CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION 2025

GEOGRAPHY

2279/01

Paper 1

26 August 2025
1 hour 45 minutes

Candidates answer on the Question Paper.
Additional Materials: Insert

Suggested Marking Guide

1 Cluster 1: Geography in Everyday Life

During their internship with the Singapore Tourism Board (STB), a group of students were tasked to investigate the benefits and costs of Singapore hosting the Formula 1 (F1) race annually.

Using information that they found online, the students came up with a simplified map of the area where the race was held, Fig. 1.1 [Insert].

(a) (i) Identify the type of data that students referenced, to come up with Fig. 1.1. **[1]**

Possible responses include:

- The students referenced **secondary data** to come up with Fig. 1.1.

AO2

(ii) The students were interested to find out the original land use of the area when the race was not held to do a comparison of land-use.

Suggest one source of data that the students could find this information from. **[1]**

Possible responses include:

- The students used information from **online search engines/street directories/reference maps from libraries/archives/government agencies**.

A01

(b) The students understood that one of the drawbacks of the race was the diversion of traffic and its consequences for all affected roads. Fig. 1.2 [Insert] show parts of the race circuit and hence the affected roads where traffic would be diverted from Friday to Sunday of the race weekend.

As such, the students sought to find out the typical traffic count along St. Andrew's Road, one of the roads that would be affected. The students collected the data on a Sunday evening, between the timings of 5.00pm to 10.00pm at the location marked X.

Fig. 1.3 below shows the data collected.

Time	Number of vehicles
5pm	1100
6pm	700
7pm	1200
8pm	1300
9pm	800
10pm	700

Fig. 1.3

(i) Using Fig. 1.3, complete the graph in Fig. 1.4 to indicate the number of vehicles that were travelling along St. Andrew's Road during the study duration. **[3]**

(ii) Evaluate the reliability of the data collected by the students. **[2]**

Possible responses include:

- The data collected was **reliable because the students conducted the study for a relatively long period of 5 hours**.
- The data collected was **unreliable because the students only collected data on Sunday evening which is not representative of the whole race weekend.**
- The data collected was **unreliable because the students only did a traffic count for one of the roads which does not represent all affected roads**.

A03

(iii) Suggest two improvements that could be made to the data collection process. **[2]**

Possible responses include:

- **The students could conduct the study for a longer duration that spans more than 5 hours/more days**
- **The students could expand the collection fo traffic count to more than one affected road.**

A02

(c) The students understood that a key benefit from the holding of the F1 race was the increase in tourism expenditure when tourists travelled to Singapore to watch the event.

Using Fig. 1.5 below, the students decided to conduct interviews with tourists to invtesigate the hypothesis **"During the F1 race period, tourists travel to Singapore to watch the race only."**

Questionnnaire

1. What is your age?
   a. 0 – 20
   b. 21 – 40
   c. 41 – 60
   d. > 60

2. What is your gender?
   a. Male / Female

3. Did you travel to Singapore to specially attend the Formula 1 race?
   a. Yes / No

4. Are you staying in Singapore for more than 5 days?
   a. Yes / No

5. Will you be attending any F1-related events or activities during your stay?
   a. Yes / No

Fig. 1.5

Using Fig. 1.5, evaluate the usefulness of the questionnaire in helping the students determine if the hypothesis is valid. **[4]**

Possible responses include:

- **[Evaluation] The questionnaire is useful because it contains questions that can ellict relevant responses that are related to the hypothesis.**
- **[Additional elaboration] For example, an answer to the question such as 'Did you travel to Singapore specifically to attend the Formula 1 race?,' will provide a useful response.**
- **[Evaluation] The questionnaire is not useful because there are questions that are irrelevant to the hypothesis.**
- **[Additional elaboration] For example, questions 1 and 2 will ellicit responses that will not help students determine if the hypothesis is valid.**
- **[Evaluation] The questionnaire may be limited in its usefulness because it is made up of only close-ended questions that do not allow for hybrid or mixed responses.**
- **[Additional elaboration] For example, a tourist may have mixed thoughts about Question 3 but does not have the option to elaborate or provide more information. This could affect the information collected.**

A03

(d) The students then discussed among themselves about the sampling method and decided that they would use convenience sampling (a form of non-probability sampling) to run a pilot test of the interviews.

(i) Explain why the students decided to use a non-probability sampling method instead of a probability sampling method. **[2]**

Possible responses include:

- **Based on the context, it is unnecessary/impractical to select an unbiased and representative sample for the sampling.**
- **It is also more efficient and can be completed quickly even with time constraints.**

A01

(ii) Using Fig. 1.2 [Insert], describe how the students can go about conducting the interviews using convenience sampling. **[3]**

Possible responses include:

- **The students will come up with the questions for the interview survey.**
- **They will have an agreed sample size e.g., 100 respondents.**
- **They will then distribute it to the first 100 people they meet outside locations such as 'The Fullerton Hotel', 'Esplanade' or 'The Padang'. [Accept other plausible locations]**

A02

(iii) **Identify two limitations of the students' choice of sampling method.** **[2]**

Possible responses include:

- **This selection of tourists for the interview may be biased**
- **Data collected may be less representative of the whole population**
- **Data collected may not be accurate in allowing the students to draw general conclusions about the population**

A02

[Total: 20]

Cluster 2: Tourism

(a) Study Figs. 2.1 and 2.2 (Insert), which show the annual carbon dioxide (CO2) emissions from the aviation industry in 2013 and 2024 respectively.

(i) **Using Figs. 2.1 and 2.2, compare the annual carbon dioxide emissions from 2013 to 2024.** **[3]**

Possible responses include:

- **[Similarity] North America remained among the highest emitters in both 2013 and 2024, consistently shaded in dark orange to dark red, indicating emissions in the 10 million to over 100 million tons range.**
- **[Difference] The overall global intensity of emissions has increased, with more countries shaded in darker tones in 2024, suggesting a broad rise in aviation-related CO_2 output.**
- **[Difference] From 2013 to 2024, there has been a notable increase in emissions in East and Southeast Asia, particularly in China and surrounding regions, shifting from medium orange (around 1–10 million tons) to dark red (over 100 million tons).**
- **[Difference] Africa, especially central and western regions, shows a visible increase in aviation emissions, moving from white or light yellow (no data or near-zero emissions) in 2013 to light orange (up to 100,000 tons) in 2024.**

A02

(ii) **Explain why this change might have occurred.** **[3]**

Suggested responses include:

- **[Point] One reason for the increase in emissions is because more people are travelling to pursue their life purpose and fulfil their fullest potential.**
- **[Elaboration] Pilgrimage tourism is an example where tourists travel to sacred sites such as shrines, mosques, temples or churches that are central to their belief and faith. For example, every year, more than two million Muslims travel to Mecca in Saudi Arabia on an annual Hajj or pilgrimage, where they perform a series of rituals to fulfil their religious duty.**
- **[Point] An increase in leisure time where people are free from work responsibilities (paid leave, public holidays and shorter working weeks) has given people the increased ability to travel hence contributing to increased carbon emissions.**

- **[Example] For instance, in 2023, the Shandong province became the latest local government in China to promote annual leave in a bid to revitalise domestic tourism within its country.**

A01

(b) Study Fig. 2.3 [Insert], which shows ecotourism occurring in the Maasai Mara Nature Reserve in Kenya, Africa.

