



**National Junior College**  
**SH2 Preliminary Exam 2019**

**GEOGRAPHY**  
Paper 1 Structured Essay Questions

**9751/01**

**Higher 2**

**3 hours**  
**27 August 2019**

**READ THESE INSTRUCTIONS FIRST**

Write your index number and name on the work you hand in.  
Write in dark blue or black pen on both sides of the paper.  
You may use an HB pencil for any diagrams or graphs.  
Do not use staples, paper clips, glue or correction fluid.

**Section A**

Answer one question.

**Section B**

Answer one question.

**Section C**

Answer one question.

You should make reference to appropriate examples studied in the field or the classroom, even where such examples are not specifically requested by the question.

Diagrams and sketch maps should be drawn whenever they serve to illustrate an answer.

The world outline map may be annotated and handed in with relevant answers.

You are reminded of the need for good English and clear presentation in your answers.

At the end of the examination, fasten all your answer scripts securely together.

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



### Section A – Tropical Environments

Answer **one** question from this section.

- 1 (a) Describe and explain how the re-distribution of surplus solar radiation has led to the distinctive characteristics of the tropics. [12]
- (b) Discuss the significance of water in influencing the formation of karst landforms in the humid tropics. [20]
- 2 (a) Compare the characteristics of flash and fluvial flood hydrographs. [12]
- (b) Assess the extent to which flooding is the most disastrous impact of tropical deforestation. [20]

### Section B – Development, Economy and Environment

Answer **one** question from this section.

- 3 (a) Describe and explain the characteristics of extractive industries. [12]
- (b) With reference to examples which you have studied, discuss the extent to which resource scarcity can be managed. [20]
- 4 (a) Explain how different factors may influence society's extraction of value from the environment. [12]
- (b) Evaluate the role of resources in bringing about economic growth and human development to countries with rapidly growing populations. [20]

**Section C – Sustainable Development**

Answer **one** question from this section.

- 5 (a) Explain how the political and economic challenges in attaining sustainable development vary across developed and developing regions. [12]
- (b) How far do you agree with the assertion that climate change has had a more significant impact on developing regions than developed regions? [20]
- 6 (a) Describe how the issues that confront cities in achieving sustainable development vary across developed and developing regions. [12]
- (b) Discuss the effectiveness of strategies put in place to address the issues outlined in part (a), using examples from countries with rapidly expanding populations. [20]

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**National Junior College  
SH2 Preliminary Exam 2019  
Paper 1**

**SUGGESTED MARKING GUIDE**

*Disclaimer:*

*The Suggested Marking Guide  
should be used with discretion.*

## Notes on Marking

### Indicative Content

Indicative content is provided for all levels mark questions. It provides suggested responses and/or approaches to questions. The suggested responses and/or approaches are neither exhaustive nor should they be treated as model answers.

### Marking of Structured Essay Questions

- (i) All Part (a) structured essay questions will be assessed using the following generic level descriptors:

#### **H2 Generic Level Descriptors for 12m SEQ sub-part (a)\***

<b>Level</b>	<b>Marks</b>	<b>Descriptors</b>
4	10 – 12	Response is consistently analytical and comprises purposeful explanations. Response addresses the question fully using accurate and detailed knowledge. Depth of relevant knowledge and understanding is evident throughout. Response is coherent and use of terminology is accurate throughout.
3	7 – 9	Response is analytical and explanatory rather than descriptive. There is a clear focus on the question. Response demonstrates relevant knowledge and understanding. The response is coherent and the use of terminology is mostly accurate.
2	4 – 6	Response includes analysis and explanation but is generally dominated by description. Response reflects understanding of the question and is generally relevant. Some parts of the response may be unclear. Use of terminology is limited.
1	1 – 3	Response lacks focus on the question. Response is generally fragmentary and lacks a clear structure and organisation. There may be many unsupported, brief or incomplete assertions and/or arguments with some inaccurate use of terminology.
0	0	No creditworthy response.

- (ii) All Part (b) structured essay questions will be assessed using the following generic level descriptors:

## H2 Generic Level Descriptors for 20m SEQ sub-part (b)\*

Level	Marks	Descriptors
5	17 – 20	Response is perceptive, logical and has strong evaluative elements. Evaluation is relevant and comprehensive. Strong evidence of synoptic thinking where knowledge from different topics is synthesised purposefully. Use of detailed and accurate knowledge reflecting depth of understanding of the subject content. The argument or discussion is coherent and well supported by relevant material. Use of terminology is accurate.
4	13 – 16	Response displays a sound evaluative element. There is some evidence of synoptic thinking through synthesising knowledge from different topics. Response is generally focused on the demands of the question and features accurate knowledge, reflecting depth of understanding of the subject content. The argument or discussion is coherent and supported by relevant material. Use of terminology is accurate and appropriate.
3	9 – 12	Response is broadly evaluative rather than descriptive. Response addresses the questions and features accurate knowledge, reflecting some understanding of the subject content. Argument or discussion is mainly coherent and supported by material which is largely relevant. Use of terminology is relevant and mostly accurate.
2	5 – 8	Response is largely descriptive. Response attempts to provide an argument to address the question. The weakest responses in this level may lack balance and/or depth. Response structure is broadly coherent but may lack clarity. Some lapses in use of terminology though generally accurate.
1	1 – 4	Response lacks focus on the question and may be largely irrelevant to it. Response is fragmentary and lacks clarity. There may also be unsupported assertions and/or arguments with limited or no use of relevant terminology.
0	0	No creditworthy response.

*\*The assessment involves qualitative rather than quantitative evaluation. Judgements on the level to be awarded to an answer will be based on the principle of 'best fit' determined by the descriptors within each level*



### Section A – Tropical Environments

Answer **one** question from this section.

<b>1</b>	<b>(a)</b>	Describe and explain how the re-distribution of surplus solar radiation has led to the distinctive characteristics of the tropics.	[12]
		<p><u>Indicative Content:</u></p> <p>Candidates should be able to identify how the re-distribution of surplus solar radiation is brought about by the Hadley Cell, which can then result in distinctive characteristics of the tropics such as the humid conditions in the regions closest to the equator within 20 degrees north and south of the equator, as well as the arid conditions in the regions further away from the equator within 20 to 35 degrees north and south of the equator. Responses should include a brief description of the unevenness of solar radiation across the world, as well as an explanation of how the ascending and descending limbs of the Hadley Cell influence the distinctive climatic conditions in the humid and arid tropics (including the levels and temporal distribution of precipitation and temperature range). They should also be supported with reference to a variety of locations within the tropics, and the climatic characteristics which these locations experience.</p> <p>Better responses usually include the use of a diagram that explains how the re-distribution of solar radiation can lead to distinctive characteristics within the tropics. They should also be able to explain how the re-distributed solar radiation will respond differently to local and regional conditions, which will then have some bearing on the characteristics of the tropics.</p> <p><i>Levels marked using H2 generic level descriptors for 12m SEQ sub-part (a).</i></p>	
	<b>(b)</b>	Discuss the significance of water in influencing the formation of karst landforms in the humid tropics.	[20]
		<p><u>Indicative Content:</u></p> <p><i>Having discussed the re-distribution of surplus solar radiation and its impact of climatic characteristics, in particular rainfall, across the tropics, candidates will now examine how water, available in abundance in the humid tropics, can influence landscapes.</i></p> <p>Candidates should first be able to explain the multiple roles that water plays in the formation of karst landforms in the humid tropics. These include the chemical weathering – dissolution – of calcium carbonate in karst landscapes (or carbonation), as well as the fluvial erosion of weathered material on not only the surface of these landscapes, but also along the base of these landscapes, giving rise to a variety of karst landforms. Candidates should be able to argue that these processes are</p>	

	<p>fundamental to the formation of karst landforms, and given that water is a necessary agent for these processes to occur, it is therefore highly significant. Responses should also include a comparison of water with other factors which influence the formation of karst landforms, such as the nature of rocks, the presence, spacing and density of joints and bedding planes, relief and the rate of tectonic uplift, as well as a comparison across different karst landforms (tower, cone and isolated karst). They should also be supported with reference to evidence from a variety of locations within which karst landforms are found - all of which should be within the humid tropics.</p> <p>Higher level responses should include a discussion of the interplay across the various factors which can influence the formation of karst landforms. They could also include diagrams which are used purposefully to explain how karst landforms are formed in the humid tropics.</p> <p>Possible synoptic links include tropical climates (Theme 1.1), rock characteristics (Theme 1.1) as well as weathering and erosional processes (Theme 1.1).</p> <p><i>Levels marked using H2 generic level descriptors for 20m SEQ sub-part (b).</i></p>	
<b>2</b>	<b>(a)</b> Compare the characteristics of flash and fluvial flood hydrographs.	<b>[12]</b>
	<p><u>Indicative Content:</u></p> <p>Candidates should be able to come up with points of comparison between flash and fluvial flood hydrographs. These include lag time, peak discharge and the recession limbs of the hydrographs. Responses should also include a brief explanation of these characteristics in relation to the conditions and processes which give rise to them. Flash flood hydrographs are generally found in areas where land surfaces are less permeable, such as urbanised areas or arid regions, hence influencing the way in which water reaches the channels (more likely to be due to surface runoff as opposed to subsurface flows). Fluvial flood hydrographs are usually found in areas where land surfaces are generally more permeable, which results in the dominance of subsurface flows as compared to surface runoff in contributing to channel discharge. Responses could be backed up with reference to located examples.</p> <p>Better responses will include the use of diagrams to illustrate the differences in the characteristics of flash and fluvial hydrographs. They should also be able to point to the difficulty of distinguishing between flash and fluvial flood hydrographs, given that there are no clear markers of distinction between these two types of hydrographs.</p> <p><i>Levels marked using H2 generic level descriptors for 12m SEQ sub-part (a).</i></p>	

	<p><b>(b)</b> Assess the extent to which flooding is the most disastrous impact of tropical deforestation.</p>	[20]
	<p><u>Indicative Content:</u>  <i>Having examined the characteristics of flash and fluvial flood hydrographs, candidates should now be able to discuss whether floods are indeed the most significant consequence of tropical deforestation, or whether there are other more disastrous effects.</i></p> <p>Candidates should be able to explain how flooding can be brought about by tropical deforestation. This will entail a discussion of soil erosion and sedimentation as well as landslides, and how these can possibly affect channel characteristics - and more specifically a channel's bankfull discharge. Candidates should then be able to explain the other effects of tropical deforestation, including the disruption of ecosystems and biogeochemical cycles, the loss of biodiversity, as well as the release of stored carbon. Candidates should be able to compare these with flooding to determine the extent to which the impacts are disastrous. Responses should be supported with a variety of case studies.</p> <p>Higher level responses should include the use of a well-delineated set of criteria which can be used to evaluate the extent to which the consequences are disastrous, such as the scale of impact, the temporal extent of the consequences and the volume of economic losses incurred.</p> <p>Possible synoptic links include both hydrological and fluvial processes (Theme 1.1) as well as climate change, especially in terms of how deforestation affects the global carbon cycle (Theme 3.1).</p> <p><i>Levels marked using H2 generic level descriptors for 20m SEQ sub-part (b).</i></p>	

**Section B – Development, Economy and Environment**

Answer **one** question from this section.

