

THEME 3: ISSUES AND STRATEGIES FOR SUSTAINABLE DEVELOPMENT

SYLLABUS CONTENT (H3)

Theme 3: Issues and Strategies for Sustainable Development	
Theme 3 examines how global economies can promote sustainable development through strategies and policies. Candidates will have knowledge of fundamental growth theories and the role of institutions. Candidates will be able to evaluate various sustainable development strategies and policies in real-world economies. In addition, candidates will examine various issues in sustainable development such as inclusive economic growth and environmental protection.	
Economics Content	
3.1 Issues and Strategies for Inclusive Economic Growth	Additional Information
3.1.1 Sustainable development includes a. Inclusive economic growth 3.1.2 Issues in inclusive economic growth a. Slow or inequitable growth 3.1.3 Strategies and policies for inclusive economic growth a. Role of Multinational Enterprises (MNEs), and integration (vertical, horizontal and conglomerate) in inclusive economic growth b. Strategies to gain dynamic comparative advantage in terms of rapid growth in productivity and value added per unit of labour	An awareness of the Capital Approach (financial, produced, natural, human and social capital) as a framework in measuring sustainable development will suffice. A broad understanding of the neo-classical growth model (Solow-Swan) and the endogenous growth model (Romer), including the usefulness and limitations in explaining recent economic growth trends, is sufficient.
3.2 Issues and Strategies for Environmental Protection	
3.2.1 Sustainable development includes a. Environmental Protection 3.2.2 Issues in environmental protection a. Exploitation of emerging economies, resource curse, renewable vs non-renewable resources, and climate change 3.2.3 Strategies and policies for environmental protection a. Role of Multinational Enterprises (MNEs), and integration (vertical, horizontal and conglomerate) in environmental protection b. Environmental protection through sustainable consumption production patterns and through the circular economy approach to reduce waste	Mathematical analysis of the economic growth models is not required. A broad understanding of the role of economic institutions in promoting economic growth and sustainable development will suffice.



Anderson Serangoon Junior College JC2 H3 Economics 2024

THEME 3:

ISSUES AND STRATEGIES FOR SUSTAINABLE DEVELOPMENT

CHAPTER 1: SUSTAINABLE DEVELOPMENT AND INCLUSIVE GROWTH

- **SUSTAINABLE DEVELOPMENT**
 - **WHAT IS SUSTAINABLE DEVELOPMENT**
 - **CAPITAL APPROACH**
 - **WHAT IS INCLUSIVE GROWTH**
 - **MEASURING INCLUSIVE GROWTH**
- **SLOW GROWTH AND INEQUITABLE GROWTH**
 - **DIFFERENCES IN GROWTH RATES**
 - **CAUSES OF INEQUITABLE GROWTH**
 - **IMPACTS OF INEQUITABLE GROWTH**
- **PROMOTING INCLUSIVE GROWTH**
 - **STRATEGIES AND POLICIES**
 - **ROLE OF MNES AND INTEGRATION**
 - **DYNAMIC COMPARATIVE ADVANTAGE**

CHAPTER 2: RESOURCE DEPLETION AND ENVIRONMENTAL DEGRADATION-FRAMEWORKS

- **ISSUES ARISING FROM ECONOMIC GROWTH**
 - **ECONOMIC GROWTH AND RESOURCE DEPLETION**
 - **ECONOMIC GROWTH AND ENVIRONMENTAL DEGRADATION**
 - **APPROACHES**
- **ENVIRONMENTAL PROTECTION**
 - **ISSUES**
 - **IMPACT ON THE ENVIRONMENT**
- **STRATEGIES AND POLICIES**
 - **MNES AND FIRM INTEGRATION**
 - **CIRCULAR ECONOMY APPROACH**
 - **EFFECTIVENESS**

Issues and Strategies for Sustainable Development

Overview

Theme 3 examines how global economies can promote sustainable development, in particular, inclusive economic growth and environmental protection, through various strategies and policies. We will learn about the fundamental growth theories and the role of institutions, and how to evaluate various sustainable development strategies and policies in real-world economies.

Inclusive Growth

In Theme 3.1.1, we find out how various international organisations define inclusive economic growth and its indicators.

Some of the key questions in this sub-theme are:

- What is sustainable development?
- How is sustainable development measured using the Capital Approach?
- How do we define inclusive economic growth?
- How do we measure inclusive economic growth?

In Theme 3.1.2, we seek a deeper understanding of inclusive economic growth by exploring two issues: slow growth and inequitable growth. Extending from our knowledge of the causes and impacts of slow economic growth from the H2 syllabus, we delve deeper into the issue of slow growth by using growth models to investigate the differing growth rates of economies.

For this sub-theme, key questions are:

- Why do the economic growth rates of some economies stagnate while others increase?
- What are the causes of inequitable growth?
- What are the impacts of inequitable growth?

In Theme 3.1.3, we study the strategies and policies that promote inclusive economic growth. Emphasis is placed on multinational enterprises (MNEs) and how dynamic comparative advantages can, in turn, promote economic growth.

Some key questions for this sub-theme are:

- What are the strategies and policies that can promote inclusive economic growth?
- What is the role of MNEs and integration in promoting inclusive economic growth?
- What are the strategies to gain dynamic comparative advantage for the economy?

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Environmental Protection

For sustainable development to be achieved, besides inclusive growth, environmental protection is another key area of focus for countries. To achieve economic growth and development, countries often experience significant resource depletion and environmental degradation, which leave fewer resources worsens the living environment for future generations. Hence, for economic growth to be sustainable, strategies and policies to protect the environment are required so that the rate of resource utilisation and environmental degradation can be controlled and kept within manageable levels.

In Theme 3.2.1, we start off with the analysis of the relationship between economic growth, resource depletion and environmental degradation.

Some of the key questions that will be explored in this sub-theme are:

- Why may economic growth cause resource depletion?
- Why may economic growth cause environmental degradation?
- What are the various approaches towards environmental protection?

In Theme 3.2.2, we will gain a deeper understanding of the need for environmental protection by looking at specific issues such as the exploitation of emerging economies, the resource curse, renewable vs non-renewable resources, and climate change.

The key questions that will be addressed for each of these issues are:

- What is the issue (i.e. exploitation of emerging economies, the resource curse, renewable vs non-renewable resources, climate change) about?
- What is the impact of the issue on the environment?

In Theme 3.2.3, we conclude the analysis by looking at strategies and policies that can be employed for environmental protection. We will first look at how the behaviour of MNEs and firm integration may affect the environment before looking at how environmental protection can be promoted through the circular economy approach to waste reduction.

In this section, the key questions explored are:

- How have MNEs and firm integration affected the environment?
- How can the circular economy approach to waste reduction be used to protect the environment?
- How far can these approaches help reduce resource depletion and environmental degradation?

1. Sustainable Development and Inclusive Economic Growth

1.1 Sustainable development includes inclusive economic growth

Sustainable development

United Nations (UN) defines sustainable development as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

For sustainable development to be achieved, it is crucial to harmonize three core elements:

- economic growth,
- social inclusion and
- environmental protection

These elements are interconnected and all are crucial for the sustained improvement of well-being of individuals and societies.

The Sustainable Development Goals (SDGs) are the blueprint to achieve sustainable development, born at the 2012 United Nations Conference on Sustainable Development. The 17 Goals are all interconnected, and in order to leave no one behind, it is important that these goals are achieved by 2030.

SUSTAINABLE DEVELOPMENT GOALS



Refer to <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> for more information.

Capital Approach to measuring sustainable development

One way to measure sustainable development is the Capital Approach. To do that, sustainable development can be simplified as increasing well-being over a very long time, where well-being encompasses:

- utility obtained from the consumption of goods and services purchased in the market
- It also includes consumption of goods and services provided freely by nature (e.g., forest products and beautiful sunsets), and
- abstract ideas of enjoyment of the benefits of human rights and “psychic fitness” (well-being of the soul, spirit and mind).

By measuring the economy’s capital stock amount either at a point in time or over a period of time, the sustainable development level or how much the economy has developed sustainably, can be determined.

In classical development theory, human-made capital and investments (increase in capital) are the main determining factors for economic development because more capital results in more goods and services. Here we assume that all goods and services are produced using capital in conjunction with human labour. Since sustainable development assumes a broader definition of consumption to include both the goods purchased in the market as well as those provided freely by nature, capital is broadened to include other forms of capital such as:

- produced capital: machinery, buildings, telecommunications and other types of infrastructures;
- human capital: educated and healthy workforce;
- financial capital: stocks, bonds and currency deposits;
- natural capital: natural resources, land and ecosystems providing services like waste absorption; and
- social capital: functioning social networks and institutions.

A country needs to ensure that its total capital stock or base is managed in a way that it is maintained over time. This is because a fall in capital stock would result in a lower ability to produce goods and services, impeding sustainable development in the long run (Hamilton and Ruta, 2006). Therefore, the change in an economy’s capital stock would be an indicator of sustainable development.

The use of the Capital Approach allows us to better understand the inevitable trade-offs in sustainable development, especially when development proceeds. For example, the framework allows economists and policymakers to ask whether the decline of one capital stock (e.g. petroleum wealth) is being offset by another capital e.g. produced capital or the growth of one capital stock (e.g., produced capital like factories) would result in the decline of another stock (e.g., human or social capital), and the net effect on well-being overtime.

SDL: QR code for more information on the importance of digital access to attain sustainable development



<https://go.gov.sg/inclusive-digital-economies>

Definitions of inclusive economic growth

According to the World Bank (Lanchovichina & Lundstrom, 2009), inclusive growth denotes both the pace and pattern of economic growth. The World Bank defines inclusiveness as equal opportunity in terms of access to markets, resources and unbiased regulatory environment for businesses and individuals. Inclusive growth thus implies participation and benefit-sharing (OECD, 2014).

