such as agriculture and tourism.
- Apply the concepts of sustainable production and consumption.
- Apply sustainability to different business areas including infrastructure, waste management and tourism.
- Explain the concept of industrial symbiosis.

WORKLOAD

There are 4 units in this MOOC, with several topics under each unit. You are encouraged to complete a Unit per week. The total duration of the module is four (4) weeks.

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**TUTOR**
A tutor will be assigned to you for each unit. Please feel free to share your thoughts and perspectives with the tutor and your peers.

**ASSESSMENT**
Each Unit will have 10 Quiz Questions at the end.

**Certificate of Completion**
A Certificate of Completion will be issued to you by the Open University of Mauritius and the Commonwealth of Learning. The Criteria for the award of the Certificate will be:
- Participating in at least one Forum throughout the course
- Completing the Quiz Questions for each unit

**Links to Videos for the MOOC**

**Week 0**
- FREE MOOC: Introduction to Sustainable Development in Business: https://youtu.be/F2YNn1NvU6s
- MOOC Introduction: Enhancements for you: https://youtu.be/xcRNxq2O7w4

**UNIT 1**
- FREE MOOC: Unit 1 - Introduction to Sustainable Development Goals: https://youtu.be/AFWWLzLbuzU
- Unit 1: An Appropriate Measure for Sustainable Development Goals: https://youtu.be/jk20vThT9Hs

**UNIT 2**
FREE MOOC: Unit 2 - Introduction to Sustainable Business Strategy and Scorecard: https://youtu.be/GxniFIVeKHI

Unit 2: Developing a Corporate Sustainability Strategy - A Simple Approach: https://youtu.be/haLn5h7WzXg

**UNIT 3**
- Unit 3: Sustainable Trade and Economic Growth (Topic 1): https://youtu.be/AzMICQ5t70
UNIT 4

• FREE MOOC: Unit 4 - Introduction to Sustainable Production and Consumption: https://youtu.be/MWhDnovBz5U
• Unit 4: Sustainable Production and Consumption: https://youtu.be/pwtqhhG8G8

*We wish you a very enriching journey with us on learning about sustainable development in business and we look forward to interacting with you.*
OVERVIEW OF UNIT 1

In this unit, we discuss the interrelationships, challenges, and complexities relating to the United Nations Sustainable Development Goals (SDGs).

We start by giving you an overview of the SDGs. We then present the two main topics in this unit, to be covered over one week:

• Topic 1: Interrelationships between SDGs
• Topic 2: Challenges and Complexities of the SDGs

LEARNING OUTCOMES

By the end of this unit, you should be able to:

• Discuss interrelationships between the SDGs.
• Reflect on the relevance and complexities of the SDGs.

TASKS FOR STUDENTS FOR WEEK 1

VIDEOS

• Unit 1: Introduction to United Nations Sustainable Development Goals
• Unit 1: An Appropriate Measure for Sustainable Development Goals
• Unit 1: United Nations Sustainable Development Goals (Part A, Interrelationships)
• Unit 1: United Nations Sustainable Development Goals (Part B, Challenges and Opportunities)

READINGS

• Week 1, Topic 1: Interrelationships between SDGs
• Week 1, Topic 2: Challenges and Complexities of the SDGs

ASSESSMENT

• One (1) Forum Discussion
• Ten (10) Quizzes

UNIT 1: OVERVIEW OF THE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

We will begin by introducing the 17 Sustainable Development Goals (SDGs) and their various priorities, before moving to Topic 1.

On 25 September 2015, numerous countries around the planet adopted the United Nations (UN) 2030 Agenda for Sustainable Development, including 17 sustainable development goals (SDGs) and 169 targets. Essentially a plan of action to ensure the longevity of humanity and Earth’s ecosystems, the SDGs follow on from the former Millennium Development Goals (MDGs) also developed by the UN (2006-2015).

Each of the 17 goals and their respective targets are described below. For further information, see the UN SDGs website: https://sustainabledevelopment.un.org/sdgs
GOAL 1: NO POVERTY
The first goal is to end poverty in all its various forms by 2030. The UN seeks to promote equal rights of access to economic resources and to appropriate social protection systems for all, through the correct policies and frameworks (UN SDGs Goal 1 Target). It aims to build the resilience of the poor and the vulnerable, especially for people dwelling in the ‘Least Developed Countries’ (LDCs), by providing adequate means and appropriate programs and policies. It also aims to create sound policy frameworks at national, regional and international levels to boost accelerated investment in poverty eradication actions. Through enhanced development cooperation and mobilization of resources from various sources, the UN aims to close the poverty gap for good.

Extreme poverty as defined by the World Bank is living below the poverty line of $1.90 per day. Poverty, while mainly depicting the lack of financial resources, has also many other socio-economic implications and scourges attached to it — starvation, lack of water, poor health, poor sanitation and premature death, to name only a few. Ending poverty has often been challenged as utopian, but according to the Chief Economist and UN senior adviser, Jeffrey Sachs, it is a possibility (Sachs, 2005). It would require a mobility of resources of about US $175 billion per year, which is a figure that accounts for approximately one percent of global wealth.

GOAL 2: ZERO HUNGER
Goal 2 has, as its primary objective, to achieve zero hunger worldwide by 2030 by providing the poor and vulnerable, especially children, access to safe, nutritious and sufficient food all year round. It also aims to end all forms of malnutrition, and to sufficiently cater to the nutrition requirements of adolescent girls, pregnant and lactating women, and older persons. This includes doubling the agricultural output and earnings of small-scale producers, especially women, indigenous people, family farmers, pastoralists and farmers by 2030. To preserve food security, the UN intends to maintain the genetic diversity of cultivated plants and farmed animals. It will also adopt measures to ensure the proper functioning of food commodity markets and to correct and prevent trade restrictions in world agricultural markets.

Hunger and food security are fundamental for all countries, governments and large organizations. It is important to address the entire model of how farmers produce and distribute food and also to address how much we consume. At the current rate of exploitation of resources, our soils, oceans, freshwater and biodiversity are being depleted at an alarming rate. Vast areas of tropical rainforests such as the Amazon and the Indonesian rainforests are also being cut down, with direct and indirect effects on biodiversity. Communities relying on forests and nature reserves for their survival are directly threatened, facing alienation and persecution from those taking over land in the name of consumerism and capitalism.

GOAL 3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES
A number of targets have been delineated by Goal 3 to foster global health of the world population and to enhance the general well-being. The first is to reduce the global maternal mortality ratio and to end preventable deaths of newborns and children. The second objective is to end the epidemics of acquired immunodeficiency syndrome (AIDS), tuberculosis, malaria, and hepatitis, among others. Further, this goal seeks to curtail premature mortality from non-communicable diseases by one third, and promote mental health and well-being. It also seeks to strengthen the prevention and treatment of substance abuse, including narcotics use and overconsumption of alcohol as well as to halve the number of deaths and injuries from road accidents. Moreover, the UN aspires to achieve universal worldwide health coverage and universal access to sexual and reproductive healthcare services.
Good health and well-being for all people of all ages are essential for a society to prosper and to sustain itself. Considerable progress has been made by science and technology in increasing life expectancy and containing severe diseases. However, efforts must be sustained especially in developing countries to contain the spread of such diseases, given that poor sanitation and lack of clean water unfortunately facilitate the propagation of such diseases. There are also other paradigms of health that should be considered, especially of mental health. Statistics show that mental illnesses such as anxiety, depression, and schizophrenia are increasing at an exponential rate and that these conditions are more prevalent in developed countries.

GOAL 4: ENSURE INCLUSIVE AND QUALITY EDUCATION FOR ALL AND PROMOTE LIFELONG LEARNING

Through Goal 4, the UN has as primary objective the need to ensure that boys and girls complete free, equitable and quality primary and secondary education and have access to quality early childhood development and pre-primary education. It seeks to promote equal access to affordable and quality technical, vocational and tertiary education for all women and men. It aims to eliminate gender disparities in education and to foster inclusion of people at all social levels, accessibility needs and economic statuses. The goal promises to build and upgrade education facilities that are child-, accessibility- and gender-sensitive, and to substantially expand the number of scholarships available to developing countries globally.

‘Education is the premise of progress, in every society and in every family’ - Kofi Annan. As globalization increases the competition for resources on multiple levels, the need for a quality education has grown dramatically. The gap in standards of living between the “educated” and “uneducated” is widening, as can be evidenced by societies where illiteracy is rampant, such as Sub-Saharan Africa, compared to the educated parts of the world. It is estimated that out of the children who have not enrolled in school, more than half of them reside in poor regions of Sub-Saharan Africa.

GOAL 5: GENDER EQUALITY

Goal 5 calls for ending all forms of discrimination against women and girls and towards ensuring gender parity. This includes ensuring women’s full participation and equal opportunities for leadership as well as equal access to economic resources such as land, property, financial services, and inheritance. It seeks to eliminate all forms of violence against women, and to halt exploitation of women and girls such as trafficking, sexual exploitation, and child, early and forced marriage. Goal 5 recognizes and values unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household. It also aims to democratize access to technology in order to empower women and to legislate in favor of gender equality and empowerment of women.

The former MDG goals regarding achieving greater gender equality and women’s empowerment was successful to a certain extent, however it is also known that women and girls are still facing ongoing discrimination and violence in various regions of the world. Basic necessities such as education, healthcare, the right to vote, a bigger representation of women in politics and the corporate world are essential for achieving sustainable economies.

GOAL 6: ENSURE ACCESS TO WATER AND SANITATION FOR ALL

Through Goal 6, the UN has as its main purpose to achieve universal and equitable access to safe and affordable drinking water for all. By 2030, it also aspires to achieve access to adequate and equitable sanitation and hygiene for all and to end open defecation while paying special attention to women and girls. The aim is also to improve water quality
by reducing pollution of aquifers and eliminating dumping and release of hazardous chemicals and materials. By 2030, it seeks to increase water use efficiency across all sectors and to implement integrated water resources management as well as to protect and restore water-related ecosystems. It endeavors to expand international cooperation to support developing countries in water and sanitation related programs including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.

From early civilizations such as the Indus Valley or the Egyptians, the importance of clean water for a thriving society is well documented (Juuti, et al., 2007). The planet has vast water resources, whether freshwater or seawater (which can be converted to drinking water by desalination). However, due to poor infrastructure, and lack of political willingness, millions of people and children die from diseases caused by poor sanitation. Prolonged droughts in certain parts of the world worsen their plight.