<b>3</b>	<b>(a)</b>	Describe and explain the characteristics of extractive industries.	[12]
		<p><u>Indicative Content:</u> Candidates should be able to define what extractive industries constitute before describing and explaining their characteristics with reference to case studies from energy minerals (oil), metallic minerals (tin ore) and non-metallic minerals (diamonds). These characteristics include the fixed amounts in which the natural resources in these extractive industries exist, the locational specificity of these industries, their capital and often, technologically, intensive nature, the volatility of demand for the resources from these industries, as well as the centrality of state involvement.</p> <p>Better responses will include a discussion of how these characteristics might vary across different extractive industries, with some industries being more technologically intensive than others, and others with varying degrees of state involvement.</p> <p><i>Levels marked using H2 generic level descriptors for 12m SEQ sub-part (a).</i></p>	
	<b>(b)</b>	With reference to examples which you have studied, discuss the extent to which resource scarcity can be managed.	[20]
		<p><u>Indicative Content:</u> <i>Having described the characteristics of extractive industries, candidates should now be able to discuss how resource scarcity can or cannot be managed.</i></p> <p>Candidates should be able to define what resource scarcity constitutes, before explaining how it can be managed. One of the resources explored at length in the syllabus is that of water, so candidates are expected to make reference to case studies regarding water resource management. Responses are therefore expected to include an evaluation of the various strategies put in place to manage the scarcity of water resources, including privatisation of water, desalination and conservation, as well as strategies addressing water scarcity issues in urban areas such as poor pro-poor policies for safe water supply and sanitation, and integrated urban water management and governance. Other possible strategies to be discussed include actions taken to enhance agricultural productivity and sustainability such as increasing efficiency of water use in farming, increasing crop productivity and limiting agricultural water pollution, as well as actions taken to increase industrial and energy efficiency such as the combination of power and desalination plants and the retrofitting of facilities and plants to increase water efficiency. Responses should be backed up with</p>	

		<p>reference to detailed case studies such as Singapore, Israel and Mexico.</p> <p>Higher level responses should include the use of an appropriate and well-defined set of criteria which can be used to assess the extent to which the resource scarcity can be managed, such as the consequences which these resource management strategies could possibly lead to, their economic costs and the extent to which these regions experiencing issues of water scarcity can support, the extent to which the strategies target the causes of water scarcity as well as the temporal extent of the strategies.</p> <p>Possible synoptic links include sustainable urban development (Theme 3.2).</p> <p><i>Levels marked using H2 generic level descriptors for 20m SEQ sub-part (b).</i></p>	
4	(a)	<p>Explain how different factors may influence society's extraction of value from the environment.</p>	[12]
		<p><u>Indicative Content:</u> Candidates should be able to explain the various factors which may affect the way in which the appraisal of resources can occur. These include socio-economic factors such as income and education levels, cultural factors such as value systems and traditions, technological factors such as knowledge and technical expertise and political factors such as the influence of international organisations on the value of resources and national policies. Responses should be supported with evidence from various examples including anthropocentric and ecocentric attitudes towards the environment, the desalination of saltwater to increase the supply of water for consumption, as well as the manipulation of oil prices by the Organization of Petroleum Exporting Countries (OPEC).</p> <p>Better responses will demonstrate an understanding of resource appraisal as a multi-dimensional issue which is affected by the interplay of multiple factors. A case in point would be the financial capability of a country and its impact on the level of technological infrastructure and expertise within the country, therefore influencing society's extraction of value from the environment.</p> <p><i>Levels marked using H2 generic level descriptors for 12m SEQ sub-part (a).</i></p>	
	(b)	<p>Evaluate the role of resources in bringing about economic growth and human development to countries with rapidly growing populations.</p>	[20]
		<p><u>Indicative Content:</u> <i>Having explained how the value of resources in society are influenced by a myriad of factors, candidates should now be able to discuss how resources can influence economic growth and human development in</i></p>	

*countries with rapidly burgeoning populations.*

Candidates should be able to explain how resources bring about economic growth to countries with fast-growing populations by generating revenue and employment for the people living in these countries. They should also be able to explain how these can lead to human development including higher life expectancies, higher levels and better quality of education as well as increased standards of living. Candidates should then be able to point out that while resources can be positive for society, the enclave tendencies of some of these resource industries – in particular the mineral resources – as well as their volatile nature, might possibly have impeded economic growth and human development in these countries. This might sometimes be referred to as the resource curse thesis. The role of resources should then be compared with other factors which can also bring about economic growth and human development, often by influencing the locational decisions of transnational corporations (TNCs), such as labour characteristics, state policies, regulations by international organisations and the actions of non-state actors. These factors should be discussed in relation to examples of TNCs as well as a multitude of initiatives undertaken by various states, international organisations and non-state actors.

Higher level responses should include an evaluation of the interplay across different factors in bringing about economic growth and human development to countries with rapidly growing populations. This would require a contextualization of these factors and how they might be relevant to countries which require rapid economic growth to meet the needs of their rapidly increasing populations. The complexity across the different factors which can bring about economic growth and human development would be clearly elucidated here.

Possible synoptic links include the notion of human development, the global production network and its constituents, as well as the actors which govern the global economy (Theme 2.1).

*Levels marked using H2 generic level descriptors for 20m SEQ sub-part (b).*

**Section C – Sustainable Development**

Answer **one** question from this section.

<b>5</b>	<b>(a)</b>	Explain how the political and economic challenges in attaining sustainable development vary across developed and developing regions.	[12]
		<p><u>Indicative Content:</u></p> <p>Candidates should be able to differentiate across the political and economic challenges which developed and developing regions face. These challenges include the need to promote renewable and alternative sources of energy in a bid to reduce carbon footprints for developed countries, the effects of structural adjustment programmes (SAPs) on existing and future loans for developing regions, as well as the need for new or additional financial resources to implement sustainable development programmes. Candidates should be able to explain how these challenges are different across developed and developing regions. Responses should also be supported by a variety of examples from different countries.</p> <p>Better responses will include a synthesis of the various challenges that developed and developing countries face, including similarities such as the need to balance energy needs with economic costs and pollution, and differences such as the management of water in urban areas. This would have allowed for a more holistic explanation of the challenges faced in developed and developing regions, such as the conflicting interests of development faced by developing regions.</p> <p><i>Levels marked using H2 generic level descriptors for 12m SEQ sub-part (a).</i></p>	
	<b>(b)</b>	How far do you agree with the assertion that climate change has had a more significant impact on developing regions than developed regions?	[20]
		<p><u>Indicative Content:</u></p> <p><i>Having explained the political and economic challenges which developed and developing regions face in attaining sustainable development, candidates should now be able to discuss how climate change has affected developing regions more adversely than developed regions.</i></p> <p>Candidates should be able to explain how the effects of climate change are varied across the world due to the differences in the extent of exposure to the effects that each region has, as well as the extent of vulnerability caused by variations in the levels of development and technological expertise, and degree of preparedness. Responses should include a discussion of the different effects of climate change such as rising sea levels and its impact on agriculture and food security, as well as the spread of infectious diseases and heat-related mortality, and how these</p>	

		<p>compare across developed and developing regions. There should also be an understanding of how the challenges which developed and developing countries face influence their ability to adapt to and mitigate the impacts of climate change. Responses should also supported by a variety of case studies.</p> <p>Higher level responses should include the use of a set of well-developed criteria to evaluate the impact of climate change including the scale of the effects, for example in the relative economic dependence of the region on climate-influenced industries, the temporal extent of these consequences, the nature of governance across the countries as well as the extent to which the needs of the populations in these countries can be addressed.</p> <p>Possible synoptic links include the impact of climate change on atmospheric, hydrological and fluvial processes (Theme 1.1), the formation of tropical cyclones and floods (Theme 1.2), and the nature of economic governance across countries at different levels of development (Theme 2).</p> <p><i>Levels marked using H2 generic level descriptors for 20m SEQ sub-part (b).</i></p>	
6	(a)	Describe how the issues that confront cities in achieving sustainable development vary across developed and developing regions.	[12]
		<p><u>Indicative Content:</u></p> <p>Candidates should be able to differentiate the issues which cities across developed and developing regions are confronted with in their pursuit of sustainable development. These issues can include waste generation and management, the provision of affordable housing for all urban dwellers, as well as ensuring mobility for them. They impede the ability of cities in achieving sustainable development when the needs of all stakeholders in the city are not met, and when the environment is damaged beyond its regenerative capacity. Candidates should be able to compare how the same issues are similar / different between developed and developing countries. Responses should be well-supported by evidence regarding transport congestion, housing conditions and non-hazardous solid waste generation.</p> <p>Better responses will demonstrate an integrated understanding of the issues. These include the use of a set of criteria to distinguish them, such as the extent of severity of the issues, the causes of these issues, the role which governments play in bringing about these issues, as well as the extent of economic costs incurred.</p> <p><i>Levels marked using H2 generic level descriptors for 12m SEQ sub-part (a).</i></p>	



	<p><b>(b)</b> Discuss the effectiveness of strategies put in place to address the issues outlined in part (a), using examples from countries with rapidly expanding populations.</p>	[20]
	<p><u>Indicative Content:</u>  <i>Having described the differences in the issues challenging sustainable urban development between developed and developing regions, as outlined in part (a), candidates should now be able to discuss the strategies which have been put in place to address these issues.</i></p> <p>Candidates should be able to identify and explain the myriad of strategies which could be implemented to address the issues encountered in locations with rapidly growing populations. These the provision of more and better quality roads as well as the implementation of traffic regulations to counter congestion, the eviction of existing urban slums, the allocation of sites for housing to be constructed and the provision of basic construction materials for urban dwellers to be engaged in the construction process, the implementation of proper solid waste disposal systems, all of which are specific to countries with rapidly growing populations. Candidates should be able to compare these strategies with one another, and comment on their effectiveness, with reference to evidence from a variety of case studies.</p> <p>Higher level responses could possibly include the development of a set of criteria which can be used to evaluate the effectiveness of these strategies, such as the extent to which the strategies address the root causes of these issues, the extent of the different dimensions and severity of the consequences brought about by these strategies, the extent to which states are able to implement the strategies as well as the cooperation of various stakeholders. Attempts to synthesise across the strategies should also be present such as the need for the efficient use of government funds across all strategies.</p> <p>Possible synoptic links include a consideration of the impact which rapidly increasing population growth rates have on the environment (Theme 2.2) as well as environmental impacts including those on hydrological and fluvial processes (Theme 1.1).</p> <p><i>Levels marked using H2 generic level descriptors for 20m SEQ sub-part (b).</i></p>	



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**SH2 Preliminary Exam 2019**

**GEOGRAPHY**  
Paper 2 Data Response Questions

**9751/02**

**Higher 2**

**3 hours**  
**18 September 2019**

**READ THESE INSTRUCTIONS FIRST**

Write your index number and name on the work you hand in.  
Write in dark blue or black pen on both sides of the paper.  
You may use an HB pencil for any diagrams or graphs.  
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

You should make reference to appropriate examples studied in the field or the classroom, even where such examples are not specifically requested by the question.  
Diagrams and sketch maps should be drawn whenever they serve to illustrate an answer.  
The world outline map may be annotated and handed in with relevant answers.  
You are reminded of the need for good English and clear presentation in your answers.

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

This document consists of **5** printed pages and **3** blank pages.

## Section A

### Theme 4: Geographical Investigation

- 1 A group of five junior college students conducted a geographical investigation to study the impacts of urban re-imaging efforts in Kampong Glam, Singapore, on the different groups of dwellers in the area. For their investigation, the students came up with the following hypothesis:

*“The re-imaging efforts in Kampong Glam to cater to tourists have created positive economic and social benefits for the urban dwellers in the area.”*

They chose one weekday during the June Holidays to visit the area. During that weekday, they conducted a questionnaire survey for people in the area to understand their opinions on Kampong Glam. The students chose to collect their data at the Sultan Mosque, one of the tourist attractions in the area. The students approached any person who seemed friendly to answer their questionnaire. The students also took photos of themselves conducting the questionnaire with the respondents, as well as photos of the area around Sultan Mosque to use as data.

Resource 1 shows a map of Kampong Glam, as used by tourists. Resource 2 shows the data collected by the students from their questionnaire.

- (a) With reference to Resource 1, explain why the hypothesis crafted by the students is a suitable one. [4]
- (b) With reference to the students’ data collection methods, as well as Resources 1 and 2, describe the limitations of the data collection process and explain how these limitations can be addressed. [6]
- (c) Suggest one way by which the students can present the data they have collected as shown in Resource 2, and outline the strengths and limitations of this data presentation method. [4]
- (d) Describe two ethical issues that may arise with the taking of photos to use as data. [4]
- (e) Using Resource 2 and your own knowledge, explain how the students may use other types of data to better understand the impacts of urban re-imaging on the urban dwellers in Kampong Glam. [7]

**Section B****Theme 1: Tropical Environments****Climate and Landscapes in the Lut Desert**

- 2** The Lut Desert is a large salt desert in Iran that is located between the latitudes of 28 to 32 degrees North of the Equator. It is the world's 27th largest desert, and it was inscribed on UNESCO's World Heritage List in 2016.

Resource 3 is a climograph of Shahdad, a town located within the vicinity of the Lut Desert in Iran. Resource 4 shows a map of the location of the Lut Desert. Resources 5 and 6 depict a landform and a rock found in the Lut Desert respectively.