In terms of the pace and pattern of growth, economic growth rate should be sufficiently high to reduce absolute poverty and should be broad-based across sectors and include a large part of the country's labour force to be considered inclusive growth.

Possible indicators of inclusive economic growth

The most common measure of income inequality is the **Gini coefficient**. To recap, the Gini coefficient measures the extent to which distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. Its value lies between 0 (which reflects perfectly equal distribution) and 1 (which reflects perfectly unequal distribution).



Applications to the Singapore Context 3–1: Comparison of Gini Coefficient Between Countries

The Gini coefficients² for selected countries are:

Figure 3–1: Gini Coefficient for Selected Countries (Latest Data Available)

Countries	Gini Coefficient (Year of Latest Data)
Slovak Republic	0.22 (2019)
Finland	0.27 (2018)
Germany	0.29 (2018)
Switzerland	0.31 (2018)
Japan	0.33 (2018)
Singapore (including employer CPF contributions)	0.38 (2020)*
South Korea	0.34 (2018)
United Kingdom	0.37 (2019)
United States	0.40 (2019)
China	0.46 (2015)
South Africa	0.62 (2017)

Source: OECD (a), SingStat and NBS websites, accessed 20 September 2021

* Singapore's Gini Coefficient in 2020 before accounting for government transfer and taxes was 0.45.

Another measure that some economists use is the **labour income/wage share of GDP**. According to OECD (2015), the labour income share is the part of national income allocated to labour compensation, while the capital share is the part of national income allocated to capital. The division of national income between labour and capital is called the functional distribution of income. The labour income share of GDP can be a gauge of the distribution of income between labour and capital owners. Data shows that over time and across many countries, a lower labour income share is associated with higher inequality in personal income distribution (OECD, 2015, p. 2).

Singapore's wage share to GDP has been about 40 per cent for the last three decades while in many developed economies the wage shares are mostly above 50 per cent. In 2018, the wage share in Japan was 52 per cent and Germany was 53 per cent (Ministry of Communications and Information Gov.SG website, 2020).

Income share of various income groups is another indicator used to determine income inequality. If a particular income group has a disproportionate share of income, it is an indication that the income gap is very large.

Figure 3–2: Percentage of Income Share of Highest 10 Per Cent Income Earners of Selected Countries (Latest Available Data)

Country	Percent (Year of Latest Available Data)
China	25.8 (2016)
Finland	22.6 (2018)
Germany	24.6 (2015)
Indonesia	29.9 (2019)
Japan	26.4 (2013)
Malaysia	31.3 (2015)
South Korea	24 (2016)
South Africa	50.5 (2014)
Thailand	27.2 (2019)
United Kingdom	26.7 (2017)
United States	30.8 (2018)

Source: World Bank website (a), accessed 20 Sept 2021

The **percentage of the population living below the poverty line** is used to determine the poverty level. A high percentage of the population living below the poverty line indicates that a large proportion of the people have very low standard of living. If the economic growth rate, GDP or GDP per capita of an economy is very high, but there is a large population percentage living below the poverty line, it may suggest that growth is not inclusive.

The international poverty line, used by the United Nations and World Bank, refers to a person living on less than US\$1.90 per day (purchasing power parity or PPP exchange rate).

Figure 3–3: Percentage of Population Living Below International Poverty Line for Selected Countries (Latest Available Data)

Country	Percent (Year of Latest Available Data)
China	0.5 (2016)
Finland	0.1 (2018)
Germany	0 (2016)
Indonesia	2.7 (2019)
Japan	0.7 (2013)
Malaysia	0 (2015)
South Korea	0.2 (2016)
South Sudan	76.4 (2016)
Thailand	0.1 (2019)
United Kingdom	0.3 (2017)
United States	1.0 (2018)

Source: World Bank website (b), accessed 20 Sept 2021

1.2 Issues in inclusive economic growth

Sustainable and inclusive economic growth is one of the macroeconomic objectives of most governments. Slow economic growth has implications on the objective of sustainable economic growth because it may signify the beginning of an economic downturn, leading to negative economic growth eventually.

Additionally, slow economic growth may have implications on inclusive growth. Slower economic growth can result in fewer employment opportunities for lower-income groups or a government's reduced ability to re-distribute resources/income to this group. There may also be less incentive for households to consume or firms to invest, thereby reducing the economy's productive capability.

Slow economic growth

Economists are interested to find out why some economies grow at an accelerated rate while others slow down or even stagnate. In order to do so, economists use economic models to determine the factors promoting economic growth. Two of the most well-known models are the Solow-Swan (exogenous growth) model and the Romer (endogenous growth) model.

Note: while there is mathematical modelling in the growth models, mathematical analysis is not required for the H3 syllabus. The focus is on gaining a broad understanding of the key predictions of these models, and their usefulness and/or limitations in explaining the economic growth of different economies.

Solow-Swan growth model

Todaro and Smith (2009, p. 147) credit the Solow-Swan growth model as a “basic reference point for the literature on growth and development”. Robert Solow received the Nobel Prize in Economics for this theory in 1987. To understand this model, we start with the common formulation for output:

$$y=f(k)$$

The above equation states that y is a function of k , where y is the income (Y) per effective labour (labour productivity (A) multiplied by the quantity of labour (L)) and k is the capital stock (K) per effective labour (AL). Thus, y and k can also be represented by

$$y=Y/AL \text{ and } k=K/AL$$

Crucially, in the first equation, there are diminishing marginal returns on k , i.e., as the capital per effective worker increases, income per effective worker increases at a decreasing rate.

Since y is a function of k , we will know how income per effective worker changes over time by determining the change in capital per effective worker.

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In Solow-Swan's model, investments per effective labour (i) will increase the stock of capital per effective worker (k), and this is equal to the savings rate (s) multiplied by the income per effective worker of the economy (y).

$$i = sy = sf(k)$$

The decrease in the stock of capital per effective worker (k) depends on the depreciation rate (g), productivity or technological growth rate (m) and population growth rate (n). This makes intuitive sense as g affects capital stock (K), m affects labour productivity (A) and n affects the labour force (L), all of which contribute to the capital per effective worker (k).

From the above, the change in capital per effective worker can be written as

$$\text{Change in } k = sf(k) - (g+m+n)k$$

The above will adjust over time until equilibrium is reached where change in $k=0$. When savings ($sf(k)$) is more than withdrawals ($(g+m+n)k$), it will result in a rise in k and when the reverse is true, there will be a fall in k .

The key takeaway is that over time, k will stop increasing or falling and since $y=f(k)$, the growth rates of economies will also stagnate in the long run! Solow thus predicted that any growth will only occur in the short run when either savings rate (s) increases, or capital depreciation rate (g), population growth rate (n) or the rate of technological change (m) decreases. When the above happens, it will not only affect growth rates but income levels as well. This is because when s increases or when g , m or n decreases, the capital per effective worker (k) will fall.

To summarise, according to Solow Swan's model, the key implications are that (1) the steady-state output is constant, i.e., the growth rate is zero for all countries in the long run; (2) short-run growth is only transitional in nature; and (3) countries with similar characteristics will converge in income to the same steady state.

Limitations of the Solow-Swan growth theory:

Many academics have sought to test if capital (K), labour (L) and technology (A) are good predictors of a nation's real GDP (Y) but as technology is not as easily measured as income, capital and labour, economists have determined the influence of capital and labour on real GDP instead and attributed any remaining change of the real GDP as being caused by the level of technology. As it turns out, capital and labour only account for 50 per cent of the historical growth of industrialised nations and so the remaining 50 per cent is attributed to technology. As "technology" is treated as an exogenous variable (i.e., the model takes the level of technology as a given and does not attempt to explain how it is influenced by other variables such as capital), Solow's theory is often referred to as the exogenous growth theory.

There are a number of drawbacks to this.

First, it is impossible to analyse the determinants of technological advancement in the Solow-Swan model because it is independent of the decisions of economic agents. Second, exogenous growth theories predict large differences in the impact of technology on growth for some countries when, in reality, the impact of technology on growth is quite similar. Third, we do

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not observe all countries converging to a steady state of zero growth rate nor similar countries converging to the same level of income.

Romer growth model

The main contribution of Romer's model is that it addresses technological spillovers (in which one firm's or industry's productivity gains has a positive externality and leads to spillover productivity gains in other firms or industries). Another way of saying this is that Romer's model treats knowledge as a non-rival good, such that the economy-wide capital stock positively affects output at an industry level and, hence, national income at the economy-wide level, thus removing the assumption of diminishing returns of capital on income that Solow's model imposes.

Therefore, when firms invest in capital, the economy's growth rate can be non-zero in the long run as firms are constantly "learning by investing". Romer's model therefore endogenises the reason for growth to capital investment leading to technological progress rather than attributing growth to an exogenous unexplained technological variable (as in the Solow-Swan model).

Romer (1994) also notes that economists should recognise that both market incentives and government policies have an effect on the discovery and diffusion of technological advances. He adds that, to promote such technological advances and subsequent growth, economists could look to (i) tax subsidies for private research; (ii) antitrust exemptions for research joint ventures; (iii) refining the scope of protection for intellectual property rights; (iv) greater links between private firms and universities; and (v) explicit government-led technology policy.

This model thus explains why countries do not experience convergence in national income or growth rates. The degree of investment on capital varies greatly across countries and, in turn, affects technological progress in many developing and emerging economies, leading to lower income and growth rates as compared to advanced economies.

