GEOGRAPHY
SYLLABUS
Pre-University
H2

Implementation starting with
2023 Pre-University One Cohort

Ministry of Education
SINGAPORE

CONTENTS

1. INTRODUCTION

1.1 Geography Curriculum Concept

The Geography Curriculum Concept holistically explores sustainability challenges through different topics on human-environment relationships. The subject introduces students to interdisciplinary thinking and contributes to sustainable development. It also emphasises the role of inquiry-based learning in fieldwork. Learning continuity is strengthened with syllabus content selection being guided by contemporary sustainability challenges.

The Geography Curriculum Concept, as illustrated in Figure 1, highlights the following:

- **Selection of sustainability-themed content for all levels of study.**
  The overarching theme of sustainable development in the Geography syllabuses aim to deepen students' understanding of the impact of human activity on environmental sustainability and vice versa. Defined as "that (development) which meets the needs of the present without compromising the ability of future generations to meet their own needs", sustainable development has become a part of everyday lexicon since its articulation in the report of the World Commission on Environment and Development, Our Common Future (1987).[1] Countries have committed towards building sustainable and resilient futures, through the United Nations 2030 Agenda for Sustainable Development.[2] The study of Geography provides opportunities for students to understand sustainability-related challenges around the world including Singapore in an integrated way, while inspiring them to take action to achieve a more sustainable world. A holistic and continued coverage of ideas and knowledge through the context of sustainable development is planned in the curriculum.

- **Disciplinary approach to strengthening learning progression and continuity from Lower Secondary to Pre-University.**
  The Geography Curriculum Concept makes clear that learning progression refers to "students acquiring more sophisticated understanding of disciplinary concepts and are able to undertake more rigorous fieldwork methods over time". Thus, the same set of disciplinary concepts -- Space, Place, Environment and Scale will be adopted for all levels of study. This allows students to deepen their use of disciplinary lenses in analysing phenomena and issues as they go on to learn Geography at a higher level of study. Learning continuity is also strengthened with syllabus content selection across all levels of study being guided by contemporary sustainability challenges.

- **Unique features of Geography's pedagogy and assessment, integrating education research with geographical practices.**
  Students learn a variety of knowledge and methods in Geography. This variety of quantitative and qualitative methods help students undertake more rigorous

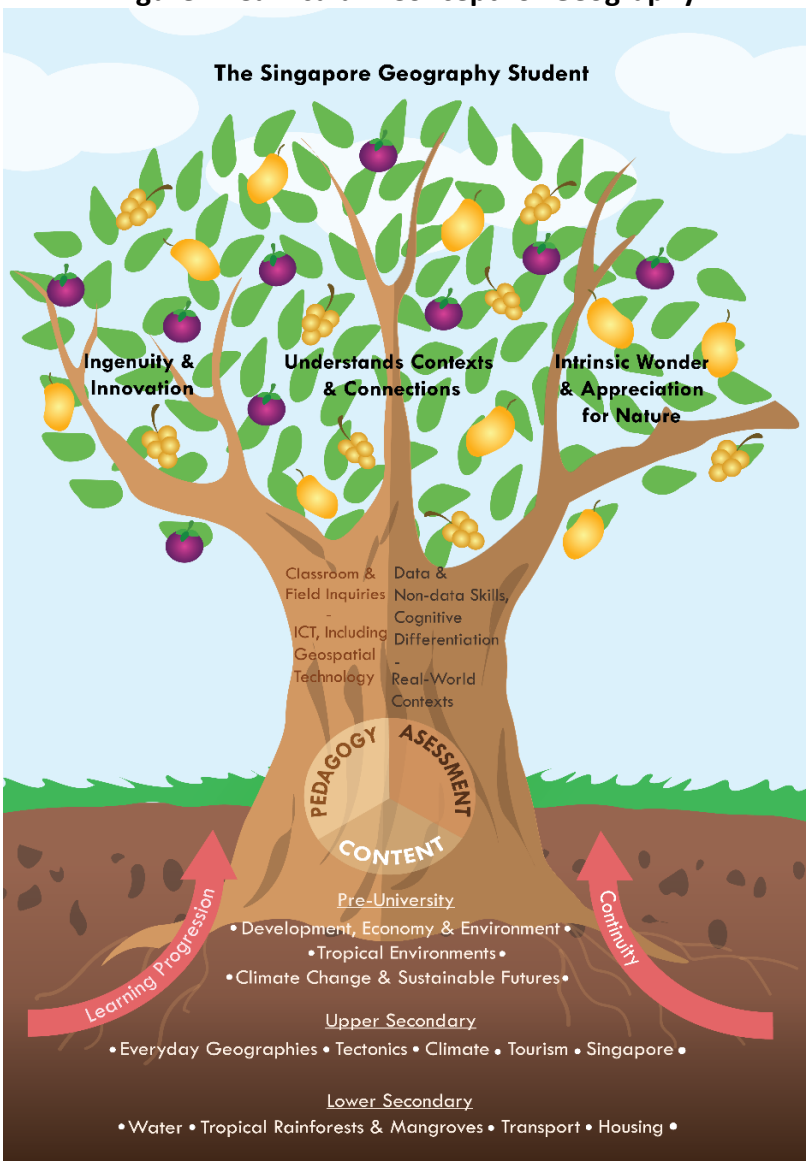
[1] Bruntland, G. J. (1987). *Report of the World Commission on environment and development: Our Common Future.* UN.

[2] United Nations. (n.d.). *Sustainable Development Goals*. Retrieved from: https://www.un.org/sustainabledevelopment/

fieldwork methods over time, in analysing geographical phenomena and issues. Testing students' understanding using real-world contexts has been a mainstay of Geography as they are able to simulate a variety of field conditions for questions testing students' fieldwork competencies.

- **Attributes of <u>The Singapore Geography Student</u>.**
  The Singapore Geography Student contributes to Singapore's and the world's sustainable development by exercising **ingenuity** and **innovation** in generating solutions for a sustainable future. They will be able to consider **connections** between people, places, events and environments, combining this knowledge with their understanding of the spatial arrangement of phenomena, and deliberate on human's reciprocal relationship with nature. Additionally, students will understand how our local **context** interacts with the driving forces behind globalisation, and be able to strike a balance between being open to innovations and ideas, and recognising our unique local context and culture. Through Geography education, they will develop an **intrinsic wonder and appreciation for nature**.