**GOAL 7: AFFORDABLE AND CLEAN ENERGY**

Goal 7 aims at ensuring universal access to affordable, reliable and modern energy services to all and to substantially increase the share of renewable energy in the global energy mix. It seeks to double the global rate of improvement in energy efficiency and enhance international cooperation to facilitate access to clean energy research and technology. Through Goal 7, the UN will expand infrastructure and upgrade technology in order to provide modern and sustainable energy services to developing countries and LDCs.

Energy in its various forms, especially electricity, is the backbone of progress for any economy. The various consequences of global warming are being felt in various parts of the world. Leaders, regrouped at the COP21 meeting in Paris in 2016, strengthened their commitment to combating climate change, and agreed to an accord which gave them clean energy targets to achieve (Climate Focus, 2015). This has led to increased investments in new energy sources which have nearly quadrupled since the last decade. New energy mega projects are now being built in countries such as India, China, and Saudi Arabia.

**GOAL 8: PROMOTE INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, EMPLOYMENT AND DECENT WORK FOR ALL**

Goal 8 is about promoting inclusive and sustainable economic growth, employment and decent work for all. The UN aspires to achieve this by sustaining per capita economic growth and specifically by reaching a target of at least 7 percent Gross Domestic Product (GDP) growth per annum in the LDCs. By fostering diversification, technological upgrading and innovation, it aims to achieve higher levels of economic productivity. The focus will also be increased towards high value-added and labor-intensive sectors. Development-oriented policies will be promoted that support productive activities. Global resource efficiency will be maximized, and economic growth will be decoupled from environmental degradation in greater measures. Goal 8 aims to substantially reduce the number of youth in unemployment and to ensure productive work for men and women across all age groups. Goal 8 also seeks to eradicate forced labor, end modern slavery and human trafficking, and secure the prohibition and elimination of the worst forms of child labor.

A key ingredient of economic prosperity and general well-being is that people are able to find decent jobs to support their families and themselves. The middle class around the globe is rising and becoming richer. However, the income inequality gap is widening around the globe and job creation is not growing at the same rate as the labor force, as can be evidenced by worldwide youth unemployment. There are more than 64 million unemployed youth in the world and 145 million young workers living in poverty
The main victims are young graduates, who are finding it extremely difficult to find employment after the completion of their studies. Over 200 million people are currently jobless around the world.

**GOAL 9: INDUSTRY, INNOVATION AND INFRASTRUCTURE**

Goal 9 aims to increase investments in infrastructure such as transport, sanitation, irrigation, energy and communication technology. It also seeks to increase the manufacturing value added per capita in developing countries which is US $100 compared to over US $4,500 in Europe and Northern America (UN SDG Goal 9) and put more emphasis on reducing carbon emissions during manufacturing processes. Innovation is sought especially by technology progress with increased emphasis on resource and energy efficiency. The UN wants to enhance the role of sustainable industrialization and increase the share LDCs have in national gross development potential (GDP) of both developed and developing countries.

Infrastructure development in areas such as water management, transport, energy and information and communication technology are key to the sustainable development of a country. Zangoueinezhad & Azar (2014), argued that a planned, funded and maintained infrastructure extends a country’s global wealth. Such infrastructures are severely lacking in developing countries which are often plagued by rampant corruption. Approximately 2.6 billion people do not have access to electricity, mostly in Asian and Sub-Saharan Africa. Some 1 billion people still do not have access to phone networks and services. Besides the basic infrastructural need of a community such as health care, sanitation and transport, technological infrastructure is key to competing in this globalized world. Additionally, adequate amenities for health care, sanitation and transport as well as universal access to the internet have become crucial for nations to compete in a globalized world.

**GOAL 10: REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES**

Goal 10 aims to boost the growth of the bottom 40 percent of the population by a higher rate than the national average. It also seeks to promote inclusion of all — be it social, political or economic. Through the implementation of the right fiscal, wage and social protection measures, it aims to achieve greater equality. Another way that it can use to reduce inequality is better regulation of the global financial markets and better monitoring of financial institutions. Ensuring safe migration and mobility of people as well as encouraging enhanced representation of developing countries are means through which Goal 10 aims to safeguard the interests of those who find themselves at the bottom of the ladder.

Poverty is a global issue that every nation is trying to fight. However, the most vulnerable nations, such as the small island development states, and the landlocked countries, often do not have the same natural and human capital resources and relative advantages that other countries might possess. Therefore, one of the major targets is to reduce inequality within and among countries, by providing resources and expertise to fight the different scourges of society. Economic growth, as can be seen from historical data, has not entirely resolved the problem of poverty but has caused growth in income inequality. One of the negative side effects of economic growth is that it tends to cause growth in income inequality.

**GOAL 11: SUSTAINABLE CITIES AND COMMUNITIES**

Goal 11 aims to help countries make better informed decisions on how to invest in infrastructure in a way that reduces the impact that natural calamities and force majeur events have on society at large. Ideally, cities need to provide all their inhabitants with the same access to basic needs, and provide equal opportunities. The way to achieve this
would be to develop safe and affordable housing and sustainable transport, protect the natural and cultural heritage, support positive links between cities and peripheral regions, safeguard the environment and mobilize resources to combat calamities and disasters.

Cities and communities are the lifeblood of a country’s economy. It is estimated that about half of the global population lives in cities, and that developing countries are set for an unprecedented expansion of urban cities. The Center for Strategic and International Studies 2015 reports that “nearly 99% of urbanization between now and 2050 will take place in the developing world. Cities must be designed in a way that maximizes the resources available while reducing common externalities such as pollution, congestion, and a declining infrastructure.”

GOAL 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

This Goal aims to foster responsible consumption and production by maximizing the efficient use of resources and minimizing waste products, while at the same time promoting safe and environmentally friendly recycling. One of the targets is to halve per capita food waste which tends to manifest at alarming levels because of food losses. The aim is also to promote environmentally sound management of chemicals and preclude the release of toxic substances into the atmosphere and the natural environment. One of the UN targets is to support developing countries and LDCs in strengthening their scientific and technological capacity to achieve more sustainable patterns of production, to address the impact of economic growth on the environment.

According to UN estimates, about one third of the global food production goes to waste, which is equivalent to 1.3 billion tons of waste costing about US $ 1 trillion per year (The UN SDG 12 Target and Info, 2017). This includes household and industrial waste. Responsible consumption and production in broad terms entails maximizing the efficient use of resources while minimizing the waste products. Due to the highly industrialized nature of production cycles, where goods are being produced in large numbers, there is a percentage of the resources used that often goes to waste, despite sustained efforts in recycling. In Europe, 5 tons of waste were generated per EU inhabitant in 2016, and 37.8% are recycled (Eurostat Waste Statistics 2016). By 2030, the UN wants to considerably decrease waste generation through different action guides such as prevention, reduction, and recycling. Throughout the production life cycle, they hope to achieve environmentally friendly management of wastes and chemicals, so that they have a minimum impact on the environment.

GOAL 13: URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACT

Goal 13 aims to tackle climate change head-on and to mitigate climate change related hazards by reinforcing resilience and adaptive capacity and integrating climate change measures into national policies, strategies and planning. To enhance mitigation, the aim is to improve education, raise awareness and strengthen institutional capacity. The UN Framework Convention on Climate Change seeks to mobilize US $100 billion annually to address the needs of developing countries in terms of mitigation strategies in order to fortify them against the hazards of climate change and related disasters.

Ban Ki Moon, the former Secretary-General of the United Nations famously said, “We are the first generation to be able to end poverty, and the last generation that can take steps to avoid the worst impacts of climate change”. Countries gathered during the COP 21 Paris Agreement 2016, formally recognized their obligations to start adopting policies to limit the rise of global temperatures to 2 degrees above pre industrial levels. All major emitting countries have pledged to reduce their carbon footprint and help assist the developing countries in their climate mitigation and adaptation efforts. The Intergovernmental Panel on Climate Change presented the following worrying facts:
1. The global average sea level rose by 19 cm from 1901 to 2010 due to ice melting in the poles, and it is expected to rise even further.
2. Global emissions of carbon dioxide have increased by almost 50% from 1990 to 2012.
3. The Northern Hemisphere has recorded the hottest summer while the Southern Hemisphere recorded the hottest winter during 2019.

Goals on Climate Change are very dynamic due to its complex nature. There are significant time lags in the fight against climate change and even if the greenhouse gas emissions were cut down entirely in one day, it would take a significant amount of time for the oceans and the atmosphere to adjust to such changes. Furthermore, the complex interactions between the change in atmospheric compositions, human activities, biodiversity, rainforests and oceans can imply that outcomes to reduce emissions may often be presented in probabilistic terms rather than certain predictions. All of these complexities make the UN SDG Goal 13 very dynamic in nature, but also the most urgent one, otherwise future generations will blame our current generation for not acting before it was too late.

GOAL 14: CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS, AND MARINE RESOURCES

Goal 14 aims to combat marine pollution and to protect the marine ecosystem. It seeks constant improvement in marine technology that enables further discovery of the deep ocean and helps unravel the mystery of the creatures that inhabit it. The Goal aims to combat marine pollution, littering and marine nutrient pollution, to minimize ocean acidification and to curtail overfishing and illegal harvesting. In addition, it seeks to implement measures which foster scientific cooperation at all levels and to implement science-based plans to effectively manage marine ecosystems to avoid further damage and pollution. Furthermore, it seeks to prohibit certain forms of fisheries subsidies that contribute to overfishing. Finally, it also aims to empower small island developing states to achieve increasing economic benefits from the sustainable use of their marine resources geared towards fishing, tourism and aquaculture.

Oceans are vital to sustaining life on this planet. They drive the currents, regulate temperature and are hosts for biodiversity (UN SDGs, Goal 14). However, exploitation of the sea through overfishing and by throwing industrial wastes in lagoons has caused much damage to life under water. Fisheries subsidies would be subject to review and addressed if they are found to contribute to unregulated and illegal fishing.

GOAL 15: LIFE ON LAND

Goal 15 aims to protect terrestrial, inland and freshwater ecosystems such as forests, wetlands, mountains and drylands. This includes reinforcing international agreements to promote the sustainable management of forests, to stop deforestation in its tracks and to restore degraded forests by increasing afforestation and reforestation. It also aims to combat desertification and to preserve mountain ecosystems and rainforests. It seeks to take urgent action to halve the degradation of natural habitats, to end poaching and trafficking of protected species and to curtail the impact of invasive alien species on land. In doing so, the UN aims to safeguard biodiversity on land, forests and natural habitats to preclude the otherwise devastating effects of biodiversity loss and extinction.

