Singapore Examinations and Assessment Board

CAMBRIDGE International Education

Singapore–Cambridge Secondary Education Certificate (2027)

G2 Geography (Syllabus K226)

CONTENTS

INTRODUCTION

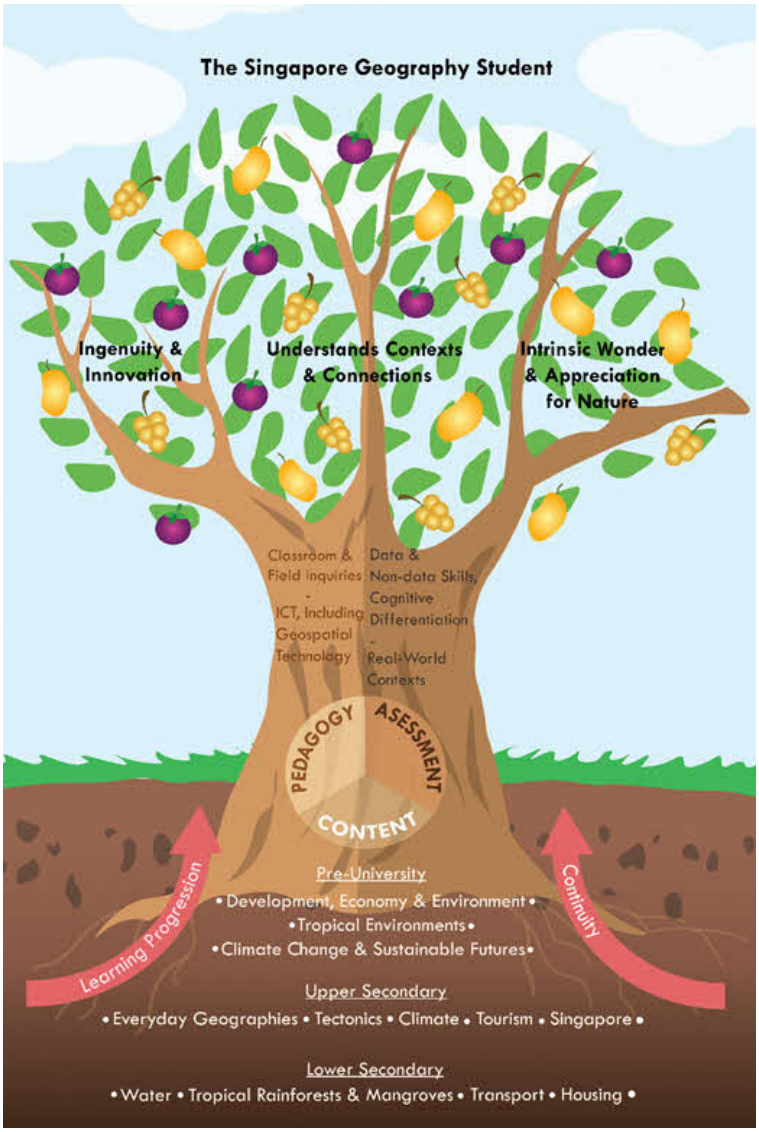
At all levels of study, Geography bridges the humanities, social and natural sciences. It is a holistic subject that provides students with integrative ways of understanding the real world. Students will explore Earth, its natural and man-made environments, and examine the interactions of humans with these environments from the personal to global scales. Geography fascinates and inspires students, enabling them to gain a deep appreciation of Earth's beauty, the immense power of natural forces, and the ingenious ways humans thrive under different circumstances. Through Geography, students will understand how places and landscapes evolve, deliberate on consequences arising from our everyday decisions, and experience the mosaic of cultures and societies.

Fieldwork satisfies and nourishes students' curiosity about contemporary issues that affect their communities. Through fieldwork, students apply their classroom learning in the real world to make new discoveries. They also get to hone their abilities to generate innovative solutions and help make our world a better place. Such learning experiences make Geography a vital resource in enabling students living in an interconnected world to discover what it means to live sustainably and exist harmoniously with one another and with other living species.

The Geography Curriculum Concept

The Geography Curriculum Concept (Figure 1) articulates the aspirations of Geography education in Singapore, from Secondary to Pre-University. It signals a shared belief regarding the nature, purpose and structure of Geography for all levels of study so that all stakeholders can better support students' growth as they progress from one level of study to the next.