SDL: QR code for SLS lesson on Growth models



<https://go.gov.sg/h3-sls-growth-models>

Economic institutions

A useful definition for institutions is given by Douglass North (1995, p. 97):

Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property right) Institutions provide the incentive structure of an economy; as that structure evolves, it shapes the direction

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of economic change towards growth, stagnation,
or decline.

From the above definition, it should be noted that institutions can exist in different but often interconnected realms of politics, economics and society.

Pages 73-79 of the book *Why Nations Fail* by Acemoglu and Robinson (2012) would serve as a good general introduction on the role of institutions. In the book, the authors look at the outcomes of many economies over time and make a strong case for institutions as a key factor in determining the economic success or failure of countries. Specifically, they highlight two contrasting types of economic institutions - inclusive and extractive.

Inclusive economic institutions feature secure private property, an unbiased system of law and provision of public services that provide a level playing field in which people can exchange and make contracts; such institutions also permit the entry of new businesses and allow people to choose their career. On the other hand, extractive economic institutions extract income and wealth from a subset of society to benefit another (usually smaller) subset. Meritocracy, protection of property rights and a fair system of law are seldom practised for the broad population.

As a result of inclusive economic institutions, the economy's workforce is likely to be highly educated and skilled as the population have access to better educational opportunities and greater willingness to pursue education. Innovation and advancement of technology are also supported by inclusive economic institutions which ensure the protection of property rights, competition in markets and upholding of contracts.

SDL: QR codes on Romer's TED presentations on charter cities



<https://go.gov.sg/romer-charter-cities-1>



<https://go.gov.sg/romer-charter-cities-2>

After watching the videos, **discuss** how the success of charter cities and a country's economy are intricately linked to politics and society as well.

Inclusive growth

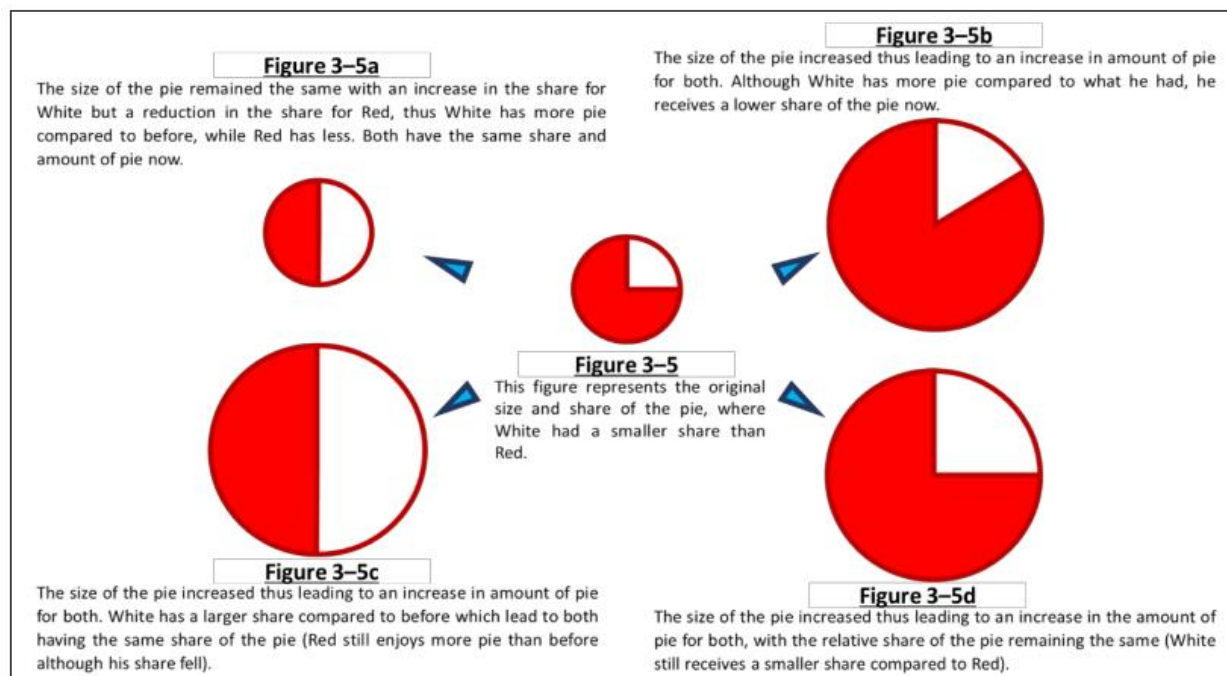
Economic growth is important because it can potentially increase the material well-being of people and provide necessary resources to achieve social goals. Nevertheless, increasing GDP, income and consumption possibilities is increasingly seen as insufficient. This is because not all groups benefit from economic growth equally. The need to know how different groups are benefiting from economic growth, as well as framing policies to ensure that all are benefiting from it equitably is crucial since people's well-being is affected by their socio-economic situation. For example, low-income groups tend to live shorter lives, have lower educational achievement and employable skills, poorer job prospects and remain in a vicious cycle of poverty. (OECD, 2014)

The global situation for inclusive economic growth over the years has been mixed (OECD, 2014):

- In 1980, none of the OECD countries had the richest 1 per cent of the population enjoying more than 8 per cent of the total pre-tax incomes. By 2010, however, the richest 1 per cent enjoyed 10 per cent or more of the income in 9 out of 18 OECD countries.
- Income gaps between the rich and poor are much wider in developing countries and emerging market economies than in OECD countries. For example, in the early 2010s, the richest 10 per cent earned as much as 100 times and 50 times more than the poorest 10 per cent in South Africa and Brazil respectively. Meanwhile, the richest 10 per cent earned about 9.5 times that of the poorest 10 per cent in Germany and Sweden.
- While absolute poverty has fallen worldwide, relative poverty has increased in many countries.

Nonetheless, some degree of inequity may provide people with the incentive to excel, compete, save, and invest, inducing human capital accumulation and economic growth. Income inequity can also influence growth positively by providing incentives for innovation and entrepreneurship. (IMF, 2015)

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The figures above represent the original situation (Figure 3-5) and possible subsequent scenarios (Figure 3-5a to 3-5d).

Which of the scenario(s) is/are acceptable? Why?

Normative analysis is involved when discussing inclusiveness and equity as fairness cannot be objectively proven and is subjective. There is no correct or wrong answer. It is more important for society to determine collectively the value system it should use when making economic decisions.

Causes of income inequity

Some prominent causes of income inequity detailed by the International Monetary Fund (IMF) (2015) and United Nations Conference on Trade and Development (UNCTAD) (2014) are technological change, globalisation, unhealthy economic development, lack of good educational opportunities, financial deepening and changes in redistributive policies.

While technological change (especially in information technology) has resulted in improvements in productivity and well-being, it has also resulted in income inequity. This is because technological change disproportionately increases the demand for capital and skilled labour, compared to low-skilled and unskilled labour. Technological advancement eliminates many jobs through automation or increasing the skill level required for jobs, thus creating a skill premium. Studies (UNCTAD, 2014) have shown that technological advancement contributed to almost a third of the widening income gap between the top 10 per cent and bottom 10 per cent in many OECD countries over the past 25 years.

Similarly, while globalisation has resulted in growth for many economies by promoting competitiveness and efficiency, the shift to using labour-saving technologies and offshoring (shifting production to other lower cost countries) has led to a decline in the manufacturing sector and increase in skill premium, thus reducing incomes of unskilled workers. However, globalisation

has also increased real wages (including those of the lower income group) through cheaper imports.

Unhealthy economic development contributed to jobless growth in many emerging economies. As incomes increased, these economies focused on expanding the service-sector instead of the manufacturing sector. However, as the manufacturing sector provides greater employment opportunities, expansion of the service-sector resulted in fewer job opportunities created. Additionally, many emerging economies relied on the mineral- and oil-extraction sectors, which are more capital-intensive than labour-intensive, which again restricted the number of new job opportunities.

Financial deepening or the financial sector's development potentially provides households and firms with greater access to resources to meet their financial needs, such as saving for retirement, and investing in education. While this may lower income inequity as lower income households have more and easier access to financial resources, studies have found that those with higher incomes and wealth have greater access to finance and loans (at least in the early stages of economic development), boosting returns to their wealth through financial investments, thus increasing income inequity.

Lack of good education opportunities has been found to contribute to income inequity. Education can increase access to jobs (especially higher wage jobs) and increase wages but studies (IMF, 2015) have shown that many low-income households in many economies have limited access to good education. There is lack of investment in education by individuals and the government and a low rate of return on investment (due to the poor quality of education).

Labour market conditions can contribute to income inequity. A flexible labour market enables reallocation of resources to more productive sectors and enables firms to restructure. This, however, reduces the incomes of lower skilled workers, especially those without labour union representation. Excessive market power of firms (e.g., monopsony) can also contribute to income inequity as firms set wage rates at unfair levels. Studies have found that certain labour market regulations, such as unionisation, minimum wage and social security contributions, result in better income distribution.

Changes in redistributive policies can cause increases in income inequity. Many advanced economies have seen a shift to less progressive tax systems where higher income individuals and corporations face lower effective tax rates (IMF, 2015).

Impact of non-inclusive economic growth (IMF, 2015)

To exclude someone from growth is not morally justified and there are also economic implications when economic growth is not inclusive.

Inequity reduces labour productivity because it reduces low-income households' capacity to invest in education and skills for themselves and their children, maintain their health and acquire physical capital. All these can reduce labour productivity and thus aggregate production and growth for the economy.