Extensive human activities and exploitation of resources are severely impacting forest life. Deforestation, including that of the Amazon, is on the rise due to massive exploitation of wood. This is negatively impacting the biodiversity of the forest, where the homes of many animals are being destroyed, with unprecedented extinction rates. The UN aims to address this decline, protecting natural lands by promoting sustainable management of all the highly deforested areas of forests and increasing the rate of
reforestation across the globe. Poaching and illegal trafficking are also being tracked down heavily and actions to curb the demand and supply of tusks and other prized parts of animals should be implemented as quickly as possible.

**GOAL 16: PROMOTE JUST, PEACEFUL AND INCLUSIVE SOCIETIES**
Goal 16 aims to significantly reduce all forms of violence and conflicts worldwide. In order to ensure a fair and equitable society for everyone, the aim is to promote worldwide peace. The promotion of the rule of law plays an important role at national and international levels, especially in developing and least developed countries, where corruption and bribery undermine the true potential of the economy.

To promote worldwide peace, the UN seeks to uphold and further the rule of law, at national and international levels, and ensure equal access to justice for all. While murder rates globally have been reduced, the rate of violent conflicts has risen. Community Against Violence, an international NGO stipulates that violent conflicts can take the form of domestic violence, sexual violence, child abuse, elder abuse, stalking, technology-assisted abuse and youth and dating abuse (Community Against Violence). It aims to considerably bring down illicit financial and arms flows in order to fight all forms of organized crime. It also intends to substantially reduce corruption by developing accountable and transparent institutions at all levels. In order to help developing countries, Goal 16 seeks to further their participation and involvement in instances of global decision-making and governance and foster participatory decision-making.

**GOAL 17: PARTNERSHIPS FOR THE GOAL**
Goal 17 aims to ensure that countries and organizations cooperate instead of compete in order to further the cause of international cooperation. It aims to develop multi-stakeholder partnerships to share knowledge, expertise, technology and financial support, which are critical to the overall success of the SDGs. This includes fostering the development, dissemination, transfer and diffusion of technology, especially environmentally sound technology, to aid the LDCs. As for systemic issues, the UN wants to enhance global macroeconomic stability and policy coherence for sustainable development. In order to increase monitoring and accountability, it also aims to generate better metrics to gauge levels of progress on sustainable development.

Increasing international cooperation, as Goal 17 stipulates, is seen as vital to achieving each of the 16 previous goals. Goal 17 is included to ensure greater cooperation among countries and organizations. Developing multi-stakeholder partnerships to share knowledge, expertise, technology and financial support is seen as critical to the overall success of the SDGs. Public-private partnerships that involve civil societies are specifically mentioned.

**REFERENCES**
- America’s Climate Choices (2011), The Unique Challenges of Climate Change. [https://www.nap.edu/read/12781/chapter/5#37](https://www.nap.edu/read/12781/chapter/5#37) [Accessed 03 November 2019]
• Sachs, J., 2005. The end of poverty: How we can make it happen in our lifetime. Penguin UK.

UNIT 1: TOPIC 1: INTERRELATIONSHIPS BETWEEN SDGS

Now that you have a good understanding of the 17 Sustainable Development Goals (SDGs), let us discuss the interrelationships between them.

The SDGs are quite interconnected despite how broad and diverse we may first think they are. As social, environmental and economic issues are all integrated within all 17 goals (through the targets within each of them), if each goal is addressed separately, we may not realize the full benefits – indeed there could even be unintended negative results. For example, using fossil fuels to improve energy access (Goal 7) in South East Asian countries would contribute to worsening climate change and may affect life on sea and land, which contradicts Goals 13, 14 and 15. Identifying goals that complement each other and implementing proper policies, can create synergies – or ‘multiplier effects’ – where the trade-offs are minimized, and the benefits maximized. For example, achieving a greater percentage of educated females (Goal 4) would positively affect health and well-being aspirations (Goal 3), alleviating poverty targets (Goal 1) and help to reduce the gender equality gap (Goal 5).

A challenge in achieving such synergistic benefits and multiplier effects is that policy makers, government authorities and decision-makers, often still operate in silos, with each ministry or department handling one aspect of national interest such as health, energy, tourism, and education. In addition, various government departments and their employees may not have the knowledge or tools to identify interactions, synergies and subsequent priorities to be addressed, or indeed how to tackle them. Figure 1.1 shows a classification of SDGs into three categories according to ‘Well-being’, ‘Infrastructure’, and ‘Natural Environment’, that are all interconnected and underpinned by partnerships (shown as a box around the three circles). In the following paragraphs, we discuss them in relation to how they can be addressed.
The people-centered inner circle ‘well-being’ has as its objective the welfare of both the individual and collective level of people. To achieve this, ease of access to education on a continuous basis, and education for all without discrimination are significant related objectives.

The middle circle ‘infrastructure’ contains all the necessary networks and mechanisms for production, delivery, sale and distribution to support the well-being circle. To address well-being, it is important to address how goods and services are provided to communities. This includes clean water for drinking and washing purposes, food production, waste disposal systems and provision of adequate sanitation services. Infrastructural development can take the forms of sanitation services, road and sea routes, electricity infrastructure, telephone and communication lines and grids.

The ‘natural environment’ outer circle brings to light the importance of the proper management of the environment and resources with a view to ensuring their continued availability to future generations. This includes management of global natural resources such as land and oceans as efficiently and sustainably as possible.

This illustration using the three circles and surrounding role of partnerships, is helpful in setting out a framework for policy makers. With regard to partnerships, the institutions responsible for delivering ‘well-being’ and ‘infrastructure’ goals are clearly defined and well-established, namely health, welfare and education. They have the same core governance structure with great potential for synergy. However, they still exist in silos and better cooperation and coordination are needed. Frameworks for addressing the ‘natural environment’ are not yet as clearly defined or implemented as the other two circles. For example, despite COP 21 (the Paris Agreement) articulating the need for institutions to prioritize the conservation and preservation of the environment, it is not legally binding (i.e. a country might challenge or opt out).

Within the ‘infrastructure’ circle, there is also the potential for a variety of competing interests. For example, development draws from the same stock of natural resources to complete projects, which might have different priorities for different authorities –
consider steel used for building a stadium that could be used for building railways. Decisions are taken usually by elites and experts of the particular field and they may not always act in the best interest of the people. A combination of private interest and weak forms of transparency can shift the onus from maximizing social benefits to instead increasing private benefits.

From this discussion of interrelationships, we can see that good governance is important for the SDGs ambitions to be realized, across all three categories and enabled through partnerships. Furthermore, we can benefit from addressing interrelationships to open the door for many opportunities while minimizing the risks involved. Special care and attention should be given to developing the ‘infrastructure’ goals, with transparent and deliberate planning and implementation to avoid adversely impacting on the ‘well-being’ and ‘natural environment’ goals.

UNIT 1: TOPIC 2: CHALLENGES AND COMPLEXITIES OF SDGS

The United Nations (UN) Sustainable Development Goals (SDGs) have been discussed around the world as bold, ambitious and by some as too utopian. As we have already learned, the goals span ending poverty in all its various forms, empowering women all over the world striving towards gender equality, protecting the environment and the different forms of life on land and sea and ensuring decent living standards for everyone.

The SDGs follow the previous eight UN Millennium Development Goals (MDGs) (2006-2015) wherein significant progress was achieved on several issues including reduced poverty rates and the halving of annual global deaths of children. While some experts claim that the MDGs had limited influence on these figures, as much of it could be attributed to the economic growth of developing countries such as that of China, the MDGs are widely acknowledged as having provided important focus for dialogue and action by national and international authorities. With this in mind, and looking ahead at the goals and time remaining for the UN SDGs, we now discuss seven challenges regarding potential complexities and challenges to be addressed.

CHALLENGE 1: ARE THE GOALS TOO NUMEROUS GIVEN OUR CAPACITIES TO ADDRESS THEM?

17 SDGs require a rigorous approach to enable progress over this decade. There have been many deliberations about the number and their component targets, to increase focus and facilitate implementation. Furthermore, countries are in significant discussions to determine which goal/s should be their focus, given the diversity of factors including their resource base and national interests. Aligning national interests to the SDGs requires thorough consideration of existing legislation and policies that can be used, augmented and/or replaced, within the appreciation that the SDGs are not binding rules. Governments and international agencies such as the UN Financing for Development are also working towards effective funding programs directed at the SDGs.
CHALLENGE 2: DO THE GOALS HAVE CONFLICTING GOALS AND BENEFITS?
Some of the goals might initially appear to be in contradiction to each other. For instance, could achieving high GDP growth to boost food security and end poverty undermine environmental agendas? Could increasing wages and fighting unemployment compete against reducing the cost of living? Ensuring synergistic positive outcomes across the goals requires a whole-of-system approach to addressing the SDGs, and awareness of the potential for accidental trade-offs in the absence of holistic approaches to achieving the goals. For example, agricultural improvements need to be considered within the context of biodiversity protection and water resources, to avoid forests being cut down or water resource degradation to expand agriculture. Energy security improvements need to be considered within the context of food security so that important food crops are not used for biofuel production.

CHALLENGE 3: DO WE KNOW ENOUGH ABOUT THE COSTS OF IMPLEMENTATION?
According to an estimate from The Economist, achieving the 17 goals will require approximately $2-3 trillion USD per year over the next 15 years, which is a figure that is so large that it is difficult to understand for most people. To make the expenditure more realistic and achievable, governments need to mobilize capital and resource requirements. The business sector also needs to be convinced that SDGs will not be achieved unless they partner with the appropriate authorities. The matter extends beyond typical ‘Corporate Social Responsibility’ (CSR) commitments, for the corporate world to address the imperative – and cost benefits – of concurrently tackling climate change and other SDGs with government.

CHALLENGE 4: CAN WE OVERCOME THE CHALLENGES OF INTEGRATION?
Organizations involved in working towards the SDGs need to be efficient and integrated, with multidisciplinary and ‘cross-sector’ approaches to problem-solving. There are many examples of established and emergent non-government organizations working in alliance with corporations and government bodies. To realize the SDGs it is imperative to address their interrelationships, requiring collaboration, coordination and integration at the highest levels of leadership.