Figure 1: The Geography Curriculum Concept



AIMS AND LEARNING OUTCOMES

AIMS

This syllabus enables students to:

1 acquire knowledge and skills to describe, explain and analyse geographical phenomena and processes that occur in Singapore and beyond

2 examine selected geographical phenomena and processes by analysing data

3 be aware of different value orientations towards the environment, which influence people's actions

4 be imbibed with a sense of responsibility towards the environment; and

5 be provided with opportunities to discuss solutions and take actions to achieve a more sustainable world.

LEARNING OUTCOMES

Knowledge and Understanding

This syllabus develops students with the knowledge and understanding of:

- geographical phenomena and processes that occur in Singapore and beyond
- geographical concepts associated with selected natural and human phenomena
- geographical methods of inquiry to investigate selected natural and human phenomena and processes; and
- sustainable development and approaches that enhance the sustainability of our world at various scales.

Skills

This syllabus seeks to equip students with skills to:

- analyse geographical data
- interpret geographical data to recognise patterns and trends, and suggest relationships
- pose relevant geographical questions to learn about natural and human phenomena and processes
- apply selected geographical concepts and methods to investigate natural and human phenomena and processes; and
- evaluate geographical information to make reasoned decisions.

Values and Attitudes

This syllabus seeks to nurture in students:

- an awareness of different value orientations towards the environment, which influence people's actions; and
- a sense of responsibility towards the environment, and a desire to contribute towards building a sustainable future.

ASSESSMENT OBJECTIVES

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.

Assessment Specification Grid

The table below shows the approximate weighting of the Assessment Objectives in the syllabus.

Assessment Objectives	Weighting for Paper 1	Weighting for Paper 2
AO1: Knowledge with Understanding	20%	20%
AO2: Skills and Analysis	20%	20%
AO3: Judgement and Decision-Making	10%	10%
Total	**50%**	**50%**

SCHEME OF ASSESSMENT

Paper 1 **1h 45min** **50 marks** **50%**	Candidates answer <u>two</u> compulsory structured questions. • **Question 1***: Cluster 1 – Geography in Everyday Life (*Topic 1.3*) (25 marks) • **Question 2**: Cluster 2 – Tourism (25 marks) Each structured question will consist of no more than 12 sub-parts. Candidates will be required to answer <u>one</u> 6-mark question testing AO3 in Question 2. This question will be marked using generic level descriptors. All other questions in this paper will be point-marked. ** Question 1 is on fieldwork. The fieldwork context may or may not be based on any of the clusters in the syllabus.*
Paper 2 **1h 45min** **50 marks** **50%**	Candidates answer <u>two</u> compulsory structured questions. • **Question 1**: Cluster 1 – Geography in Everyday Life (*Topics 1.1 and 1.2*) (25 marks) • **Question 2:** Cluster 3 – Climate (25 marks) Each structured question will consist of no more than 12 sub-parts. Candidates will be required to answer <u>one</u> 6-mark question testing on AO3 in Question 2. This question will be marked using generic level descriptors. All other questions in this paper will be point-marked.

USE OF CALCULATORS

An approved calculator may be used in both papers.

SYLLABUS FRAMEWORK AND OUTLINE

The G2 Geography syllabus is organised by topics that are grouped according to clusters to achieve a balance between breadth and depth of content coverage. A key feature is the close examination of students' everyday experiences using geographical concepts and methods in the Geography in Everyday Life Cluster. This would elevate the relevance and applicability of Geography learning. Additionally, this would enable students to learn new concepts and skills in familiar environments, before applying them to understand different contexts featured in the subsequent clusters. Students shall undertake an extended fieldwork (10 weeks) and apply their classroom learning to carry out an in-depth study of any content area featured in the syllabus.

Content Overview
This syllabus is divided into **three** clusters of three topics.

Cluster 1: Geography in Everyday Life
- Topic 1.1 – Thinking Geographically
- Topic 1.2 – Sustainable Development
- Topic 1.3 – Geographical Methods

Cluster 2: Tourism
- Topic 2.1 – Tourism Activity
- Topic 2.2 – Tourism Development
- Topic 2.3 – Sustainable Tourism Development

Cluster 3: Climate
- Topic 3.1 – Weather and Climate
- Topic 3.2 – Climate Change
- Topic 3.3 – Climate Action

Extended Fieldwork (10 weeks)

SYLLABUS CONTENT

Cluster 1: Geography in Everyday Life

Geography is more than a world knowledge. Geographers make sense of their everyday lives and the world around them by viewing it through a 'geographical lens' or concept. Concepts introduce the diversity of ways to think geographically and investigate using geographical methods, the connections and relationships between places and spaces. Learning Geography is to engage mentally with questions about people, society, environment and the planet. Geographers studying sustainable development explore how people attach values to the environment and consider people's varied responses to sustainability challenges in context.