Increasing inequity is also found to increase the possibility of financial crises. The rich may lobby for greater financial deregulation while lower income households overextend their credit,

increasing the chances of defaults and financial crises. This is especially so if the financial system is not well regulated.

Increasing income inequity may result in poor policy choice as push-back against growth enhancing policies like economic liberalisation, and support for protectionist policies may increase. Additionally, high-income groups may pressure the government to limit the provision of goods and services that benefit the poor to reduce the possibility of an increase in tax rates.

1.3: Strategies and policies for inclusive economic growth

While a high level of sustainable economic growth is important to facilitate inclusive economic growth, it is a necessary but not sufficient condition. This is because the benefits of growth may not be automatically distributed equitably. Policies and certain institutional conditions are required to ensure inclusive economic growth.

Investment in Physical Capital - Basic services and infrastructure.

The common availability of basic services and infrastructure underpins the equality of economic opportunity. For example, a well-connected and effective transport and telecommunication system enables access to employment and educational opportunities. Availability of health, sanitation and utility services also ensures the well-being and productivity of the workforce. An economy with effective and well-run infrastructure also attracts investments, which create jobs and increase incomes. Strategies and policies: provide core infrastructure and basic services to all, so that everyone can be productively engaged. Examples include developing and maintaining infrastructure.

Investment in Human Capital - Education and skills training

Labour income is the primary income source for most households, especially lower income households. Education and skills training increase labour productivity which, in turn, increases job opportunities and wages for individuals, and promote economic growth. It is thus important that there are policies that ensure everyone has access to good quality education that will help increase employability and wages.

Policies that promote equitable access to good education and skills training such as public provision of or subsidies for skills training and basic education as well as ensuring an effective education system.

Productive employment and labour compensation

Ensuring productive employment and fair labour compensation for all are central to achieving inclusive growth. Policies in this area include creating sufficient employment opportunities in the economy as well as ensuring that employment compensation is fair (i.e., wages for the lower income workers are not unfairly low).

SDL: QR code on Workfare



<https://go.gov.sg/socialsecurityworkfare>

Asset building and small business ownership.

Small business entrepreneurship and home ownership are the first means, in many economies, by which working families accumulate wealth beyond savings from wages and pension contributions. They also provide progression to higher income bands for many low-income households. The government can put in place policies that facilitate home ownership and setting up of business such as low-cost loans for housing, assistance to start and maintain small businesses, and regulating the excessive market power of large businesses.

Equal access to financial services.

A financial system that is inclusive enables all to access funds for business, education and health-related services. This enables low-income households to access essential services that can increase their employability and incomes, as well as start a business. A financial system that deploys private savings for productive purposes and enables new capital formation in the real economy would promote productive investments and allow creation of jobs. Government can put in place policies that ensure that the banking and financial system is sound and inclusive in their activities for example subsidised and low interest loans, regulation against excessive market power of banks, regulation to ensure the banking system is safe and reliable and facilitates the availability of microfinancing or microcredits.

Redistributive policy.

Taxes provide an important source of funds for a government to redistribute resources and provide essential goods and services. Social safety nets or their equivalent can help mitigate the effects of external and transitory livelihood shocks as well as meet the minimum needs of the chronically poor so they too can participate in and benefit from growth. Government can put in place a tax system and social protection scheme that seek to address income inequity without compromising economic growth. Some examples include progressive tax systems and transfers.

Roles of MNEs and integration (vertical, horizontal and conglomerate) in inclusive economic growth

In Thomas L.Friedman's book, *The World Is Flat 3.0: A Brief History of the Twenty-First Century* (2006), he identified 10 flatteners that are making our world increasingly globalised. Many of them, such as outsourcing, offshoring and supply-chaining, have been present from as early as the 1800s when Dutch and English companies searched the world over for business and trade opportunities.

MNE's role in today's global economy is even more important. As a starting point on MNEs, it would be useful to adopt a working definition for these companies. One such definition can be found in the book, *Multinational Enterprises and the Global Economy*, by John Dunning and Sarianna Lundan (2008, p. 3):

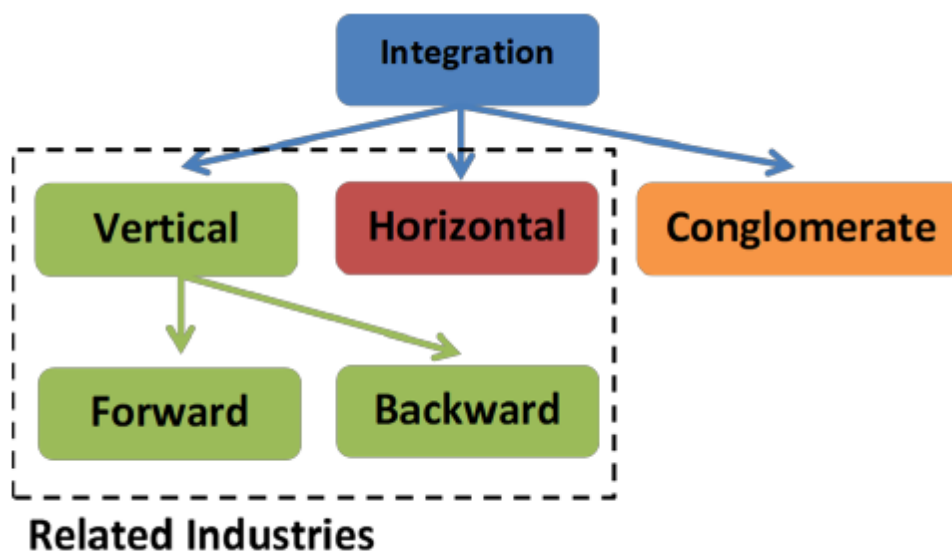
A multinational or transnational enterprise is an enterprise that engages in foreign direct investment (FDI) and owns or, in some way, controls value-added activities in more than one country.

In the next three sub-sections, we will explore, in greater detail, how MNEs work and their impact on the national economy.

Vertical, horizontal and conglomerate integration in relation to MNEs

In this sub-topic, we consider three broad strategies that MNEs commonly employ to enter other economies: vertical, horizontal and conglomerate integration. Figure 3-8 presents a simple diagram to think about the different types of integration:

Figure 3-8: Types of Economic Integration



Vertical integration refers to MNEs locating different stages of their production processes in different countries according to the countries' comparative advantage before shipping the product for international sale. This is usually done in the form of **backward integration**, where the MNE further down the value chain purchases the companies that supply raw materials to it, allowing it to secure a steady stream of raw materials. Alternatively, **forward integration** might occur, where an MNE merges with firms that are at a later stage of their production, ensuring a ready demand for its products. The impact of this integration on society and the consumer in terms of lower prices depends on several factors, such as whether costs are reduced as a result of the merger or whether the firm chooses to exploit its market power to increase prices.

An example of vertical integration can be found in the oil industry. In the 1970s and 1980s, the industry experienced a major shift when large extraction and exploration companies such as Shell and BP started expanding their operations beyond their traditional reach. They acquired downstream industries to ensure they could refine the crude oil they were extracting, and distribute them on their own.

Horizontal integration for MNEs refers to the acquisition of firms in different countries that are from the same industry and which engage in the same production activities. The main benefits of such integration to the MNE are an increased ability to exploit economies of scale, for example, through the bulk purchase of common resources. If the product is sold internationally, the combined firm would gain a greater international presence and command greater monopoly and monopsony power. This will allow greater bargaining power with suppliers and greater price-setting ability with consumers, respectively. If the firm's home country is a small one, it also makes sense for the company to expand beyond its shores to secure a larger market. The firm would be able to save on shipping and other trade costs if it had been exporting to the host country previously. However, such integration may cause legal issues such as anti-trust cases, especially if it is seen to make the industry less competitive as a result.

One example of horizontal integration can be found in the US movie industry with Disney's purchases of popular production studios Pixar and Marvel in 2006 and 2009, respectively, to expand its movie franchise. These acquisitions were conducted in the US, with the MNE growing through mergers in the same country.

Horizontal integration can also occur through the purchase of foreign companies in the same industry. An example of horizontal integration across different countries can be observed closer to home. Singapore's local telecommunications company, Singtel, bought over the Australian telecommunications company Optus, in 2001. With Singtel already controlling a large market share in the small Singapore consumer market, expanding horizontally made perfect sense as it had the necessary expertise to venture into another country's telecommunications market. To expand its mobile advertisement presence, Singtel acquired American mobile advertising company Amobee in 2012, allowing it to tap on foreign expertise in a field it was relatively new in.

Conglomerates are formed when MNEs acquire foreign firms whose production activities are totally unrelated to that of the parent firm. An example of **conglomerate integration** is the US\$19.6 billion acquisition of the British chocolate brand Cadbury by American brand Kraft (famed more for its cheeses and snacks), in 2009.

SDL: QR code on Luxxotica



<https://go.gov.sg/conglomerateluxxotica>

After watching the video, **discuss** the impact of such vertical and horizontal integrations on the economy.

Impact of MNEs on inclusive economic growth

The impact of MNEs on inclusive economic growth is felt in both home and host country and is best analysed from these two perspectives. The impact of MNEs on inclusivity is divided, i.e., there are positive and negative effects. The key is to ensure there are structures, regulations and mitigating policies to ensure that negative effects are minimised, and gains are distributed fairly.