CHALLENGE 5: CAN WE OVERCOME CHALLENGES IN EVALUATING PROGRESS?
As many nations work on how to institutionalize the goals, figuring out how to measure progress is also a difficult task. Appropriate metrics, data and indicators need to be developed in order to gauge how much progress is being achieved in order to meet the 2030 Agenda. Some goals are rich in data sets to enable evaluation, while others lack data and information, or clarity in what metrics to measure. There are substantial efforts globally to establish data sets around each of the targets for the 17 goals, and to prioritize what should be monitored to effectively and efficiently evaluate progress.

CHALLENGE 6: HOW CAN WE ADDRESS VARYING LEVELS OF AWARENESS ABOUT THE SDGS?
Although the SDGs focus on tackling problems people can easily identify with, the awareness of the 17 SDGs still remains quite low globally. In an estimate, only 12 percent of the people of Colombia and Denmark are aware of the 2030 agenda to achieve these goals. The UN is working across its numerous initiatives and departments to embed the SDG goals within strategies and communications to stakeholders.
CHALLENGE 7: HOW CAN WE ENGAGE WITH SUFFICIENT AND APPROPRIATE STAKEHOLDERS?

Sustainable development requires different stakeholders operating together. National governments, international corporations, local and international NGOs and small villages have to be able to work together. For example, in relation to energy distribution, different stakeholders will need to be involved in order to decide on the installation of specific technologies, on ensuring sustainable energy systems and on achieving affordable pricing. Goal 17 has been set to focus attention on the importance of partnerships, however it must be remembered that partnerships are key to enabling all of the other 16 other goals as well.
OVERVIEW OF UNIT 2

This unit introduces the role of a sustainable corporate strategy and the benefits of using a ‘sustainability balanced scorecard’ to evaluate business performance. We highlight the business opportunities associated with committing to a sustainability policy informed by the United Nations (UN) Sustainable Development Goals (SDGs), including the resources needed to achieve associated business-level (i.e. Corporate) sustainability goals. We also discuss the sustainable business model with regard to integrating concepts linked to the triple bottom line (i.e. profits, people and planet) into business practice.

There are four topics in this unit:
• Topic 1: Business Opportunities
• Topic 2: Developing a Corporate Sustainability Strategy
• Topic 3: Sustainability Balanced Scorecard
• Topic 4: Adopting a Sustainable Business Model

LEARNING OUTCOMES

By the end of this unit, you should be able to do the following:
• Identify business opportunities that SDGs create.
• Explain issues related to developing a Corporate Sustainability Strategy.
• Discuss the stages in developing a Corporate Sustainability Strategy.
• Identify four different perspectives pertaining to the Traditional Balanced Scorecard.
• Discuss additional considerations for a Sustainability Balanced Scorecard.
• Recall the three spheres of sustainability when adopting a sustainable business model.

TASKS FOR STUDENTS FOR WEEK 2

VIDEOS
• Unit 2: Introduction to Sustainable Business Strategy and Scorecard
• Unit 2: Developing a Corporate Sustainability Strategy – A Simple Approach

ADDITIONAL VIDEOS
• Unit 2: Corporate Sustainability
• Build a Strategy for Sustainability, Harvard Business Review. Video Link: https://youtu.be/K_usARoT9be (Duration: 10 minutes, 26 seconds)
• World Bank Corporate Sustainability. Video Link: https://www.youtube.com/watch?v=okrWjbrPrEs. (Duration: 2 minutes, 18 seconds) [Source: World Bank, 2016]

READINGS
• Week 2, Topic 1: Business Opportunities
• Week 2, Topic 2: Development of a Corporate Sustainability Strategy
• Week 2, Topic 3: Sustainability Balanced Scorecard
• Week 2, Topic 4: Adopting a Sustainable Business Model
UNIT 2: **TOPIC 1: BUSINESS OPPORTUNITIES**

Traditionally, ‘sustainability in business’ has been linked only to addressing environmental issues and reducing environmental damage to ‘cause less harm’. However, with the advent of globalization and competition for resources, the concept of sustainability has evolved. Companies no longer view the concept as being only linked to green issues. Instead, the view has shifted towards ‘creating value’ through sustainable business practices such as ‘energy efficiency’, ‘doing less with more’, ‘lean and green thinking’, and ‘closing the loop’ on the flow of energy, water and materials within manufacturing. Hence, new business opportunities are being created for companies embedding ‘sustainability’ thinking and actions within their operations and deliverables.

Companies are increasingly being scrutinized as to how they treat their workforce, and what kinds of practices they are involved in. Consumers are more likely to respond to a company that adopts good and sustainable business practices. Indeed, investors are also more sensitive to companies that have sustainable risk profiles and understand new and emergent sustainable business opportunities. As such, sustainability portrays opportunities for businesses to create value for customers and gain a competitive edge. A leading example is Interface Carpets, who have recreated their brand and manufacturing towards unprecedented goals of zero waste and energy efficiency.

According to a report by the Business & Sustainable Development Commission (2017), by 2030 a total of US $12 trillion of revenue and business savings could be generated by SDGs across four main sectors including: food and agriculture, energy, health and well-being, and sustainable cities. The report also highlights 60 important market opportunities that can be achieved by implementing SDGs from sustainable mine reconstruction to sustainable farming – resulting in the potential for approximately 380 million new jobs to be created in the next two decades.

**REFERENCES**


UNIT 2: TOPIC 2: DEVELOPING A CORPORATE SUSTAINABILITY STRATEGY

INTRODUCTION

Strategies have been traditionally developed by businesses to establish long-term economic success by setting policies that aim to have advantages over competitors. However, when we talk about sustainability, environmental and social dimensions have to be taken into account when formulating corporate strategies. The United Nations (UN) Sustainable Development Goals (SDGs) 12 ‘Responsible Production and Consumption’, 14 ‘Life Below Water’ and 15 ‘Life on Land’ in particular provide immediate opportunities to reflect on what is possible in using the indicators within the goals – their synergies and co-benefits.

So, when developing a corporate sustainability strategy, the commitment of all stakeholders is important to ensure that the corporate strategies include economic, ecological and social issues. However, the business must also understand that it needs to mobilize resources to attain sustainable strategic goals.

Moreover, prior to the development of a corporate strategy policy, the business must recognize that some of the company’s actions or decisions can directly impact on society and environment, and there are issues that are important to society, the environment, and the economy, but which the company is not able to influence. Furthermore, changes in the external environment such as temperature rise and changing weather patterns, can also impact the company’s competitiveness and influence its activities.

STAGES FOR DEVELOPING A STRATEGY

There are different ways to develop corporate sustainability strategies. According to Epstein & Buhovac (2014), the development of corporate strategies can go through three phases:

1. Stage 1 - Regulatory Compliance: This is important to ensure that the firms conform to the various social, environmental, and economic regulations in the country. In particular, the aim is to develop strategies which meet the regulatory standards. The company must also identify possible legal risks if social and ecological issues are ignored.

2. Stage 2 - Competitive Advantage: Once there is legal compliance towards social and environmental issues, the company must try to develop innovative strategies to increase its competitiveness. The company can improve its performance through different means such as by setting strong safety and new environmental technology standards.

3. Stage 3 - Social, Environmental, and Economic Integration: At this stage, the company focuses on sustainability planning rather than on compliance. We expect that the organization has reached a stage where decision making processes at all levels take into account the social, ecological and economic issues.

REFERENCES

UNIT 2:  TOPIC 3: SUSTAINABILITY BALANCED SCORECARD

INTRODUCTION

According to Kaplan and Norton (1992), the Traditional Balanced Scorecard allows managers to look at the business from four important perspectives, providing answers to four basic questions:

1. How do customers see us? (customer perspective)
2. What must we excel at? (internal business perspective)
3. Can we continue to improve and create value? (innovation and learning perspective)
4. How do we look to shareholders? (financial perspective)

Evolving from this position, the ‘Sustainability Balanced Scorecard’ integrates concepts linked to the triple bottom line – profits, people and planet – to assess the company’s performance based on the above four perspectives.

SUSTAINABILITY BALANCED SCORECARD

Traditional Balanced Scorecard focuses at the operational level considering Key Performance Indicators (KPIs) in four areas (Finance, Learning and Growth, Internal Business Processes, and Customers) while the ‘Sustainability Balanced Scorecard’ focuses on three different perspectives: financial goals, environment and society. In this respect, the Sustainability Balanced Scorecard introduces two additional perspectives to the Balanced Scorecard method: Society and Environment.

There are different ways to build a Sustainability Balanced Scorecard. Environmental and social aspects can be integrated within the existing four standard perspectives of the Traditional Balanced Scorecard, as shown in Figure 2.1.

The following diagram summarizes the social and ecological elements of a Sustainable Balanced Scorecard.

| Financial | Internal Processes |
| Environment and Social | Strategy of Business | Environment and Social |
| Customer | Learning and Growth |

Figure 2.1: Sustainability Balanced Scorecard Approach


The application of the Sustainability Balanced Scorecard is associated with different ‘key performance indicators’ (KPIs) linked to environment and social issues. However, every business activity is different and the types of performance indicators will as such differ under each perspective. For example:

- In some businesses, the KPIs under the financial perspective (taking into account the environment) will be to lower fuel costs while in other businesses, it could be to increase revenue of green products.
- In some firms, they strive to reduce paper wastage to improve the internal business process while in others firms, they may seek to reduce gas consumption.
- With regards to the customer perspective, the KPIs could range from increased customer participation to the guarantee provided on the products.
• From the learning and growth perspective, some firms could look for workforce diversity while others try to bring policies to reduce the wage gap among employees.

The **SDG Compass** is a resource developed by GRI, UN Global Compact, World Business Council for Sustainable Development to assist businesses in aligning their strategies as well as measuring and managing their contribution to the realization of the SDGs.

The **Asian Development Bank: Tool Compendium - Sustainable Development Goals** also exists to assist businesses evaluate and choose appropriate tools that can help plan and implement sustainability strategies.

**REFERENCES**

- SDG Compass: [https://sdgcompass.org/](https://sdgcompass.org/) [Accessed 28 October 2019]

**UNIT 2: TOPIC 4: ADOPTING A SUSTAINABLE BUSINESS MODEL**

One approach for adopting a sustainable business model is to consider the model proposed by Desjardins and Willis (2011), which builds on foundational work on the triple bottom line (Elkington, 1997). This model considers **three** spheres of sustainability. These are economic, social and environmental sustainability as illustrated in the following diagram:

![Figure 2.2: The Three Spheres of Sustainability](https://soapboxie.com/social-issues/The-Environmental-Economic-and-Social-Components-of-Sustainability) [Accessed 28 October 2019]
ECONOMIC SUSTAINABILITY
It is important to holistically consider both short- and long-term benefits. Economic sustainability entails considerations towards spending in a smart way and adopting fiscal policies to promote social benefits and protect the environment. Decisions to spend on education or to provide subsidies to boost green products are examples of economic sustainability.