TOPIC 1.1: THINKING GEOGRAPHICALLY

About this Topic

Notwithstanding the diversity of practices among geographers worldwide, disciplinary concepts are commonly used by geography teachers to support students in classifying and establishing their understanding of concepts and phenomena. These disciplinary concepts exemplify how geographers conduct research, providing a meaningful structure that helps students to organise conceptual and factual knowledge. Equipped with the ability to think geographically would make students' knowledge powerful, enriching their civic participation and enabling them to contribute productively in cross-disciplinary teams.

Key Questions	Content
1 What is the relationship between people and nature in their neighbourhoods?	1 Relationship between people and nature (a) local communities and nearby nature areas are dependent upon each other (b) local communities and nearby nature areas mutually affect each other 2 Benefits enjoyed by people and nature (a) nature areas lower air temperatures, remove pollutants and provide space for recreation (b) community activities promote the importance of environmental protection 3 Disadvantages to people and nature (a) wildlife from nearby nature areas may harm people and environmental protection limits development (b) visitors to nature areas cause soil erosion, damage vegetation, worsen pollution and disturb wildlife
2 How do people acquire a sense of place in their neighbourhoods?	1 Sense of place (a) people associate importance, meanings and memories with specific locations in their neighbourhoods (b) people's experiences with natural and built environments, and interaction with others at these locations 2 Acquiring a sense of place (a) individuals repeatedly encounter people and objects along familiar paths or roads during regular travel (b) individuals experience significant or memorable events at local landmarks and gathering places 3 Representing a sense of place (a) individuals and organisations use different forms and types of media to express people's sense of place (b) individuals' sense of place could be enhanced or contradicted by these different representations

Key Questions	Content
3 What is the relationship between locations in a neighbourhood?	1 Regions (a) areas with similar physical and/or human characteristics or are known for something (b) spheres of influence of services, events and objects on other locations in the area 2 Spatial patterns (a) non-random arrangement of services, events and objects in an area (b) services, events and objects arranged in recognisable shapes, geometry, clusters or at regular intervals 3 Spatial associations (a) tendency of a pair of services, events and objects to locate near each other (b) tendency suggests a connection between a service, event or object and another service, event or object
4 How are neighbourhoods organised in Singapore?	1 Spatial scales in Singapore (a) more than 20 towns spread across the country, catering to different lifestyles (b) each town has a town centre, serving as commercial and social hubs for residents living in its neighbourhoods 2 Spatial hierarchies in Singapore (a) nested areas of different sizes beginning with a single residential unit (b) clusters of residential units form a precinct, which in turn forms neighbourhoods that combine into a town 3 Town planning in Singapore (a) serve residents and provide for nature at distinct levels of the precinct, neighbourhood and town (b) create connections and synergies across precincts, neighbourhoods and towns

TOPIC 1.2: SUSTAINABLE DEVELOPMENT

About this Topic

The key to sustainable development is to achieve a balance between the exploitation of natural resources for economic and social development and conserving ecosystem services that are critical to people's livelihoods and well-being. Disasters destroy lives, undoing many years of effort in protecting natural environments and improving economic and social conditions. Therefore putting emphasis on disaster risk reduction is central to sustainable development.

Key Questions	Content
1 What are sustainable urban neighbourhoods?	1 Sustainable development (a) meet the needs of the present population by achieving high standards of living for all (b) ensure the ability of future generations to meet their own needs 2 Economic and social sustainability in urban neighbourhoods (a) high enough population density to support local businesses, and keep transport and infrastructure costs low (b) small population size to enable regular interaction among residents and to discuss decisions affecting the neighbourhood 3 Environmental sustainability in urban neighbourhoods (a) ample protection for nature and facilities that support waste minimisation and recycling (b) adopts energy and water efficient design approaches for buildings and landscapes
2 What ecosystem services are found in urban neighbourhoods?	1 Urban neighbourhoods as ecosystems (a) ecosystems consist of living communities and the non-living environment interacting with one another (b) aquatic and terrestrial ecosystems in neighbourhoods including ponds, lakes, parks and forests 2 Provisioning and regulating services (a) provisioning services available in neighbourhoods include fresh water and food (b) regulating services in neighbourhoods include microclimate regulation, flood mitigation, air and water quality control 3 Cultural and supporting services (a) cultural services in neighbourhoods include aesthetics, education and recreation (b) supporting services in neighbourhoods include soil formation, pollination and photosynthesis

