



ST ANDREW'S JUNIOR COLLEGE

Weighted Assessment 1 (WA 1)

General Certificate of Education Advanced Level

Higher 1

ECONOMICS

8843

35 minutes

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.

Write in dark blue or black pen on both sides of the paper.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

At the end of the test, fasten all your work securely together with the question paper provided.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **3** printed pages

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[Turn Over]

Answer all questions

Question 1: Singapore Electricity Market

Extract 1 Cleaner energy sources

Chemical processes can turn biomass into biofuels like ethanol and methanol, and some crops yield vegetable oil, another fuel. Also, when biomass decomposes anaerobically (without air), methane gas is generated, which is yet another potential fuel (methane is CH₄, the main component of natural gas). All of these energy sources are derived from biomass plant matter.

Generating a significant amount of biomass energy requires large amounts of land. The economics of biomass energy are thus to a large extent land economics. How much land can be made available, and at what price? Using land for biomass energy production always has an opportunity cost, since the same land could be used to produce food or fibre, or to preserve wilderness. The effect of large-scale biomass energy use on food availability and prices is a particular concern.

Source: The Economics of Renewable Energy, <http://ase.tufts.edu/gdae>

Extract 2 Nearly a quarter of Singapore's power generation capacity due for replacement in next 5 years: EMA

With almost a quarter of Singapore's power generation capacity expected to reach the end of its lifespan over the next five years, the Energy Market Authority (EMA) is studying how future gas power plants entering the power system before 2030 could impact its target for net zero emissions by or around 2050.

These power plants that currently run on natural gas, a less polluting fossil fuel that produces 95 per cent of the country's energy, will remain the "backbone of Singapore's electricity generation" even as the power sector decarbonises, the industry regulator said in a tender on Sept 8.

This comes after a report, which was commissioned by EMA, said in March that it is realistic for the power sector to bring down its planet-warming emissions to net zero by 2050 in ways that will neither compromise Singapore's energy security nor affordability.

Strategies that the report recommended include intensifying research in cleaner energy sources such as hydrogen and geothermal. Still, natural gas is needed to ensure "a reliable supply of electricity" amid the transition to cleaner and renewable energy sources, the EMA spokesman said.

Dr Victor Nian, chief executive of independent think-tank Centre for Strategic Energy and Resources, said imposing a carbon emission intensity limit demonstrates EMA's commitment to decarbonise the power sector, noting that achieving this requires a phased approach.

"However, before our industry can adopt hydrogen and ammonia, we still need to address the present gaps and uncertainties, such as the lack of infrastructure supporting a hydrogen or ammonia economy, technology readiness and commercial viability, future cost of hydrogen and ammonia relative to the cost of fossil fuel, and security of supply," he added.

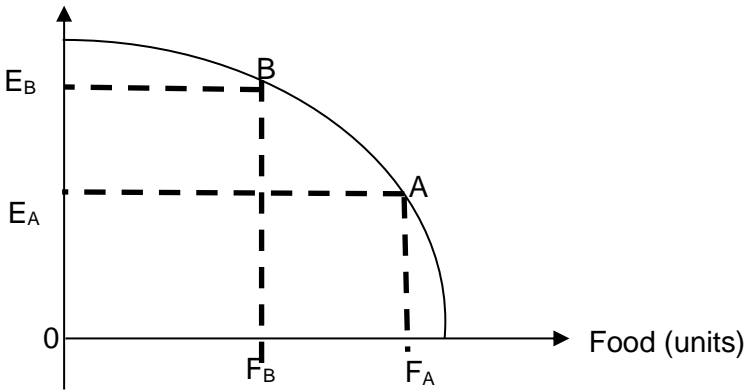
Source: The Straits Times, 19 Sep 2022

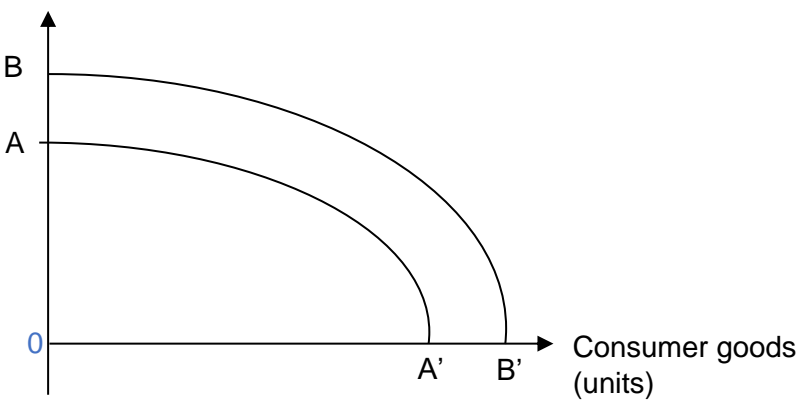
Questions

- (a) With reference to Extract 1 and using a Production Possibility Curve (PPC), [4]
Explain the opportunity cost of allocating more land to develop cleaner energy sources such as biomass energy, assuming a country uses land to produce both food and energy.
- (b) With reference to Extract 2 and using a Production Possibility Curve (PPC), [4]
Explain the impact of technological advancement in the harnessing of geothermal energy on Singapore's economic growth.
- (c) With reference to Extract 2,
- (i) Explain the factors a Singapore government should consider when making a [6]
decision on whether to continue to invest in cleaner energy sources such as geothermal energy.
- (ii) Comment on whether they should do so. [2]

[Total Marks: 16 marks]