With reference to Fig. 2.3, explain how ecotourism achieves sustainable tourism development. **[3]**

Possible responses include:

- **[Point] Ecotourism educates and increases tourists' appreciation of nature as such tours to natural areas allow tourists to experience and interact with nature.**
- **[Additional elaboration] This increases tourists' knowledge and appreciation of nature, which can encourage tourists to take action to conserve and minimise damage to the environment. This ensures environmental sustainability.**
- **[Point] Ecotourism also puts in place measures to minimise negative impacts on the environment. This allows visiting tourists to explore the conserved natural environment within safe perimeters that minimise tourist impact.**
- **[Example] For example, the Galapagos Islands in Ecudaor has been intentionally conserved to retain its unique biodiversity, with 97% of the islands' total area declared a national park. Authorities implemented some rules and regulations to conserve the natural area. For instance, only a limited number of visitors is allowed in the park on any given day to minimise disturbances to wildlife.**
- **[Point] Another focus of ecotourism is to ensure that tourism revenue earned from is channelled into the conservation of the natural environment. This can be done by hiring local park rangers.**
- **[Additional elaboration] Aside from providing job opportunities to locals, these park rangers ensure that laws set up to protect the environment are adhered to. This minimises damage to the environment.**

A01

(c) Study Fig. 2.4 (Insert), which shows a scene on Maya Beach, Thailand, after tourists have left the popular tourist attraction.

Using Fig. 2.4, explain how tourism can result in negative environmental impacts. **[3]**

Possible responses include:

- **[Point] The tourism industry generates a significant amount of waste and in places with no proper waste disposal systems, some tourists may leave litter behind, causing land and water pollution as seen in Fig. 2.4.**
- **[Additional elaboration] As some tourists may not be aware of the consequences of their actions, the incidents of littering may increase overtime as tourism grows, further worsening the pollution.**
- **[Point] Tourist activity can also result in an overuse of provisioning ecosystem services that depletes natural resources such as water. As water is diverted to meet the tourism industry's needs, this can dry up rivers, worsening environmental conditions.**

- **[Example] Bali, Indonesia uses approximately 3 million litres of water per day. This is due to its booming tourism industry, which draws water from public water supply systems as well as groundwater to meet the needs of tourists. As water is diverted to meet Bali's water needs, this has dried up rivers in the region and depleted available water resources for locals.**

A02

(d) **Explain how tourism development can result in an economic leakage.** **[3]**

Possible responses include:

- **[Point] Economic leakage happens when tourist revenue does not remain in the same country where it is generated. Tourist revenue may be lost to foreign-owned businesses as money is paid for the import of goods and services needed to support the tourism industry.**
- **[Point] Some of this revenue can also be lost as money is paid to other countries for the import of goods and services, as well as wages to foreign employees.**
- **[Point] In some developing countries, the extent of leakage may be so significant that it can virtually wipe out the economic benefits of tourism.**
- **[Example] For example, for a typical safari holiday in Kenya, 83% of the income generated leaks out of the country through a foreign-owned hotel chain, a Western tour operator as well as the airline company. What remains is 17% of income that goes to the local safari company and the Kenyan government.**

A01

[Total: 15]

3 Cluster 3: Climate

(a) Figs. 3.1 and Fig. 3.2 (Insert) show climographs of two locations, Mexico City and Cancun respectively. Both cities are located at different altitudes in Mexico with Mexico City having an altitude of 2,240m above sea level and Cancun at sea level.

Using Figs. 3.1 and 3.2, explain how altitude can impact the climate of both cities. **[3]**

Possible responses include:

- **[Compulsory point] Cancun is located a lower altitude as compared to Mexico City; hence it experiences a higher mean annual temperature of 26.3°C as compared to 16°C for Mexico City.**
- **[Explanation] At higher altitudes, air is less dense, which means air pressure is lower. When air pressure is lower, there are fewer air molecules.**
- **[Explanation] This means that the air molecules are less able to absorb heat radiating from the earth's surface, resulting in lower temperatures. Hence, places at higher altitudes experience lower temperatures than areas near sea level.**

A02

(b) **Explain how adaptation strategies can be used to build a community's resilience to climate change.** **[3]**

Possible responses include:

- **[Point] Structural adaptation strategies involve the construction of physical structures such as sea walls to ensure water and flood management. Seawalls are constructed along the coast to prevent the sea from advancing onto the land as sea level rises.**
- **[Example] In 2019, then Prime Minister Lee Hsien Loong announced that $100 billion or more may be needed to strengthen coastal defences with seawalls so as to protect Singapore against rising sea levels.**
- **[Point] Raising awareness and educating communities on how to respond to climate change so as to minimise disruption to their livelihood in the wake of climate change.This will allow them to take appropriate steps to protect themselves from the impacts of climate change**
- **[Example] For example, in Singapore, the public is educated on what to do when a sudden flash flood occurs, or how to prevent heat stress injuries during warm weather.**

A01

(c) Study Fig. 3.3 (Insert), which shows the damage caused by wildfires in 2024, a direct impact of how climate change affects human systems.

"The direct impacts of climate change on human systems outweigh the indirect impacts due to the geographically evenness of regions."

With reference to Fig. 3.3, to what extent do you consider this statement to be true? Explain your answer. **[9]**

To note: A complete explanation paragraph will not require all the following points

Direct impacts of climate change:

Heatwaves

- A heat wave can be defined as a period of excessively hot weather that is abnormal for the location. It usually lasts for several days or longer.
- Heat waves are projected to be hotter and more frequent with climate change.
- Heat waves can cause temperatures to be as hot as over 40°C. Such high temperatures can have adverse effects on humans such as heat stroke, difficulty breathing and even death. Heat waves have caused thousands of deaths worldwide.
- Additionally, heat waves can deplete the soil moisture necessary for crops to grow, leading to widespread crop failures. This can then affect the global food supply.
- One example is the 2003 heat wave that hit Europe. It is estimated that around 70,000 people died from the heat wave which lasted for two weeks. The heat wave affected the growth of many crops such as wheat, thereby causing the price of bread to increase significantly. Food became less affordable for people.
- In 2019, two intense heat waves raged across Europe again, breaking many historical temperature records. For instance, temperatures of 45°C were recorded in France.

Droughts

- Severe droughts are becoming more frequent, especially in places with drier climates. This is because increased temperatures brought about by climate change cause higher rates of evaporation and transpiration. Increasing rates of evapotranspiration results in the loss of soil moisture, worsening the already dry conditions.
- The World Health Organisation (WHO) estimates that globally, 55 million people are affected by droughts every year. For instance, a shortage in clean water may cause people to die of dehydration. As crops perish because of a lack of water, food supply is also affected. This can cause prolonged periods of hunger and even death.
- In Afghanistan, a severe drought that persisted from 2018 to 2019 affected more than two-thirds of the country. Over 10 million people were affected due to a lack of food, and many were displaced.

Wildfires

- Wildfires are unplanned and uncontrolled fires that happen in natural areas such as forests or grasslands.
- With a warmer and drier climate, dead trees and vegetation that have dried out become easy fire starters, setting off wildfires that are also more challenging to put out.
- Wildfires can cause humans to suffer from suffocation, burns, and other heat-related injuries. Humans may also develop respiratory illnesses if they inhale large amounts of carbon dioxide, carbon monoxide and fine particulate matter that are produced as a result of wildfires.
- Wildfires can also destroy buildings and properties, resulting in homelessness and economic losses.
- In 2019-2020, wildfires raged throughout Australia. The wildfires in Australia were difficult to contain as many parts of country were already

experiencing dry conditions. Climate change further worsened the warm and dry conditions, thereby making the fires difficult to control.