- (a)** Describe the climatic characteristics of Shahdad in Iran, as shown in Resource 3. [4]
- (b)** With reference to Resource 4, explain the reasons for the aridity observed in the Lut Desert. [5]
- (c)** Identify the landform in Resource 5, and describe its distinctive features. [3]
- (d)** Explain the types of weathering processes which may have occurred on the rock shown in Resource 6. [4]
- (e)** Using Resources 3 and 5, as well as your own knowledge, evaluate the extent to which wind is the dominant agent that shapes landscapes in the Lut Desert. [9]

**Theme 2: Development, Economy and Environment****Research and Development (R&D) and Dyson's operations around the world**

- 3** Resources 7A and 7B show Research and Development (R&D) expenditure (as % of GDP) across the world in 2005 and 2015 respectively. Resource 8 shows Dyson's investment in R&D and Capex (Capital expenditure). Resource 9 is an extract from an article on the relocation of Dyson's corporate headquarters to Singapore.
- (a)** Describe the changes in R&D expenditure (as % of GDP) across the world between 2005 and 2015 as shown in Resources 7A and 7B. [4]
- (b)** Using evidence from Resources 7A and 7B, identify the region with the highest R&D expenditure in 2015 and suggest reasons to account for the region's amount of R&D expenditure. [4]
- (c)** Describe the changes in Dyson's investment in R&D and Capex (i.e. capital expenditure) as shown in Resource 8. [4]
- (d)** With reference to Resource 9 and your own knowledge, account for Dyson's decision to relocate its corporate headquarters to Singapore. [5]
- (e)** Using Resource 9 and your own knowledge, explain the impacts of Dyson's relocation of its corporate headquarters and setting up of electric-car manufacturing facility on the host economy (i.e. Singapore). [8]

### Theme 3: Sustainable Development

#### Contemporary climate change, deforestation and renewable energy

- 4 Resource 10 is a graph documenting the relationship between global temperature and solar activity since 1880. Resource 11 shows a comparison of tropical tree cover loss and its CO<sub>2</sub>e\* emissions, with the five biggest CO<sub>2</sub>e emitters across the world in 2016. Resource 12 shows global tropical tree cover loss from 2001 to 2017. Resource 13 illustrates new worldwide investments in the renewable energy sector between developed and developing countries since 2004.

*\*CO<sub>2</sub>e: Carbon dioxide equivalent is a standard unit for measuring carbon footprints and expresses the impact of each different greenhouse gas in terms of the amount of CO<sub>2</sub> that would generate the same amount of warming*

- (a) With reference to Resource 10, describe the relationship between global temperature and solar activity. [6]
- (b) Explain two ways in which tropical deforestation could have resulted in CO<sub>2</sub>e emissions, as shown in Resource 11, and one other way in which it could have led to an increase in the concentration of greenhouse gases in the atmosphere. [6]
- (c) Explain how other anthropogenic activities, besides tropical deforestation, could possibly account for the relationship between global temperature and solar activity from the 1960s in Resource 10. [4]
- (d) To what extent do you agree that an increase in investments in renewable energy by developing countries, as shown in Resource 13, can mitigate contemporary climate change? You may refer to the resources provided, as well as your own knowledge. [9]

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SH2 Preliminary Exam 2019**

**GEOGRAPHY**  
Paper 2

**9751/02**

**INSERT**

**3 hours**  
**18 September 2019**

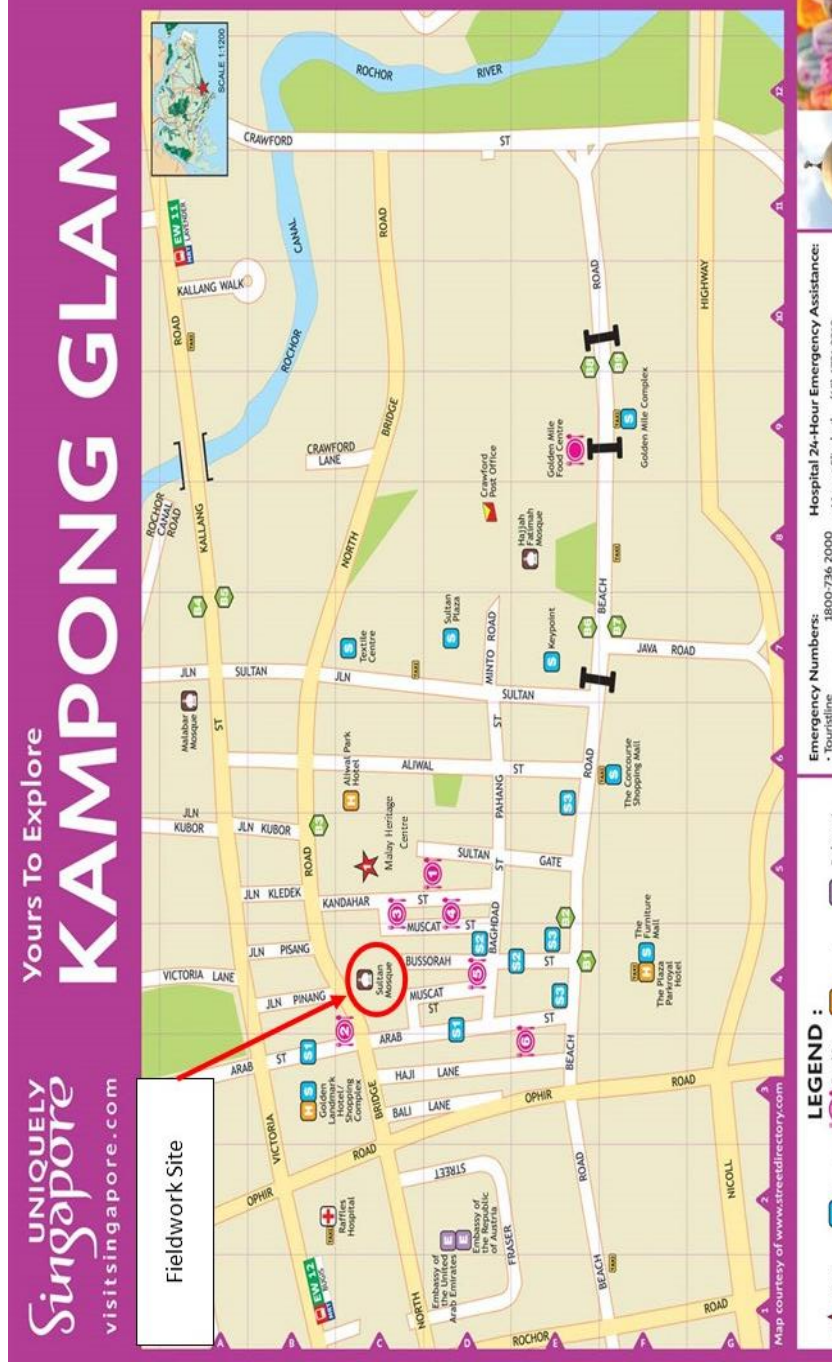
**READ THESE INSTRUCTIONS FIRST**

The insert contains all the Resources referred to in the questions.

This document consists of **15** printed pages and **1** blank page.

Resource 1 for Question 1

Map of Kampong Glam Area



## Resource 2 for Question 1

## Data collected by the students from their questionnaire

Number of Respondents: 70

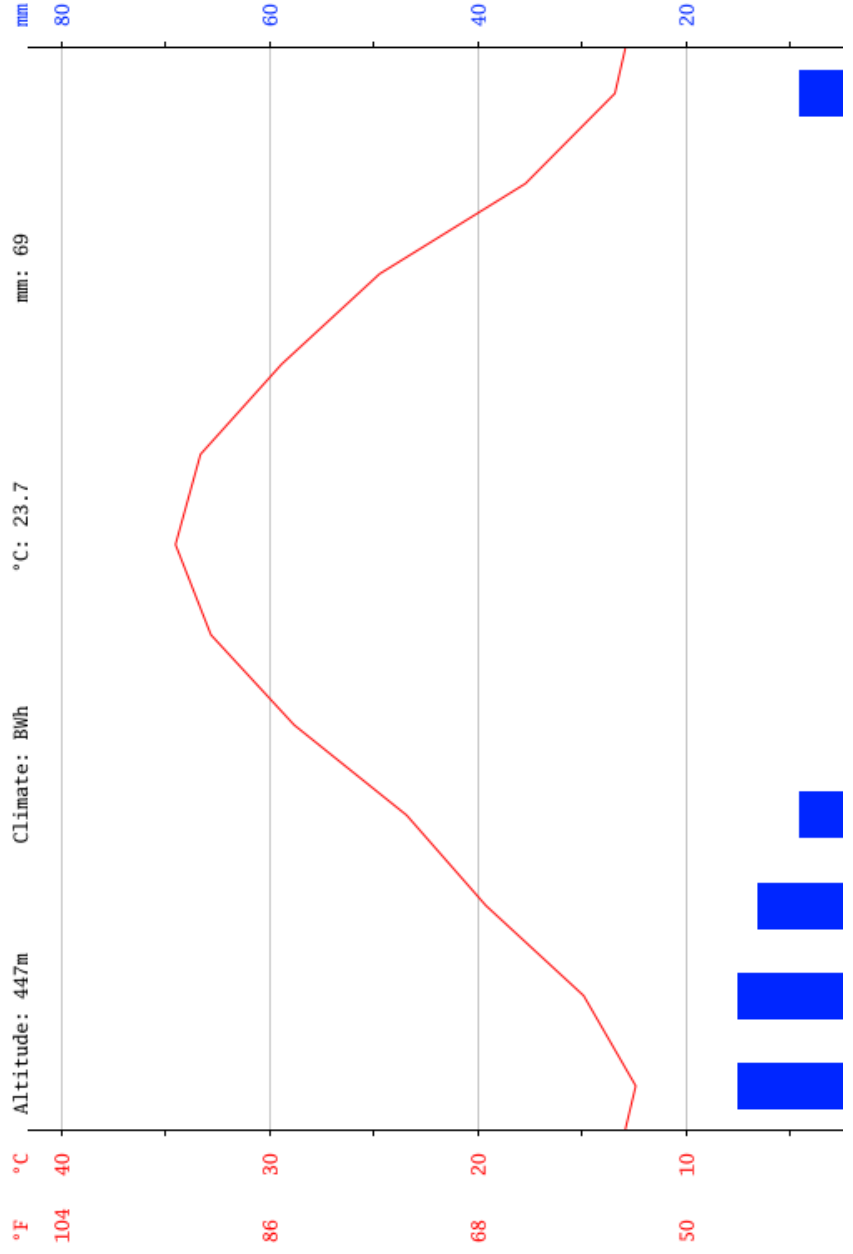
Local Tourist	12
International Tourist	54
Local Resident (lives in the area)	4

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a) Kampong Glam caters well to different groups of people.	16	50	1	3	0
b) Kampong Glam has a good mix of businesses.	12	37	3	14	4
c) Kampong Glam is very lively with a lot of activity.	13	24	8	23	2
d) The infrastructure in Kampong Glam is well maintained.	19	48	0	3	0
e) Kampong Glam is catered to tourists more than it is catered to residents.	10	8	34	13	5
f) Overall, Kampong Glam meets my needs.	18	33	9	8	2