SOCIAL SUSTAINABILITY
Social sustainability is focused on the betterment of society. This sphere focuses on the long-term quality of life of future generations. In this respect, issues related to the protection of human rights as well as environmental and public involvement and participation must be considered in a sustainable business model.

ENVIRONMENTAL SUSTAINABILITY
This entails decisions related to the proper management of our natural resources. In a sustainable business model, any decisions should be evaluated considering the impacts on the environment.

REFERENCES
- Desjardins, J. and Willis, A. (2011), Sustainability: Environmental and Social Issues Briefing: Questions for Directors to Ask, The Canadian Institute of Chartered Accountants, Canada
OVERVIEW OF UNIT 3

With trade being seen as a key engine of economic growth, and given the rapid expansion of trade, there is an increasing need to connect the trading sector with Sustainable Development opportunities. In this unit, we discuss issues related to sustainable trade and economic growth and opportunities for developing countries in particular.

We discuss these through the three topics in this unit:
• Topic 1: Economic Growth and Sustainability
• Topic 2: Economic Growth and Sustainable trade
• Topic 3: Sustainable Trade Opportunities and Developing Countries

LEARNING OUTCOMES

By the end of this unit, you should be able to do the following:
• Explain concepts of economic growth, and decoupling degradation.
• Explain the concepts of recoupling environmental and social benefits.
• Recall the case for sustainable trade and its drivers.
• Relate opportunities related to sustainable trade for developing countries.

TASKS FOR STUDENTS FOR WEEK 3

VIDEOS
• Unit 3: Introduction to Sustainable Trade and Economic Growth
• Unit 3: Sustainable Trade and Economic Growth (Topic 1)
• Unit 3: Sustainable Trade and Economic Growth (Topic 2)

READINGS
• Unit 3, Topic 1: Economic Growth and Sustainability
• Unit 3, Topic 2: Economic Growth and Sustainable trade
• Unit 3, Topic 3: Sustainable Trade Opportunities and Developing Countries

ASSESSMENT
• One (1) Forum Discussion
• Ten (10) Quizzes
UNIT 3: TOPIC 1: ECONOMIC GROWTH AND SUSTAINABILITY

Economic growth proxied by the level of Gross Domestic Product (GDP) is broadly speaking, a measure of the level of economic activity of a nation which is considered to represent its level of prosperity. This is certainly one of the reasons why GDP growth has been one of the most important policy goals for nations around the globe for most of the last century. Such economic growth is unsurprisingly appealing for the world’s poorest nations while in the richer nations, where subsistence needs are largely met, further proliferation of consumer goods adds to material comfort.

The link between growth and the environment has received much attention in the economics literature and one of the most commonly used models is known as the Environmental Kuznets Curve (EKC). The EKC represents a long-term relationship between environmental degradation and growth/level of development. The initial stages of a country’s development tend to be characterized by increasing environmental degradation. After a threshold level of per capita income is reached, environmental degradation is expected to start decreasing, thus depicting an inverted U-shaped curve as shown in Figure 3.1.

![Figure 3.1: Environmental Kuznets Curve](http://cyclingprof.blogspot.com/2010/01/on-environmental-kuznets-curve.html)

The most common explanation of the EKC is based on the transition of countries along the different stages of development. At the early stages of development, people and even governments are more interested in the creation of jobs and the production of goods rather than environmental quality, leading to more pressure on natural resources. The focus on rapid growth results in greater use of natural resources and emission of pollutants. The countries are either too poor to pay for abatement and/or simply disregard the environmental consequences of such growth. However, at higher levels of development, more resources start to be directed towards environmental quality. As the population starts to enjoy a higher standard of living, institutions, regulations and policies are established to protect the environment and more modern and environmentally-friendly industrial processes are developed. Economic growth is here considered as the solution for environmental issues. By stimulating growth and income levels over time, trade can thus help to increase demand for a better environment.
However, there is recognition that, beyond a certain point, the continued pursuit of economic growth may even impede human welfare. In particular, the questions are how – and for how long – is continued growth possible without coming up against ecological limits and the reserves of the finite resources of the planet? (Churchill et al., 2018). Indeed, an important sustainable development challenge arises from unsustainable consumption and production patterns around the world. In addition, for many developing countries, much of their growth tends to stem from increasing revenues from the trade of natural resources such as fuels and minerals, thus depleting their natural resources. In addition, the proceeds of the trade of these resources do not necessarily benefit the majority of the populations in these exporting countries (World Bank, 2017), thus widening the inequality divide.

Herein exists an opportunity to consider sustainable development through the lens of ‘decoupling’ (see Figure 3.2), which literally means to continue with economic growth (all the positive aspects associated with prosperity for people and planet), while removing the relationship with negative social and environmental impacts (Smith, Hargroves and Desha, 2010). For example, we have seen the production of refrigeration goods (fridges, freezers) flourish internationally, while ‘decoupling’ the use of ozone-depleting gases. Two forms of decoupling are important to consider:

- Decoupling economic activity from resource use (Resource decoupling)
- Decoupling of economic activity from environmental impact (Impact decoupling)

**Resource decoupling** means reducing the rate of use of resources per unit of economic activity. This ‘dematerialization’ is based on using less material, energy, water and land resources for the same economic output. Resource decoupling leads to an increase in the efficiency with which resources are used.

**Impact decoupling**, by contrast, requires increasing economic output while reducing negative environmental impacts. The negative environmental impacts decline while value is added in economic terms. Negative impacts arise from the extraction of required resources (such as groundwater pollution due to mining or agriculture); production (such as land degradation, wastes and emissions); transport resulting in carbon dioxide ($CO_2$) emissions and so on. One way to favor impact decoupling is to use electric cars to reduce $CO_2$ emissions.

![Figure 3.2: Decoupling Diagram](image)

**Figure 3.2: Decoupling Diagram**

From Figure 3.2, decoupling may be relative or absolute. Relative decoupling occurs when economic activities grow faster than resource use grows. This means that economic activity (GDP) grows faster than resource productivity (GDP/resource use) leading to growing resource use but at a lower rate than that of GDP growth.

Absolute decoupling occurs when economic activity grows while overall resource use stabilizes or declines. This is also illustrated by the Environmental Kuznets Curve that claims that if prosperity rises beyond a certain point, the environmental impact of production and consumption decreases. To allow for absolute decoupling (i.e. reduction in resource use and environmental impact), resource efficiency and emission intensity must improve at a faster rate than GDP growth.

Furthermore, the opportunity exists to consider ‘recoupling’, where activities that are replenishing and restorative for the environment and communities, are ‘reattached’ to economic growth. For example, we have seen fishing industries rejuvenated through the restoration and management of waterways.

REFERENCES


UNIT 3: TOPIC 2: ECONOMIC GROWTH AND SUSTAINABLE TRADE

1. SUSTAINABLE ECONOMIC GROWTH

As we discussed in Topic 1, economic growth is broadly speaking a measure of the level of economic activity of a nation. It represents its level of prosperity. The term ‘Gross Domestic Product’ (GDP) has until recently been one of the most used metrics for nations around the globe, for most of the last century. A more recent term, ‘Genuine Progress Indicator’ (GPI) has been developed to more holistically measure the economic growth of a country, as an alternative metric to GDP (Kubiszewski et al., 2013)

The GPI indicator takes everything the GDP uses into account, but adds other figures that represent the cost of the negative effects related to economic activity. This includes, for example, the cost of crime, ozone depletion, resource depletion, and pollution. In effect, the GPI determines the ‘net’ result of considering both the positive and negative impacts of economic growth, to examine whether or not it has benefited people overall.
We can think of the relationship between GDP and GPI mimicking the relationship between the gross profit and net profit of a company. The net profit is the gross profit minus the costs incurred (expenses), while the GPI is the GDP (value of all goods and services produced) minus the environmental and social costs. Accordingly, the GPI will be zero if the financial costs of poverty and pollution equal the financial gains in production of goods and services, all other factors being constant.

Quantifying costs and benefits of these environmental and social externalities is indeed a difficult task. For example, GPI counts the initial pollution as a loss rather than a gain, attempting to find the equivalent amount it will cost to clean up the pollution later over potentially many years and over great distances, in addition to the cost of negative impacts that the pollution will have in the meantime.

By accounting for the costs borne by the society as a whole to repair or control pollution and poverty, GPI balances GDP spending against external costs. GPI advocates claim that it can more reliably measure economic progress, as it distinguishes between the overall "shift in the 'value basis' of a product, adding its ecological impacts into the equation." (Kubiszewski et al., 2013)

2. THE CONTEXT FOR SUSTAINABLE TRADE
Trade is a powerful tool to increase productivity and growth and to improve living standards. Greater trade openness leads to a more efficient allocation of natural resources. Accounting for a significant share of low-income countries’ GDP, international trade can also be an important source of finance (especially for developing countries) and promote technological transfer. The volume of world trade grew at an unparalleled speed in the 20th Century. From the year 1960 to the global financial crisis (GFC) in 2007, global trade in goods and services increased at an average of about 6 percent a year, the double of real GDP growth during the same period. This increase was sustained by reductions in barriers to trade through changes in policy such as reductions of tariffs as well as trade costs due to technological developments pertaining to transport and ICT in particular. The decline in trade costs enabled the development of global value chains (GVCs), which have contributed to improved productivity since the early 1990s. In developed economies as well as emerging and developing economies, the higher level of affluence that came with greater trade openness gave credibility to the view of trade as a key engine of economic growth (IMF, 2017).

Within this context, sustainable trade embraces the definition of sustainability (Bruntland Commission, 1987) – including the three pillars of 1) economic growth, 2) social equity, and 3) environmental stewardship – also known as the triple bottom line namely: Profits, People, and Planet (Slaper and Hall, 2011). Considering the language of decoupling that we explore in topic 1, sustainable trade enables the decoupling of profits from negative community and environmental outcomes.