- As a result of the wildfires, air quality was at hazardous levels, posing a great risk to human health. In total, 34 people died and thousands of buildings were burnt down. Many people were also left homeless due to the wildfires

Floods

- Climate change can cause higher incidences of flooding as warmer temperatures lead to excessive rainfall in some parts of the world, specifically areas which already experience high rainfall.
- Warmer temperatures can also lead to more snowmelt. When excessive amounts of water enter water bodies, this may cause rivers and lakes to overflow their banks.
- Climate change brings about sea level rise, increasing the risk of coastal floods.
- Flooding can result in a loss of human lives as well as destruction of buildings and properties. People may become homeless as their houses are destroyed. Flooding also pollutes water sources, affecting food and water supplies. It also increases the risk of spread of waterborne diseases such as cholera.
- For example, Bangladesh is a densely-populated country that experiences seasonal flooding. This is in part due to its tropical monsoon climate, where monsoon winds bring heavy rainfall between June to September.
- Climate change has also made the country extremely vulnerable to flooding as warmer temperatures are increasing the amount of meltwater coming from the icecaps and glaciers in the Himalayas. Bangladesh is also vulnerable to coastal flooding caused by sea level rise as it is a low-lying country where many live along the coast.
- In 2020, Bangladesh experienced one of the worst flooding events brought about by the monsoon rains. This flood was estimated to have caused the deaths of 260 people. 1.3 billion homes were destroyed and the damage of agricultural crops was estimated to be valued at millions of dollars. This economic loss was substantial, especially for Bangladesh which is a developing country.

Tropical Cyclones

- Tropical cyclones are intense storms that form over warm tropical oceans.
- Cyclones are accompanied by strong winds that can exceed 320km per hour, heavy rainfall of over 100mm per day, and storm surges where the sea level can rise to a height of 6 meters.
- With climate change, oceans are warmer and there is more water vapour in the atmosphere. It is believed that these conditions are driving forces for more intense tropical cyclones to form. Places which usually experience tropical cyclones such as Vietnam and the Philippines are therefore experiencing more intense tropical cyclones as global warming continues.
- Strong winds, heavy rain, and storm surges brought by the tropical cyclones can result in loss of lives due to flooding, landslides, and collapsing buildings and infrastructure. Strong winds can also destroy buildings and crops, leading to economic losses, and threatening food security
- For example, from October to November 2020, the Philippines was hit by six tropical cyclones. The strongest typhoon that hit the Philippines

was Typhoon Goni. It brought about strong destructive winds and high rainfall, leading to a loss of lives and massive destruction of properties. Nearly 1 million people had to be evacuated. It is estimated that the damage of crops amounted to almost $36 million.

Indirect impacts of climate change:

Impact on provisioning ecosystem services

- Cliimate change causes an increase in ocean surface temperatures as well as ocean acidification. Such changes to the aquatic environment can prompt aquatic species to migrate to a more suitable environment. Hence, this may affect the number of aquatic species in some waters, thereby affecting fishermen's livelihoods.
- In fisheries, aquatic species may also die if they cannot cope with the sudden changes in the aquatic environment. For instance, rising sea levels can lead to saltwater entering rivers, which comprises of freshwater. This mixture of water may threaten freshwater fisheries and indirectly impact people who depend on the fisheries for their livelihoods. It may also affect a place's food security as fish supplies dwindle.
- In Cambodia, fish is a big part of the locals' diet, especially for people living near Tonle Sap, the largest lake in the country. With increasing temperatures and unpredictable rainfall, the water level in Tonle Sap has declined significantly, reducing fish habitats and the availability of fishes. Hence, this threatens the economic livelihoods and food security of Cambodians.
- While climate change has altered the aquatic conditions of some areas, other places in the world may benefit from changing climate conditions. For instance, places located at higher latitudes may benefit from the increase in migration of species in search of cooler waters.
- For example, in recent years, fishermen in Portugal have begun to catch new species, which were previously found in warmer regions. This increase in catch allows these places to be able to provie a more diverse range of seafood for consumers, allowing them to make more money to sustain their daily livelihood.
- Extreme weather events such as heat waves, droughts, floods, cyclones and wildfires can destroy crops, affecting food production.
- For example, in 2020, Thailand experienced its worst drought in four decades. A lack of rain and a shorter monsoon season led to dry reservoirs and barren land that affected the growth of crops.
- As Thailand's agricultural sector uses 70% of the nation's water supply, the drought had a severe impact on the farmers and the agricultural sector in Thailand. This impacts the economic livelihoods of farmers greatly.
- When food production falls and food becomes scarce, food prices will increase. This will affect the poor most since a larger proportion of their income will need to be spent on food. If people cannot afford to pay for food, this could result in malnutrition and starvation.
- For example, people in Sub-Saharan Africa and South Asia, the two poorest regions in the world, are most vulnerable to food insecurity due to climate change.

Impact on regulating ecosystem services

- As more countries in the world experience warmer temperatures, this creates more conducive environments for vectors such as mosquitoes and ticks to breed.
- Mosquitoes will also be able to migrate to higher latitudes to breed. This will increase the number of areas in the world that are at risk of vector-borne diseases. In turn, this can increase the incidences of vector-borne diseases, such as malaria, dengue fever and Zika, which are responsible for more than 700 000 deaths annually.
- Currently, most vector-borne diseases are usually located in the warmer latitudes, but it is expected that climate change will expose more people to these diseases. Studies predict that half of the world's population will be exposed to mosquito-borne diseases by 2050.
- An example of this can be seen in Bhutan, one of the coldest mountainous locations in the world. Prior to 2018, mosquitoes were non-existent in the mountainous regions of Bhutan as they could not breed in low temperatures. However, in 2019, Bhutan suffered the country's first national dengue epidemic where 19 out of the 20 districts of the country reported cases of the dengue virus.
- Hence, climate change affects regulating services provided by ecosystems by increasing the risk of vector-borne diseases. In turn, as more fall ill, this reduces the productivity level of the country as people are unable to work. The country may have to bear the added healthcare burden, and this may lead to reduced economic growth.

Impact on cultural ecosysterm services

- Climate change can result in changes to natural landscapes, which affects the cultural services provided by ecosystems.
- In general, ecosystems provide people with the following cultural services: A sense of wellbeing, a sense of place, social cohesion, and recreational and tourism opportunities.
- However, when ecosystems are altered as a result of climate change, this will have an indirect impact on humans. For instance, climate change may destroy natural landscapes. This reduces people's desire to visit the places of attraction, thereby reducing tourism revenue for the country. Individuals working in tourism-related industries may also lose their livelihood.
- An example of how climate change has affected cultural ecosystem services is the melting of the Arctic ice, which has made the region more accessible to ships. This has led to an increase in tourism opportunities for tourists who may be drawn to the Arctic landscape. This means that the Arctic tourism industry will benefit by seeing an increase in economic returns.
- However, with the melting of the ice caps, the everyday cultural practices of the Arctic indigenous people are affected.
- For instance, traditional practices such as the storing of food in ice cellars are threatened due to the melting ice.
- Ice melting has contributed to a rapid decline in the number of sled dogs, which are typically used for travel and hunting.
- The melting of ice caps may also cause sea level rise, which threatens low-lying islands such as Maldives, which relies heavily on tourism as an economic driver. With rising sea levels, many parts of Maldives will become uninhabitable.
- Corals, which are a huge tourist attraction in Maldives, would also be affected by coral bleaching brought about by warmer oceans. This will eventually lead to a reduction in tourist revenue as fewer tourists visit the Maldives.

Level	Marks	Descriptors
3	7-9	• Develops arguments that support **both sides** of the discussion clearly using a **range of points** with some **elaboration**. • **Example(s)** used demonstrate a **comprehensive** understanding of the issue or phenomenon. • **Evaluation** is derived from a **well-reasoned** consideration of the arguments.
2	4-6	• Develops arguments that support **one side** of the discussion well using **one or two points** with some **elaboration**. • **Example(s)** used demonstrate a **good** understanding of the issue or phenomenon. • Evaluation is **well-supported** by arguments. • Cap at 4-5m for arguments that support both sides of the discussion using one/two points with some elaboration and supported by example(s) which demonstrate a reasonable/appropriate understanding of the issue or phenomenon.
1	1-3	• Arguments are unclear with **limited description** or may be **listed**. • **No examples** provided or **examples are generic**, demonstrating a **basic** understanding of the issue or phenomenon. • **Evaluation is simple, missing or unclear**.
0	0	• No creditworthy response.