Table 3:1: Analysis of impact of MNE on the home and host country

	Impact of MNE on:	
	Home Country	Host Country
Employment	When MNEs shift operations to cheaper locations abroad, workers that once held these jobs in the home country may be displaced by foreign counterparts who are willing to work longer hours at lower wages. This is especially true for lower skilled and low income workers in advanced economies as they are more likely to lost their jobs when MNEs relocate.	The main beneficiaries in the home country are the workers in the host country who experience increased demand for their services. Many locals are pleased to work for MNEs as they normally pay higher wages than local firms. MNEs also create jobs for the local population and suppliers of inputs for the MNEs benefit too.
Inflation	Outsourcing by MNEs could lead to lower cost of production and ultimately leads to lower prices for consumers in the home country.	Introduction of MNEs in industries that traditionally lack competition would lower prices and increase the variety of products available for consumers.
Trade	A large amount of FDI in the world is currently high-skilled and intra-industry in nature As a result, both home and host countries would expect to see an increase in intra-industry trade as MNEs import and export goods and services from their various subsidiaries which are based in different countries.	

	This could potentially increase both the home and host countries' economic growth through its aggregate demand (assuming export revenue greater than import expenditure)	
Exploitation of workers & environment	NIL	Some argue that MNEs have the tendency to exploit low-skilled workers (in the form of hazardous working conditions and unfair wages) and the environment (pollution and over-extraction of natural resources). Although the detrimental effects on the environment are universal for all in the country, low-income groups tend to bear the bulk of it as most of them depend on natural resources for their livelihood, and pollution levels tend to concentrate in areas where they live.
Technology and skills transfer	NIL	MNEs bring with them technology, marketing capabilities and managerial skills. These technology and skillsets spill over to local firms, accelerating the development of industries in the host country. This can also be good for low-skilled and low-wage workers because they acquire skills and knowledge while working in these MNEs, increasing their employability and incomes.

Strategies to gain dynamic comparative advantage

Globalisation and trade have resulted in rapid growth for many economies. We have learnt about the principle of comparative advantage as the basis of trade in the H2 syllabus. However, the principle of comparative advantage assumes that the countries' comparative advantage does not change over time and that economies will produce and export the same good because factor endowments and technology are assumed to be constant. In reality, **comparative advantage is dynamic and changes over time when as a country's factor endowments and technological capabilities evolve**. When an economy gains comparative advantage in the production of a particular good, it can potentially export more and improve its economic growth.

Countries (especially developing countries) can leverage dynamic comparative advantage to **move up the value chain and diversify their exports** as they accumulate capital, improve infrastructure, and invest in human capital.

Factors like government policies, foreign direct investment, and technological innovation can influence a country's productivity and thus dynamic comparative advantage over time.

Strategies can be adopted to increase productivity, specifically labour productivity (value added per unit of labour) through the following ways:

Technology. Advancement in technology can be achieved by promoting research and development (R&D) or innovation, enabling more to be produced with a given unit of labour. Some strategies to promote R&D and technological advancement include providing funding for R&D and protection for intellectual property.

Education and skills training. Education and skills training increase workers' knowledge and skills, thereby increasing their productivity. Governments can subsidise or provide education and skills training directly.

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Labour market conditions. A more flexible labour market allows firms to easily switch from labour-intensive to capital-intensive production, thus increasing productivity. One way to do this is to reduce the power of unions and remove labour market regulations.

Attracting FDI in areas of higher value-add goods/services. FDI can introduce new technologies, management practices, and access to global value chains, enabling countries to produce new or higher-quality products and services more efficiently, developing new areas of comparative advantage.

SDL: QR code on how Singapore can create dynamic comparative advantage



<https://go.gov.sg/creatingdynamiccomparativeadvantage>

After watching the video, you may wish to think about the policies put in place by the Singapore government since 2021 to drive some of these identified areas.

2. ISSUES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION

2.1: Sustainable development includes environmental protection

Economic growth and resource depletion

For economic growth to occur, a country must produce more goods and services, and in the process more resources are used up. Natural resources such as metals, minerals and fossil fuels are non-renewable, so the greater the current rate of utilisation, the faster their depletion, and the lesser the amount of such resources available for future use. Other resources such as fish in the sea and wood from forests are renewable because animals and plants can grow, procreate and multiply. However, it may take a long time for such resources to regenerate. If the rate of utilisation exceeds the rate of regeneration, the total stock of such resources will diminish, leaving less of such resources available for future generations. If an economy has less resources in the future, its ability to produce goods and services may decline, thus future economic growth and sustainability may be jeopardised.

Economic growth and environmental degradation

The production of goods and services needed to generate economic growth will inevitably result in the generation of waste materials. For example, the production of furniture will result in leftover inputs like wood, fabric, leather, paint and plastics, while the production of goods like metals and chemicals will often generate highly toxic by-products.

Moreover, as the economy grows, income and consumption will rise, thus generating waste such as leftover food and packaging, as well as discarded older consumer goods which have been replaced by newer ones. Regardless of production or consumption, the dumping of waste into landfills or the emission of waste into waterways and the atmosphere will result in land, water and air pollution, respectively.

To facilitate both production and consumption, energy and transportation are required. As electricity generation and transportation are largely powered by the burning of fossil fuels, the resulting emissions of carbon dioxide as well as other greenhouse gases contribute to global warming, which has been shown to cause climate changes that lead to natural catastrophes like droughts, forest fires, hurricanes and floods. Power generation and motor vehicles also emit other pollutants where the resulting haze and smog can cause respiratory problems for residents in the affected areas.

Environmental degradation harms both the physical and mental well-being of people, which may then adversely impact labour productivity. As we had learned in the H2 syllabus, a fall in labour productivity has negative impact on actual and potential growth and consequent fall in national income and living standards. Fall in labour productivity means workers are less efficient in production which would drive up unit cost of production and lead to a fall in short-run aggregate supply, causing fall in real national output and actual growth. Economies with less productive workforce are less able to attract investment, causing fall in aggregate demand and actual growth, as well as fall in potential growth as there is less transfer of capital and technological know-how. Hence environmental degradation not only reduces non-material living standards, it may also reduce growth, income and material living standards.

Approaches to environmental protection

When looking at policies for environmental protection, there are generally a few broad approaches.

The first approach is to directly target economic agents or markets which have environmentally harmful behaviours. Such an approach involves the use of market-based incentives that enable agents to internalise the externalities. For example, taxes can be imposed on the production or consumption of environmentally harmful goods or directly on the pollution itself so that negative externalities are internalised, while subsidises can be provided for environmentally friendly production or consumption activities so that positive externalities are internalised.

Alternatively, direct controls in the form of rules and regulations can be used. For example, firms can be directed to meet certain pollution targets or standards or to use cleaner inputs or production methods, while households can be prohibited from engaging in activities which are environmentally unfriendly. Tradeable permits can be seen as an amalgamation of both direct controls and market-based solutions.

Finally, moral suasion in the form of public education campaigns can be used to inform the public of environmentally harmful or beneficial products or behaviours so that preferences can be altered towards more environmentally sustainable decisions. All these policy tools are covered in the H2 syllabuses while more in-depth coverage of tradeable permits can be found in Theme 2.2.1a of the H3 syllabus.

The second approach is to enact broad laws which clearly delineate the rights of affected parties when environmentally unfriendly behaviours occur. Although Coase Theorem predicts that socially efficient outcomes will be achieved regardless of whether the property rights are assigned to the perpetrators of such behaviour or those who suffer from the resulting consequences, assigning rights to the former is likely to be morally offensive and therefore too politically unpopular to be enacted, hence rights are usually assigned to the latter. Nevertheless, real-world application of Coase Theorem is highly limited because pollution is often cross-boundary, generated by multiple parties and causes harm to multiple parties. Hence, ascertaining culpability and impact as well as achieving consensus is often too complex for meaningful resolutions to be achieved through legal processes and negotiations. Transaction costs tend to be exceedingly high. In-depth analysis of Coase Theorem is covered in Theme 2.2.1a of the H3 syllabus.

The third way is to take a more holistic approach towards environmental sustainability in terms of promoting production sustainability, consumption sustainability and a circular economy. Firstly, production involves a whole series of activities such as, product development, input procurement, manufacturing, distribution and retail. Promoting production sustainability thus requires collaboration between the government and firms to identify areas where waste generation is most severe, and to then devise joint solutions on how the generation of such waste can be minimised.

Secondly, to promote consumption sustainability, coordinated efforts between the government, firms and social advocacy groups can help nudge consumers to cut down waste in areas such as food and single-use plastics as well as promote green behaviours like repairing, reusing, recycling, donating and sharing of consumer goods, as well as to make deliberate choices to purchase more energy efficient products.

Lastly, the circular economy approach to reducing waste requires coordinated strategies that enable resources to be continually reused in an endless loop. For example, collecting, filtering, and treating used water such that it can be transformed into potable water enables this resource to be used continuously, resulting in zero waste. Efforts are thus required to identify suitable types of resources where such an approach can be applied, before developing an ecosystem to enable the complete recycling of such resources. Detailed explanations, exemplification, and evaluation of sustainable production, sustainable consumption, and the circular economy approach to reducing waste will be provided in the final segment of this section.

2.2: Issues in environmental protection

Exploitation of emerging economies

Developed countries in general tend to have stricter environmental regulations and better enforcement of such regulations as compared to developing countries. To minimise costs of pollution abatement, firms in developed countries tend to offshore or outsource the more polluting parts of the supply chain to developing countries, which results in environmental degradation in developing countries. According to Europe's Economic Policy Journal, firms in carbon intensive industries and those whose home country have stricter regulations against carbon emissions tend to generate higher emissions abroad, especially in countries where environmental regulations are less stringent. Even without deliberate offshoring or outsourcing, when developed countries import goods which are more polluting rather than produce these goods themselves, they are also indirectly shifting the burden of environmental degradation to the developing countries which are producing and exporting such goods.