Key Questions	Content
3 What are common hazards in urban neighbourhoods?	1 Fire hazards (a) fires in neighbourhoods are commonly caused by faulty electrical appliances and wiring, and unattended cooking fires (b) negative consequences of fires include burn injuries, smoke inhalation and property damage 2 Air pollution hazards (a) air pollution in neighbourhoods is commonly caused by burning vegetation and industrial and motor vehicle emissions (b) negative consequences of air pollution include respiratory infections, heart disease and lung cancer 3 Traffic hazards (a) traffic accidents in neighbourhoods are commonly caused by speeding, red-light running and drink driving (b) negative consequences of traffic accidents include serious injury and loss of life
4 How to build sustainable urban neighbourhoods?	1 Environmental stewardship (a) promote volunteerism among neighbourhood residents to share knowledge with others about the importance of healthy ecosystems (b) partner public and private stakeholders in environmental stewardship efforts 2 Disaster risk management (a) reduce neighbourhoods' exposure to hazards and the vulnerability of people and properties to hazards (b) improve residents' preparedness in responding to hazards and implement monitoring and warning systems 3 Community resilience (a) strengthen relationships among residents and raise their awareness of potential hazards (b) develop residents' ability to organise themselves and equip themselves with resources to resist, adapt and recover from a disaster

TOPIC 1.3: GEOGRAPHICAL METHODS

About this Topic

Geographical inquiry is integral to school geography and provides the closest proximate to the practice of geographers. It is learning that takes place outside the classroom and occurs in a real-world context. It is a systematic approach to investigating geographical phenomena and their related issues, by applying relevant geographical concepts and skills. At the end of their inquiry, students should reflect on the learning process by evaluating the reliability of the data collected, and the validity of their conclusion or findings.

Key Questions	Content
1 How to design fieldwork?	1 Research questions and hypotheses (a) identify a topic or thesis from textbooks, news articles and websites (b) craft a question that outlines a specific scope and a measurable hypothesis about one or two variables 2 Data collection sequence through primary and/or secondary sources (a) collect quantitative data then design qualitative data collection to examine patterns and trends (b) collect qualitative data then design quantitative data collection to verify observations 3 Limitations and risks (a) adjust research aim, study area, sample size and timeframe according to available resources (b) implement measures to avoid harming oneself, other people and nature
2 How to collect primary data?	1 Sampling (a) use non-probability sampling methods including convenience and quota sampling (b) use probability sampling methods including simple random sampling and stratified random sampling 2 Closed-ended questionnaire surveys (a) create pre-defined responses to questions that are limited to short phrases, single words or numbers (b) use rating scales to guide responses including the Likert scale, frequency scale and ranking scale 3 Mental maps (a) visualise experiences by drawing features and adding labels onto the base map of a study area (b) conduct semi-structured interviews with open-ended questions exploring features and labels added to the map

Key Questions	Content
3 How to process and analyse data?	1 Closed-ended questionnaire surveys (a) interpret responses using measures of frequency including counts and percentages (b) interpret responses using measures of central tendency including mean, mode and median 2 Mental maps (a) analyse how well maps represent reality, and how features and labels are drawn or added (b) examine how memories of experiences are represented on maps and described during semi-structured interviews 3 Relationships and patterns (a) visualise positive and negative correlations using scatter plots and best-fit lines (b) identify recognisable geometric shapes, clusters and repetition
4 How to present findings?	1 Maps (a) represent spatial information using dots, lines and polygons (b) provide title, date, orientation, scale, legend, author and source(s) on maps 2 Graphs (a) use bar graphs and pie charts to show distributions (b) use line graphs to show trends and relationships between two variables 3 Photographs and texts (a) use satellite and aerial images to display spatial information (b) use colour-coded quotations and word clouds to represent qualitative analyses

Cluster 2: Tourism

Tourism is a complex and multi-dimensional phenomenon that is best understood as a system. Tourism activity consists of flows of people and goods and services between places. These flows are interdependent, existing within a wider system. Tourism benefits and harms people and nature across different scales. As places are unique, sustainable tourism development cannot be achieved using a one-size-fits-all approach. Strategies to benefit from tourism and solutions to address problems caused by tourism would need to be adapted to suit different contexts.