A03

[Total: 15]

Assessment Specification Grid

Question	Max Mark	Question part	AO1	AO2	AO3
1	20	(a)(i)		1	
		(a)(ii)	1		
		(b)(i)		3	
		(b)(ii)			2
		(b)(iii)		2	
		(c)			4
		(d)(i)	2		
		(d)(ii)		3	
		(d)(iii)		2	
		Total	**3**	**11**	**6**
2	15	(a)(i)		3	
		(a)(ii)	3		
		(b)	3		
		(c)		3	
		(d)	3		
		Total	**9**	**6**	**0**
3	15	(a)		3	
		(b)	3		
		(c)			9
		Total	**3**	**3**	**9**

AO1: 3 + 9 + 3 = 15
AO2: 11 + 6 + 3 = 20
AO3: 6 + 0 + 9 = 15

Assessment Format (with reference to 2279 Geography GCE Ordinary Level Syllabus)	▪ 3 structured questions. ▪ No more than 9 sub-parts per question. ▪ Q1 is on fieldwork. ▪ One 9-mark OEQ in either Q2 or Q3.
Recommended Weighting of AO for Sec 4 Preliminary Examination (with reference to 2279 Geography GCE Ordinary Level Syllabus)	AO1: 15% AO2: 20% AO3: 15%

AO1: Knowledge with Understanding

Candidates should be able to construct responses based on understanding of theories, generalisations, models and concepts. This will be demonstrated by the ability to:

(a) identify, describe or explain theories, generalisations, models, concepts and methods

(b) classify environments, events, methods, objects, people, processes and places into categories according to their common features

(c) explain how events, objects and processes cause changes to environments, people and places.

AO2: Skills and Analysis

Candidates should be able to apply their understanding to break down information into its component parts or to carry out an investigation. This will be demonstrated by the ability to:

(a) support conclusions using relevant material from information provided

(b) identify, describe or compare characteristics, relationships, patterns and trends shown in graphs, maps, photographs, diagrams, tables and texts

(c) compare similarities and differences between environments, events, methods, objects, people, processes and places

(d) describe or explain how to collect, process, interpret and present quantitative and qualitative data

(e) adapt methods to manage risks, limitations and achieve investigation objectives.

AO3: Judgement and Decision-Making

Candidates should be able to use defined criteria and standards to evaluate methods, outcomes and proposals. This will be demonstrated by the ability to:

(a) arrive at an overall evaluation by considering constraints and opportunities in the environment, people's varying needs, attitudes and beliefs, or the importance of sustainable development

(b) evaluate the reliability and validity of investigation findings.

CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION 2025

GEOGRAPHY **2279/02**

Paper 2 **21 August 2025**
1 hour 45 minutes

Candidates answer on the Question Paper.
Additional Materials: Insert

MARK SCHEME

1 **(a)** Explain how the planned layout of neighbourhood in a town contributes to convenience for residents. [2]

- In Singapore, each town is systematically planned to include several neighbourhoods. These neighbourhoods are strategically arranged around the town centre, where key amenities such as transport hubs, retail outlets, healthcare facilities, and community services are concentrated.
- *[Elaboration]* This town structure ensures that residents from various parts of the town can easily access essential services within a short distance.
- The integrated layout also promotes efficient mobility throughout the urban area. By concentrating services such as public transport, shops, schools, and healthcare facilities within or near the town centre, residents can reduce their reliance on private vehicles and instead make use of well-connected networks.
- *[Elaboration]* This design significantly reduces travel time for everyday tasks and commutes, which improves the overall quality of life.

(b) Using supporting examples, suggest ways in which social sustainability can be promoted in an urban neighbourhood. [5]

- **A smaller population** makes it easier for residents to engage in frequent and meaningful interactions, which can help foster a strong sense of community.
- When residents regularly come together to discuss local concerns and collaboratively solve issues, it builds a culture of participation, mutual support, and resilience—key elements of a socially sustainable neighbourhood.
- [Example] Dawson estate comprises around 3,700 residential units spread across several Build-To-Order (BTO) projects such as SkyVille @ **Dawson** and SkyTerrace @ Dawson. This smaller population size supports more frequent and meaningful interactions among residents.
- Another important factor is the presence of **shared community spaces**. Facilities such as parks and green areas provide neutral, inclusive spaces where residents can interact and build positive relationships.
- [Example] For instance, HDB incorporated features such as sky gardens, rooftop terraces, and open community spaces in the **Dawson estate**. These shared spaces are designed to encourage casual meetups and interactions among neighbours, fostering a sense of familiarity and connection.
- By attracting individuals with diverse interests and backgrounds, these communal areas also promote interaction across different social groups, strengthening social cohesion within the neighbourhood.

(c) Study Fig. 1 (Insert), which shows the 'Garden by the Roof' project implemented in Jurong West.

Using Fig. 1, describe how the ecosystem service has benefited people in the neighbourhood. [4]

- Fig. 1 illustrates a **provisioning ecosystem service**, where natural systems supply resources—specifically food—to people.
- ***"A bountiful harvest of edibles for residents,"*** indicates that the rooftop garden provides fresh produce for the local community.
- This contributes to food sustainability and supports part of the residents' nutritional needs.
- The benefit is made possible through the collective efforts of residents who came together to ***"set up MCSP rooftop garden to promote food sustainability,"*** showing how community-led urban farming can directly improve quality of life in the neighbourhood.

1 **(d)** Study Photograph A (Insert), which shows the impacts of fire hazard in a neighbourhood.

Using Photograph A, explain the negative consequences fire hazards may have on the urban neighbourhood. [4]

Health Impacts

- Fires can release high levels of toxic gases such as carbon monoxide (CO) and carbon dioxide (CO_2). Early signs of carbon monoxide poisoning include headaches, dizziness, weakness, and confusion. Exposure to high concentrations can lead to loss of consciousness and even death.
- *[Elaboration]* In addition, acidic gases and other chemical irritants released during fires can cause permanent damage to the respiratory system. Smoke inhalation can lead to severe breathing difficulties and suffocation, which are common causes of fire-related fatalities.
- These health risks are visually represented in Photograph A, where *individuals in the foreground* are seen wearing masks, likely as a protective measure against toxic fumes and smoke.

Economic Impact

- Fires can cause extensive destruction to residential and commercial properties, as shown in the *background of Photograph A*. The loss of goods, furniture, and important documents contributes to significant economic losses.
- Beyond the immediate destruction, post-fire recovery costs—including expenses for repair, rebuilding, and restoration—can place a heavy financial burden on property owners.
- *[Elaboration]* This often disrupts business operations and displaces affected families, further compounding the social and economic impact of the fire.

Social Impact

- Fires can also lead to significant emotional and psychological trauma for those affected. The immediate shock of losing one's home, belongings, or even loved ones can leave individuals deeply shaken.
- In the left foreground of the image, the individuals appear visibly distressed — their body language and facial expressions suggest they may be experiencing acute stress, grief, or anxiety. These emotional responses are common in the aftermath of a fire, especially when individuals are suddenly displaced or have witnessed traumatic events.
- *[Elaboration]* Children and elderly residents are more vulnerable to lasting psychological effects, which may hinder their ability to resume normal routines or reintegrate into school or community life. This trauma can ripple through families and neighbourhoods, weakening social bonds and increasing the need for emotional support and counselling services.

2 **(a)** Study Table 1 (Insert), which shows the characteristics of selected major earthquakes.