Figure 1: Curriculum Concept for Geography



1.2 Aims of H2 Geography

The aims below represent the body of geographical knowledge, skills and values that students will acquire through H2 Geography.

Knowledge
The syllabus requires students to develop an understanding of:

- the uniqueness of places;
- the dynamic and complex interactions and interdependence between natural environments and human environments at various scales;
- the evolution of landscapes and development of issues over time;
- the processes that shape spaces, places and the environment at various scales;
- the connections, trends and patterns in different parts of Asia and the rest of the world;
- a range of contemporary issues in different parts of Asia and the rest of the world through geographical perspectives; and
- knowledge from different subfields of geography to understand different approaches to solve real-world problems and achieve sustainable development.

Skills
The syllabus seeks to equip students with the ability to:

- consider evidence and different viewpoints to develop logical arguments and explanations;
- analyse, evaluate and reflect on information from a geographical perspective to make informed and sound decisions;
- construct understanding through inquiry using different data collection and analysis methods; and
- use and evaluate data representation techniques to communicate findings.

Values
The syllabus seeks to encourage students to:

- be inspired by the splendour of natural environments and human ingenuity;
- care for delicate ecosystems and understand the importance of environmentally sustainable lifestyles;
- develop as global citizens, seek harmony and respect others in a culturally diverse world; and
- contribute responsibly towards the building of a robust and inclusive society.

1.3 Desired Outcomes of Education and 21st Century Competencies

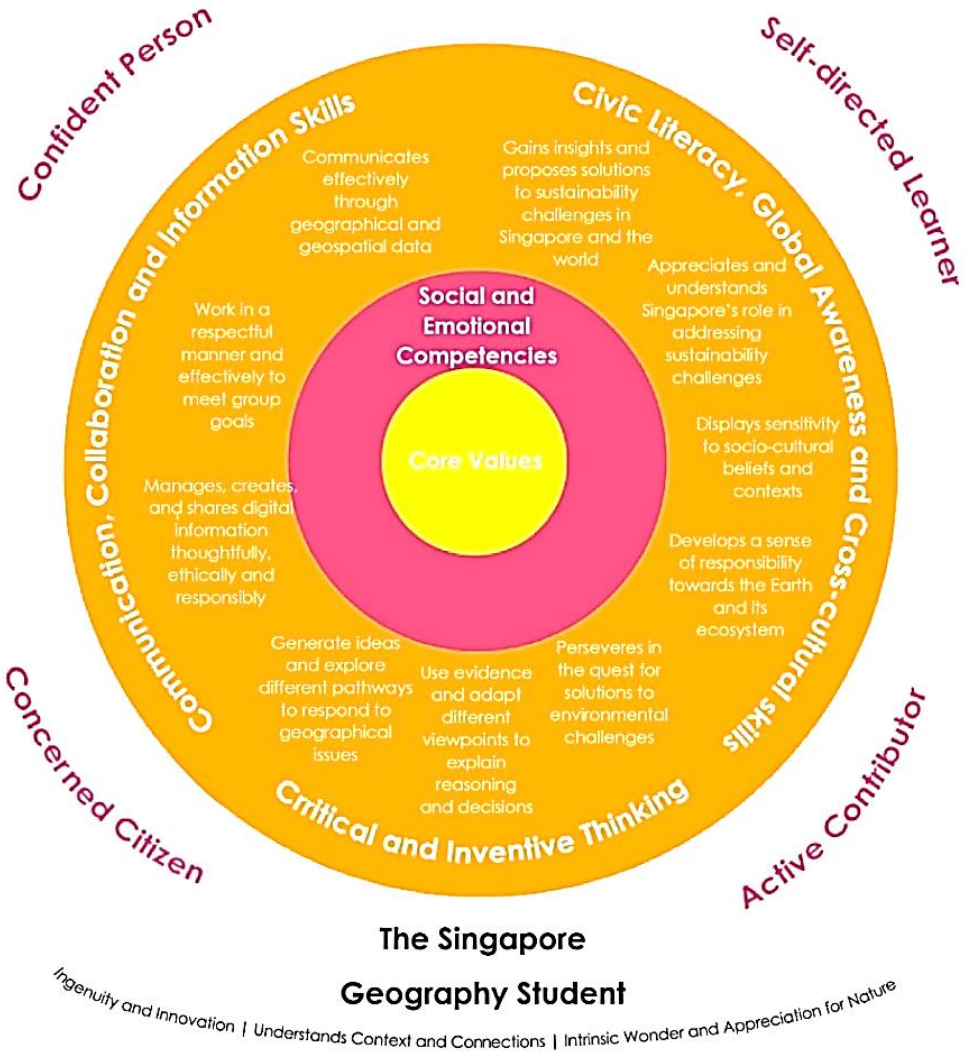
The Desired Outcomes of Education (DOE) are attributes that educators aspire for our learners upon the completion of their formal education. These outcomes establish a common purpose for Geography educators, drive our school-based programmes, and serve as a compass to guide curriculum and instruction.

The Singapore Geography student embodies the DOE, and exercises ingenuity and innovation in contributing to Singapore's and the world's sustainable development. He/she understands contexts and connections, and possesses an intrinsic wonder and concern for nature. In sum, he/she is:

- ***confident person*** who has a strong sense of right and wrong, is adaptable and resilient, knows himself/herself, is discerning in judgement, thinks independently and critically, and communicates effectively;
- ***self-directed learner*** who questions, reflects, perseveres and takes responsibility for his/her own learning;
- ***active contributor*** who is able to work effectively in teams, is innovative, exercises initiative, takes calculated risks and strives for excellence; and
- ***concerned citizen*** who is rooted to Singapore, has a strong sense of civic responsibility, is informed about Singapore and the world, and takes an active part in bettering the lives of others around him/her.

The H2 Geography syllabus is aligned to the Framework for 21st Century Competencies (21CC) and Student Outcomes (Figure 2), and it enables students to develop competencies necessary for them to thrive in a globalised and fast-changing world. Learning Geography supports the acquisition of the 21CC through inquiries, developing well-constructed explanations and responses to phenomena or issues. Geography also introduces investigative and communication tools including maps, fieldwork and Geographic Information Systems (GIS), which offer unique opportunities to make sense of the modern world.