Questions

(a)	With reference to Extract 1 and using a Production Possibility Curve (PPC),	
	Explain the opportunity cost of allocating more land to develop cleaner energy sources such as biomass energy, <i>assuming a country uses land to produce both food and energy</i> ,	[4]
	<p>Assume a country produces both food and energy using land.</p> <p>Opportunity cost is the value of the next best alternative forgone when a decision is made.</p> <p>When more land is allocated to produce more biomass energy E_A to E_B, opportunity cost is incurred. Assuming the next best alternative of using the land is for food production, less units of food will be produced i.e. F_A to F_B.</p> <p>This is represented by a movement from Point A to Point B on the PPC shown below. Opportunity cost in terms of the benefit derived from the units of food forgone (F_A to F_B) is incurred</p> <p>Illustrate on the diagram – Show movement of Point A to Point B in diagram</p> <p>Energy (units)</p>  <p>Food (units)</p> <p>Markers' comments:</p> <ul style="list-style-type: none"> Resist the urge to “vomit” a pre-rehearsed diagram or answer. Take note of what the question is requiring of you. E.g., there is no need to have multiple points on the diagram, and no need to explain scarcity and choice, and increasing opportunity cost. Question's requirement is to explain the trade-off when more energy is produced hence answers should be contextualised to explain the movement of a point from A to B where B leads to more energy produced but lower production of food (not the other way round). Do ensure diagrams are large, perhaps $\frac{1}{4}$ of a page in size, and fully label the diagrams. 	

(b)	With reference to Extract 2 and using a Production Possibility Curve (PPC), explain the impact of technological advancement in the harnessing of geothermal energy on Singapore's economic growth.	[4]
	<p>Technological advancement leads to increase in quality of capital or increase in quantity of resources.</p> <p>This leads to an increase in productive capacity of the economy as the economy is now able to produce more goods and services.</p> <p>This implies potential economic growth and is represented by an outward shift in the PPC from AA' to BB'.</p> <p>Capital goods (units)</p>  <p>Consumer goods (units)</p> <p>Markers' comments:</p> <ul style="list-style-type: none"> It is necessary to point out how has technology affected the quantity or quality of resources and to specify the relevant resource that is affected e.g. improvement in quality of capital goods. Do note that the context of part (b) is different from that in part (a), thus the output of the economy and the axes of the PPC diagram would be different. As part (b)'s requirement requires showing the impact on Singapore's economic growth, using consumer goods and capital goods for the axes will be most appropriate as compared to using two markets such as agriculture and energy. Do practice being more precise in your analysis; e.g., instead of just stating "economic growth", do clearly indicate whether it is actual or potential economic growth especially since this difference is important in the PPC framework. 	

(c)	With reference to Extract 2,	
(i)	Explain the factors a Singapore government should consider when making a decision on whether to continue to invest in cleaner energy sources such as geothermal energy.	[6]
	<p><u>Two requirements (relate to context)</u></p> <p><u>1. Cost-benefit Analysis</u></p> <p><i>Analysis of Benefits: Cleaner environment, more investor-friendly with lower carbon emissions. Greater energy security [2m]</i></p> <p><u>Firstly, a Singapore government should consider if there is net benefit in continuing its investment in cleaner energy sources. Thus they should consider the marginal benefits of one more unit of investment in cleaner energy. This includes a cleaner environment, more investor-friendly climate due to lower carbon emissions as well as greater energy security.</u></p> <p>Analysis of Costs: Investment cost, government subsidies, opportunity costs</p> <p>They should also consider the marginal costs involved in increasing one more unit of investment. This includes the cost of building more R&D plants or hiring more researchers. It can also come in the form of spending more on subsidies. They should also consider opportunity costs, for example, if the next best alternative to invest in is education services, opportunity costs in terms of the education services forgone is incurred.</p> <p><u>2. Other Factors</u></p> <p>Constraints: Infrastructure and Technological constraint Perspectives: Commercial viability as producers may prefer cheaper alternatives. Information: Reliability of data, scope of data collected</p> <p>Markers' comments:</p> <ul style="list-style-type: none"> • Of the many elements of the DMF, do note that the benefits and costs are the two more critical elements, thus these should be included in the analysis first. • For a complete analysis, do explain clearly what the benefits or costs of the decision is, beyond merely lifting relevant phrases from the extract. For example, quoting "bring down its planet-warming emissions to net zero" does not explain the benefits of better air quality, reduction in floods/droughts due to climate change. • There's some confusion between constraints and costs. Constraints are obstacles in generating the additional unit of investment thus examples include budget constraints, geographical, technological and manpower (skills) constraints to tap cleaner energy in Singapore. Costs are the explicit and implicit costs incurred when producing the additional units. 	

	<ul style="list-style-type: none"> • A minority did not use factors from decision-making framework. They limit their discussion to areas such as availability of factors of production which essentially are examples of constraints in resources. • Students should be mindful of the format they present their answers and should address the question. Avoid listing the factors without contextualisation and using point forms in the answers. 	
(ii)	<p>Comment on whether they should do so.</p> <p>Conclusion: Govt should continue to invest when MSB outweighs MSC (and until MSB=MSC to maximise societal welfare-optional).</p> <p>Comment→ Substantiation. Considering the fluctuations of oil prices, it may be in the national interest to consider other sources of energy that can be generated in Singapore for greater energy security. In the comparison of long-term benefits vs long-term costs of investing in cleaner technology, it is likely for benefits to outweigh costs.</p> <p>Markers' comments:</p> <ul style="list-style-type: none"> • The criteria for decision making must be clearly stated in any answer/ conclusion – i.e., to proceed if MSB>MSC. • Make a recommendation based on your analysis if MSB is likely to be greater or less than MSC. Many students repeat examples of benefits and/or costs but did not substantiate why marginal benefit outweigh marginal costs or vice versa. • Do carefully analyse the requirement of each question part; precious marks were lost in scripts where this comment/conclusion were included in (c)(i) but omitted in (c)(ii). 	[2]
	[Total Marks: 16 marks]	