Source: Original

Resource 3 for Question 2

Climograph of Shadad, Iran



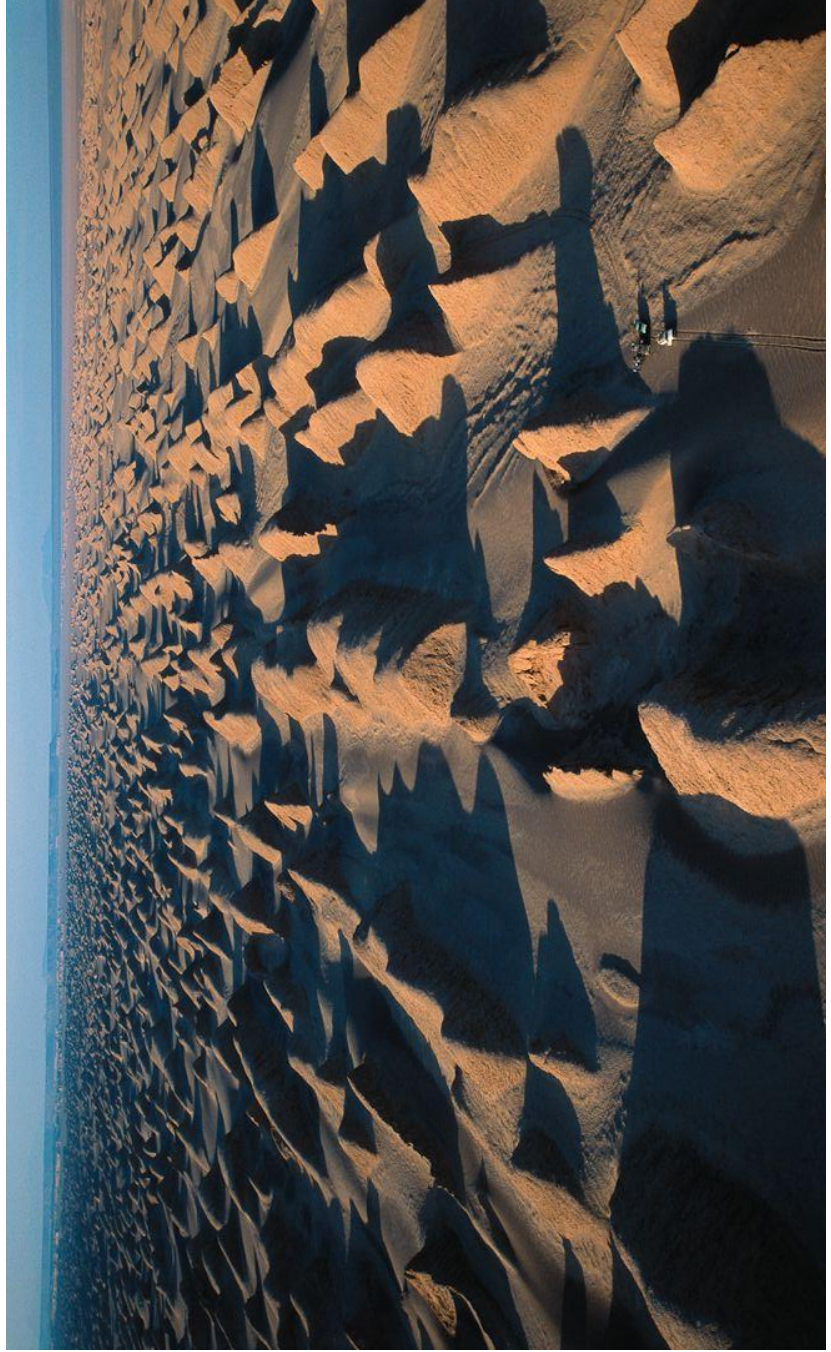
Resource 4 for Question 2

Location of the Lut Desert



**Resource 5 for Question 2**

**Landform found in the Lut Desert**



**Resource 6 for Question 2**  
**Rock in the Lut Desert**





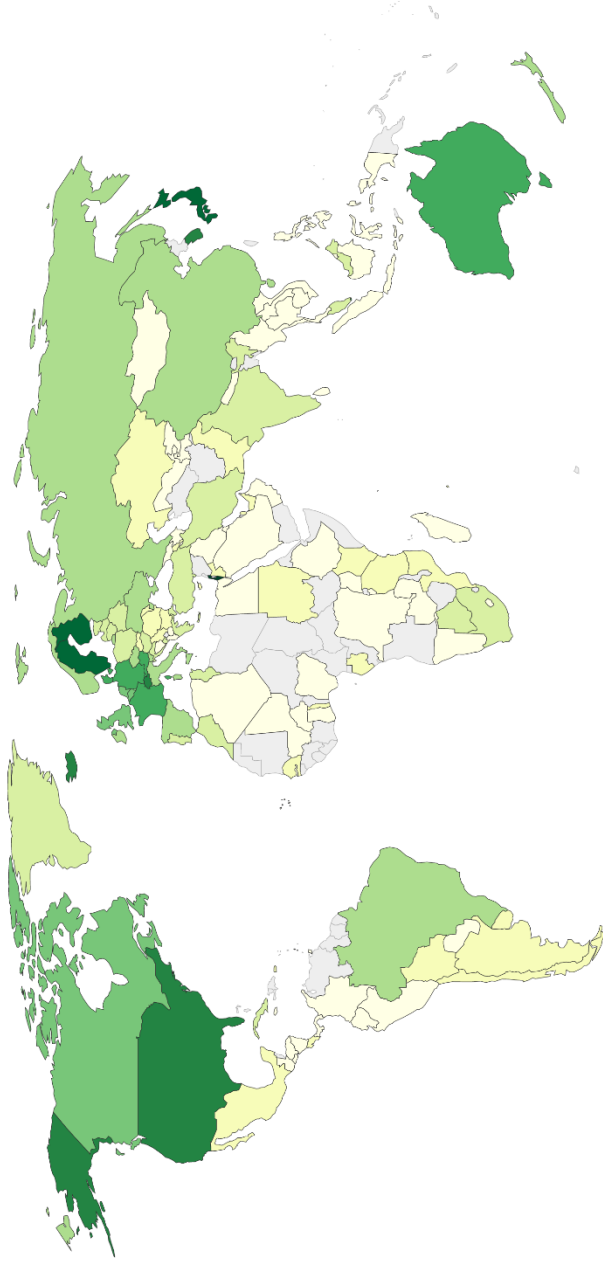
### Resource 7A for Question 3

#### Research and Development (R&D) expenditure (as % of GDP) across the world in 2005 and 2015

##### Spending on research and development as share of GDP, 2005

Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.

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in Data



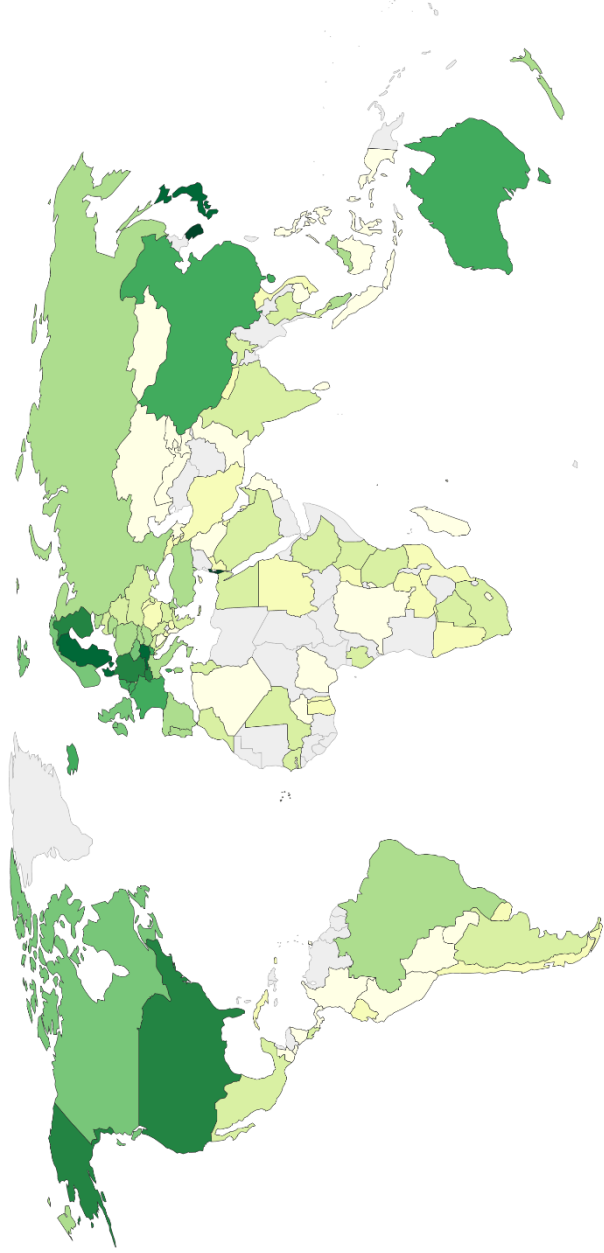
**Resource 7B for Question 3**

**Research and Development (R&D) expenditure (as % of GDP) across the world in 2005 and 2015**

**Spending on research and development as share of GDP, 2015**

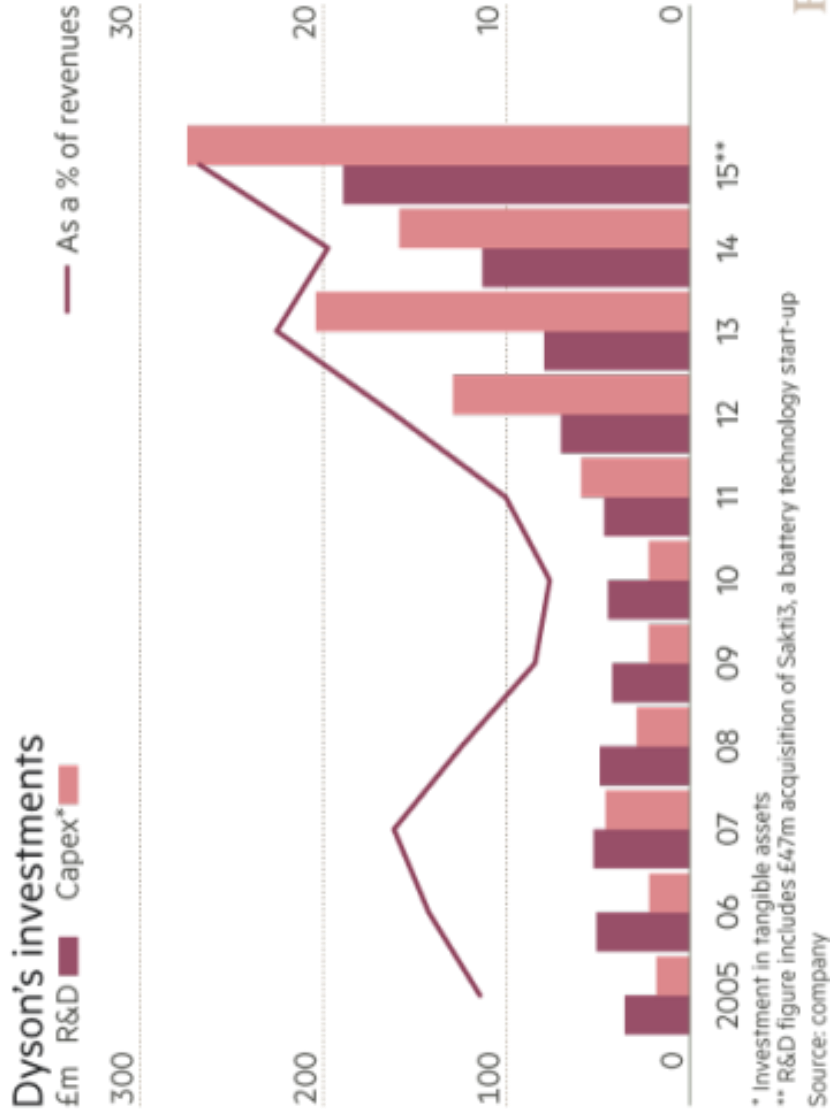
Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.

Our World  
in Data



Resource 8 for Question 3

Dyson's investment in R&D and Capex (capital expenditure)



**Resource 9 for Question 3****Extract on the relocation of Dyson's corporate headquarters to Singapore****British manufacturer Dyson to relocate corporate headquarters to Singapore**

SINGAPORE - British home appliance manufacturer Dyson will transfer its head office's registration to Singapore, a decision that comes just months after it announced that it will set up its first electric car plant here. This means Dyson - famed for its bagless vacuum cleaners and bladeless fans - will become a Singapore-based business and primarily be regulated by the law here.

[...] Jim Rowan, Dyson's chief executive stressed that the move to relocate to Singapore was an "evolutionary decision" due to the changing landscape. Dyson's "centre of gravity" has been shifting towards Asia, which in 2017 generated almost 75 per cent of its revenue growth. [...] He also said Singapore's corporate tax rate of 17 per cent - lower than Britain's - was also one reason for the relocation.

The firm already employs 1,100 people here and plans to double the size of its research and operations (R&D). Its Singapore Technology Centre at Science Park One will double in size as well. Its global R&D team grew to 5,853 engineers and scientists in 2018, with investments deepening in areas including energy storage and robotics. [...]

Dyson has also announced that its profits in 2018 broke £1 billion for the first time, growing 33 per cent to £1.1 billion (\$1.9 billion) from 2017. This came as investments in advanced manufacturing and research reached a new high, while revenue growth continued, in part on the back of new products such as its new hairdryer and air purification technology. [...]