Figure 2: 21st Century Competencies and Student Outcomes



1.4 Learning Progression and Continuity in Geography

The Learning Progression and Continuity in Geography (Table 1) is developed and featured in the Geography Curriculum Concept (Figure 1); with students acquiring more sophisticated understanding of geographical concepts and undertaking more rigorous fieldwork methods from Secondary to Pre-University.

Planning for progression in the Geography curriculum (Table 1) is featured as follows:

- **Breadth of geographical knowledge**: Breadth refers to the gradual extension of students' geographical knowledge, which is a cumulative process as they move through each level of study. Previously acquired knowledge is reinforced when students perceive it to be relevant to new learning, and long-term recall is usually facilitated by periodic revisiting.
- **Depth of geographical understanding**: Progression in students' geographical understanding is closely associated with the development of their ability to describe and explain geographical ideas and being able to apply them to new situations. Hence this is evidenced by students' ability to comprehend and undertake cognitively more demanding tasks, including interpretation, analysis, synthesis and evaluation of information.
- **Use of geographical skills**: Geographical skills are varied and can be categorised as specific techniques associated with fieldwork, skills associated with cognitive tasks, and skills associated with inquiry strategies.
- **Attitudes and values**: While explicitly articulated in the Geography Curriculum Concept (Figure 1), its specific progressions are implicitly embedded in all syllabuses through the sustainability-themed topics and concepts such as contestation over land use, responses to hazards, sustainable development and stewardship. The curriculum has planned increasing opportunity for students to examine social, economic, environmental and political issues at each higher level of study.

Planning for continuity in the Geography curriculum (Table 1) is seen in these aspects across all levels of study:

- **Overarching theme of sustainable development**: Sustainability-themed content is first introduced in the 2021 Lower Secondary Geography through sustainable resource use and management and will be explored further in the 2023 Upper Secondary and Pre-University Geography Syllabuses under sustainability challenges through different topics on human-environment relationships.
- **Disciplinary concepts of Space, Place, Environment and Scale**: The same set of disciplinary concepts are adopted across all levels of study. This allows students to deepen their use of disciplinary lenses in analysing phenomena and issues as they learn Geography at a higher level of study.
- **Teaching with inquiry as a signature pedagogy**: Teaching with inquiry is emphasised across all levels of study through the Geography Inquiry Process. Geographical inquiry encourages questioning, investigation and critical thinking about issues affecting the environment and people's lives, now and in the future.

- **Fieldwork as the cornerstone of Geography education:** Across all levels of study, students are given the opportunity to understand geographical phenomena and issues through investigative fieldwork. At each higher level of study, they are exposed to more rigorous quantitative and qualitative fieldwork methods.

Table 1: Learning progression and continuity in Geography from Lower Sec Geography to Pre-U Geography

	Lower Secondary Geography	Upper Secondary Geography	Pre-University Geography
Progression in Disciplinary Concepts			
Place	• Places as locations with distinctive characteristics; *Singapore occupying a particular point on the Earth's surface.* • Places as locales with physical and human characteristics; *deforestation of tropical rainforests in Brazil.*	• Places as locales with physical and human characteristics that change with time; *the development of tourist destination over time.* • Places as socially constructed with personal meaning; *people develop a sense of place through personal, community and national identity rooted in places.*	• Places as socially constructed with place-based identities; *sustainable urban development and liveability, urban reimagining.* • Places as socially constructed are interacting continuously; *places are sites of contestation as local and global processes socially construct and reconstruct places (all the time).*
Space	• Basic spatial concepts; *location, distance, direction, scale, and movement.* • Spatial patterns and processes; *distribution of tropical equatorial climate and global process of the hydrological cycle.*	• Spatial concepts; *region, volume and interdependence to show the connections in physical and human phenomena.* • Spatial patterns, processes and associations of physical and human phenomena; *climate risks variation and its influence on physical and human systems in surrounding regions.*	• Complex spatial concepts; *connectivity, networks and hierarchies to show the spatial organisation of the global economy and trans-national corporations.* • Spatial and temporal relations; *fluvial processes change over time and shape patterns in the distribution of human and physical phenomena.*
Environment	• Physical and human environments; *natural landscape versus built-up urban areas.* • Simple interrelationships in the environment; *humans through building homes can change the physical environment (into an urbanised city).*	• Nature-human interrelationships in the environment; *tourism activity depends on the natural environment, and also impacts the environment as a result.* • Environment as ecosystems; *natural and human systems are connected within and across systems.*	• Environment as dynamic and complex; *changes in one part may affect others.* • Synoptic links between development, economy & environment; *environmental integrity in dimensions of sustainable urban development.*
Scale	• Scale concepts by fundamental levels of organisation; *local (eg. Bishan Park), national (eg.Singapore), regional (eg. Southeast Asia), global (eg. world).* • Scale of imagery; *satellite and aerial to ground photographs.*	• Scale concept by duration; *temporal scale of daily occurrences of land and sea breezes vs. seasonal monsoon winds.* • Scale concept by size of the space; *spatial scale & spatial hierarchies of residential units, neighbourhoods and town centres in Singapore.*	• Scale concept by length; *synoptic scale of wind circulations.* • Scale concept by duration; *geological time scale in warming and cooling of the earth.* • Scale as socially constructed; *politics of scale in human geography where issues manifest at different and multiple scales are also interconnected.*
Progression in Fieldwork Methods			
Geography Inquiry Process	• Geography inquiry process; *focus on entire inquiry process to aid understanding of prescribed geographical phenomenon.*	• Geography inquiry process; *focus on the depth and different parts of the entire process to understand a selected geographical phenomenon.*	• Geography inquiry process; *as a framework to plan and design a student-directed research on a selected geographical phenomenon.*
Sampling Methods	• Exposure to sampling methods; *convenience, (simple) random and systematic random sampling.*	• Basic non-probable and probable sampling methods; *convenience and quota sampling, and (simple) random and stratified random sampling.*	• Range of non-probable and probable sampling methods; *selection guided by research questions/ hypotheses and topic under investigation.*
Data Collection Methods	• Exposure to generic methods; *use of interviews and field sketches.*	• Basic qualitative and quantitative methods; *mental maps and semi-structured interviews, and closed-ended questionnaire survey*	• Range of qualitative and quantitative methods; *selection guided by research questions/ hypotheses and topic under investigation.*

1.4 Design of the Syllabus

Aligned with the Geography Curriculum Concept (Figure 1), the H2 Geography syllabus has adopted an integrated design approach to prepare students for interdisciplinary learning. Integrating physical and human geography knowledge help them understand real-world issues and facilitate transfer of learning.