Using Table 1, compare how the characteristics of the four earthquakes affected the death toll and economic loss of each location. [5]

Vulnerable Conditions – building condition/geology:

- **[Similarity]** A clear similarity is observed in Haiti (2010) and Türkiye–Syria (2023), where widespread building collapse occurred due to non-engineered or poorly regulated structures. This led to devastating death tolls of ~230,000 and ~59,000, respectively.
- **[Similarity]** Similarly, the Indian Ocean earthquake (2004) impacted many coastal communities in Sumatra that lacked seismic-resistant infrastructure, resulting in an estimated 227,000 deaths.
- **[Difference]]** In contrast, Japan's Tōhoku region had implemented strict earthquake building codes, which greatly limited structural failure and helped reduce fatalities—even though the event had a magnitude of 9.0, only ~19,700 lives were lost.

Vulnerable Conditions - Soil Composition:

- **[Similarity]** a common vulnerability in Haiti and Türkiye–Syria was that many affected urban areas were constructed on soft sediments or alluvial plains. These geological conditions amplified seismic waves, increasing the intensity of shaking and the extent of structural damage. This likely contributed to their extremely high death tolls—~230,000 in Haiti and ~59,000 in Türkiye–Syria.

- **[Similarity] Tōhoku** experienced **liquefaction** in reclaimed coastal areas causing the economic loss to be the highest at $235 billion despite having the lowest death toll.

Distance from epicentre:

- **[Similarity]]** The distance from the epicentre also played a crucial role. Both Haiti and Türkiye–Syria had onshore epicentres located close to major population centres—~25 km from Port-au-Prince and ~37 km from Gaziantep, respectively. This proximity meant intense shaking directly impacted highly populated areas, contributing to high human losses: ~230,000 in Haiti and 59,000 in Türkiye–Syria.
- **[Difference]** In contrast, the epicentre of the Tōhoku earthquake was offshore, approximately 70 km from the nearest major cities (Sendai), which led to a significantly lower death toll at 19, 700 lives lost.

Magnitude

- **[Similarity]** All four earthquakes were powerful, each registering a magnitude above 7.0. The 2004 Indian Ocean earthquake (magnitude 9.3) and the 2011 Tōhoku earthquake (magnitude 9.0) were the strongest, causing massive destruction and economic losses of approximately $15 billion and $235 billion respectively. Despite having the lowest magnitude (7.0), the 2010 Haiti earthquake resulted in an estimated USD 8 billion in economic losses and a devastating death toll of around 230,000 lives

(b) Study Photograph B (Insert), which shows some tectonic hazards that affected the town of Beichuan, China, following the Wenchuan earthquake in 2008.

With reference to Photograph B, explain how tectonic hazards can affect natural systems. [4]

- **Ground shaking** during an earthquake can cause significant damage to terrestrial ecosystems, particularly forests. The intense vibrations can fracture tree trunks, uproot vegetation, and lead to the collapse of forest canopies. This results in widespread loss of plant life, which not only reduces biodiversity but also disrupts the structure of the ecosystem.
- As habitats are damaged or destroyed, food sources and breeding grounds for many species are lost, which can lead to population declines or displacement of wildlife. In addition, terrestrial animals may be injured or killed by falling trees, branches, or debris, further contributing to biodiversity loss and ecological imbalance.

- **Soil liquefaction** occurs when saturated soil temporarily loses its strength and behaves like a liquid due to intense seismic shaking. This can have serious environmental consequences. Trees and vegetation rooted in the affected soil may tilt, sink, or topple, resulting in the destruction of large areas of forest and vegetation cover.

- The dislodged soil can flow into nearby water bodies, such as rivers and lakes, leading to sediment build-up that smothers aquatic plants and disrupts aquatic ecosystems.
- Moreover, if underground sewage pipes are damaged during the event, untreated waste may leak into rivers, contaminating the water and harming or killing aquatic organisms due to oxygen depletion and the presence of toxins.

- **Landslides** triggered by seismic activity can have wide-reaching effects on both land and aquatic ecosystems. Large masses of soil, rocks, and vegetation may slide down slopes, burying forests, wetlands, and habitats in their path. This leads to immediate destruction of plant and animal ecosystems and leads to the death of fish and other life and a significant reduction in biodiversity.
- When the debris reaches rivers, it can pollute the water, disrupting aquatic species. In some cases, the volume of debris may block rivers, forming temporary dams. When these natural dams collapse, they may cause sudden floods, which further damage downstream ecosystems by eroding banks, uprooting vegetation, and introducing large amounts of sediment and contaminants into the water.

- When a **tsunami** strikes, the massive influx of seawater inundates coastal areas, leading to coastal erosion and the removal of large amounts of soil, vegetation, and sediment. This sudden change in landform can alter natural drainage patterns, reshape coastlines, and degrade habitats such as wetlands, beaches, and dunes.
- The powerful wave energy also damages or destroys marine ecosystems, such as coral reefs and seagrass beds, by smothering them with debris and sediment or breaking apart their physical structures. In addition, the force of the waves can disturb the ocean floor, displacing marine life and altering the balance of local ecosystems.

(c) Evaluate the potential risks and benefits associated with living near volcanic regions. [6]

Benefits:

- **Farming with fertile soil**
    - Volcanic areas often have extremely fertile soil due to the breakdown of volcanic ash and lava over time. These materials are rich in minerals like potassium and phosphorus, which are essential for plant growth.
    - As a result, volcanic regions support productive agriculture, especially for crops like coffee, grapes, and rice. This makes volcanic regions attractive for farming communities and supports local food production and economic stability.

- **Extracting precious minerals and fossil fuels**
  - Volcanic activity brings valuable minerals closer to the Earth's surface, making them easier to extract. These include copper, silver, gold, and sulphur. Mining these resources can generate significant income and employment for local populations.
  - The presence of such natural resources creates economic opportunities and contributes to regional development.

- **Harnessing geothermal energy**
  - Volcanic regions are ideal for harnessing geothermal energy due to the high temperatures beneath the Earth's surface. This renewable energy source can be used to generate electricity and provide heating, reducing dependence on fossil fuels.
  - This not only supports sustainable development but also lowers greenhouse gas emissions, making volcanic regions important for clean energy solutions.

- **Tourism activities**
  - Volcanic landscapes often attract large numbers of tourists due to their unique natural features, such as craters, hot springs, and lava fields.
  - Tourism creates jobs and boosts local economies through spending on accommodation, transport, food, and guided tours. While there are risks, the income generated from tourism helps improve infrastructure and public services in volcanic regions.

Risks:

- **Destruction to properties and infrastructure**
  - Volcanic eruptions can cause widespread destruction to homes, buildings, roads, and other critical infrastructure. Lava flows, pyroclastic materials, and ashfall can collapse roofs, ignite fires, and damage transport networks.
  - This leads to significant financial loss for individuals and governments, as rebuilding efforts require extensive time and resources. The destruction of infrastructure also disrupts daily life and slows down economic recovery in affected areas.

- **Disruption of services**
  - Volcanic activity can severely disrupt essential services such as electricity, water supply, transportation, and communication networks. Ashfall can contaminate water sources and damage power lines, while roads and airports may become inaccessible.
  - These disruptions hinder emergency response efforts and affect the delivery of aid and supplies. Prolonged service interruptions can lower the quality of life for residents and delay the return to normalcy after an eruption.

- **Threats to public health, injuries and fatalities**
  - Volcanic eruptions pose serious threats to human health and safety. Ash particles and gases released during an eruption can cause respiratory issues, skin irritation, and eye problems. People may suffer injuries from falling debris or burns from hot gases and lava.
  - In severe cases, eruptions can lead to fatalities, especially when evacuation is delayed or when people live in high-risk zones. The psychological impact of loss and trauma also affects community well-being.