TOPIC 2.1: TOURISM ACTIVITY

About this Topic

The components of the tourism system span the globe, connecting communities and economies from different parts of the world. Its efficient functioning depends on the maintenance of the relationship between tourist generating and tourist destination regions. Tourist arrivals was about 25 million in 1950. About 60 years later, it exceeded 1 billion as the motivation and ability of individuals to travel increased. The tourism boom resulted in the transformation of many places, as they evolve as tourist destination regions, attracting tourists with different personality characteristics at different stages of their life cycle.

Key Questions	Content
1 What is a tourism system?	1 Components of the tourism system (a) key components include tourist generating regions, tourist destination regions and transit routes (b) volume and direction of travel between regions are influenced by transit routes 2 Relationship between tourist generating and destination regions (a) push factors at tourist generating regions and pull factors at tourist destination regions (b) interdependence of tourists, businesses and organisations at tourist generating and destination regions 3 Interactions between tourism and the environment (a) tourism activity interacts with nature, communities and economies in their local environment and beyond (b) changes to one part of the tourism system affect the local and wider environment, and vice versa
2 What led to the growth of tourism?	1 Motivation to travel (a) individuals seeking relaxation, self-fulfilment and unique travel experiences (b) made possible by growth in individuals' incomes 2 Ability to travel (a) growth in disposable incomes and increased leisure time due to paid vacation. (b) facilitated by business innovations, lower transport costs and accommodation costs 3 Mobility in travel (a) expansion of public transport services and infrastructure, and new modes of air, land and sea travel (b) increased private car ownership improving travel convenience to nearby locations

Key Questions	Content
3 How do tourist destination regions develop over time?	1 Exploration and involvement stages (a) small number of tourists undertaking individual and irregular travel to visit the destination's primary attractions (b) locals offer tourist services, advertising the destination, requesting more public tourist amenities and facilities 2 Development and consolidation stages (a) increase in tourist numbers with destinations having more man-made attractions, advertisements and foreign labour (b) growth in tourist numbers slow and tourists outnumber locals resulting in a tourism dependent economy 3 Stagnation and decline or rejuvenation stages (a) tourist numbers peak as a destination's carrying capacity is reached, resulting in negative impacts (b) tourist numbers decline as a destination loses its tourist appeal or is rejuvenated with new cultural or man-made attractions
4 How do different personality characteristics of tourists affect tourist destination regions?	1 Spectrum of personality characteristics (a) Dependables and Venturers, with small proportion of tourists on both extreme ends (b) majority of tourists in the middle of the spectrum, with a mixture of both extremes 2 Features of personality characteristics (a) Dependables spend cautiously, guided by authoritative figures, prefer structure in daily living and the company of friends and family (b) Venturers spend readily, guided by personal judgement, prefer different activities and being alone 3 Personality characteristics influence travel patterns (a) different types of tourist destination regions appeal to tourists with different personality characteristics (b) tourists who are more Venturer types influence travel decisions of those who are more Dependable types

TOPIC 2.2: TOURISM DEVELOPMENT

About this Topic

Tourism is expected to continue growing, characterised by more diverse travel experiences offered by a larger variety of tourism operators. Thus, the potential of tourism contributing to environmental protection, economic and social development is widely recognised. It is equally important to recognise that this potential cannot be fulfilled without paying close attention to the negative, and in some cases irreversible, impacts of tourism. Left unattended, the negative impacts of tourism could negate all the benefits that it has brought to tourism destination regions.

Key Questions	Content
1 What are the trends in tourism?	1 Globalisation and tourism (a) continued expansion in international tourist arrivals (b) tourism becomes increasingly diverse in tourist generating and destination regions 2 Diversity in tourism demand (a) growing popularity of lesser-known destinations that were not previously as popular or were less accessible (b) emergence of new experiences including adventure, heritage, sports and health tourism 3 Diversity in tourism supply (a) small specialist operators adding to services of mass market tour operators (b) tourism marketing changing from traditional print and broadcast media to new online media
2 How does tourism affect the economies of places?	1 Economic impact in the tourism system (a) tourist generating and destination regions operate interdependently in the tourism system (b) tourism's impact on the economy is experienced more significantly at tourist destination regions 2 Positive economic impact (a) increased employment in the formal and informal tourism sectors at tourist generating and destination regions (b) higher income generated from tourists' spending on consumer goods and services especially at tourist destination regions 3 Negative economic impact (a) economic leakages resulting in less tourism revenue (b) overdependence on tourism increasing tourist destination regions' vulnerability to a sudden fall in tourist numbers