The content in the H2 Geography syllabus is organised using sustainable development as the lens to understand contemporary issues. Geography's longstanding interest in human-environment relationships makes it well-suited for a holistic exploration of a range of sustainability challenges. The H2 Geography syllabus expose students to learning about the complexities of the interactions between the physical environment, economy and society, which are the three key dimensions of sustainable development.

To develop students' disciplinary lens when examining sustainability issues, four key geographical concepts underpin the H2 Geography syllabus. The concepts of *Space*, *Place*, *Environment* and *Scale* provide students with the framework to ask geographical questions about the world they live in. Table 2 shows the overview of the content in the H2 Geography syllabus.

Table 2: Overview of the H2 Geography Syllabus Content

Cluster	Topic
Cluster 1 | Development, Economy and Environment	Topic 1.1 | Environment and Resources
	Topic 1.2 | Development and the Global Economy
Cluster 2 | Tropical Environments	Topic 2.1 | Tropical Climates and Drainage Basins
	Topic 2.2 | Landforms in the Tropics
Cluster 3 | Sustainable Futures and Climate Change	Topic 3.1 | Cities in a Sustainable Future
	Topic 3.2 | The Future with Climate Change
Cluster 4 | Fieldwork	Focus areas | Community response to climate change Needs analysis of the elderly living in an urban neighbourhood Fluvial flood risk and strategies to mitigate it

2. CONTENT

Cluster 1 | Development, Economy and Environment

Topic 1.1 Environment and Resources

Why is the environment important for sustainable development?

In 2015, governments adopted the Sustainable Development Goals, broadening the definition of development to encompass economic, environmental and social dimensions. This shift highlights the importance of the natural environment as a provider for human activities and an absorber of human wastes. Given the limitation of the natural environment's ability to meet present and future needs, it is important that we manage natural resources sustainably.

In this topic, students will first develop an understanding of sustainable development, which is the foundational concept of this syllabus. They will then explore the importance of the environment and factors influencing our resource supply. The study of Thomas Malthus' and Ester Boserup's ideas will facilitate students' evaluation of whether there are adequate resources to support the needs of our growing population. They will also explore the management of renewable energy, transboundary water resources, and extraction of non-renewable resources.

Key Question	Content
	Students will understand:
1. Understanding Sustainable Development	
What is sustainable development?	• The concept of sustainable development, as defined in 'Our Common Future': - the meeting of present and future needs, in particular the essential needs of the poor - the maximising of goals across economic, environmental and social dimensions • The interdependence between economic, environmental and social dimensions • The possible trade-offs between economic, environmental and social dimensions • Limits on ability to meet present and future needs imposed by: - current level of technology - the environment's ability to meet those needs
How do we know that there is progress towards sustainable development?	• Ways to progress towards sustainable development, as defined by the Sustainable Development Goals (SDGs): - economic growth - environmental protection - social inclusion • Use of quantitative targets and indicators to measure: - economic growth - environmental protection - social inclusion

	• The difficulty of measuring progress towards sustainable development using quantitative indicators due to the lack of capacity of some countries to collect data
What are the challenges that might limit the progress towards sustainable development?	• Challenges limiting the progress towards sustainable development: - economic challenges - political challenges
2. Environment and Resources	
Why is the environment important?	• The importance of ecosystem services provided by the environment: - provisioning services - regulating services - cultural services - support services • Variations over time and space of what is considered a provisioning service due to: - demand for the provisioning service - technology • Human activities which can compromise the ability of the environment to provide ecosystem services: - destruction of habitats - pollution of natural environment - introduction of invasive species
Will our supply of provisioning services ever be depleted?	• Classification of provisioning services based on their renewability: - renewable resources - non-renewable resources • The impact on supply of renewable resources when their regenerative capacity is exceeded • Classification of provisioning services based on their availability: - proven reserves - conditional reserves - hypothetical reserves - speculative reserves
Are there adequate provisioning services to support population growth?	• Thomas Malthus' views on limit imposed by the natural environment on population numbers • Ester Boserup's views on role of technology in expanding resource base • Limitations to Thomas Malthus' and Ester Boserup's views: - Malthus' lack of credit to human inventiveness - Boserup's lack of consideration of degradation of the resource base because of technological innovations

	• Malthus' and Boserup's lack of consideration of unevenness in access to resources across the population
3. Managing Resources	
How do we manage the use of renewable energy sources?	• Potential of solar power and hydropower to reduce dependence on fossil fuels as energy sources • Limitations of solar power and hydropower in providing energy security • Trade-offs associated with solar power and hydropower: - economic considerations - environmental considerations - social considerations
How do we manage conflicts over transboundary water resources?	• Transboundary nature of rivers that are shared by multiple countries • Conflicts between countries sharing transboundary water resources due to negative impacts of the actions of one country on another • Varying success of strategies to manage conflicts over transboundary water resources
How do we manage the extraction of non-renewable resources by the extractive industries?	• Characteristics of extractive industries: - extraction of non-renewable and locationally specific resources - capital and technology intensive - dominated by large private and state-owned firms • Variations in impacts of extractive industries between places - economic impacts - environmental impacts - social impacts • Varying success of strategies to manage impacts of extractive industries on places

Topic 1.2 Development and the Global Economy

How does the global economy impact places?

The global economy is complex, characterised by dynamic geographies and interactions between multiple actors at different scales. The global economy connects places at different scales and creates interdependence between them. An understanding of how the global economy works is key in building students' ability to examine the relationship between people and the economy.

In this topic, students will develop an understanding of the global economy. After acquiring an understanding of the current state of development across the world, students will learn about the geographical patterns of trade, investment and labour flows in the global economy. The unevenness in the flows will contribute to students' understanding of how the global economy can result in variations in development levels. Students will continue to build their understanding of economic configuration using the

global production network framework. Studying the interactions between different actors will help students understand the relative influence of each actor in the global economy.