The company has about 430 people working in the electric-car manufacturing facility, and expects this to grow as well. Its Singapore manufacturing facility is part of Dyson's £2 billion move into automobiles. Singapore expertise in advanced manufacturing was among the factors that made it an "ideal location" to manufacture the Dyson car, said the company, adding: "An increasing majority of Dyson's customers... are now in Asia. This shift has been occurring for some time and will quicken as Dyson brings its electric vehicle to market."

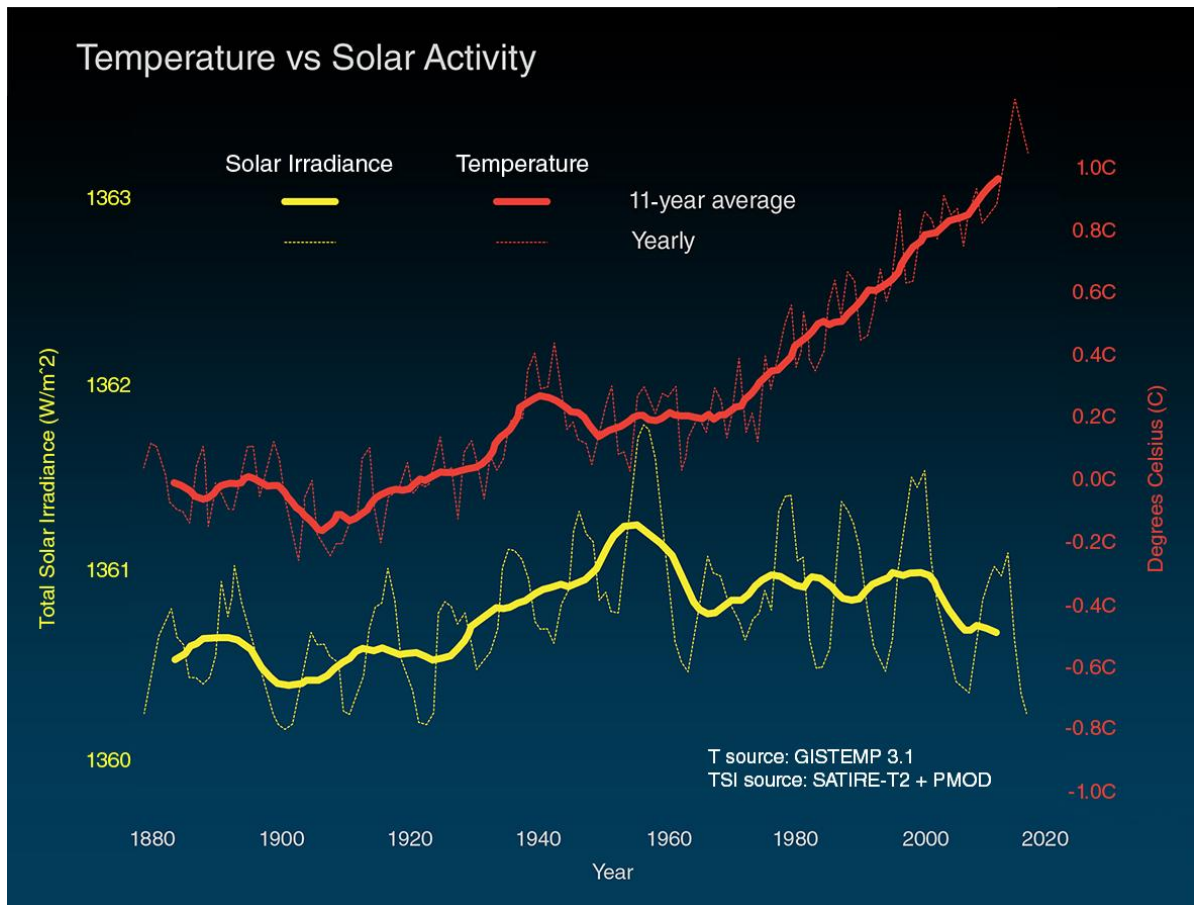
The company ceased British production of domestic appliances in 2003. It has facilities in Malaysia and the Philippines as well. Dyson continued its £31 million investment in higher education in Britain, where its core creative and engineering parts will remain.

Asked about the relocation, the Economic Development Board of Singapore's assistant managing director Kiren Kumar said: "Over the past decade, Singapore's manufacturing sector has been steadily transforming into one that competes based on the deep skills of our workforce, the use of advanced technologies such as robotics and automation, and a strong ecosystem of suppliers locally and in the region." [...]

**Source:** <https://www.straitstimes.com/business/companies-markets/british-manufacturer-dyson-to-relocate-corporate-headquarters-to>

## Resource 10 for Question 4

## Relationship between global temperature and solar activity since 1880

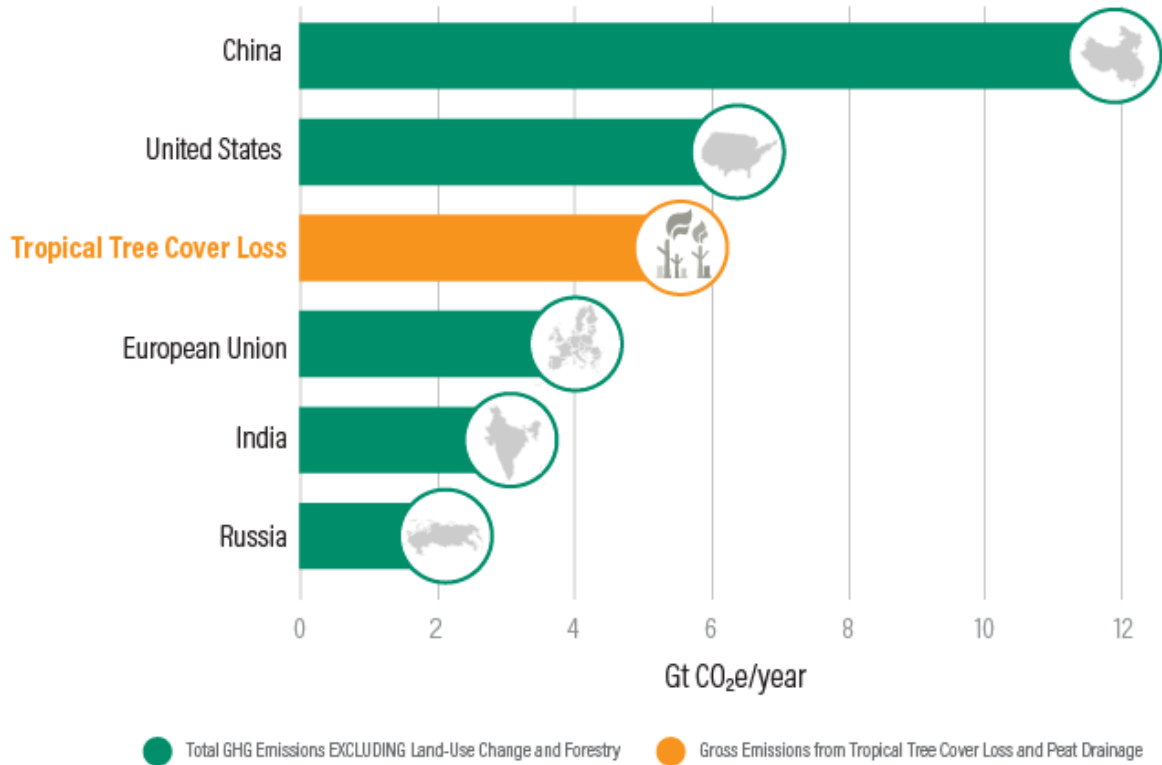


Source: [https://climate.nasa.gov/internal\\_resources/1802/](https://climate.nasa.gov/internal_resources/1802/)

Resource 11 for Question 4

Comparison of global tropical deforestation and its CO<sub>2</sub>e emissions with the top 5 CO<sub>2</sub>e emitting countries

If Tropical Deforestation were a Country, it Would Rank Third in CO<sub>2</sub>e Emissions



Source: Seymour & Busch, 2016.



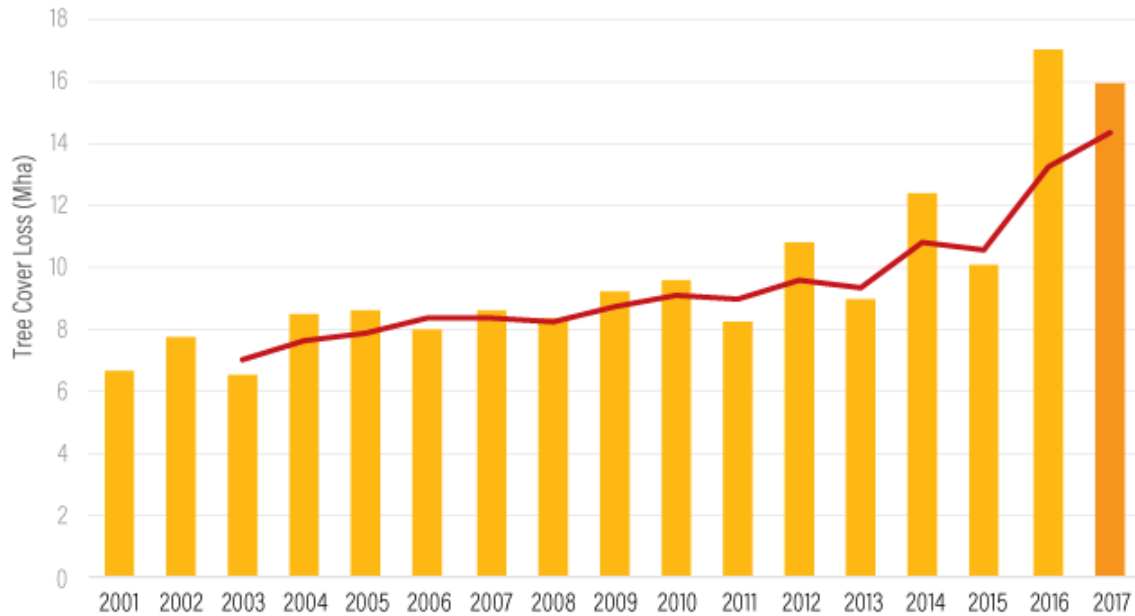
WORLD RESOURCES INSTITUTE

Source: <https://www.weforum.org/agenda/2018/11/chart-of-the-day-what-if-deforestation-were-a-country/>

## Resource 12 for Question 4

## Global tropical tree cover loss from 2001 to 2017

## Tropical Tree Cover Loss



— Three-year moving average. The three-year moving average may represent a more accurate picture of the data trends to uncertainty in year-to-year comparisons. All figures calculated with a 30% minimum tree cover canopy density.