Key Questions	Content
3 How does tourism affect the society of places?	1 Social impact in the tourism system (a) tourists and local communities at tourist destination regions mutually affect each other (b) outcomes are shaped by the nature of interaction between tourists and local communities 2 Positive social impact (a) increased interest among tourists and local communities in preserving traditional cultural practices and art forms (b) environmental protection at tourist destination regions enhances cultural ecosystem services 3 Negative social impact (a) commodification of traditional cultural practices and art forms resulting in loss of values and conflict among locals (b) negative attitudes of local communities towards tourists including cultural clashes and tourists as victims of crime
4 How does tourism affect the environment of places?	1 Environmental impact in the tourism system (a) natural environments provide important provisioning and regulating ecosystem services (b) environmental degradation due to tourism impacts tourist destination regions significantly 2 Positive environmental impact (a) conservation of natural environments and preservation of biodiversity to maintain natural attractions (b) restoration of degraded aquatic and terrestrial ecosystems to create new natural attractions 3 Negative environmental impact (a) pollution caused by greenhouse gas emissions, inadequate sewage facilities and improper waste disposal (b) construction of facilities and attractions encroaches on nature, depletes natural resources and threatens wildlife habitats

TOPIC 2.3: SUSTAINABLE TOURISM DEVELOPMENT

About this Topic

Sustainable tourism development is necessary for economies, communities and natural environments to continually benefit from tourism. However, it is challenging to balance the different dimensions of sustainable development given the numerous stakeholders who are involved in tourism. The values, attitudes and needs of these stakeholders could differ or be in conflict. There are many approaches to achieving sustainable tourism development, which strive for sustainable tourism production and consumption, ensuring the equitable distribution of tourism benefits.

Key Questions	Content
1 How does tourism development help achieve sustainable development?	1 Economic sustainability (a) tourism development should continually provide employment opportunities and income growth (b) tourism development should result in more social services that raise local standards of living 2 Social and environmental sustainability (a) tourism development should respect authenticity of local communities, practices and art forms, and contribute to intercultural understanding and tolerance (b) tourism development should maintain essential ecological processes and conserve natural heritage and protect biodiversity 3 Sustainable tourism development (a) achieved when sustainability principles are applied to the economic, social and environmental aspects of tourism development (b) all three dimensions are balanced to guarantee tourism's long-term sustainability
2 How effective are stakeholders in influencing sustainable tourism development?	1 Governments and international organisations (a) governments establish policies, create plans and enforce regulations to manage tourism development (b) international organisations offer consultancy, financial assistance and raise public awareness 2 Businesses, local communities and tourists (a) businesses and local communities could seek advice from others and participate in decision-making (b) tourists could develop genuine interest in tourist destination regions and interact responsibly 3 Challenges faced by stakeholders (a) stakeholders may have conflicting priorities and needs (b) stakeholders have differing amounts of control over resources and may view how sustainability is measured differently from other stakeholders

Key Questions	Content
3 How effective are the different approaches in achieving sustainable tourism development?	1 Ecotourism (a) comprises diverse approaches that lie on a spectrum from hard to soft ecotourism (b) limitations include uncertainty over continuity of efforts in conserving nature and involving local communities 2 Community-based tourism (a) innovative small-scale tourism managed by local communities including homestays and agricultural tourism (b) limitations include the potential loss of local culture and competition from larger-scale tourism operators 3 Pro-poor tourism (a) focused on improving livelihoods of the poor through training and access to micro-finance (b) limitations include the inability to significantly reduce poverty as compared to direct investment in social services
4 How might tourism continue to develop sustainably?	1 Sustainable tourism production (a) when demands on ecosystem services do not exceed the supply of resources (b) when different stakeholders adopt a long-term responsible and coordinated approach instead of short-term profit. 2 Sustainable tourism consumption (a) when destination regions manage demand and tourism is consumed responsibly by tourists (b) when policies give local communities primary attention while considering needs of tourists 3 Equitable distribution of tourism benefits (a) effective tourism management to ensure benefits are enjoyed by all (b) minimising negative trade-offs within or between economic, social and environmental dimensions

Cluster 3: Climate

Climate change is not new. Earth's climate has changed in response to the varying amounts of energy from the Sun and the evolving atmospheric composition. This has occurred over timescales ranging from millions to hundreds of years. Today, changes in the climate have been exacerbated due to anthropogenic activities. The climate system is part of the natural system that is interconnected with the human system. Hence, changes in one part of the system affect another, impacting people and nature. Climate action could build our resilience to the effects of climate change, but it requires active participation from many stakeholders.