Key Question	Content
	Students will understand:
1. Development	
How do levels of development vary across space?	• Variations across space in levels of development between: - macro-regions - countries within a macro-region - different places within a country
How are global patterns of trade, capital and labour flows related to variations in levels of development across space?	• Global patterns of flows of trade, capital and labour: - unevenness across space - shifts since the 1950s • Influence of global patterns of flows of trade, capital and labour on variations in levels of development across space • Influence of variations in levels of development across space on global patterns of flows of trade, capital and labour
How might the structure of a country's economy be affected by shifts in global patterns of manufacturing, services and agriculture?	• The shifts in the global patterns of production in manufacturing, services and agriculture since the 1950s and their impact on a country's economy: - likely shift towards the manufacturing sector and a decrease in the share of agricultural sector for some countries - likely shift towards the service sector for countries at higher levels of development as the competitiveness of their manufacturing sector declines
2. Geography of the Global Economy and Transnational Corporations (TNCs)	
How do global patterns of flows of trade, capital and labour illustrate the interconnectedness within the global economy?	• The connections between places through trade, capital and labour flows • The interdependence between places in the global economy as a result of trade, capital and labour flows
How do the global production networks of TNCs connect places within the global economy?	• Ways by which Global Production Networks (GPNs) of TNCs connect places within the global economy through flows of materials and capital: - sourcing of inputs from different places - transformation of inputs into products at different places - distribution of products to different places - consumption of products in different places
How do TNCs' global production networks	• Positive and negative impacts of GPNs of TNCs on host and home economies: - economic impacts

impact their home and host economies?	- environmental impacts - social impacts
3. Relative Influence of Actors in Shaping the Global Economy	
Can states influence economic activities?	• Influence of states on TNCs' operations through their role as regulators of economic activities • Varying degree of states' influence over the operations of TNCs
Can labour influence economic activities?	• Influence of labour characteristics on TNCs' locational decisions • Influence of labour unions on TNCs and states • Influence of TNCs and states on labour: - regulation of labour by states - impact of TNCs' decisions on labour
Can multilateral institutions influence economic activities?	• Influence of multilateral institutions on TNCs and states: - Association of Southeast Asian Nations (ASEAN) - World Trade Organisation (WTO) - World Bank

Cluster 2 | Tropical Environments

Topic 2.1 Tropical Climates and Drainage Basins

What are the interrelationships between climatic and hydrological systems in the tropics?
Physical geographers today focus on the diverse natural environment. Modern physical geography aims to explain the spatial patterns in the environment, the underlying dynamics and processes underpinning them at different scales. Popular among physical geographers is the systems approach, which examines the interrelationships between different components in the environment.

In this topic, students will examine climatic and hydrological systems, with a focus on the tropics. Students will first study the temperature and rainfall characteristics of different climate zones in the tropics and understand how the climate zones are influenced by circulations at the global and synoptic scales. They will then explore how climate influences the balance between input and output of moisture in drainage basin systems. They will also learn how water moves and is stored in drainage basin systems. An understanding of climatic and hydrological systems enables students to then examine flooding in the humid tropics.

Key Question	**Content**
	Students will understand that:
1. Tropical Climates	
What are the similarities and differences in the temperature and rainfall patterns in the tropics?	• Classification of locations in the tropics into climate zones according to their temperature and rainfall characteristics: - humid tropics: tropical rainforest (Af), tropical monsoon (Am), tropical savanna (Aw) - arid tropics: sub-tropical steppe (BSh), tropical desert (BWh)

	• High temperatures as the key distinguishing characteristic of the tropics • Variations in amount of rainfall between the humid and arid tropics • Seasonal variations in rainfall patterns in different parts of the tropics
How does global atmospheric circulation affect rainfall in the tropics?	• Effect of high angle of incidence on surplus heat and temperature in the tropics • Role of surplus heat in driving atmospheric circulation in the Hadley cells • Influence of atmospheric circulation in the Hadley cells on rainfall patterns in the tropics • Influence of seasonal migration of the Hadley cells on rainfall patterns in the tropics
How does synoptic scale circulation affect rainfall in the tropics?	• Influence of distribution of heat over land and sea on summer and winter monsoon circulations in humid tropical Asia, and the resultant effects on rainfall patterns • Atmospheric and surface conditions necessary for the development of tropical cyclones and resultant effects on rainfall patterns • The three phases of the El Niño Southern Oscillation (ENSO) and the associated changes in rainfall over tropical Pacific: - El Niño phase - neutral phase - La Niña phase
2. Drainage Basin Hydrology	
How does the balance between input and output in the drainage basin system vary in the tropics?	• Input of water into the drainage basin system via: - precipitation - snowmelt • Output of water from the drainage basin system via: - evapotranspiration - river discharge • Variations in the balance between input and output over time and space in the tropics due to natural factors
How does water storage in the drainage basin system vary in the tropics?	• Storage of water in the drainage basin system as: - channel storage - groundwater storage - interception storage - soil moisture storage • Variations in storage in the drainage basin systems in the tropics over time and space due to: - natural factors - human factors

How do pathways in the drainage basin system vary in the tropics?	• Movement of water through the drainage basin system via pathways: - baseflow - channel flow - infiltration - overland flow - percolation - throughflow • Variations in pathways in the drainage basin systems in the tropics over time and space due to: - natural factors - human factors
3. Floods in the Humid Tropics	
What factors contribute to fluvial flooding in the humid tropics?	• Occurrence of fluvial floods when peak discharge exceeds bankfull discharge and inundates adjacent areas that are usually dry • Factors contributing to occurrence of fluvial floods in the humid tropics: - natural factors - human factors
Why do fluvial floods affect places and people differently?	• Impacts of fluvial floods on places: - positive impacts - negative impacts • Variations in the effects of fluvial floods on places • Variations in the effects of fluvial floods experienced by different groups of people due to differences in their vulnerability
Can fluvial floods be effectively managed?	• Strengths and limitations of strategies to manage fluvial floods • Varying success of strategies to manage fluvial floods • Extent to which humans can control the occurrence of fluvial floods

Topic 2.2 Landforms in the Tropics

How do natural processes and human activities influence landforms in the tropics?

Present-day landforms are shaped by processes that have operated over very long timescales. These processes work together to shape the earth's surface, creating landforms that contribute to the splendour of the natural environment. As humans continue to build settlements in the natural environment, these landforms will be impacted by anthropogenic activities.

In this topic, students will examine landforms on the earth's surface, with a focus on river and karst landforms in the humid tropics. Students will first study the various geomorphic processes that shape the earth's surface. Their understanding of the

geomorphic processes will enable students to explore the development of karst landforms and selected fluvial landforms in the humid tropics. Students will also examine how anthropogenic activities can impact karst and fluvial landforms in the humid tropics.