3. THE CASE FOR SUSTAINABLE TRADE
The need to address trade as an enabler of sustainable development arose as people began to connect the production, sale and disposal of goods as a key contributor to environmental and social degradation around the planet. Key considerations included (World Bank, 2018):

- An expanding global market and increasing use of technology leading to unsustainable production methods and trade patterns
- Natural resource depletion and environmental degradation and biodiversity loss
- Pollution from industrialization and international transportation and increasing GHG emissions leading to global warming contributing to climate change
• Escalating Environmental footprint of countries
• Widening Inequalities within and across countries

4. SUSTAINABLE TRADE STRATEGIES
Alongside this increasing appreciation of trade’s negative impact, efforts increased from the 1990s in particular, to create ‘sustainable trade’ that addressed the impacts listed above. Let’s explore a couple of sustainable trade strategies that are being used to enable ‘sustainable trade’, including legal policies and the concept of the ‘circular economy’.

5. INTERNATIONAL AGREEMENTS FOR SUSTAINABLE TRADE
The SDGs stress the significant role that trade and investment play in promoting sustainable development. There have also been noteworthy developments in the international trade arena, having implications for the sustainable development agenda. For example, the World Trade Organization also offers a supporting framework for sustainable development and the green economy through its objectives and monitoring of potential trade protectionism, its enforcement mechanisms and rules and regulations.

In addition, the expansion of areas of the Regional Trade Agreements (RTAs) and other international associations, in particular BRICS (the acronym used for five major emerging national economies: Brazil, Russia, India, China and South Africa) could become another important impetus for change. Some RTAs such as the North American Free Trade Agreement (NAFTA), and Mercosur contain provisions aimed at the achievement of sustainable development targets, especially regarding trade-offs between trade and sustainable development as well as measures in line with international or national environmental and labor legislations, environmental protection and social development goals.

6. SHIFTING FOCUS TO A ‘CIRCULAR ECONOMY’
More recent efforts in addressing environmental and social degradation resulting from GDP-based growth has created a concept known as the ‘circular economy’, which is defined as “an industrial system that is restorative or regenerative by intention and design”. (Ellen MacArthur Foundation, 2013). Essentially circular economy aims at maintaining the value of products, materials and resources as long as possible and minimizing the generation of waste. (European Union Commission, 2015: 2).

A keyword within the context for circular economy is sustainability, which refers to using resources at a rate that allows the Earth’s systems to renew them. The ultimate goal is to create renewable energy based closed-resource loops, where one’s waste is another’s resource, thus maximizing the value of each resource. The ideology of circular economy draws analogy from biological ecosystems that are cyclical by nature, as shown in Figure 3.3. There is no such thing as ‘waste’ in nature: as organisms die, they become nutrient to other organisms eventually ending up enriching the soil (Ellen MacArthur Foundation, 2013: 22-23, 27).
In Figure 3.3, the following terms are important to understand:

- **Recycle** means to re-use materials and converting them into a new material or product. Additional water and energy are often used to convert the material into something new. However, this is likely to be a lot less than creating the equivalent product from raw materials. The recycled material can keep the same value, or can be turned into a lower value material (see **downcycle**) or into a higher value material (see **upcycle**).

- **Downcycle** means to convert (recycle) materials into lower-value materials. For example, quality writing paper or copy paper might be recycled into lower value cardboard paper. This is avoided where possible as the potential for the material to be of use to society is reduced.

- **Upcycle** means to convert (recycle) material into higher-value materials. There are two kinds of up-cycling: material and functional. The first type (material) is about converting raw material into a new material of higher value, e.g. converting low-value plastic into high-value plastic. The second type (functional) is about using and combining disposed materials into a new functional product, e.g. converting a plastic bottle into planters or smart phone holders.

7. **WHAT IS FRUGAL INNOVATION?**

When we think about shifting focus to a circular economy, the concept of ‘Frugal Innovation’ is helpful. It is defined as the practice of simplifying product components and manufacturing processes into basic elements, so that the processes are more efficient and the end-product is more cost-effective and better for the planet and people. Frugal innovation enables the creation of low-cost mass market products that are affordable by all (Sammut-Bonnici and McGee, 2015).

Through frugal innovation, products such as mobile phones, cars and appliances can be stripped of irrelevant and costly features, for example the Tata Nano cheapest car contains only basic features. Another example is the design of a portable Electrocardiogram...
(MAC 400) in India. The MAC 400 costs around $800, compared with other hospital-class units from GE Healthcare that range from $2,000 to $10,000. This ECG machine is designed to extend the capability of a traditional ECG to a largely rural and poor population (Nevejan, 2016).

In summary, frugal innovation creates less complex and more streamlined products that are easier to handle and considerably cheaper to produce. As the price of a frugal product is low, the margin per product is proportionately low. However, the volume of the mass market can be vast and the total gains can be extraordinarily high, making it an attractive business proposition for entrepreneurs who are keen to do financially well by doing good for the planet and people.

REFERENCES


UNIT 3: TOPIC 3: SUSTAINABLE TRADE AND DEVELOPING COUNTRIES

SUSTAINABLE TRADE OPPORTUNITIES
Trade boosts a country’s income generating capacity, which is one of the essential prerequisites for achieving sustainable development (in line with SDG target 17.11). Higher levels of income associated with trade can increase the population’s demand for a better quality of environment as seen previously. In addition, demand for an improved environment can provide incentives for firms to improve production technologies, adopt greener production methods and develop greener products and services.
International trade is also increasingly being considered as a potential important contributor to sustainable development. The contribution of trade to sustainable development has been recognised in different UN conferences such as in Rio in 1992 and in Johannesburg in 2002 (UN report). The 2030 Agenda for Sustainable Development (paragraph 68) as well as the Addis Agenda of Action (paragraph 82) also recognise international trade as an engine for inclusive economic growth, poverty alleviation and a significant medium to attain the Sustainable Development Goals (SDGs).

Trade openness leads to a more efficient use of resources by enhancing production efficiency through specialisation, exploitation of economies of scale, technology transfer and enhanced competition. Trade can thus play an important role in the protection of the environment as a means for green technology transfer by promoting the development of green goods, services and technologies: for instance, to reduce pollution or energy use, or improve their access. Openness to trade can also provide access to a larger variety of imported goods and services involving environmentally friendly technologies at a lower cost for consumers by increasing the size of the markets for the manufacturers, and increasing the returns from innovation for those involved in the production of green goods. The ability to market innovations globally makes it possible to increase specialisation and provides incentives to produce green goods requiring intensive research and large capital requirements.

Trade can also act as a vehicle for Sustainable Development in the following ways:

- Countries and supranational organisations such as the World Trade Organisation (WTO) can encourage trade policies to be aligned with SDG 8: Promote sustained, inclusive, and sustainable growth, full and productive employment, and decent work for all; sustainable consumption and production and support the development of rules for sustainable trade leading to an integration of national and international initiatives for green trade and sustainable development;
- Trade encourages participation in international and regional supply chains; sustainable trade can thus help to improve resource efficiency and create jobs by promoting ‘green’ international value chains;
- Sustainable Trade can encourage economic diversification and reduce dependence on extractive industries and adding more value especially to developing countries’ exports;
- Sustainable Trade can help to promote the development and harmonisation of environmental standards across the globe;
- Sustainable Trade can promote social inclusion and economic empowerment of minorities and women.

SUSTAINABLE TRADE OPPORTUNITIES FOR DEVELOPING COUNTRIES

Development of Environmental Markets and Green Growth

The expansion of the environmental goods and services market provides opportunities for the diversification of the economy and the development of a green economy. A Green Growth Strategy aims to promote economic growth and development, while addressing four key environmental challenges: climate change, unsustainable use of natural resources, loss of biodiversity and ecosystem services, and unsustainable materials management (OECD, 2011).

During the period 2007–2011, the growth of the world’s imports of environmental goods and services, in particular renewable energy, and key environmental goods, for instance waste management and treatment, water management, significantly exceeded the increase of the total goods imports. Furthermore, international trade in environmental goods and services fuelled the creation of jobs. By becoming part of the mainstream markets, green products and services can also create opportunities for developing countries to become part of global green production and trade value chains in different industries such as agriculture, fisheries, forestry and manufacturing.
Greening of Trade
Extractives such as fossil fuels and ores and metals, tend to dominate developing countries’ exports, especially in Africa. In order to create a comparative advantage in the production of goods and services that are green, significant reduction of material intensities (i.e. an increase in efficiency of resource use) and lower emissions associated with trade flows are required from these countries. Greening of trade flows can attract new investments in manufacturing and value added services for countries that are currently involved in the production of no or low value-added goods.

Trading in Renewable Energy
The global market in low-carbon and energy-efficient technologies, which include renewable energy supply products such as solar photocells and solar panels, is projected to nearly triple to $2.2 trillion, by 2020 (UNEP, 2017). The growing market for renewable energy products and carbon credits thus holds potential for expanding trade.

Promoting Ecotourism for Enhanced Trade
A green economy generates trade opportunities for goods and services that embody “green” attributes. One such example is ecotourism. Ecotourism provides a niche or higher value-added product that is attractive to many tourists. Ecotourism focuses on nature-based activities. Many developing countries have a comparative advantage in ecotourism due to their natural environments, cultural heritage and possibilities for adventure holidays. Ecotourism facilitates trade of other goods and services, enhances revenue generated from tourism and creates job opportunities which might be an important contribution to poverty alleviation in certain regions.

Promoting Inclusive Green Growth in the Agriculture Sector Through Trade
Increased demand for organically produced food and awareness of environmental issues among consumers can be exploited. In addition to being a prospective niche and higher value-added market as compared to conventional farming, the returns for organic products have proven to be more inclusive and more economically profitable as well as more environmentally friendly and sustainable in terms of the production and processes. Developing countries are good candidates to capture this niche as they hold significant amount of agricultural land with still little, to no use of agrochemicals.

A green economy also promotes ethical trade through Fair Trade production chains which ensure that small developing country producers receive fairer terms of trade and better prices for their goods. Fair Trade ensures that the proceeds of sale of goods and services trickle down to the small producers or minorities involved in the production. The sale of Fair Trade certified products such as cotton, coffee, and cocoa are on the rise around the world, directly benefiting farmers and workers especially in developing countries. Fair Trade principles can be expected to be applied more widely in a green economy.