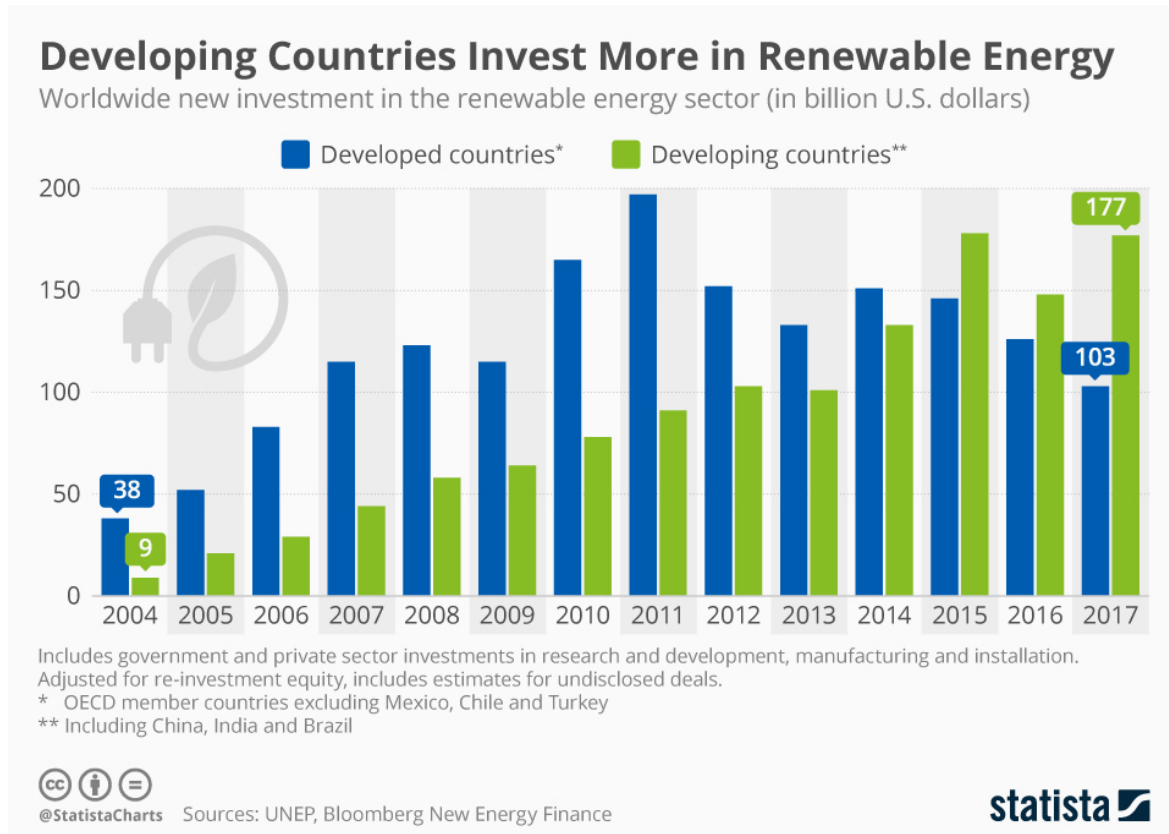


WORLD RESOURCES INSTITUTE

**Source:** <https://www.weforum.org/agenda/2018/06/deforestation-is-accelerating-despite-mounting-efforts-to-protect-tropical-forests-what-are-we-doing-wrong>

## Resource 13 for Question 4

**New worldwide investments in the renewable energy sector between developed and developing countries since 2004**



**Source:** <https://vsrecollective.com/asia-looms-large-as-potential-renewable-energy-superpower/>



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**National Junior College  
SH2 Preliminary Exam 2019  
Paper 2**

**SUGGESTED MARKING GUIDE**

*Disclaimer:*

*The Suggested Marking Guide  
should be used with discretion.*

## Notes on Marking

### Indicative Content

Indicative content is provided for all levels mark questions. It provides suggested responses and/or approaches to questions. The suggested responses and/or approaches are neither exhaustive nor should they be treated as model answers.

### Marking of Non Open-Ended Data Response Questions

- Data response questions may be **point mark** or **levels mark**.
- **Levels marking** is used when quality of thought, defined by the breadth and/or depth of thinking, is key in awarding marks.
- Where **point marking** is used, the general rule is that each relevant point is awarded one mark.

### Marking of Open-Ended Data Response Questions

All open-ended data response questions will be assessed using the following generic level descriptors:

#### **H2 Generic Level Descriptors for Open-ended 9m DRQ on Themes 1, 2 and 3\***

<b>Level</b>	<b>Marks</b>	<b>Descriptors</b>
3	7 – 9	<p>Response demonstrates a clear knowledge and understanding of the context in the question. Uses relevant, detailed and accurate factual information and conceptual understanding. Reflects strong critical thinking skills and may include perceptive insights for the strongest responses. Source(s) is well used to support the response.</p> <ul style="list-style-type: none"> <li>• Provides a logical and well-developed evaluation well founded on evidence and/or different viewpoints.</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Makes a decision which clearly addresses different elements of the issue and/or interests of different stakeholders.</li> </ul>
2	4 – 6	<p>A satisfactory response which is generally sound and contains relevant points, but may not always focus on the context in the question. Uses factual information and conceptual understanding that is generally appropriate to the given context but lacks detail and may contain some inaccuracies. Displays general critical thinking skills. Source(s) is used to support parts of the response.</p> <ul style="list-style-type: none"> <li>• Provides an evaluation, which may be limited in depth and sufficient elaboration in some parts.</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Shows some attempt to address different elements of the issue and views of different stakeholders when making a decision but is not well developed.</li> </ul>
1	1 – 3	<p>Response shows a poor understanding of the context in the question. Uses basic factual information and conceptual understanding which has some, but limited, relevance to the question. Source(s) is not used or not accurately used to support the response.</p> <ul style="list-style-type: none"> <li>• Provides little or no evaluation.</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• Evidence of decision-making, if present, is simple and may be flawed.</li> </ul>

0	0	No creditworthy response.
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*\*The assessment involves qualitative rather than quantitative evaluation. Judgements on the level to be awarded to an answer will be based on the principle of 'best fit' determined by the descriptors within each level*

### **H2 Generic Level Descriptors for Open-ended 9m DRQ on Theme 4\*\***

<b>Level</b>	<b>Marks</b>	<b>Descriptors</b>
3	7 – 9	Response demonstrates accurate knowledge and understanding of geographical investigation skills and methods relevant to the given context. Provides a logical and well-developed evaluation, which may include perceptive insights for the strongest responses. Reflects strong critical thinking skills and a good understanding of the requirements of the question.
2	4 – 6	Response demonstrates good knowledge and understanding of geographical investigation skills and methods relevant to the given context. Provides an evaluation, which may be limited in depth and detail. Response reflects critical thinking skills in general but may not always be relevant to the question.
1	1 – 3	Response shows inadequate knowledge and understanding of geographical investigation skills and methods. Response has some, though limited, relevance to the given context. Provides little or no evaluation. May include material that is irrelevant to the question.
0	0	No creditworthy response.

*\*\*The assessment involves qualitative rather than quantitative evaluation. Judgements on the level to be awarded to an answer will be based on the principle of 'best fit' determined by the descriptors within each level.*

*\*\*The descriptors in each level may be worded differently in actual assessment to link them more to the questions set. However, regardless of the wordings used, the quality of responses expected of candidates in each level would not deviate from that stated in the generic level descriptors.*

## Section A

## Theme 4: Geographical Investigation

1	<p>A group of five junior college students conducted a geographical investigation to study the impacts of urban re-imaging efforts in Kampong Glam, Singapore, on the different groups of dwellers in the area. For their investigation, the students came up with the following hypothesis:</p> <p style="text-align: center;"><i>“The re-imaging efforts in Kampong Glam to cater to tourists have created positive economic and social benefits for the urban dwellers in the area.”</i></p> <p>They chose one weekday during the June Holidays to visit the area. During that weekday, they conducted a questionnaire survey for people in the area to understand their opinions on Kampong Glam. The students chose to collect their data at the Sultan Mosque, one of the tourist attractions in the area. The students approached any person who seemed friendly to answer their questionnaire. The students also took photos of themselves conducting the questionnaire with the respondents, as well as photos of the area around Sultan Mosque to use as data.</p> <p>Resource 1 shows a map of Kampong Glam, as used by tourists. Resource 2 shows the data collected by the students from their questionnaire.</p>	
	<p><b>(a)</b> With reference to Resource 1, explain why the hypothesis crafted by the students is a suitable one.</p>	[4]
	<p><u>Possible Responses:</u></p> <ul style="list-style-type: none"> <li>• Suitable scale of research (within the vicinity of Kampong Glam)</li> <li>• Manageable in terms of the 5 students studying this area</li> <li>• Reimaging efforts are clearly defined to refer to efforts catering to tourists</li> <li>• Effects of reimaging efforts are clearly scoped as economic and social benefits</li> </ul> <p><i>Point marked</i> <i>Award 1 mark for each suitable justification for the hypothesis</i></p>	
	<p><b>(b)</b> With reference to the students’ data collection methods, as well as Resources 1 and 2, describe the limitations of the data collection process and explain how these limitations can be addressed.</p>	[6]
	<p><u>Indicative Content:</u></p> <p>Candidates should be able to use the data in the preamble and Resources 1 and 2 to identify and explain the limitations of the methods adopted in this fieldwork process. They should also suggest suitable ways to address</p>	

	<p>these limitations to improve the reliability and accuracy of the data collected.</p> <p><u>Possible Responses:</u></p> <ul style="list-style-type: none"> <li>• No proper sampling was done for the respondents. <ul style="list-style-type: none"> <li>○ The students approached any person that seemed friendly to answer their questionnaire (preamble), and this resulted in a skewed distribution of survey respondents, as too many were international tourists and very few were local residents in the area (Resource 2).</li> <li>○ Students should have conducted a stratified sampling of the population, where there can be equal representation of different groups of people to have a better representation of the population within Kampong Glam.</li> </ul> </li> <li>• Site selection within Kampong Glam. <ul style="list-style-type: none"> <li>○ Students only stood at one site (Sultan Mosque) to collect data, thus not representative of all urban dwellers in the area. There are many other areas in Kampong Glam (as shown in Resource 1) that could be surveyed as well.</li> <li>○ Students should have conducted the questionnaire at multiple sites in the area, such as near the Golden Mile Food Complex, to have a greater representation of views from people utilising various areas within Kampong Glam.</li> </ul> </li> <li>• Timing of data collection might affect the results <ul style="list-style-type: none"> <li>○ Students chose to collect questionnaire data on a weekday, which might have affected the representation of different groups in their data. In particular, the working population might not be present in the area.</li> <li>○ Students could conduct the questionnaire on a weekend to increase the likelihood of having a better representation of the population mix in the area.</li> <li>○ Students also only chose one weekday to conduct their questionnaire. Conducting the questionnaire on multiple days to get multiple data sets might improve the accuracy and reliability of responses.</li> </ul> </li> </ul> <p><i>Point marked</i>  <i>Award 1 mark for the identification of a suitable limitation</i>  <i>Award 1 mark for a suitable suggestion to address the limitation</i></p>	
(c)	Suggest one way by which the students can present the data they have collected as shown in Resource 2, and outline the strengths and limitations of this data presentation method.	[4]
	<u>Possible Responses:</u>	

	<p>Data representation methods include:</p> <ul style="list-style-type: none"> <li>• Composite Bar Graph (With each bar representing a response on the likert scale, and each bar segment representing the type of respondent [tourist, resident...])</li> <li>• Multiple Bar Graphs (With each bar set representing a response on the likert scale, and each constituent bar from a bar set representing the type of respondent)</li> <li>• Pie Chart (with each pie wedge/segment representing a response on the likert scale)</li> </ul> <p>Strengths and limitations of the suggested methods include:</p> <ul style="list-style-type: none"> <li>• Bar Graphs <ul style="list-style-type: none"> <li>○ Visually effective in communicating relative magnitudes</li> <li>○ Simple to construct</li> <li>○ However, it can be too complicated and hard to read with multiple bars</li> <li>○ It may also not be a fair comparison if the number of respondents within each respondent type (tourist, resident) is uneven</li> </ul> </li> <li>• Pie Chart <ul style="list-style-type: none"> <li>○ Visually effective – easy to see the relative contribution of individual segments and relative proportions</li> <li>○ If multiple sites are studied, then pie charts can also be used on a map to provide extra information (usually combined with proportional symbols / circles)</li> <li>○ However, it can be hard to assess the proportion accurately from the pie chart, especially if the individual slices are small</li> <li>○ Also, very small segments (less than 5 degrees) are difficult to draw</li> </ul> </li> </ul> <p><i>Point marked</i>  <i>Award 1 mark for identifying a suitable data representation method</i>  <i>Award 1 mark for each strength/limitation</i>  <i>Award a maximum of 3 marks if only strengths or limitations are mentioned but not both.</i></p>	
	<p><b>(d)</b> Describe two ethical issues that may arise with the taking of photos to use as data.</p>	[4]
	<p><u>Possible Responses:</u></p> <ul style="list-style-type: none"> <li>• Recording a video/image of the respondents in Kampong Glam may be seen as an infringement of their privacy. This is especially so if students do not seek permission from the respondents before taking these photos.</li> <li>• Students are conducting their research at a religious place (mosque), and the taking of photos within the vicinity might be upsetting for</li> </ul>	