Key Question	Content
	Students will understand:
1. Geomorphic Processes	
What influences the weathering of rocks?	• Weathering processes: - chemical weathering: carbonation, hydrolysis, oxidation, reduction, solution - physical weathering: freeze-thaw, pressure release, salt weathering, thermal weathering • Factors influencing weathering of rocks: - natural factors - human factors
What influences the movement of materials on slopes?	• Movement of materials on slopes: - mass movement: fall, flow, creep, slide - water erosion: rainwash, rillwash and splash erosion • Factors influencing movement of materials on slopes: - natural factors - human factors
What influences fluvial processes?	• Fluvial processes: - erosion: corrasion, corrosion, cavitation - transportation: traction, saltation, suspension, solution - deposition • Factors influencing fluvial processes: - natural factors - human factors
2. Karst Landforms in the Humid Tropics	
What karst landforms can be found in the humid tropics?	• Karst landforms: cockpit karsts, tower karsts, caves • Features of cockpit karsts: cone-shaped hills, star-shaped depressions • Features of tower karsts: towers, plains • Features of caves: solutional opening, speleothem
What factors influence the formation of karst landforms in the humid tropics?	• Role of geomorphic processes in the formation of karst landforms • Factors influencing the formation of karst landforms
What is the importance of karst landforms in the humid tropics?	• Ecosystem services provided by karst landforms • Impact of human activities on ecosystem services provided by karst landforms

3. Fluvial Landforms in the Humid Tropics	
What fluvial landforms can be found in the humid tropics?	• Fluvial landforms: meanders, braided channels and deltas • Features of meanders: sinuous channel, river cliff, point bar • Features of braided channels: mid-channel bars • Features of deltas: delta plain, delta front, prodelta
What factors influence the formation of fluvial landforms in the humid tropics?	• Role of geomorphic processes in the formation of fluvial landforms including the role of sediment removal and dispersal by waves and tides in the formation of deltas • Factors influencing the formation of fluvial landforms
What is the importance of deltas in the humid tropics?	• Ecosystem services provided by deltas • Impact of human activities on ecosystem services provided by deltas

Cluster 3 | Sustainable Future and Climate Change

Topic 3.1 Cities in a Sustainable Future

Can cities be liveable yet sustainable?

More than half the world's population live in urban areas today. The proportion of people living in urban areas is expected to grow especially in less developed regions, putting pressure on natural environments. This is because cities consume more resources and produce more waste than rural areas. Therefore, managing the growth of cities effectively is key to achieve sustainable development.

In this topic, students will explore the challenges and opportunities to make cities sustainable. Students will first be introduced to how sustainable urban development can be measured. They will then study the management of waste, slums and urban reimaging. Students will also explore the complementarity and tension between sustainability and liveability. This understanding will be useful as they examine how two key identity markers – age and gender – can influence people's experience of living in urban areas.

Key Question	Content
	Students will understand:
1. Sustainable Urban Development	
How can sustainable urban development be measured?	• Dimensions of sustainable development in urban areas: - economic vitality - environmental integrity - social well-being • The use of relevant indicators to monitor sustainable urban development • Difficulties faced when measuring sustainable urban development: - difficulty in deciding what aspects of the dimensions to measure - difficulty in selecting appropriate indicators

How do urban population trends influence progress towards sustainable development?	• Possible challenges in progressing towards sustainable urban development: - high urbanisation rates and rapid urban growth - urban population loss
How does the demand placed on natural environments by urban areas influence progress towards sustainable development?	• Demand placed on natural environments due to: - high concentration of waste - large ecological footprints - vast quantities of resources absorbed by urban areas from the surrounding areas • Demand placed on natural environments when waste is not viewed as a potential resource • Demand placed on the environment of the surrounding areas resulting in environmental problems there
2. Sustainable Cities	
Why is effective waste management important for progress towards sustainable urban development?	• Problems associated with non-hazardous solid waste in urban areas of countries at different levels of development • Impact of these problems on sustainable urban development • Varying success of strategies to manage non-hazardous solid waste across places
Why is effective slum management important for progress towards sustainable urban development?	• Reasons for development of slums in urban areas of countries at different levels of development • Impact of multiple deprivations experienced by slum dwellers on sustainable urban development • Varying success of strategies to improve the lives of slum dwellers across places
Why is effective urban reimaging important for progress towards sustainable urban development?	• Economic reasons for urban reimaging efforts • Impact of urban reimaging on sustainable urban development • Varying success of urban reimaging strategies across places
3. Liveable Cities	
How are sustainable urban development and liveability related?	• Subjective nature of liveability due to place, time and purpose of the assessment • Factors influencing liveability of a place: - economic factors - environmental factors - social factors • Complementarity and tension between sustainable urban development and liveability
How do we create liveable cities for the elderly?	• Increase in proportion of the elderly in urban areas in countries at different levels of development • Issues faced by the elderly living in the city related to:

	- economic well-being - social well-being - psychological well-being • Varying success of strategies to address the issues faced by the elderly living in the city
How do we create liveable cities for women?	• Importance of gender equality for progress towards liveable cities • Issues faced by women living in the city related to their: - economic well-being - social well-being - psychological well-being • Varying success of strategies to address the issues faced by women living in the city

Topic 3.2 The Future with Climate Change

Can we successfully respond to climate change?

Scientists know that global warming is occurring from evidence such as measurements of rising surface air temperatures and observations of retreating glaciers. They believe that global warming is largely caused by human activities, resulting in climate change. The Intergovernmental Panel on Climate Change (IPCC) warns that climate change can compromise our progress towards sustainable development. Climate change also impacts different aspects of our lives, including economic, environmental and social dimensions.

In this topic, students will learn about contemporary climate change. Students will first study contemporary climate change in relation to past changes in Earth's climate. This will provide students with a better understanding of anthropogenic contributions to contemporary climate change. Students will then examine how contemporary climate change might impact humans, deepening their understanding of human-environment interactions. Students will also explore possible responses to climate change, and the challenges associated with the planning and implementation of these responses.