Trade can create opportunities for women’s empowerment and well-being but can also amplify prevailing gender-based inequalities. The Addis Ababa Action Agenda of the Third International Conference on Financing for Development by the United Nations (UN) links issues for sustainable development between trade and gender issues and aims to promote social justice through measures to help women harness the benefits and opportunities of trade integration. These include for instance targeted, gender-sensitive subsidies; the strengthening of women associations such as cooperatives, microcredit schemes and training and mentoring (UNCTAD, 2016).
REFERENCES

OVERVIEW OF UNIT 4

The United Nations (UN) Sustainable Development Goal (SDG) 12 ‘Sustainable Consumption and Production’ relates to minimising the use of natural resources and the production of waste materials. It also promotes the efficient use of raw materials, through ‘energy efficiency’, ‘lean and green thinking’ and ‘closing the loop’ on energy, materials and water during manufacturing in particular. In this unit, you will learn about the concept and fundamentals of sustainable consumption and production as well as the trends that exist in this field, towards sustainable business practice.

There are 3 topics in this unit:

• Topic 1: Sustainable Production and Consumption
• Topic 2: Trends in Sustainable Consumption and Production
• Topic 3: Lean and Green Thinking, and Examples of Sustainable Consumption and Production

In Topic 3, we also briefly consider other areas of sustainable infrastructure, sustainable tourism, and sustainable waste management.

LEARNING OUTCOMES

By the end of this unit, you will be able to:

• Understand the concept of sustainable production and consumption, including awareness of the concept of industrial symbiosis
• Be aware of the SDGs related to sustainable production and consumption
• Be familiar with trends and policy opportunities towards lean and green thinking, waste management, sustainable cities, and sustainable tourism.

TASKS FOR STUDENTS FOR WEEK 4

VIDEOS

• Unit 4: Introduction to Sustainable Production and Consumption
• Unit 4: Sustainable Production and Consumption

READINGS

• Week 4, Topic 1: Sustainable Production and Consumption
• Week 4, Topic 2: Trends in Sustainable Consumption and Production
• Week 4, Topic 3: Lean and Green Thinking, and Examples of Sustainable Consumption and Production

ASSESSMENT (COMPULSORY)

• One (1) Forum Discussion
• Ten (10) Quizzes
UNIT 4:  TOPIC 1: SUSTAINABLE CONSUMPTION AND PRODUCTION

Goal 12 of the United Nations (UN) Sustainable Development Goals (SDGs) aims to “Ensure Sustainable Consumption and Production Patterns”. The goal consists of eleven targets, which are considered in this unit with regard to key concepts. These include: cleaner and safer production (Targets 12.4 and 12.A); infrastructure, cities and urban planning including food supply (Targets 12.1, 12.2., 12.3 and 12.C), waste management (Target 12.5), public procurement (Target 12.7); and tourism (Target 12.B). Target 12.6 relating to company considerations within reporting is also addressed in Unit 3, and Target 12.8 regarding education and awareness is also the aim of this MOOC on sustainable business practice.

UNDERSTANDING THE CONCEPT

One of the most widely accepted definitions of sustainable consumption and production was developed at the Oslo Symposium in 1994 (Norwegian Ministry of Environment, 1994, cited by UNEP, 2010) as:

“the use of services and related products which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations.”

When we think about this definition, three aspects are particularly important to address:

1. Transforming Our Relationship with Non-Renewable Natural Resources
Fossil fuels still account for a major fraction of the world’s total primary energy requirement, although this is changing. Given the significant environmental and social consequences of fossil fuel extraction, processing, and emissions when used as fuel, it is imperative to reduce demand for such essentially non-renewable natural resources, and shift to other options for energy supply that are more sustainable. Minimizing the current utilization of natural resources through sustainable consumption can be achieved through promoting sustainable lifestyles that include reducing energy demand through better design of housing, transport infrastructure and food supply systems. The International Energy Agency provides comprehensive coverage of these opportunities, including in its report on energy efficient prosperity as the first fuel of economic development (IEA, 2016).

2. Transforming Our Relationship with Toxic Materials
Dealing with toxic or hazardous materials results in several consequences such as impacts on the environment as well as human health. As such, such materials directly impact two pillars of sustainability, namely the environmental and social aspects. As a result, it is crucial that such use of hazardous or toxic materials in the manufacturing of other products is followed throughout the life cycle of the product including ultimately if it ends up as waste material (see Unit 3 for alternatives to waste disposal). To minimize the use of toxic materials, cleaner production and material substitution may be applied while a sustainable waste management system is also essential to deal with any hazardous or toxic wastes so as to eliminate their negative impact on both the environment and on human and other species’ health.
3. Transforming Our Relationship with Emissions of Waste and Pollutants
Emissions of waste and pollutants constitute one of the major issues of any production activity, even after the ‘waste management hierarchy’ (refer to the pdf document “UNIT 4 topics 1-3 slides”) have been addressed. Waste generation may be from domestic, commercial or industrial activities. Managing waste and pollutant production is key to sustainable production. This can be achieved for example through an ‘integrated waste management system’ that prioritizes the most favorable options in the waste management hierarchy described above. Pollutant emissions can be eliminated or at least minimized, through cleaner production as discussed in subsequent sections.

TWO ENABLING CONCEPTS FOR CLEANER PRODUCTION
Two concepts are fundamental to enable sustainable consumption and production, namely understanding the relationship of consumption and production with poverty, and appreciating the life cycle of a product or service (UNEP, 2015).

1. Understanding the Relationship of Consumption and Production with Poverty
Our conversation about sustainable consumption is directly related to poverty. On the one hand, sustainable consumption is encouraged through minimization of the use of natural resources but on the other hand, minimizing the utilization of natural resources has a major impact on the people who are already suffering from lack of natural resources. Common examples of these resources include lack of water, energy insecurity issues in poor countries, and no access to new products, among others.

Our conversation about sustainable production is also directly related to poverty. While developed countries are mostly responsible for the production of waste and pollutants, it is often the least developed or developing countries (poorer countries) that suffer the most. A simple example is the higher emission of greenhouse gases by industrialized countries as opposed to small island developing states (SIDS). Yet, these small economies are most vulnerable to the impacts of climate change caused by increasing levels of greenhouse gases.

Sustainable consumption and production can help create a more even distribution of natural resources between poorer and richer countries while also reducing the negative environmental impacts. Some examples include a higher availability of resources to poor countries due to a reduction in their utilization by richer countries, a cleaner and healthier environment with reduced waste and pollutants, and job creation in sustainable areas of development (UNEP, 2015).

2. Appreciating the Life Cycle of a Product or Service
Whenever a product is manufactured or a service is delivered, there exists a complex process behind it. The manufacturing of any product follows a sequence of stages from raw materials to the final product. In between, there are intermediate compounds that are produced, and in addition to the end-product, other waste materials and pollutants are also generated. After the product has been manufactured and has been used, it is often discarded.

As such, the ‘life cycle’ of the product refers to a series of changes that have occurred from the procurement of raw materials to the point when an end-product is discarded as waste material. Similarly, when a service is delivered, there are several activities that take place, and the life cycle of a service would thus be defined as the series of changes that have occurred from the first stage to the moment the service has been delivered.

From this description, we can see that sustainable consumption and production need to consider the life cycle of a product or service. This includes the consumption of natural resources, and how these impacts on the environment and human health. Sustainable consumption and production strategies can strive to minimize these impacts and promote a more circular economy where resources are used efficiently and recycled.
resources and the production of waste and pollutants during raw materials procurement, during the manufacturing process, during usage of the end-product and when the end-product is discarded as waste material. Common examples of consumption of natural resources include energy and freshwater usage, cutting down trees for wood and deforestation for project development while production of wastes and pollutants includes wastewater production, emission of gaseous pollutants as well as the production of solid and hazardous wastes.

REFERENCES


UNIT 4: TOPIC 2: TRENDS IN SUSTAINABLE CONSUMPTION AND PRODUCTION

In this topic, we introduce a number of terms and trends that are associated with the concept of sustainable consumption and production, within the context of the term ‘cleaner production’. These include: ‘closing the loop’, ‘improved process efficiency’, ‘raw materials and resources substitution’, ‘resource reuse and recycling’, and ‘safer production’. We also introduce the term ‘industrial symbiosis’ which draws upon these other terms to provide a transformed operating context for manufacturing as a sustainable business.

Additionally, we provide some useful links where you can further explore these terms and trends.

CLEANER PRODUCTION

Cleaner production has a main goal of waste and pollution reduction while maximizing production output, remembering that ‘waste’ is just a ‘resource’ that does not have a purpose. For a specific amount of raw materials, maximized production output (owing to cleaner production) implies enhancing resource consumption efficiency. Consequently, cleaner production is also related to sustainable consumption, since enhancing resource conversion efficiency minimizes its consumption for the same amount of production output. In the following paragraphs, we will now explore examples of cleaner production strategies.

Further Readings:
- https://www.gdrc.org/sustdev/concepts/02-c-prod.html
CLOSING THE LOOP
Historically, the case for considering the life of a product or service has contained information from the point of extraction of raw resources/materials, through to their processing and use in products, and then ultimate disposal. More recently, the term ‘cradle to grave’ used to describe this process has been surpassed by the term ‘cradle to cradle’ which closes the loop on material flow through society, encouraging companies and decision-makers to consider the potential for keeping the product in service for as long as possible – delaying or even avoiding altogether the need for landfill.

Further Readings:
- https://www.ellenmacarthurfoundation.org/circular-economy/concept

IMPROVED PROCESS EFFICIENCY
Improved process efficiency has immediate and secondary benefits that make it an attractive area for business to consider. Process efficiency can be achieved through equipment modification, process instrumentation and control, as well as waste minimization. Improved process efficiency may be achieved at two levels: raw materials consumption and production output, and energy consumption. At the level of raw materials or natural resources consumption, wastage must be minimized. At the level of energy consumption, replacing high-energy use equipment with those that are less energy intensive can help improve energy efficiency. Reducing the overall demand for energy can also create opportunities for alternative energy supply and battery storage that is sufficient for the manufacturing requirements. This could even result in decoupling the manufacturing process from networked energy grid, resulting in improved resilience for production and supply.

Further Readings:
- https://www.gdrc.org/sustdev/concepts/02-c-prod.html

RAW MATERIALS AND RESOURCES SUBSTITUTION
Raw materials substitution involves replacing raw material that is potentially hazardous or toxic with one that is less hazardous or non-hazardous and non-toxic. As a consequence, any waste materials generated can be expected to be less hazardous and thus pose a lower risk to the environment. Non-renewable resources may also be substituted by renewable ones. Energy from fossil fuels, for instance, may be partly or wholly substituted by renewable energy, with additional possibilities now available in robust onsite and community-scale battery storage solutions.