Another example is the export of waste materials from developed countries to developing countries for "processing". The developing countries often do not process the waste but simply burn or dump them in their own environment. This not only harms the health of residents of these countries through land, air and water pollution, but also adversely affects the global ecosystem. For instance, plastic waste which is indiscriminately burnt leads to emissions of carbon dioxide, thus contributing to global warming. Plastics which are discarded in local waterways eventually flow into the world's oceans, which not only harms marine life and the livelihoods of people who depend on fishing, but also pollutes the beaches and mangroves of other countries when such plastics are washed ashore.

Other than plastics, the exporting of electronic waste (e-waste) is another major area of concern. With rapid technological advancements, consumers will inevitably upgrade their electrical and digital devices like household appliances, audio-visual equipment, computers and mobiles phones. This generates massive amounts of e-waste, especially in developed countries, which is often exported to developing countries where such items are taken apart so that valuable metals found in these items can be extracted and recycled. However, with weak environmental regulations, heavy metals, chemicals and toxins found in such e-waste often find their way into groundwater and waterways, poisoning the residents in the surrounding areas. Notable examples of towns which specialise in e-waste processing include Guiyu in Guangdong Province and the Taizhou regions of Zhejiang Province in China, which at one time were processing up to 70 per cent of the world's e-waste, until imports of such wastes were banned by the Chinese government in 2018, after which e-waste was increasingly diverted to other developing countries in Asia and Africa (Larmer, 2018).



Additional readings: Exploring the Problems of Carbon Offshoring and E-waste Exports (IBL)

The following resources show the problems that arise when developed countries offshore, outsource or export their carbon emissions and waste to developing countries.

QR code for 'Exporting pollution: Where do multinational firms release CO2?'



QR code for 'Toxic e-waste dumped in poor nations, says United Nations'



QR code for 'By exporting trash, rich countries put their waste out of sight and out of mind'



Resource curse

One would expect countries which are rich in natural resources like fossil fuels, precious metals and minerals to have an advantage over other countries in terms of economic development. Such countries can extract and export such commodities so that the revenues generated can be used to finance the provision of social services like housing and healthcare, as well as imports of consumption goods, thus directly raising living standards. The revenues can also be used to finance human capital development and physical infrastructure, which helps promote long run economic growth and development. However, many such countries, especially those which are still developing, have instead experienced weak and unstable growth, and are more likely to face internal and external conflicts, corruption, as well as political and social oppression, as compared to countries which are naturally less endowed. This phenomenon is known as the resource curse or the paradox of plenty.

According to Fernando (2020) and the Natural Resource Governance Institute (2015), there are various reasons why the resource curse occurs.

- First, there is a tendency for the natural resource sectors to attract excessive investment and employment, thus depriving other sectors of the resources needed for growth and development. This hampers economic diversification and makes the country more vulnerable to macroeconomic instability arising from fluctuations in commodity prices.
- Second, exports of such natural resources tend to drive up the exchange rates of these countries, thereby reducing the competitiveness of other exports. This situation, which is called the Dutch Disease, also hampers the development of other non-resource related sectors, thus inhibiting economic diversification.
- Third, as the governments of such resource rich countries tend to generate most of their revenues from such exports rather than from general taxation, there tends to be less accountability to taxpayers for their spending, thus creating a political environment which breeds economic inefficiency arising from wasteful spending and corruption.
- Finally, there tends to be in-fighting between internal groups and with neighbouring countries for the control of such lucrative natural resources, thus leading to social and political instability as well as border conflicts.

Besides the adverse impact on economic growth and development, the countries also face environmental degradation. For example, areas surrounding mines often suffer from land scarring caused by deforestation and excavation when mining pits and tunnels are created. The land-clearing and excavation activities also generate substantial air pollution, which often tends to persist due to the removal and erosion of topsoil that leaves the land barren and uncovered. Mining areas also tend to lack proper sewage and waste disposal infrastructure, resulting in slums and shanty towns. Chemicals used in the extraction process may leak into the ground and contaminate ground water sources and even waterways when rain washes them into streams and rivers. Also, large volumes of water required to blast and break up rocks and sediment may result in the depletion of local water sources, especially for regions which are already water scarce. Finally, emissions of carbon dioxide as well as other harmful gases generated from mining equipment and processes not only cause localised air pollution, but also contribute to global warming.

As mining is highly capital intensive, mining firms are typically large and powerful, and thus have substantial incentive and ability to influence local as well as national governments and their officials. This often leads to weak enforcement of environmental regulations and inadequate compensation for residents staying near these mining areas. Hence existing power imbalances between those who benefit from the resource extraction and those who suffer from it, exacerbates the resource curse problem.



Additional readings: Understanding the Resource Curse and its Environmental Impact

The following resources explain the problem of the resource curse and illustrates the environmental impact caused by the extraction of natural resources.

QR code for 'Are natural resources a curse, a blessing or a double-edged sword.'



QR code for 'Beating the resource curse? Lessons from Bolivia, Kazakhstan, Mongolia and Zambia'



Renewable vs non-renewable resources

The issue of renewable vs non-renewable resources has two aspects. First, resource depletion is a greater problem for non-renewable resources as compared to renewable resources. For non-renewable resources like metals and minerals, once the resources have been depleted, they cease to be available for future generations. In contrast, resources like wood and marine life are renewable because forests and fishes can regenerate over time so depletion may not occur if the rate of utilisation is kept under control. Hence for non-renewable resources, reducing usage, cutting wastage and promoting recycling can only delay but not eliminate resource depletion. However, such efforts when combined with efforts to promote reforestation and commercial cultivation of marine life can prevent resource depletion for renewable sources.

The second aspect is about the shifting of energy sources towards cleaner non-renewable sources as well as to renewable sources.

Currently, most of the world's electricity is generated from the burning of fossil fuels like coal, fuel oil, diesel and natural gas. Also, sea, air, and land transportation vehicles are largely powered by engines that run on fossil fuels like fuel oil, diesel, kerosene (aviation fuel) and petrol. The problems with using fossil fuels as a source of energy is the generation of carbon dioxide and other greenhouse gases which lead to global warming, and the emission of harmful particles which leads to respiratory problems. However, some types of fossil fuel burn more cleanly than others and thus generate less pollution. When measured by the amount of carbon dioxide generated per unit volume, coal is the dirtiest of all fossil fuels, followed by fuel oil, diesel, kerosene, petrol, and finally natural gas. Hence one of the ways to combat global warming and pollution is to encourage power generation companies, firms and consumers to switch from dirtier to cleaner fossil fuels.

A better way to combat global warming and air pollution is for countries to switch from using dirty non-renewable fossil fuels to clean renewable energy sources like solar, wind, geothermal, and hydroelectric power. According to the International Hydro Power Association (n.d.), in 2019, hydro power was the largest source of non-renewable energy as it contributed 15.9 per cent of global electricity supply. This was followed by wind and solar power, which contributed 5.9 per cent and 2.8 per cent of global electricity supply respectively, while geothermal and ocean power contributed less than 0.4 per cent.

Hydro power can be generated from dams and by placing turbines in flowing waters like rivers and streams. The advantage of hydro power is that it is scalable and is a generally stable source of power. Hydro power can also be varied according to power demand by adjusting the number of turbines used at any point of time. However, the main disadvantage is that the construction of large dams can cause substantial environmental and ecological damage.

Wind power, which is generated from windmills is also highly scalable as very small windmills can be used for small farms and rural households while larger ones can be used for commercial wind farms. The largest windmills are typically located offshore and are often as tall as skyscrapers. One key limitation is that wind power is unstable as wind speeds can vary throughout the day and year. Also, as windmills can be noisy and wind speeds are typically higher in rural and hilly areas, wind farms tend to be located far from urban areas. This leads to substantial power loss when electricity is transmitted over long distances from rural to urban areas.

Solar power is generated when electricity is converted from sunlight using solar cells. Unlike hydro and wind power, which may only be viable for countries that are sufficiently windy or have sufficiently large, elevated, and fast flowing waterways, solar power can be used by all countries. However, as the amount of sunlight varies according to weather conditions and is non-existent at night, solar energy is not stable and hence batteries are required to store and regulate the supply of electricity. Also, with current technology, countries without sufficient land area may find it hard to generate meaningful amounts of electricity from solar cells to supply their power consumption needs.

As for other forms of renewable sources, only countries with abundant natural heat sources like hot springs and geysers can employ the use of geothermal power. For ocean power, although tides are generally stable and countries with large coastlines have ample access to the sea, creating large tidal barrages (like dams in the sea) can disrupt shipping lanes and harm marine life and ecosystems.



Additional readings on Renewable Energy and Applications to the Singapore Context

QR code for YouTube video on Singapore's Energy Story



QR code for 'Why hasn't solar energy in Singapore taken off in a big way after o long?'



Climate change

Since the industrial revolution in the 1800s, the increasing use of fossil fuel for power generation and transportation as well as the clearing of land for agricultural and economic development have led to increasing amounts of carbon dioxide being released into the atmosphere, while resulting deforestation has reduced the earth's natural ability to absorb the gas. Emissions of methane, which is generated from garbage in landfills, the incineration of waste and the production of animal livestock have also been rising in tandem with global economic and population growth. Carbon dioxide, methane and other greenhouse gases in the earth's atmosphere trap the sun's heat, causing global warming. As a result, significant climate change has occurred where rising average temperature has resulted in heightened frequency and intensity of severe weather conditions such as heatwaves, forest fires, droughts, snowstorms and hurricanes. Melting polar icecaps are also causing sea levels to rise, thus putting many coastal settlements in danger of inundation.