- **Destruction of ecosystem**
  - Volcanic eruptions can lead to the destruction of natural habitats and ecosystems. Lava flows and ash deposits can wipe out vegetation, kill wildlife, and alter the natural landscape. This loss of biodiversity disrupts food chains and can have long-term ecological consequences.
  - Recovery of ecosystems may take years or even decades, affecting both the environment and the communities that depend on it for resources and livelihoods.

[compulsory evaluation]

(A) While living in volcanic zones offers economic and environmental benefits, the severe risks to life, property, and ecosystems often outweigh these advantages, especially in areas with frequent or unpredictable eruptions.

(B) Despite the potential hazards, volcanic areas can be highly beneficial when proper monitoring, planning, and response systems are in place. With effective risk management, communities can safely harness the environmental and economic advantages of living near volcanoes.

3 (a) Fig. 2 (Insert) shows Singapore's annual average PM2.5 concentration over the last 10 years.

Using Fig. 2, describe how Singapore's average PM2.5 concentration has changed between 2014 and 2023. [3]

- Fig. 2 shows a consistently decreasing trend of PM2.5 concentration - by 10 $\mu g/m^3$ over the decade from 16 $\mu g/m^3$ to 6 $\mu g/m^3$.
- Steepest decline observed between 2017 – 2018 at 2.5 $\mu g/m^3$.
- Annual average PM2.5 increased between 2018 and 2019, an increase of 1 $\mu g/m^3$ - an anomaly in the largely decreasing trend.

(b) With the use of specific examples, explain how Singapore has applied mitigation strategies to strengthen its climate resilience. [4]

[Mitigation strategy] Green buildings and clean energy

- One major initiative is the **Green Building Masterplan**, which encourages the development of environmentally sustainable buildings. These buildings are designed to improve energy and water efficiency, reduce waste, and use eco-friendly materials – lowers the overall resource consumption and carbon footprint of buildings.
- For example, in 2012, Parkroyal Hotel on Pickering received the Green Mark Platinum rating for incorporating energy-saving features such as LED lighting and photovoltaic cells to harness solar power. As a result, the hotel saves over 3,000 megawatt-hours (MWh) of energy annually.

- Singapore has also made significant progress in using **cleaner energy** sources as part of its strategy to enhance climate resilience through mitigation. This transition has played a crucial role in reducing Singapore's overall greenhouse gas emissions while maintaining energy security. By using a cleaner energy source, Singapore reduces its contribution to global warming and strengthens its ability to adapt to future climate risks.
- Since 2018, approximately 95% of the nation's electricity has been generated from natural gas, which is the cleanest-burning fossil fuel available.

- In addition to natural gas, Singapore is diversifying its energy mix by investing in **renewable energy**, especially solar power, which is more sustainable in the long term. Given land constraints, Singapore has developed innovative solutions such as floating solar photovoltaic (PV) systems on reservoirs. This not only reduces carbon emissions but also supports a greener water treatment process, making essential public utilities less reliant on fossil fuels.
- For example, the Tengah Reservoir floating solar farm, launched in 2021, is one of the world's largest inland floating solar installations. It can generate up to 60 megawatt-peak (MWp) of electricity—enough to power about 16,000 four-room HDB flats annually.

(c) Fig. 3 (Insert) shows the tourism performance in Singapore in 2022.

Using Fig. 3, describe the economic impacts brought about by tourism. [4]

Generation of income:

- In Q1, tourism receipts reached **$1.3 billion, marking a 213%** increase compared to the same period in the previous year.
- This sharp rise reflects the strong recovery of the tourism sector and increased tourist spending across various industries. The boost in tourism receipts strengthens the national economy.

Employment opportunities:

- The accommodation sector experienced a **344% increase**, indicating a sharp rise in demand for hotel and lodging services.
- This in turn stimulates job creation across multiple sectors - creates more jobs for hotel staff, cleaners, front desk personnel, and maintenance workers.
- The **retail sector** saw a **373% increase** in spending, especially in shopping-related activities.
- This surge supports employment in sales, customer service, logistics, and supply chain operations. As tourist demand increases, businesses expand their workforce to meet service expectations.

(d) 'A competitive economy is more important than a sustainable environment in ensuring Singapore's sustainable development.' [9]

To what extent do you agree with this view? Explain your answer.

Competitive Economy: This is crucial to ensure a competitive economy, sustainable environment, and a high quality of life for all. A sustainable Singapore ensures a competitive economy despite its small landmass and limited natural resources. By continually reviewing and shifting economic strategies, Singapore can attract investments and provide employment opportunities to stay relevant and competitive in an economy.		
	Strengths	**Limitation**
Attractive investment:	**Early Phase – Industrialization (1960s–70s)** Attracted multinational corporations (MNCs) to invest in Singapore's economy. Enabled scaling up of manufacturing and use of foreign capital to build key infrastructure (e.g., roads, ports, utilities). *Example: In 1961, Shell, a global MNC, built Singapore's first oil refinery — kickstarting the petrochemical industry.* Foreign investments facilitated the transfer of knowledge, expertise, and technical skills to local firms. This	**Overdependence on Foreign Capital** • FDI accounts for over 200% of Singapore's GDP (World Bank, 2022), showing high reliance on external investors. • During the 2008 Global Financial Crisis, Singapore's GDP shrank by 0.6% in 2009, as MNCs cut operations and demand plummeted. **Environmental Impact**

	helped develop local industries and increase economic self-reliance over time. **Shift to Higher-Value Industries (1980s)** Transitioned from labor-intensive to higher-value sectors like electronics and petrochemicals to stay competitive. This shift was supported by government policies, workforce upgrading, and education. Despite the 1985 economic recession, Singapore continued attracting foreign investments by diversifying its economy. Expanded into financial services, info communication technology (ICT), and entertainment sectors. **Modern-Day Success** In 2022, Singapore was the third-largest recipient of foreign direct investment (FDI) globally. Remains attractive to investors due to: • Political stability • Transparent legal system • Efficient governance • World-class infrastructure Continues to uphold a reputation as a safe, business-friendly global hub. Attracting foreign investment supports Singapore's sustainable development by driving economic growth, creating quality jobs, and enabling a shift to high-value, low-carbon industries. This builds long-term economic resilience, supports innovation, and helps maintain a high quality of life.	• Singapore's manufacturing sector contributes about 60% of national industrial emissions, with petrochemicals and semiconductors among the largest emitters. • The Pulau Bukom refinery, operated by Shell, processes 500,000 barrels/day and contributes significantly to air and water pollution, despite modern controls. • Rising carbon tax rates (from $5/ton in 2019 to $25/ton in 2024 and projected to reach $50–80/ton by 2030) reflect the environmental cost of sustaining heavy industries. **Resource Strain** • The semiconductor industry, heavily driven by foreign investment (e.g., GlobalFoundries' $4 billion expansion in 2021), uses large volumes of ultra-pure water and electricity. • Singapore's land area is only 728 km². Industrial investments compete with housing, green spaces, and food security land use (e.g., 30x30 food goal). Overreliance on foreign investment can threaten Singapore's sustainable development by making the economy vulnerable to global shocks and causing environmental pollution. Heavy industries funded by foreign capital also strain limited water and land resources, challenging efforts to protect green spaces and ensure food security.
Provide employment opportunities	**Job Creation through Foreign Investment (1960s–1970s)** • Singapore attracted **multinational corporations (MNCs)** like **Shell** and **Texas Instruments** to set up operations in Jurong	**Job Quality vs Quantity** • Not all jobs created are high-quality or future-proof. • In a highly competitive economy, some jobs—especially in services, gig work, or logistics—may be