Further Readings:
- https://www.gdrc.org/sustdev/concepts/02-c-prod.html

MATERIAL REUSE AND RECYCLING
Waste minimization is an important component of sustainable production, and becomes possible once a ‘waste audit’ is conducted and opportunities are identified with this knowledge. Waste can be in solid, liquid or gaseous forms; irrespective of their forms, they need to be appropriately treated or managed in an environmentally sound manner prior to disposal. However, prior to disposal, the potential for reuse or recycling of this waste must be investigated within any industrial process. Solid waste materials may often be recycled or reused while wastewater that is not heavily contaminated or polluted may be recycled within the industrial process or reused for cleaning purposes, reducing freshwater consumption in the manufacturing process.
Further Readings:

SAFER PRODUCTION
Safer production concerns mainly the health and safety of people involved in the manufacturing of the intended products or in the provision of the requested services. Safer production ensures that the health and safety of workers are fundamental when dealing with or handling hazardous or toxic materials either as raw material or as end-product. Similar to cleaner production, safer production also implies that the production of toxic or hazardous waste is minimized as far as possible.

Further Readings:

INDUSTRIAL SYMBIOSIS
With these cleaner production strategies in mind, let us now look at the concept of ‘Industrial Symbiosis’, which is at a macro (larger) scale than the individual business, and a concrete application of sustainable consumption and production. In short, Industrial Symbiosis uses the waste or by-products of one industry as raw materials for another industry. When the waste from industry “X” is used as raw materials for industry “Y”, waste minimization is practiced in industry “X” while reduction in the consumption of natural resources is practiced by industry “Y”.

Essentially, when businesses work together as a community, further opportunities become available to reduce the overall impact of their activities. An example of industrial symbiosis is in the sugar processing sector. The by-products from sugar production are bagasse and molasses. Bagasse is used for combustion in cogeneration plants to produce electrical energy, while molasses is used in distilleries for the production of ethanol.

Furthermore, the concept of industrial symbiosis is not limited to the use of waste as raw materials, but it also includes the sharing of common infrastructures within an industrial network. For instance, part of the electrical energy produced from the combustion of bagasse is used for running the sugar factory. Likewise, common transportation may be used for industries that are close to each other so as to reduce overall cost of transportation.

As observed in these examples, industrial symbiosis can result in further reductions in the consumption of natural resources while also minimizing waste or pollution.

Further Readings:
• https://www.nordregio.org/nordregio-magazine/issues/industrial-symbiosis/

REFERENCES/FURTHER READINGS
• Cleaner Production: Available online at https://www.gdrc.org/sustdev/concepts/02-c-prod.html
• What is a Circular Economy? A Framework for an Economy that is Restorative and Regenerative by Design. Ellen Macarthur Foundation: Available online at https://
UNIT 4: TOPIC 3: LEAN AND GREEN THINKING, AND EXAMPLES OF SUSTAINABLE CONSUMPTION AND PRODUCTION

INTRODUCTION
In this last topic of the MOOC, we provide some useful context with regard to ‘Lean and Green Thinking’ and how it applies to sustainable consumption and production. We then consider two examples that can help you to think about applications in businesses within ‘sustainable infrastructure’ and ‘sustainable tourism’. We finish this unit with an overview of what can be done immediately in addressing ‘sustainable waste management’, which applies to all sectors.

LEAN AND GREEN THINKING
Over the last decade in particular, ‘Lean and Green thinking’ ‘has emerged as an enabling concept for sustainable consumption and production. ‘Lean and Green’ refers to the convergence of ‘Lean thinking’ (efficiency) and ‘Green thinking’ (environmental) tools and practices, that makes sure efficiency improvements are good for planet and people (Caldera et al, 2019).

The convergence of lean thinking with green thinking creates a powerful context for selecting which of the many tools can – and should – be used to optimize and evaluate particular manufacturing or other facilities (see the slide set for the tools matrix).

Business can think in terms of:
• Creating manufacturing processes that are ‘doing more with less’
• Achieving outcomes that benefit people, planet and profit
• Managing across five main ‘work streams’: waste, water, energy, emissions, chemicals

SUSTAINABLE INFRASTRUCTURE
Sustainable infrastructure refers to the conception, construction and utilization of structures while due considerations are given to the economic, social and environmental aspects of sustainability. Some examples of sustainable infrastructure are as follows, noting the interrelationship with other SDGs:
Clean Water and Sanitation - SDG 6
Clean water and sanitation are fundamental to the social aspect of sustainability. These must be an essential component of sustainable infrastructure development as the lack of water and poor sanitation negatively impact life.

Affordable and Clean Energy - SDG 7
Clean energy, in the form of renewable energy, must be a part of sustainable infrastructure and cities/urban planning. Rapid technology innovation in many parts of the renewable energy sector – from wind, water and solar energy capture technology through to battery storage – are transforming the business case for installation and maintenance of such infrastructure.

Transportation
Although sustainable transport is not represented by one SDG, it is included directly and indirectly in many of the other SDGs (Goals 2, 3, 6, 7, 9, 11, 12, 13). Freight, public and active transport infrastructure are all key considerations, understanding that inadequate provisioning for transportation can limit access to a variety of opportunities including education, jobs, and health, among others (Eccles, 2019).

SUSTAINABLE TOURISM
Sustainable tourism refers to the practice of visiting a particular place without negatively impacting the environment, economy and social life of the host country or place of visit. Sustainable tourism is not limited to the impacts at the moment of visit but also includes the environmental impacts associated with the whole tourism industry.

For example, whenever a tourist travels to a particular location by plane, the emissions generated by the consumption of jet fuel impact the environment negatively. As a sustainable approach, an amount can be charged on the tourist’s fare, and this money can be used for environmental projects (for example, plant a tree in the host country).

Another example is the construction of hotels in different locations without consultation with the indigenous residents. Since these directly impact the daily activities of the local populace, the latter need to be consulted and must be agreeable to any such proposed project. As one of the requisites, there needs to be the generation of local linkages being developed between the hotels and the local inhabitants, and these may be by way of improved infrastructures and by the creation of direct and indirect jobs.

Sustainable tourism must also lead to or foster reduced consumption of natural resources and emissions of waste. Very often, the tourism industry is regarded as one of the highest generators of food waste. Hotels need to therefore plan their activities to ensure that they generate the least amount of waste. As an added benefit of proper planning, the reduction of waste generated implies that a lower amount of natural resources is consumed. Another example of sustainable tourism is that hotels may generate their own electricity through renewable energy sources such as solar power (solar photovoltaic cells). Hotels also quite often have the scale sufficient to produce their own freshwater through desalination processes. Finally, hotels may promote the sale of artisanal products made from recyclable materials, as this is in line with both sustainable consumption and production.

SUSTAINABLE WASTE MANAGEMENT
A sustainable waste management system is based on the waste management hierarchy which prioritizes waste prevention and minimization, reuse and recycle (including composting) followed by waste-to-energy (anaerobic digestion, incineration, gasification, pyrolysis) and ultimately, landfilling. Any sustainable waste management system must adopt an integrated approach; the “waste” problem cannot be solved
with only one technology. Here we summarise some key terms to help you in your conversations about what could be possible:

**Waste Prevention and Minimization**
Prevention and minimization of waste (solid or liquid) must be prioritized over the other techniques at every level of a process or an activity (domestic, commercial or industrial). Waste prevention and minimization can be achieved by minimizing resource consumption. Some common examples of waste prevention and minimization or reduction are: buying in bulk, using electronic documents instead of printed ones that would have to be discarded afterwards, and applying cleaner production (improved process efficiency, equipment modification) to reduce waste generation.

**Waste Reuse**
Reuse implies using the “waste” material over and over again without any processing. One simple example of reuse is glass bottles that can be used again.

**Recycling of Waste**
Recycling can be defined as the processing of waste material into its original or new forms. Common examples of recycling are:
- Reprocessing of broken glass into new glass products
- Reprocessing of wood and plastics to make pallets
- Reprocessing of polyethylene (PET) bottles into polyester to make fabric.

**Composting**
Composting is the conversion of organic materials in the presence of oxygen by a microbial consortium to produce carbon dioxide, water and a humus-like product called compost. Composting can be used to treat wastes with high organic matter content such as food wastes, yard wastes, animal manure or paper and cannot be used to treat waste such as non-biodegradable plastics or rubber products. The compost that is produced as a result of the aerobic bio-degradation of organic waste can be used as a soil conditioner because it improves the water retention capacity of the soil, increases the nutrient content of the soil such as nitrogen (N), phosphorus (P) and potassium (K) content, and improves the resistance of plants to common diseases.

**Anaerobic Digestion**
Anaerobic digestion is the conversion of organic matter in the absence of oxygen by a microbial consortium to produce biogas (carbon dioxide and methane) and a by-product called digestate. The biogas, after cleaning and upgrading, can be combusted to produce electrical energy while the digestate can be further treated and used as fertilizer. Similar to the composting process, the anaerobic digestion process is employed to treat only organic wastes such as food wastes, yard wastes, animal manure, slaughterhouse wastes, and agricultural residues, and cannot be used to treat waste such as non-biodegradable plastics or rubber products.

**Waste-to-Energy**
There are three main thermal waste-to-energy technologies that can be applied for waste management, namely incineration, gasification and pyrolysis:
- Incineration is the thermal oxidation of organic materials with an excess of oxygen to produce ash and a hot flue gas that can be used to produce steam in a boiler for subsequent production of electrical energy.
- Gasification is the thermal conversion of organic matter in limited amount of oxygen to produce a syngas (carbon monoxide, hydrogen and methane) and a solid residue. The syngas, which is a combustible gas, can be used to produce energy.
- Pyrolysis is the thermal decomposition of organic matter in absence of oxygen to produce a solid, liquid and gaseous fraction. The different fractions are high energy content materials and may be used as fuels for bio-energy production.
All the thermal waste-to-energy techniques are used to treat high organic content waste including food waste, yard waste, paper, plastics, rubber, and wood, among others.

**Landfilling**

Landfilling is the act of disposing waste in an engineered facility while minimizing environmental impacts associated with leachate and methane gas formation. The only landfill in Mauritius is located at Mare Chicoise and it accepts, on average, 1,200 tons/day of waste consisting of domestic, commercial and industrial waste. Operating since 1997, the landfill is nearing saturation, considering land unavailability in Mauritius coupled with the fact that landfilling is the least favored option in the waste management hierarchy.

**REFERENCES**