TOPIC 3.1: WEATHER AND CLIMATE

About this Topic

Weather and climate are closely associated phenomena that affect both natural and human systems. While climate patterns are comparatively more predictable, weather, in contrast, is highly dynamic and varies considerably. Factors affecting three weather variables – air temperature, precipitation and wind can be examined to better understand short-term weather changes and changing climate patterns over a longer term. An insight into the workings of weather and climate would aid in the study of climatic hazards and their impact on natural and human systems.

Key Questions	Content
1 What is weather and climate?	1 Weather (a) state of atmospheric conditions at a particular time and place (b) described using variables including air temperature, cloud cover, precipitation, wind speed and wind direction 2 Climate (a) average state of atmospheric conditions over a specified time period (b) climate types include tropical equatorial climate, tropical monsoon climate and cool temperate climate 3 Climatic hazards (a) changes in climate and extreme weather including heat waves, droughts, floods, cyclones and wildfires (b) impact natural and human systems significantly
2 Why does air temperature vary across Earth's surface?	1 Earth's rotation and revolution (a) Earth's rotation on its axis results in variability of air temperature over time in a day (b) Earth's revolution around the sun results in variability of air temperature over time in a year 2 Latitude and altitude (a) at the global scale, solar angles are lower at higher latitudes resulting in lower air temperatures (b) at a local scale, air pressure is lower at higher altitudes resulting in lower air temperatures 3 Nature of surfaces and distance from sea (a) Earth's surfaces, including snow cover, vegetation and exposed soil, affect site specific air temperatures (b) maritime effect on coastal areas and continental effect on inland areas affect site specific air temperatures

Key Questions	Content
3 Why does precipitation vary across Earth's surface?	1 Water cycle (a) movement of water between the atmosphere and the Earth's surface through evapotranspiration, condensation and precipitation (b) movement of water at different rates in the form of infiltration, surface runoff and groundwater flow 2 Relative humidity (a) condensation is affected by the amount of water vapour in the atmosphere (b) condensation occurs when the amount of water vapour exceeds the amount that can be held by the atmosphere at a given temperature 3 Clouds and precipitation (a) clouds form due to condensation nuclei and the coalescence of water droplets in the atmosphere (b) results in precipitation including convectional and relief rainfall
4 Why do wind direction and wind speed vary across Earth's surface?	1 Unequal distribution of air temperature (a) results in uneven distribution of pressure gradient (b) initiates horizontal motion of air and determines wind direction 2 Wind speed (a) influenced by strength of pressure gradient between two locations (b) influenced by friction due to Earth's topography 3 Local and regional winds (a) land and sea breezes occur at the local scale (b) Northeast and Southwest monsoons occur at the regional scale and are influenced by the Coriolis force

TOPIC 3.2: CLIMATE CHANGE

About this Topic

Evidence has shown that the climates we know today have not always been the same. The Earth's climates have gone through periodic cycles of change over time. However, anthropogenic factors since the dawn of modern industrialisation have affected natural climate variability significantly. The large-scale emission of greenhouse gases from human activities has resulted in the enhanced greenhouse effect, which increases Earth's temperature. This rapid change in global climates would affect both the natural and human systems.

Key Questions	Content
1 What is the natural variability of climate?	1 Evidence of past climates (a) episodes of cooling and warming over geological time (b) evidenced by data on seafloor sediment and oxygen isotope 2 Changing climate zones (a) indicated by temperature (b) evidenced by expansion and contraction of main climatic zones 3 Climate variability due to natural processes (a) changes in Earth's orbit and angle of tilt (b) occurrences of sunspots and large-scale volcanic eruptions
2 How do anthropogenic factors contribute to climate change?	1 Growth in population and industrialisation (a) altered quantity of greenhouse gases in the atmosphere including carbon dioxide, methane and nitrous oxide (b) data from the last decade has shown it to have been successively warmer than any of the preceding decades since 1850 2 Causes of the greenhouse effect (a) a natural process making Earth habitable (b) involves absorption and emission of shortwave and longwave radiation, respectively 3 Causes of the enhanced greenhouse effect (a) burning of fossil fuels (b) changing land use
3 How might climate change affect natural systems?	1 Impact of climate change on natural systems (a) increase in ocean surface temperatures and changes to ocean circulations (b) increase in atmospheric temperatures and changes in precipitation on land 2 Impact of climate change on aquatic ecosystems (a) threatens coral reefs and disruption of marine food webs (b) ocean acidification 3 Impact of climate change on terrestrial ecosystems (a) threatens flora and fauna (b) increase in extreme weathers including droughts and excessive rainfall