[Turn over

	Industrial Estate, Singapore's first industrial hub. • This spurred job creation in **labour-intensive industries** such as electronics, textiles, and shipbuilding. • By **1970**, Singapore achieved **near full employment**, with unemployment dropping to around **3%**. • **Texas Instruments (1968)** was one of the first MNCs to establish a manufacturing plant in Singapore, creating over **1,000 jobs** in its early years and paving the way for Singapore's electronics boom. **Economic Diversification & Skills Development (1980s)** • The Economic Development Board (EDB) shifted Singapore's economy toward capital- and technology-intensive industries, moving away from basic assembly work. • Investment flowed into wafer fabrication, precision engineering, and personal computer manufacturing. • In 1986, Seagate Technology, a US-based data storage giant, set up a major operation in Singapore. It later became the company's largest overseas site, employing over 8,000 workers by the early 2000s. • Government launched ITE and polytechnic education reform and created schemes like Skills Development Fund (1979) to support training. • This upskilling enabled local to take on more technical roles in engineering, R&D, and operations. **Growth of the Water Industry – A Sustainable Sector** • Singapore invested heavily in desalination and NEWater	low-wage, unstable, or lack career progression. • Over-reliance on such jobs can lead to income insecurity, even if unemployment remains low. • *E.g. In 2022, ~14% of employed residents in Singapore earned below $2,500/month despite strong GDP growth.* **Labour Market Saturation** • An open economy can result in competition between locals and foreign workers, especially in PMET (Professional, Managerial, Executive and Technician) roles. • While foreign talent supports innovation, excessive dependence can lead to local frustration, job displacement, and social tensions. **Environmental Trade-Offs** • Some industries that generate employment—like manufacturing, aviation, and construction—have significant environmental footprints (e.g. carbon emissions, resource use). • *E.g. Manufacturing alone contributes ~60% of Singapore's industrial CO_2 emissions.* • Pursuing job creation without environmental safeguards may undermine Singapore's green targets (e.g. net zero by 2050). **Job Obsolescence Due to Technology** • Jobs created today may be obsolete tomorrow due to automation, AI, or industry transformation. • Without continuous upskilling, workers may become structurally unemployed. • *Infocomm Media Development Authority*

[Turn over

	as part of its **"Four National Taps"** strategy to reduce water dependency.
	• The expansion of water tech led to significant job creation in a sustainability-focused sector.
	• Hyflux Ltd., a Singapore-based water treatment company, played a key role in early desalination projects like the Tuaspring Desalination Plant.
	• According to PUB, the water industry supported around 14,400 jobs and contributed S$2.5 billion to GDP in 2018.
	• The Singapore International Water Week (SIWW) and Global HydroHub initiatives also positioned Singapore as a centre for water R&D and business.
	
	Advanced Manufacturing and Industry 4.0
	• Singapore has embraced Industry 4.0, using AI, robotics, and automation to transform manufacturing.
	• This aims to create high-skilled jobs and boost economic output.
	• GlobalFoundries, a US semiconductor giant, invested S$5 billion in building a new wafer fab in Woodlands (2021).
	  ○ The project is expected to create 1,000 new high-value jobs, including technicians, engineers, and IT specialists.
	• According to EDB projections, Industry 4.0 is forecast to:
	  ○ Add S$3.6 billion in manufacturing output
	  ○ Generate 22,000 new jobs by 2024
	
	Long-Term Workforce Planning and Resilience
	• The Singapore government continues to support
		projects 20,000 ICT jobs yearly, but skills gaps persist.
		
		Creating many jobs alone doesn't guarantee sustainable development because some jobs may be low-paying, unstable, or at risk of automation. Competition with foreign workers can cause social tension, and some industries harm the environment. Without ongoing skills training, workers may lose their jobs, threatening economic and social stability.

[Turn over

	workforce transformation through initiatives like: ○ SkillsFuture Credit (launched in 2015) to fund adult learning ○ TechSkills Accelerator (TeSA) for digital sector skills training • Collaboration with MNCs (e.g., Google, IBM, Siemens) ensures training is aligned with industry demands. • This helps maintain employment resilience in the face of automation and technological disruption. Foreign investment has been key to Singapore's sustainable development by consistently generating quality employment across decades — from low-skilled factory jobs in the 1960s to high-tech roles in advanced manufacturing today. This job creation supports **inclusive economic growth**, **social stability**, and **skills upgrading**, ensuring citizens benefit from development. Investments in sustainable sectors like water technology and Industry 4.0 also align with Singapore's long-term vision of a **resilient, green, and innovation-driven economy**, helping it stay competitive while preparing the workforce for future challenges.	

Sustainable Environment: A sustainable Singapore ensures that the environment is clean and healthy with excellent air and water quality to benefit people and the economy.

	Strengths	**Limitation**
Clean and healthy environment	**Environmental Rights – A Global Priority** • In 2022, the United Nations General Assembly declared that access to a clean, healthy, and sustainable environment is a universal human right. • This reinforced the global importance of environmental protection as a foundation for public health, social	**High Environmental Standards Can Increase Cost of Living** • Stringent environmental regulations (e.g. carbon tax, green building standards, waste management systems) can **raise business and living costs**. ○ Example: Singapore's **carbon tax**, raised from

[Turn over

	justice, and sustainable development that Singapore places importance in. **Singapore's Longstanding Environmental Vision** • Even before the global push, Singapore recognised the need to protect the environment while growing its economy. • Under the late Mr Lee Kuan Yew, Singapore developed a vision for a "Clean and Green City" as early as the 1960s, believing it was essential to attract investment and improve living standards. **Singapore River Clean-Up (1977–1987)** • The Singapore River and Kallang Basin were heavily polluted by untreated waste from industries, squatters, and hawkers. • In 1977, a 10-year, $300 million government-led clean-up was launched to restore water quality and rejuvenate the area. • Achievements included: o Relocation of over 26,000 squatters and 4,000 street hawkers o Closure of 610 pig farms and 500 duck farms o Construction of proper sewage systems • By 1987, the river was declared clean, and it is now a prime commercial and recreational district (e.g. Boat Quay, Marina Bay). **Island-Wide Tree Planting Campaign** • The government implemented nationwide tree planting drives beginning in 1971 to improve air quality and reduce urban heat.	**$5/tons to $25/tons in 2024**, may lead to higher utility and production costs. • These costs can be **passed on to consumers**, contributing to inflation and cost-of-living pressures—especially for low-income households. **Clean Environment ≠ Climate Resilience** • A city can appear clean and green but still be vulnerable to climate risks, such as: o Rising sea levels: Singapore is only ~15m above sea level on average. o Flooding: Over 100 flood-prone areas were identified in the early 2000s. o Extreme heat: Urban Heat Island effect can cause local temps to rise 4–7°C higher than rural areas. • Addressing these risks requires infrastructure adaptation, not just environmental cleanliness. • Singapore plans to spend over S$100 billion over the next century on climate adaptation measures, including coastal protection **Clean Environment Doesn't Guarantee Green Consumption or Behaviour** • Despite having clean public spaces, consumer behaviour may still be unsustainable • Singapore's domestic waste generation in 2023 was around 1.8 million tonnes, with only 6% of plastic waste recycled • High rates of electronic and food waste persist despite awareness efforts. • Sustainability requires a shift in lifestyle and consumption habits, beyond environmental hygiene.

[Turn over

	• Initiatives include:
	  ○ Annual Tree Planting Day, involving students, residents, and government officials.
	  ○ Over 2 million trees have been planted as of 2022.
	  ○ Greenery now covers around 47% of Singapore's land area.
	• This enhances urban biodiversity, provides shade, and supports climate resilience.
	
	Modernising Street Food Culture through Hawker Centres
	• In the 1970s–1980s, unregulated street hawkers were moved into purpose-built hawker centres.
	• Over 18,000 hawkers were registered and relocated island-wide to:
	  ○ Improve sanitation and waste disposal
	  ○ Reduce pollution and overcrowding
	  ○ Promote food safety and better public hygiene
	• Cleaner streets, fewer vermin, and improved environmental health.
	• In 2020, Singapore's hawker culture was recognized by UNESCO for its cultural and social significance.
	