According to the United Nations (n.d.-c), average global temperature is now about 1.1°C higher than pre-industrialisation levels and average temperatures in the last 10 years (2011-2020) was the highest on record. Furthermore, while thousands of climate experts agree that preventing average temperatures from rising more than 1.5°C would enable the world to escape the worst of the possible climatic effects, average temperatures are currently predicted to rise by 2.7°C by the end of the 21st century.

Countries have recognised the problem of global warming and gathered to discuss possible actions. The two most recent major discussions are the Paris Agreement and the Glasgow Pact.

QR code for YouTube video on 'Climate change explained simply'



The Paris Agreement¹

To tackle climate change and its negative impacts, world leaders at the UN Climate Change Conference (COP21) in Paris reached a breakthrough agreement on 12 Dec 2015. The Historic Paris Agreement sets long-term goals to guide all nations to:

- substantially reduce global greenhouse gas emissions to limit global temperature increase in this century to 2°C while pursuing efforts to limit the increase even further to 1.5°C;
- review countries' commitments every five years; and
- provide financing to developing countries to mitigate climate change, strengthen resilience and enhance their abilities to adapt to climate impacts.

The Agreement is a legally binding international treaty and entered into force on 4 November 2016. Today, 192 Parties (191 countries plus the European Union) have joined the Paris Agreement. The Agreement includes commitments from all countries to reduce their emissions and work together to adapt to the impacts of climate change, and calls on countries to strengthen their commitments over time. The Agreement provides a pathway for developed nations to provide technological and capacity building assistance to developing nations in their climate change mitigation and adaptation efforts, while creating a framework for the transparent monitoring and reporting of countries' climate goals. Finally, the Paris Agreement marks the beginning of the shift towards a net-zero emissions world.

The Paris Agreement works on a five-year cycle of increasingly ambitious climate action plans carried out by countries. Every five years, all signatory countries are expected to submit an updated national climate action plan known as the Nationally Determined Contribution (NDC), which communicates their intended actions to reduce greenhouse gas emissions to meet the goals of the Paris Agreement, and to adapt to the impact of rising temperatures.

Effectiveness of the Paris Agreement:²

- Most countries' pledges were too low and will not be enacted soon enough to cap global temperature rise to 1.5°C, as current policies would only result in a 2.7°C (4.9°F) rise by 2100.
- Furthermore, while some countries have submitted bolder pledges ahead of the COP26 summit in Nov 2021, average temperature will still rise by 2.1°C (3.8°F) by 2100, even if all countries were to fully implement their pledges for 2030 and beyond.

The Glasgow Pact³

The UN Climate Change Conference, COP26, took place in November 2021 at Glasgow, UK. The aim of the conference was for the 197 participating parties to communicate their first five-yearly climate change action plans (i.e., their NDCs) since the 2015 Paris Agreement, and agree on revised or new commitments in the fight against global warming and climate change.

The agreements achieved at Glasgow include:

¹ This section was adapted from United Nations. (n.d.-b) and United Nations Framework for Climate Change Control (n.d.)

² This section was adapted from Maizland (2021)

³ This section was adapted from Hill (2021)

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- an agreement to “phase-down” the use of coal, which is the biggest single cause of global warming;
- new rules for trading carbon credits across borders, an issue that had evaded resolution since 2015;
- a call for nations to return in 2022 with new, more ambitious targets to curb emissions;
- a request for a yearly report summarising nations’ commitments to reduce emissions.

Additionally, various nations also shared other important pledges during COP26 including:

- the United States and China, the two largest emitters, agreed to work together to combat climate change despite recent rifts in diplomatic relations;
- over 100 nations pledged to cut 30 per cent of their methane emissions by 2030;
- more than 130 nations, together possessing 90 per cent of the world’s forests, agreed to halt and then reverse deforestation by 2030; and
- over 450 financial institutions overseeing \$130 trillion in assets promised to align their portfolios with the goal of achieving net-zero emissions by 2050.

However, there were also notable disappointments including:

- a last-minute objection by India and supported by other coal reliant economies like China to water down the wording from “phase-out” to “phase down,” with regards to the use of coal power; and
- failure to agree on how much financial support to be given by developed countries to developing countries to help them adapt to the effects of climate change and compensate for areas that have been irreparably harmed by adverse climatic impacts, although there were promises for future dialogue.

Overall, while all countries now recognise the need to fight global warming, agreement on how much each country should sacrifice remains elusive. Developing countries want developed countries to shoulder a greater burden since they had contributed and benefited most from carbon emissions over the last two centuries. However, as developing countries like China and India are now among the top polluters, developed countries want them to play a larger role in this battle.



Additional readings to evaluate the Paris Agreement and Glasgow Pact

The following resources provide some knowledge and analysis of the two most recent major international climate change agreements:

QR code for 'COP26: Together for our planet'



QR code for 'Global Climate Agreements: Successes and Failures'



QR code for 'What COP26 did and didn't accomplish'



QR code for 'What's at stake at COP26 for Asia'



Consider getting students to write an opinion piece on the following question:

'Discuss the usefulness of international climate change agreements for countries.'

2.3: Strategies and Policies for Environmental Protection

Impact of multinational enterprises (MNEs) and firm integration on the environment

As mentioned earlier, environmental degradation occurs because firms in developed countries offshore their more pollutive production processes and export much of their waste to developing countries where environmental regulation is less stringent or poorly enforced. Many of these firms are MNEs which tend to be large international conglomerates, whose revenues often exceed the GDP of many developing countries. These firms thus have the resources and connections to influence local as well as national government organisations and officials, which enables them to get away with such undesirable behaviour.

The integration of firms exacerbates the impact MNEs have on environmental degradation. When firms merge, they become bigger and thus have more financial resources, market power as well as greater breadth and depth of technical and technological abilities to outsource production, export their waste, and influence government officials, hence raising their ability to engage in environmentally exploitative behaviour. However, they also have more resources and hence the ability to adopt environmentally friendlier processes, adapt to changes in environmental protection regulations, and employ more capable managers and workers who have inherently green mindsets. Therefore, firm integration, regardless of whether it is horizontal, vertical or conglomerate, is a double-edged sword when it comes to environmental concerns.

In recent years, many MNEs are placing more emphasis on environmental sustainability due to a variety of reasons. First, with the effects of global warming and other forms of pollution like the proliferation of plastic waste being felt more acutely, consumers have become increasingly environmentally conscious. They are increasingly willing to pay more for environmentally friendlier products or buy from firms which are more environmentally friendly in their practices. Second, as consumers are also voters, governments are also responding by becoming increasingly willing to enact and enforce laws and regulations for environmental protection. Third, owners, investors, managers and employees of these firms have also become more environmentally conscious and are hence more willing to devise and adopt environmentally sustainable strategies and practices.

Nevertheless, there are challenges facing the transformation of firms from being environmentally exploitative to genuinely green.

- First, there is the problem of greenwashing, which refers to the process of conveying a false impression or providing misleading information about how a company's products are more environmentally sound (James, 2021). Greenwashing is thus about making unsubstantiated claims to deceive consumers into believing that a company's products are environmentally friendly. Such practices are often carried out by firms that have no real intention of being environmentally friendly but are merely aiming to boost sales by riding on the green trend. Although there have been efforts to expose greenwashing behaviour, such actions may be counterproductive as it can lead to scepticism among consumers regarding the claims of producers, thus jeopardising the efforts of firms which are truly trying to be green.
- Another problem is that greening efforts of firms often require the cooperation of consumers as well as the development of shared infrastructure. For example, packing products in recyclable material is only meaningful if consumers make the effort to clean and dispose the

packaging in recycling bins rather than just conveniently throwing them away with other non-recyclable trash.

- Also, unless the company is very large, it may lack enough volume to sufficiently spread out the cost of developing the infrastructure required to facilitate its greening efforts. For example, even if a firm wants to rely on reusable instead of single-use plastics to transport its products, it needs to develop a system where it can efficiently collect the reusable items back from its customers. This may involve investing in and operating a fleet of vehicles to facilitate such collection, which may not be economically viable for a single firm to undertake.

Despite the challenges of going green, the trend towards greater corporate social responsibility among firms is gaining momentum. By engaging in greening efforts to lower their water, electricity, and transportation usage, and by reusing and recycling inputs, firms can not only save the environment but may also experience substantial cost savings, especially in the long run. Therefore, what firms need to do is to hire people, especially managers who are genuinely green, to drive their businesses. Meanwhile, governments must create the necessary incentives and infrastructure for such greening to occur.