Key Question	**Content**
	Students will understand:
1. The Science of Climate Change	
Is climate variability a new phenomenon in Earth's history?	• Evidence of past climate variability derived from proxy indicators through the study of ice and ocean cores • Episodes of warming and cooling of Earth during the Quaternary period
Can natural factors fully account for contemporary climate change?	• Natural factors influencing temperature variability in the Quaternary period: - changes in solar output - changes in thermohaline circulation - changes in ice sheets

	• Influence of these natural factors on temperatures through feedback mechanisms
How significant is the influence of human activities on Earth's climate compared to natural factors?	• Consensus within the scientific community, represented by the Intergovernmental Panel for Climate Change (IPCC), that climate change in the last two centuries is unequivocal and it is very likely caused by human activities • Influence of human activities on the global carbon cycle: - activities that increase carbon emissions - activities that reduce carbon sinks • Enhanced greenhouse effect due to the increased concentration of greenhouse gases by human activities • Role of human activities in: - accelerating warming through positive feedbacks - suppressing warming through negative feedbacks
2. Possible Effects of Climate Change	
How will contemporary climate change impact humans?	• Changes in temperature and precipitation associated with contemporary climate change • Impacts of contemporary climate change on aquatic and terrestrial ecosystems • Impacts of these changes in aquatic and terrestrial ecosystems on humans
Will contemporary climate change impact everyone in the same way?	• Impacts of contemporary climate change on places: - positive impacts - negative impacts • Variations in negative impacts of contemporary climate change due to: - uneven changes in temperature and precipitation across places - differences in vulnerability of different groups of people
How certain are we of the present and future impacts of contemporary climate change?	• Reasons for uncertainty over present and future impacts of contemporary climate change: - lack of full understanding of physical processes - incomplete in-situ data on vast expanses of oceans, deserts and polar regions - intrinsic measurement errors in current climate data - uncertainty over future greenhouse gas emissions
3. Responses to Climate Change	
How can we respond to contemporary climate change?	• Mitigation strategies to reduce greenhouse gas emissions and enhance carbon sinks • Adaptation strategies to help human populations adjust and cope with actual or expected climate change and its effects
Who are the key actors involved in	• Role of key actors in climate change response: - firms

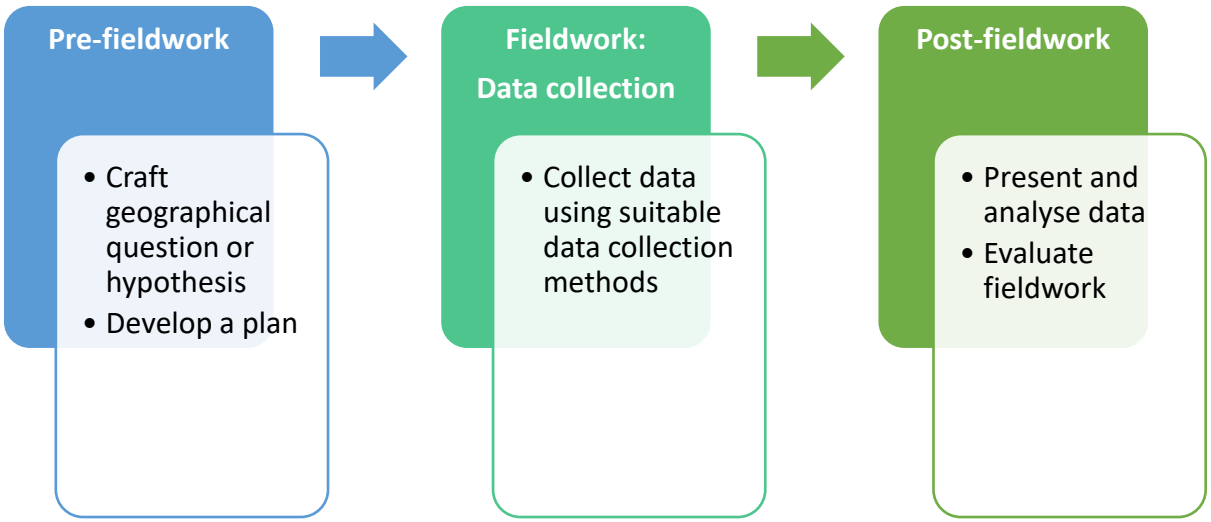
climate change response?	- non-governmental organisations (NGOs) - state • Importance of partnerships between firms, NGOs and states, NGOs in responding to climate change
Are all places able to implement effective strategies to respond to contemporary climate change?	• Varying success of strategies to respond to climate change • Challenges in implementing strategies to respond to climate change: - economic challenges - political challenges - uncertainties over future impacts of climate change

Cluster 4 | Fieldwork

With guidance from the teacher, students will identify a suitable geographical question or hypothesis to conduct fieldwork. This can be completed individually or in small groups. Students should devise geographical questions or hypotheses and follow through the fieldwork in the following areas:

- Community response to climate change
- Needs analysis of the elderly living in an urban neighbourhood
- Fluvial flood risk and strategies to mitigate it

The fieldwork should reflect the following stages:



1. **<u>Pre-fieldwork stage</u>**

Craft Geographical Question or Hypothesis

Students should be able to craft geographical questions/hypotheses based on geographical issues or phenomenon that are:

- at a suitable scale;
- researchable or measurable; and
- clearly defined.

Develop a plan

Students should be able to develop a plan that:

- establishes the primary and secondary data needed to examine the question/hypothesis posed;
- identifies appropriate methods to determine sample size, select sample and collect data;
- ensures accuracy and reliability of data collected;
- addresses possible issues related to research ethics and the limitations imposed by resources; and
- minimises potential risks in undertaking fieldwork.

2. Fieldwork stage: Data collection

Collect data using suitable data collection methods

Students should be able to:

- collect primary data using appropriate methods; and
- collect secondary data including available data from geospatial technologies.

3. Post-fieldwork stage

Present and analyse data

Students should be able to:

- organise and represent data using appropriate methods (see Additional Notes on Data);
- analyse the data using appropriate qualitative and quantitative methods; and
- draw conclusions in relation to the question/hypothesis posed.

Evaluate fieldwork

Students should be able to:

- Evaluate the validity of the fieldwork in terms of data collected and methods used to collect and present data.

Additional Notes on Data
Students are required to be familiar with the following types of data. Making sense of data and representing ideas using different graphical/tabular methods should be an integral part of learning Geography, including fieldwork.