	Civic Responsibility through the 'Keep Singapore Clean' Movement
	• Launched in 1968, the movement aimed to instill a culture of cleanliness and civic pride.
	• Focus today is on moving from being a "cleaned city" (cleaned by workers) to a "truly clean city"
	• Campaigns include:
		Economic Losses from Water Pollution
		• In 2015, the East Johor Straits experienced a plankton bloom due to pollution and poor water quality.
		• The bloom depleted oxygen levels, causing mass fish deaths.
		• Impact:
		  ○ About 600 tonnes of fish died.
		  ○ Coastal fish farms in Changi and Lim Chu Kang reported losses of up to S$3 million
		• This highlighted the vulnerability of Singapore's aquaculture sector to environmental degradation.
		
		Environmental and Residential Disruptions
		• In 2020, an algae bloom occurred in a canal at Sentosa Cove, a high-end residential area.
		• Effects included:
		  ○ Death of dozens of fish
		  ○ Emission of foul odours, affecting residents' quality of life.
		• This incident drew attention to how even premium residential zones are not immune to consequences of poor water management or pollution.
		
		High environmental standards can raise living costs and impact low-income households. A clean environment doesn't guarantee protection from climate risks like flooding or heat. Despite cleanliness, unsustainable consumption and pollution still cause economic losses and affect residents' quality of life. Sustainable development requires more than just high standards—it needs broad, adaptive solutions.

[Turn over

	○ Public education on littering and recycling ○ Community clean-ups involving schools and volunteers Singapore's focus on environmental rights and cleanliness is vital for sustainable development because it ensures public health, social well-being, and economic growth. Early efforts like cleaning the Singapore River, planting trees, and modernizing hawker centres improved living standards and made the city more attractive to investors and tourists. These actions help Singapore stay resilient, protect biodiversity, and maintain a high quality of life for future generations.	
Excellent air and water quality	**A Clean Environment Boosts Singapore's Global Appeal** • Singapore's high environmental standards help position it as a first-world oasis in Southeast Asia. • With excellent air and water quality, Singapore provides a comfortable, safe, and hygienic environment for residents, businesses, and visitors. **Attractiveness to Tourists** • In 2023, Singapore welcomed approximately 13.6 million international tourists, making it the 6th most visited country in the Asia-Pacific region • While driven largely by: ○ World-class infrastructure and facilities, ○ High public health standards, and ○ Efficient transport and safety systems, • The clean air, green spaces, and safe drinking water enhanced its reputation as a	**Environmental Quality Can Be Temporarily Disrupted by Regional Events** • Despite Singapore's strict pollution control and clean air goals, external factors like transboundary haze undermine air quality. • In 2015, haze from Indonesian forest fires pushed PSI (Pollutant Standards Index) to above 300 (hazardous): ○ Led to school closures, health advisories, and estimated economic losses of up to S$1.83 billion ○ Caused a spike in respiratory illnesses and increased public health spending. • Shows that air quality is vulnerable to external factors beyond local control. **High Water Quality Relies on Energy-Intensive Technology** • Singapore's water security is highly dependent on

	pleasant, high-quality travel destination. • Key attractions such as Gardens by the Bay, Marina Bay, and Singapore Botanic Gardens (UNESCO World Heritage Site) rely heavily on clean, well-maintained environments. **Appeal to Foreign Investors and Talent** • High environmental standards serve as a signal of strong city management and government efficiency. • This helps attract: o Foreign Direct Investment (FDI), o High-skilled professionals, and o Multinational headquarters. • In 2022, Singapore was the third-largest recipient of FDI globally, after the US and China (UNCTAD World Investment Report, 2023). • The environment is increasingly a key factor in talent mobility, especially for workers who prioritise livability and eco-conscious urban planning. **Consequences of Environmental Lapses – The 2015 Haze Crisis** • The transboundary haze crisis in 2015, caused by forest fires in Indonesia, severely impacted Singapore: • Economic losses estimated at up to S$1.83 billion. Rise in haze-related illnesses such as asthma and bronchitis. Temporary school closures due to unsafe PSI (Pollutant Standards Index) levels above 300 (hazardous) • Reduced tourism arrivals and business disruptions • Increased household costs for: o Air purifiers and air-conditioning	advanced solutions like desalination and NEWater. o While ensuring safe water, these are energy-intensive and costly to operate. o Example: Desalination uses up to 3.5 kWh of electricity per cubic metre of water—much higher than traditional water sources. • Over-reliance on such systems may increase carbon emissions, unless balanced with renewable energy and efficiency improvements. **Does Not Guarantee Resource or Energy Sustainability** • Excellent water and air quality do not automatically ensure: o Efficient resource use o Low-carbon emissions o Circular economy practices • Example: In 2023, Singapore's domestic waste generation was 1.82 million tonnes, with only 6% of plastic waste recycled. • A truly sustainable development model must integrate waste reduction, energy efficiency, and green consumption behaviours alongside environmental quality. **Quality May Be Maintained at the Expense of Other Resources** • To uphold environmental quality, there is often heavy investment in infrastructure and imported technology. • These costs can be a burden on fiscal resources or result in higher costs passed to consumers. • The Tuas Water Reclamation Plant, a key

[Turn over

	○ Face masks and medical care • Government incurred extra expenditure on: ○ Cloud seeding ○ Regional fire suppression efforts ○ Health and emergency response measures **Sustaining High Standards – The Singapore Green Plan 2030** • To future-proof the environment and economy, Singapore launched the Green Plan 2030, which includes: ○ Expanding green spaces and nature parks ○ Tightening vehicle emissions and industrial pollution controls ○ Doubling the number of EV charging points to 60,000 by 2030 ○ Strengthening coastal protection and water resilience through projects like the Tuas Water Reclamation Plant ○ Targeting to plant 1 million more trees across the island by 2030. Maintaining excellent air and water quality is crucial for Singapore's sustainable development because it attracts tourists, investors, and skilled workers by ensuring a healthy and pleasant environment. Environmental lapses like the 2015 haze caused economic and health problems, showing the importance of strong sustainability efforts. The Green Plan 2030 helps protect these standards for long-term growth and quality of life.	project under the Green Plan, costs over S$6.5 billion and is expected to begin operations by 2026. ○ While necessary, such projects must be carefully managed to balance sustainability and economic affordability. Singapore's high environmental quality can be disrupted by external factors like regional haze and relies on costly, energy-intensive technologies. Good air and water quality don't guarantee resource efficiency or low waste. Maintaining these standards requires expensive infrastructure, which can strain the economy. Sustainable development needs a balanced approach beyond just environmental quality.

[Turn over

Level	Marks	Descriptors
3	7-9	• Develops arguments that support **both sides** of the discussion clearly using a **range of points** with some **elaboration**. • **Example(s)** used demonstrate a **comprehensive** understanding of the issue or phenomenon. • **Evaluation** is derived from a **well-reasoned** consideration of the arguments.
2	4-6	• Develops arguments that support **one side** of the discussion well using **one or two points** with some **elaboration**. • **Example(s)** used demonstrate a **good** understanding of the issue or phenomenon. • Evaluation is **well-supported** by arguments. • **Cap at 4-5m for arguments** that support **both sides** of the discussion using **one or two points with some elaboration** and supported by **example(s)** which demonstrate a **reasonable/appropriate** understanding of the issue or phenomenon.
1	1-3	• Arguments are unclear with **limited description** or may be **listed**. • **No examples** provided or **examples are generic**, demonstrating a **basic** understanding of the issue or phenomenon. • **Evaluation** is **simple, missing or unclear**.
0	0	• No creditworthy response.

End of Paper