QR code for 'Greenwashing'



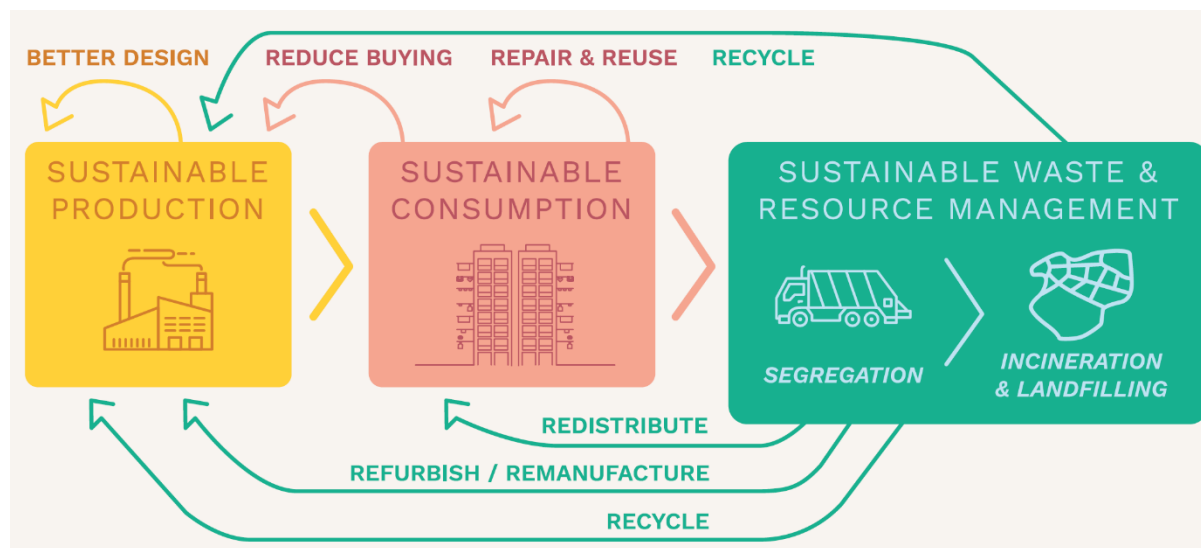
QR code for 'Are multinational corporations becoming more sustainable?'



The Circular Economy⁴

The linear economy refers to an economic model where resources are extracted from the environment to produce goods and services, which are then consumed and eventually discarded back into the environment. In contrast, the circular economy aims to keep the products in use for as long as possible and transform waste back into inputs so that the production and consumption process goes in a continuous loop, resulting in a net-zero waste outcome. The adoption of the circular economy approach requires transformation across the entire value chain so that sustainable production, sustainable consumption and sustainable waste management can take place. Such transformations include better product design that reduces the extent of resource utilisation, changes in consumer habits where products are repaired and reused instead of being replaced with new ones, and the recycling of waste and their reintroduction into the value chain.

Figure 3–9: Sustainable Production, Consumption, and Waste & Resource Management



Source: Ministry of Sustainability and the Environment (n.d.-c)

Sustainable production⁵

When firms reduce their resource utilisation and waste generation, it benefits both the environment and their profitability. Sustainable production can be promoted through sustainable design, improving resource efficiency, and the adoption of industrial symbiosis.

⁴ This section was adapted from Ministry of Sustainability and the Environment (n.d.-e)

⁵ This section was adapted from Ministry of Sustainability and the Environment (n.d.-d)

Sustainable design involves the designing of products to be more durable and repairable. This extends their lifespan, thus delaying their entry into the waste stream. Making products with materials and components that can be easily taken apart also makes them more recyclable.

Improving resource efficiency involves the provision of frameworks, technological assistance, and energy and waste audits to support firms in their efforts to reduce their energy usage and waste generation. Frameworks can help firms think about areas where energy and waste reduction can be achieved and how such outcomes can be measured. As firms may also be unaware of the energy and waste reduction technology that is available, the government can help provide such information and link firms with organisations that can supply such technology. Finally, by submitting efficiency improvement plans and outcomes to a government recognised body, accreditation can be given to firms which have achieved a certain level of improvement in resource efficiency.

Industrial symbiosis refers to collaborations that enable the waste generated by one firm to be transformed into raw material to be used by another firm. By locating these firms near each other and developing relevant infrastructure (such as pipelines), the cost and time taken to transport such waste can be greatly reduced, thus enhancing the economic viability of such by-product reutilisation. Such endeavours often require government coordination to plan and create industrial clusters to locate such firms and to pre-develop the needed infrastructure.

Inevitably, there will be limitations to which sustainable production can be achieved. First, firms may find it more profitable to design products with shorter lifespan as this promotes more frequent purchases of new products, which increases their profitability. As for improving resource efficiency, firms must themselves be convinced of the need to go green or the energy savings need to be substantial so that they are willing to undertake any form of greening efforts. Lastly, the creation of industrial clusters to facilitate industrial symbiosis may be too complex and costly for the governments of many countries, especially those which are still emerging.

Sustainable consumption⁶

Promoting sustainable consumption involves changing the mindsets of consumers so that they will try to reduce waste, re-use rather than dispose, and purchase greener products.

To reduce waste, consumers need to be aware of the amount of waste they are generating and how to go about reducing such waste. For example, to reduce food wastage, households may need to be educated on the importance of buying only what they need, on how to better store and organise their food items, and how to prepare food using methods which generate less waste.

To promote re-use, consumers should be encouraged to opt for reusable items rather than single-use disposables. For example, reusable bottles, bags and containers can be used to store purchased food and groceries rather than disposable ones. Firms can employ the concept of salience bias to nudge their customers to make such choices. For example, visual reminders can be situated at the cashier to remind consumers to bring their own shopping bags. They can also apply the concept of loss aversion by charging consumers for disposable plastic bags rather than giving discounts for those who bring their own. A more radical approach may be for retailers to restructure their stores so that consumers may bring their own containers and buy the exact amount needed, rather than buying in pre-packed amounts. This helps reduce food wastage, the

⁶ This section was adapted from Ministry of Sustainability and the Environment (n.d.-c)

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use of disposables, and the costs incurred from packaging. In terms of government policies, to curb the use of disposables, mass media campaigns can be used to educate the public, taxes can be imposed to raise the costs of such items, and regulations can be employed to limit their use. For example, the government can ban the use of disposable plastic cutlery for dine-in customers and only allow them for takeaways. Finally, efforts to promote and facilitate the selling and donating of used items as well as the repair of broken-down items will also help reduce the unnecessary disposal of consumer goods.

To purchase greener products, consumers need to know which products are greener. However, this may be difficult as greenwashing often misleads consumers into buying goods which are not as green as claimed. To overcome such imperfect information, national accreditation systems can be set up to label products. For example, in Singapore, energy intensive household appliances such as refrigerators and air-conditioners are labelled with ticks, where a higher number represents greater energy efficiency. This reduces the need for consumers to check on the power consumption specifications of such items, making it much easier for them to make greener choices.

There are various challenges to promoting sustainable consumption. First, as many of the policies and strategies involve moral suasion, the impact may be limited as it is often not easy to alter the mindsets of those who are only interested in maximising their own utility. To these consumers, the convenience of being environmentally unfriendly far outweighs any potential social and emotional costs of such behaviour. Second, although grocery retailers may save on packaging costs if they were to move away from selling their items in standardised sizes, more workers may be required to pack these items into the re-usable containers brought along by their customers. Hence overall costs may rise rather than fall. Finally, for developed countries where labour costs are high, it is often more expensive to repair a product than to buy a new one. Furthermore, if the product is too old, repairing may not be feasible because the parts and components may not be available anymore.

Sustainable waste management⁷

Despite efforts to engage in sustainable production and consumption, some waste will still be generated. The final step in the circular economy is to recycle as much of such waste as possible by transforming them into resources which can be used for production and consumption. This involves identifying the types of waste where such recycling is possible before building the necessary infrastructure and ecosystems that can enable such recycling to take place. Examples of such wastes include used water, construction and demolition waste, ferrous and nonferrous metals, and glass.

In the case of construction and demolition waste, regulation is required to direct construction firms to identify, dismantle and separate recyclable (e.g., piping and wiring) and non-recyclable parts (e.g., ceiling board and tiles) of a building so that the recyclable waste is sent for recycling while the non-recyclable waste is discarded. Once the building has been stripped to its bare frame, it can then be demolished where the resulting waste concrete and metals can be separated for further recycling. As for ferrous and non-ferrous metals, sophisticated equipment and processes such as powerful magnets, micro-grain eddy current separators, and multi-stage sieving techniques, can be used to recover them from incinerated ash.

⁷ This section was adapted from Ministry of Sustainability and the Environment (n.d.-a)

Besides industrial and commercial waste, household waste should also be recycled. For such recycling to materialise, households need to separate their waste into those which are recyclable and those which are not. Infrastructure and processes then need to be developed to make it sufficiently convenient for households to drop-off such waste and for recycling firms to collect them. As different countries and different regions within a country may have different living environments, with some areas being more urbanised than others, different areas will require different systems and solutions.

There are various limitations to sustainable waste management. First, some types of waste like fabric and leather are largely non-recyclable. Second, although items like toys, clothes and shoes may contain recyclable materials like metals, wood and plastics, it is usually not cost effective to separate these materials from the items, hence making such products largely unrecyclable. Third, automated extraction of recyclable materials like metals from raw and incinerated waste is highly capital intensive and may not be affordable for poorer developing countries nor cost effective for smaller towns and cities. Fourth, even though households may attempt to separate their waste, they often fail to properly wash the recyclable items, thus causing them to be contaminated with food and liquids, which then make them unrecyclable. Finally, ignorant or irresponsible households may dump non-recyclable trash at the recycling collection points, which hampers the recycling process.

Conclusion

Resources are scarce, information is imperfect and economic agents largely put self before society. As a result, all policies and strategies, including those that aim to create a circular economy will inevitably face challenges and limitations. However, environmental degradation and resource depletion are problems that must be effectively managed. Otherwise, the adverse consequences on both material and non-material living standards may be unimaginable. Hence, creating a circular economy where there is net-zero waste generation should be the ultimate aim for all countries, especially those which are sufficiently developed. Saving the earth is not a luxury but a necessity. All economic agents must play their part for the earth and humankind to survive and prosper.



Singapore's plan to mitigate and adapt to climate change, achieve a circular economy, and create an environmentally sustainable yet economically vibrant city.

QR code for YouTube video 'Singapore Green Plan 2030'



QR code for 'Zero Waste Masterplan in Singapore'



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