	<p>people who are visiting the location for religious purposes, and it may be seen as insensitive.</p> <ul style="list-style-type: none"> <li>Photographs used as data might contain bias from the owner of the photo, and it may not be a fair representation of the actual situation on the ground should it be misused or misconstrued. There is a need for researchers to explore multiple angles from which photographs and videos can be taken, and the implications of each of these angles.</li> </ul> <p><i>Point marked</i>  <i>Award 1 mark for identifying a suitable ethical issue</i>  <i>Award 1 mark for suitable elaboration of the ethical issue</i></p>	
(e)	<p>Using Resource 2 and your own knowledge, explain how the students may use other types of data to better understand the impacts of urban re-imagining on the urban dwellers in Kampong Glam.</p>	[7]
	<p><u>Indicative Content:</u>  Candidates should identify that the data collected in Resource 2 is primary data, that is measured in a quantifiable way. They should then explain how other forms of primary data, as well as secondary data, can help to provide a better understanding of urban re-imagining efforts, such as by providing a comparison of the liveability of the area before and after re-imagining efforts, or to have more qualitative views of the ways re-imagining efforts have affected the urban dwellers.</p> <p><u>Possible Responses:</u></p> <ul style="list-style-type: none"> <li>Secondary Data <ul style="list-style-type: none"> <li>Publications from the government/tourism board to understand the efforts made by the government to rejuvenate the area.</li> <li>Photographs of Kampong Glam before re-imagining efforts to compare the quality of urban space.</li> <li>News reports/articles that may also provide information on local dweller's needs and concerns.</li> </ul> </li> <li>Other forms of primary data <ul style="list-style-type: none"> <li>Non-participant observation to observe how urban dwellers interact with the urban space after urban re-imagining.</li> <li>Environment Quality Assessment to determine if re-imagining efforts have resulted in a more positive environment quality for Kampong Glam</li> <li>Land-Use Mapping to understand the various land uses that may contribute to the urban re-imagining efforts</li> <li>Interviews to gather qualitative data to explain respondents choices</li> </ul> </li> </ul> <p><i>Levels marked</i></p>	



		<b>Level</b>	<b>Marks</b>	<b>Descriptors</b>	
		3	6-7	<p>Response demonstrates accurate knowledge of geographical investigation skills and methods relevant to the given context.</p> <p>Reflects a good understanding of the context of urban re-imaging and an appropriate selection of primary and secondary data required to measure it.</p>	
		2	3-5	<p>Response demonstrates good knowledge of geographical investigation skills and methods.</p> <p>Description may be limited in depth and detail.</p> <p>Some of the responses may focus on generic types of primary and/or secondary data, and such suggestions may not be relevant to the context of the investigation</p>	
		1	1-2	<p>Response shows basic knowledge of geographical investigation skills and methods.</p> <p>Explanation may be incorrect, inappropriate or irrelevant to the context of the investigation.</p>	

<b>Section B</b>		
<b>Theme 1: Tropical Environments</b>		
<b>Climate and Landscapes in the Lut Desert</b>		
<b>2</b>	<p>The Lut Desert is a large salt desert in Iran that is located between the latitudes of 28 to 32 degrees North of the Equator. It is the world's 27th largest desert, and it was inscribed on UNESCO's World Heritage List in 2016.</p> <p>Resource 3 is a climograph of Shahdad, a town located within the vicinity of the Lut Desert in Iran. Resource 4 shows a map of the location of the Lut Desert. Resources 5 and 6 depict a landform and a rock found in the Lut Desert respectively.</p>	
	<p><b>(a)</b> Describe the climatic characteristics of Shahdad in Iran, as shown in Resource 3.</p>	[4]
	<p><u>Possible Responses:</u></p> <ul style="list-style-type: none"> <li>• Shahdad has a high mean annual temperature of 23.7 Degrees Celsius</li> <li>• It also has a high annual temperature range of about 23 degrees celsius, with temperatures reaching as high as 35 Degrees Celsius in June, and being as low as 12 degrees Celsius.</li> <li>• Shahdad also has a very low annual total rainfall of 69mm.</li> <li>• The rainfall pattern shows some seasonality, with no rainfall recorded from June to September indicating a relatively drier season. The wet season can be said to be between December to April, with January receiving peak rainfall of about 15mm</li> </ul> <p><i>Point marked</i> <i>Award 1 mark for each suitable description of a climatic characteristic as shown in Resource 3.</i></p>	
	<p><b>(b)</b> With reference to Resource 4, explain the reasons for the aridity observed in the Lut Desert.</p>	[5]
	<p><u>Indicative Content:</u> Candidates should be able to explain the various reasons for aridity observed on Earth. In the context of the Lut Desert, candidates should be able to use the information shown in Resource 4 to conclude that the reasons that are applicable to the Lut Desert are namely the influence of the sub-tropical high pressure zone from the Hadley Cell, and the rain-shadow effect provided by the Zagros and Elburz mountain ranges. Candidates should then explain the processes that happen for these two reasons that cause the air to remain dry with little cloud formation,</p>	

	<p>accounting for the aridity observed in the Lut Desert.</p> <p><i>Levels marked</i></p> <table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Descriptors</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>4-5</td> <td>Response demonstrates accurate knowledge of the causes of aridity. Reflects a good and detailed understanding of the reasons for aridity, with clear reference to the information provided in Resource 4.</td> </tr> <tr> <td>2</td> <td>2-3</td> <td>Response demonstrates some knowledge of the causes of aridity. Explanation provided is relevant to the context of the Lut Desert, but may be limited in depth and detail. There may be missing references to Resource 4 where necessary.</td> </tr> <tr> <td>1</td> <td>1</td> <td>Response shows little or very basic knowledge of the causes of aridity. Explanation may be incorrect, inappropriate or irrelevant to the context of aridity observed in the Lut Desert.</td> </tr> </tbody> </table>	Level	Marks	Descriptors	3	4-5	Response demonstrates accurate knowledge of the causes of aridity. Reflects a good and detailed understanding of the reasons for aridity, with clear reference to the information provided in Resource 4.	2	2-3	Response demonstrates some knowledge of the causes of aridity. Explanation provided is relevant to the context of the Lut Desert, but may be limited in depth and detail. There may be missing references to Resource 4 where necessary.	1	1	Response shows little or very basic knowledge of the causes of aridity. Explanation may be incorrect, inappropriate or irrelevant to the context of aridity observed in the Lut Desert.	
Level	Marks	Descriptors												
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1	1	Response shows little or very basic knowledge of the causes of aridity. Explanation may be incorrect, inappropriate or irrelevant to the context of aridity observed in the Lut Desert.												
	<b>(c)</b> Identify the landform in Resource 5, and describe its distinctive features.	[3]												
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• Landform in Resource 3 is a yardang, (or yardang field)</li> <li>• Yardangs are characterised as streamlined, sharp and sinuous ridges that extend parallel to the wind, and are separated by parallel depressions</li> <li>• Comprise vertical rock layers of alternately hard &amp; soft rock: Rocks (can be both hard or soft); but should be of different resistance to erosion</li> </ul> <p><i>Point marked</i></p> <p><i>Award 1 mark for identifying the landform as a yardang</i></p> <p><i>Award 1 mark for each distinctive feature described</i></p>													
	<b>(d)</b> Explain the types of weathering processes which may have occurred on the rock shown in Resource 6.	[4]												
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• Physical weathering processes are more likely to have occurred on the rock in Resource 4</li> <li>• Thermal weathering can occur due to the large temperature range observed in the Lut Desert, resulting in thermal expansion and contraction of the rock which can break it down.</li> <li>• Salt weathering can also occur when saline solutions seep into cracks</li> </ul>													

	<p>and joints in rocks and evaporate, leaving salt crystals behind. These salt crystals expand as they are heated up, exerting pressure on the confining rock</p> <ul style="list-style-type: none"> <li>• These processes could cause the rocks in the Lut Desert to crack and split apart, such as the rock shown in Resource 4. The crack lines in the rock suggest that it has weathered via physical weathering processes.</li> </ul> <p><i>Point marked</i>  <i>Award 1 mark for identifying that it is physical weathering</i>  <i>Award 1 mark for identifying and explaining a relevant type of physical weathering associated with the rock</i>  <i>Award 1 mark for describing the type of disintegration as block disintegration.</i></p>	
(e)	<p>Using Resources 3 and 5, as well as your own knowledge, evaluate the extent to which wind is the dominant agent that shapes landscapes in the Lut Desert.</p>	[9]
	<p><u>Indicative Content:</u></p> <p>Candidates should be able to explain the role of wind as a geomorphic agent that shapes aeolian landscapes in the arid tropics. This should include the processes of wind erosion (through deflation, abrasion and attrition) and wind deposition. Such explanations should then be used to illustrate the formation of various types of aeolian landforms (e.g. yardangs, dunes and loess) that result from these processes. Candidates must also consider the role of water in shaping the landscape via fluvial processes (fluvial erosion and deposition), also using various fluvial landscapes in the arid tropics as examples. Candidates will then need to weigh the two agents to determine which is more dominant in the arid tropics. Responses should make clear reference to Resources 3 and 5.</p> <p>A higher level response would include a clear explanation of how wind is a significant agent that can determine the nature of the aeolian landform (e.g. how the direction and strength of the wind can affect the type of sand dune formed). Such responses should also include a clear basis of evaluation between the role of wind and water as geomorphic agents, such as through comparing their prevalence given the climatic conditions of the Lut Desert, or by comparing the extent to which such aeolian and fluvial landscapes are prevalent in the arid tropics.</p> <p><i>Levels marked using the H2 generic level descriptors for open-ended 9m DRQ on Themes 1, 2 and 3.</i></p>	



<b>Theme 2: Development, Economy and Environment</b>		
<b>Research and Development (R&amp;D) and Dyson's operations around the world</b>		
<b>3</b>	Resources 7A and 7B show Research and Development (R&D) expenditure (as % of GDP) across the world in 2005 and 2015 respectively. Resource 8 shows Dyson's investment in R&D and Capex (Capital expenditure). Resource 9 is an extract from an article on the relocation of Dyson's corporate headquarters to Singapore.	
<b>(a)</b>	Describe the changes in R&D expenditure (as % of GDP) across the world between 2005 and 2015 as shown in Resources 7A and 7B.	[4]
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• R&amp;D expenditure has generally increased between 2005 and 2015.</li> <li>• R&amp;D expenditure remained the same for most developed countries/regions between 2005 and 2015: <ul style="list-style-type: none"> <li>○ USA: 2.5-3%</li> <li>○ Japan: between 3-3.5%</li> <li>○ Northern and Western Europe: Between 1.5 – 3.5%</li> <li>○ Australia: 2-2.5%</li> </ul> </li> <li>• R&amp;D expenditure has increased in countries/regions such as China and African countries: <ul style="list-style-type: none"> <li>○ China: from 1-1.5% in 2005 to 2-2.5% in 2015</li> <li>○ African countries: from below 0.25% in 2005 to 0.5-1% in 2015</li> </ul> </li> <li>• R&amp;D expenditure has decreased in a handful of countries/regions such as the Middle Eastern countries: <ul style="list-style-type: none"> <li>○ Middle Eastern countries: from 0.5-1% to 0.25-0.5%</li> </ul> </li> </ul> <p><i>Point marked</i> <i>Award 1 mark for each observation and evidence</i></p>	
<b>(b)</b>	Using evidence from Resources 7A and 7B, identify the region with the highest R&D expenditure in 2015 and suggest reasons to account for the region's amount of R&D expenditure.	[4]
	<p><u>Possible Response:</u></p> <p>Possible regions:</p> <ul style="list-style-type: none"> <li>• North America region [USA: 2.5-3%]</li> <li>• Northern Europe [approx. 3%]</li> <li>• East Asia [3-4%]</li> </ul> <p>Possible reasons (non-exhaustive):</p> <ul style="list-style-type: none"> <li>• Dependence of economy on tertiary and quaternary sector <ul style="list-style-type: none"> <li>○ With the North America/ Northern Europe region consisting of</li> </ul> </li> </ul>	