Key Questions	Content
4 How might climate change affect human systems?	1 Impact of climate change on human systems (a) geographically uneven due to varying climate variables and localised economic and social factors (b) impacts are interconnected and cascaded from natural systems to people 2 Direct impact of climate change on human systems (a) occurs through extreme weather events (b) including heat waves, droughts, floods, cyclones and wildfires 3 Indirect impact of climate change on human systems (a) affects provisioning ecosystem services including food production, and regulating ecosystem services including disease regulation (b) alters cultural ecosystem services including melting of arctic ice and degradation of natural landscapes

TOPIC 3.3: CLIMATE ACTION

About this Topic

Climate change affects natural and human systems unevenly across the world, and climate risks vary considerably over time and space. Considered one of the most significant threats to sustainable development, climate change complicates the challenges faced by communities, especially those living in developing countries. To be effective, climate action thus needs to be calibrated according to the vulnerability of each different community. Most importantly, mitigating and adapting to climate change require a holistic approach that combines different strategies to bring about sustained results.

Key Questions	Content
1 How does climate action help achieve sustainable development?	1 Climate action (a) adaptation and mitigation strategies are complementary responses (b) may create risks and benefits 2 Climate change is a threat multiplier (a) exacerbates other threats to natural and human systems (b) resulting in uneven climate-related effects 3 Climate change constrains development paths (a) uneven impacts of climate change globally (b) place additional burdens on disadvantaged communities and developing countries
2 Why do climate risks vary across places?	1 Climate risks (a) interaction between climate-related hazards, and vulnerability and exposure of natural and human systems to these hazards (b) results in potential loss of human lives and damage to properties 2 Affected by climate-related hazards (a) shorter-term events including cyclones and floods (b) longer-term events including sea level rise and droughts 3 Affected by vulnerability and exposure (a) conditions that increase the susceptibility of a community to suffer from a lack of water, food and health resources due to extreme weather (b) exposure to hazard areas including proximity to coastal and dry environments
3 How effective are mitigation strategies in building a community's resilience to climate change?	1 Mitigation strategies (a) involves changing how societies produce and use energy and land (b) effectiveness limited by technological, economic, social and institutional challenges 2 Mitigation strategies that reduce greenhouse gas emissions (a) international agreements and cooperation, and use of low-carbon technologies (b) use of clean energy sources and changes in consumption patterns 3 Mitigation strategies that enhance carbon sinks (a) protection of oceans and forests through land-use change (b) protection of forests through forest regeneration

Key Questions	Content
4 How effective are adaptation strategies in building a community's resilience to climate change?	1 Adaptation strategies (a) require actions to lessen harm brought about by climate change (b) effectiveness limited by technological, economic, social and institutional challenges 2 Adaptation strategies involving structural and technological approaches (a) water and flood management (b) use of technology to produce food 3 Adaptation strategies involving social and institutional approaches (a) raising awareness and education (b) national and regional policies

GEOGRAPHICAL DATA SKILLS AND TECHNIQUES (FOR PAPERS 1 AND 2)

Geographical data skills and techniques are essential to the work of geographers. They help geographers gather, analyse, present and interpret information about the characteristics, patterns and processes of the phenomenon/phenomena they are investigating. They also facilitate geographical thinking and decision-making. As students learn about a range of geographical data types such as graphs, maps and images through the topics, they will acquire the skills necessary for them to read, construct, analyse and interpret the data in context.

Candidates will be expected to interpret geographical data from the following resources:

- Tabular data
- Text extracts
- Landscape photographs
- Aerial photographs and satellite images
- Scatter graphs and best fit lines
- Simple and comparative line graphs
- Simple and comparative bar graphs
- Pie charts
- Sketch maps
- Dot maps
- Choropleth maps
- Flow line maps
- Proportional symbol maps
- Isoline maps
- Cartoons
- Wind roses
- Diagrams (schematics, block)

Candidates should be able to:

- Calculate mean, median and mode
- Describe patterns, trends and relationships
- Describe natural and human characteristics shown in photographs
- Draw simple sketches of photographs and annotate them to illustrate the features
- Identify locations on maps using compass direction, longitude and latitude
- Read map scales and symbols
- Plot scatter, line and bar graphs

Appendix A

Level	Marks	Generic Level Descriptors for 6-mark AO3 Questions
3	**5–6**	Develops arguments that support both sides of the discussion clearly, using a range of points with good elaboration. Examples used demonstrate a comprehensive understanding of the issue or phenomenon. Evaluation is well supported by arguments.
2	**3–4**	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 partially supported by arguments.
1	**1–2**	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.