	<p>developed economies that are dependent on tertiary and quaternary sectors to drive economic revenue, investment in R&amp;D to improve technical expertise and infrastructure is necessary to drive further revenue growth</p> <ul style="list-style-type: none"> <li>○ For East Asia, the increase in R&amp;D investments is more to do with the ongoing shift towards tertiary and quaternary sectors, thus requiring the investment in R&amp;D</li> <li>• Presence of / locational changes by TNCs (in particular the larger players in the R&amp;D sector): <ul style="list-style-type: none"> <li>○ With the location of some of the world's largest TNCs (or tech companies) such as Apple, Google, Facebook, and Amazon in the US, R&amp;D expenditure is necessary in improving quality of R&amp;D infrastructure and employee quality.</li> <li>○ East Asia has been a favourite destination for some of the more recent relocation decisions by R&amp;D giants in the economy</li> </ul> </li> <li>• Growing competitiveness across the world: <ul style="list-style-type: none"> <li>○ R&amp;D investments would also allow TNCs like Apple and Google to remain competitive amongst the technology and electronics companies by allowing for constant innovation and production of latest products to generate income for the region.</li> </ul> </li> </ul> <p><i>Point marked</i>  <i>Award 1 mark for identification of region</i>  <i>Award 1 mark for each reason</i></p>	
(c)	Describe the changes in Dyson's investment in R&D and Capex (i.e. capital expenditure) as shown in Resource 8.	[4]
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• General increase in both R&amp;D and Capex from 2005 to 2015 <ul style="list-style-type: none"> <li>○ Extent of increase between R&amp;D and Capex different, with the former increasing from about 40 million pounds to about 190 million pounds, and the latter increasing more, from about 20 million pounds to about 280 million pounds</li> <li>○ Rate at which R&amp;D and Capex has increased different, with the former remaining rather consistent from 2005 to 2011 (with a slight dip from 2007 to 2008) before experiencing gradual increases from 2011 to 2015, and the latter experiencing a slight increase from 2005 to 2007, before a slight decrease from 2007 to 2010, and then a rapid increase from 2010 onward</li> </ul> </li> <li>• R&amp;D investments as a percentage of revenues increased between 2005 and 2007 (11% to 16%), followed by a drop between 2007 and 2010 ((16% to 8%), before rising again to 27% in 2015. A slight dip of approximately 4% occurred between 2013 and 2014.</li> </ul>	

	<p><i>Point marked</i></p> <p><i>Award 1 mark for each description of trends in R&amp;D and Capex</i></p> <p><i>Award 1 mark for description of trends in R&amp;D investments as percentage of revenues</i></p>	
	<p><b>(d)</b> With reference to Resource 9 and your own knowledge, account for Dyson's decision to relocate its corporate headquarters to Singapore.</p>	[5]
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• Being the command and control centres of TNCs, HQs would require locations with high quality transportation and communications network and infrastructure, highly skilled/educated workforce, and economic and political stability – these would be the geographical differences in Singapore which provide the country with its comparative advantage in highly skilled economic activities often found in the quaternary and quinary sectors <ul style="list-style-type: none"> <li>○ High quality of technological/ICT infrastructure that would enable efficient inter- and intra-firm communication, crucial in facilitating coordination of various operations within Dyson</li> <li>○ Highly skilled/educated labour that possesses managerial and advanced technical skills in carrying out command and control roles, R&amp;D and advanced manufacturing processes.</li> <li>○ Economic and political stability in Singapore that provides a conducive environment for the HQ to function, due to the lower likelihood of economic shocks or civil strife.</li> </ul> </li> <li>• Favourable state actions including the incentive schemes offered by Singapore, (with relatively lower corporate tax rate of 17% in comparison with the United Kingdom), with opportunities for further tax concessions as well as the setting up of Science and R&amp;D Parks such as Science Park One</li> <li>• Proximity to market especially since Asia has emerged to become Dyson's main market, generating almost 75% of its revenue growth in 2017; the siting of its corporate HQ in Singapore near its R&amp;D labs would not only facilitate transmission of information and knowledge, but would also facilitate the development of new innovative products that is catered to its Asian market.</li> </ul> <p><i>Point marked</i></p> <p><i>Award 2 marks for each well-explained point; each points must be from a different area (i.e. existing geographical differences, state actions and proximity to market); maximum of 5 marks to be awarded</i></p>	
	<p><b>(e)</b> Using Resource 9 and your own knowledge, explain the impacts of Dyson's relocation of its corporate headquarters and setting up of electric-car manufacturing facility on the host economy (i.e. Singapore).</p>	[8]
	<p><u>Indicative Content:</u></p>	



Candidates should explain possible impacts on Singapore in various aspects by citing evidence from the resource, as well as knowledge from complementary sources beyond the resource.

Possible positive impact:

- Employment creation: Boost employment through a variety of functions, including supply chain management, advanced manufacturing, and R&D (*Already employing about 1,100 people in the R&D operations, with plans to double the size in the coming years*)
- Knowledge diffusion/transfer: Commit to developing technology, knowhow and skills in the city state (*Clustering of Singapore Technology Centre within Singapore Science Park One can contribute to the overall increase in scientific knowledge in Singapore.*)
- Local firm stimulation: Generate investment that spills over to the local economy, integration of local firms into supply network (*Ecosystem of local suppliers might benefit.*)
  - Starting an electric-car manufacturing facility in Singapore: attract parts of the supply chain to also be set up in Singapore, creating a new manufacturing network that would have a larger impact on the economy due to the hiring and expansion of the business.
- Environmental impact: setting up an electric-car manufacturing facility in Singapore would be aligned with Singapore's efforts to combat climate change

Possible negative/limited impact:

- While Dyson pumped millions of dollars into building a R&D facility at Singapore Science Park in 2017, its R&D arm in the UK continued to expand, with millions invested in the R&D infrastructure there and in higher education in Britain, where its core creative and engineering parts will remain.
- The prospects of setting up an electric-car manufacturing facility in Singapore is uncertain. Though Singapore may be an ideal location due to its connectedness to the rest of the world, car manufacturing requires large amounts of space, power and water, and none of which are in abundance in Singapore. This could result in Dyson relocating its electric-car manufacturing facility if success is not achieved that would have negative implications on Singapore's economy (e.g. employment)

*Levels marked*

Level	Marks	Descriptors
3	7-8	Response demonstrates strong knowledge of the impacts of Dyson's relocation of its corporate headquarters and setting up of electric-car

			<p>manufacturing facility on the host economy in various aspects, addressing both positive and limited/negative elements.</p> <p>Good and accurate use of the resource to explain the impacts.</p> <p>Response is clear, detailed and shows focus on the question.</p>	
		2	4-6	<p>Response demonstrates adequate knowledge of the impacts of Dyson's relocation of its corporate headquarters and setting up of electric-car manufacturing facility on the host economy in various aspects.</p> <p>Some use of the resource to explain the impacts.</p> <p>Response is mostly clear, shows some supporting details and is focused on the question.</p>
		1	1-3	<p>Response demonstrates some knowledge of the impacts of Dyson's relocation of its corporate headquarters and setting up of electric-car manufacturing facility on the host economy in various aspects.</p> <p>Limited use of the resource to explain the impacts.</p> <p>Response is somewhat clear, with some details used to support response.</p>

<b>Theme 3: Sustainable Development</b>		
<b>Contemporary climate change, deforestation and renewable energy</b>		
<b>4</b>	<p>Resource 10 is a graph documenting the relationship between global temperature and solar activity since 1880. Resource 11 shows a comparison of tropical tree cover loss and its CO<sub>2</sub>e* emissions, with the five biggest CO<sub>2</sub>e emitters across the world in 2016. Resource 12 shows global tropical tree cover loss from 2001 to 2017. Resource 13 illustrates new worldwide investments in the renewable energy sector between developed and developing countries since 2004.</p> <p><i>*CO<sub>2</sub>e: Carbon dioxide equivalent is a standard unit for measuring carbon footprints and expresses the impact of each different greenhouse gas in terms of the amount of CO<sub>2</sub> that would generate the same amount of warming</i></p>	
	<p><b>(a)</b> With reference to Resource 10, describe the relationship between global temperature and solar activity.</p>	[6]
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• In terms of 11-year average patterns, <ul style="list-style-type: none"> <li>○ Solar irradiance has not altered much since 1880, hovering between 1360.5 to 1361 W/m<sup>2</sup> whereas global temperature has increased by about 1.0oC since 1880</li> <li>○ From 1880 – 1950s, gradual increase in solar irradiance and global temperature in general</li> <li>○ In between 1950-1960, sudden increase (relatively large) in solar irradiance unmatched by trend in global temperature (gradual increase)</li> <li>○ Since 1960, there has been a divergence in trends - solar irradiance has maintained, declining by quite a fair bit from 2000 onward, whereas global temperature has seen a steady increase</li> </ul> </li> <li>• In terms of yearly patterns, <ul style="list-style-type: none"> <li>○ The fluctuations appear somewhat similar across the years, except for the years in between 1950-60 when solar irradiance experienced a sudden spike and decline whereas the changes in global temperature were a lot less noticeable</li> <li>○ The frequency of fluctuations in global temperature were also higher than the frequency of solar irradiance</li> </ul> </li> </ul> <p><i>Point marked</i> <i>Award 1 mark each</i></p>	
	<p><b>(b)</b> Explain two ways in which tropical deforestation could have resulted in</p>	[6]

	CO <sub>2</sub> e emissions, as shown in Resource 11, and one other way in which it could have led to an increase in the concentration of greenhouse gases in the atmosphere.	
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• Forests are important carbon sinks and when they are removed either by burning or the processes of decomposition, their stored carbon is released into the atmosphere as carbon dioxide</li> <li>• The removal of forest cover also leads to the exposure of soil surfaces which allows for carbon from decaying organic matter to be released into the atmosphere directly, as opposed to being embedded into rock-forming processes</li> <li>• Given that tropical forests absorb carbon from the atmosphere via the process of photosynthesis, a decline in tropical forest cover will result in less carbon dioxide being removed from the atmosphere, hence contributing to an increase in the concentration of greenhouse gases</li> </ul> <p><i>Point marked</i> <i>Award 1 mark each</i></p>	
<b>(c)</b>	Explain how other anthropogenic activities, besides tropical deforestation, could possibly account for the relationship between global temperature and solar activity from the 1960s in Resource 10.	[4]
	<p><u>Possible Response:</u></p> <ul style="list-style-type: none"> <li>• Increase in the use of fossil fuels across the world, especially with the meteoric rise of economies within the Asian-Pacific region and the increase in energy for industrialisation and the production of goods for services, resulting in the increase in greenhouse gas emissions from energy production</li> <li>• Increase in affluence across the world, in particular, Asia, which has led to changing consumption patterns from lifestyles which are more minimalistic, with lower levels of consumption, to lifestyles which require a lot more consumption; such mass consumption has triggered the increase in greenhouse gas emissions</li> <li>• Increase in food production across the world to feed the rapidly increasing populations, resulting in agricultural activities which produce greenhouse gases, in particular, methane (from rice and cattle production especially)</li> <li>• Increase in urbanisation across the world, resulting in change in surface covers from vegetated to non-vegetated concrete ones; this affects the amount of solar radiation that is absorbed by the surfaces, which results in an overall rise in global temperatures as compared to vegetated surfaces; lifestyle changes associated with urbanisation might also have contributed to this, with the increase in usage of cars</li> </ul>	

	<p>and air-conditioners, which has also led to increased emissions</p> <p><i>Point marked</i> <i>Award 2 marks for each well-explained point</i></p>	
(d)	<p>To what extent do you agree that an increase in investments in renewable energy by developing countries, as shown in Resource 13, can mitigate contemporary climate change? You may refer to the resources provided, as well as your own knowledge.</p>	[9]
	<p><u>Indicative Content:</u></p> <p>Candidates should be able to make use of the resources provided to argue whether they believe that an increase in investments in renewable energy by developing countries as shown in Resource 13 can combat climate change, before complementing their arguments with knowledge from beyond the resources.</p> <ul style="list-style-type: none"> <li>• Resource 10: Contemporary climate change – in terms of global warming – is likely to continue given that it has been increasing since 1880s</li> <li>• Resource 12: Global tropical tree loss has been on the rise, despite calls to mitigate climate change</li> <li>• Resource 11: Tropical deforestation is one of the top CO<sub>2</sub>e emitters, second only to China and the United States; the largest CO<sub>2</sub>e emitters are also not differentiated across developed and developing countries – this means that both types of economies are equally responsible for CO<sub>2</sub>e emissions</li> <li>• Resource 13: While investments in renewable energy by developing countries has increased, the amount by developed countries has declined, resulting in the total amount of investments in renewable energy maintaining since 2011</li> <li>• Other knowledge: Other climate change mitigation strategies such as international agreements, initiatives to combat deforestation as well as mindful changes to lifestyles have to be used in conjunction</li> </ul> <p><i>Levels marked using the H2 generic level descriptors for open-ended 9m DRQ on Themes 1, 2 and 3.</i></p>	