Maps | contour maps, choropleth maps, isoline maps, dot maps, flow-line maps, proportional symbols maps and cartograms

Graphs | pie charts, bars, histograms, scatter graphs, radar charts, triangular graphs and line graphs

Photographs | landscape photographs, aerial photographs and satellite images

Others | tables, schematic diagrams, illustrations and cartoons

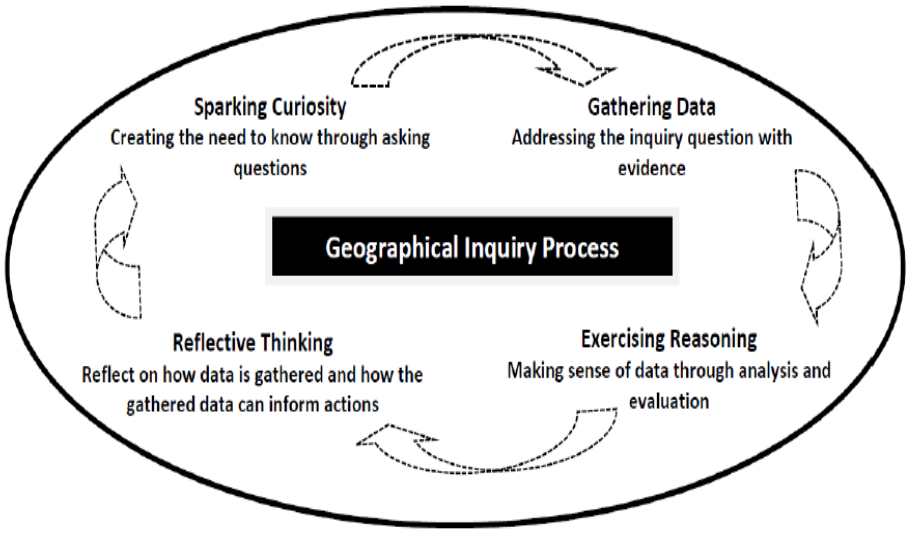
3. PEDAGOGY – GEOGRAPHICAL INQUIRY

3.1 Learning Through Geographical Inquiry

Learning through inquiry[3] stimulates students' interest in Geography and empowers them to take responsibility for their learning. The inquiry-based pedagogical approach seeks to shift students from a reliance on memorising information to actively construct new knowledge and understanding through comprehension, extraction and application of information from varied sources. The use of geographical inquiry is thus at the heart of Geography instruction and learning, and students should be provided with the opportunities to learn the skills required through practice and engagement in geographical inquiry.

The Geographical Inquiry Process (Figure 3) comprises four stages of inquiry. During the sparking curiosity stage, stimulus materials are provided to challenge students' assumptions and habitual responses to situations. Students are invited to be inquisitive and pose questions about phenomena introduced by their teacher or by other students. This is followed by the gathering data stage where students use data as evidence to address the inquiry question. By identifying relevant sources of information, data can be provided by teachers or collected first-hand by students through fieldwork. The exercising reasoning stage, which is making sense of the information gathered, is the heart of learning. Students need to analyse the data, relate it to what they know already, see relationships between different information, make all kinds of connections and develop their own understanding of what they are studying. Inquiry is not simply about finding information to answer questions, it is about developing understanding. During the final stage of reflective thinking, students recollect what has been learnt and revisit how learning has taken place. Reflecting on what students have achieved and whether they would have taken a different approach are crucial in formulating conclusions to the inquiry, evaluating evidence critically and suggesting improvements to the inquiry process.

Figure 3: Geographical Inquiry Process



[3] Roberts, M. (2013). *Geography Through Enquiry*. Sheffield: Geographical Association.

3.2 Fieldwork

Fieldwork is a key component of learning through inquiry. Bite-sized and extended fieldwork have been introduced into the syllabus to provide ample opportunities for students to conduct fieldwork.

Bite-sized fieldwork aims to:

- be convenient, quick and resource-efficient;
- spark curiosity or consolidate information at key moments within a scheme of work;
- utilise students as resources rather than rely on specialised equipment; and
- foster inclusivity, given that students have diverse learning profiles.

The syllabus recommends extended fieldwork opportunities for the focus areas identified in Cluster 4. In contrast to bite-sized fieldwork which can be completed within a lesson, extended fieldwork spans a series of lessons. Extended fieldwork provides students with the opportunity to identify a suitable geographical question or hypothesis; develop a plan for fieldwork; collect data; analyse and present their data; and evaluate their fieldwork.

3.3 Use of Geospatial Technology in Geographical Inquiry

The advancement of computer hardware and software has made geospatial data and technologies more accessible to teachers and students. Geospatial technologies, for example remote sensing, geographic information systems, Internet mapping and global positioning systems, are used to collect and process data about specific locations on the earth. Geospatial data and technologies can be readily incorporated into web-based learning activities to enhance students' learning. For example, students can explore a variety of digital content such as images, statistics and graphs using interactive web maps available from the Singapore Student Learning Space (SLS). The use of 360^{o} virtual reality technology can also provide students with an immersive experience of field sites prior to and/or after primary data collection. When appropriately applied, teaching with geospatial technology contributes towards the development of 21CC among students.

4. ASSESSMENT

The assessment objectives for this syllabus are presented below.

AO1 – Knowledge with Understanding
Candidates should be able to demonstrate knowledge and understanding of:

a. geographical terms, facts, concepts, issues, phenomena and trends; and
b. geographical skills and methods to carry out fieldwork.

AO2 – Analysis
Candidates should be able to apply understanding of geographical knowledge to:

a. analyse issues, phenomena and trends presented in given data; and
b. analyse fieldwork in terms of data collected and methods used to collect and present data.

AO3 – Evaluation
Candidates should be able to carry out analysis to:

a. make judgements, recommendations, decisions and draw conclusions through synthesising geographical knowledge and assessing evidence, viewpoints, interests of different stakeholders and/or elements of an issue; and
b. evaluate the validity of fieldwork in terms of data collected and methods used to collect and present data.

The approximate weighting of the AOs for H2 Geography is presented in Table 3.

Table 3: Approximate Weighting of Assessment Objectives for H2 Geography

Assessment Objectives	Paper 1 (Marks)	Paper 2 (Marks)	Total (Marks)	Total (Weighting %)
AO1	20	25	45	24
AO2	40	35	75	39
AO3	40	30	70	37
Total	100	90	190	100

Examination format for H2 Geography

Paper 1 100 marks; 3h; 50%	**Paper 2** 90 marks; 3h; 50%
Section A: Structured Question (60 marks) Two compulsory questions will be set. Cluster 1: Question 1 Cluster 2: Question 2 Each question: • carries 30 marks • comprises no more than 6 sub-parts • may be on specific topic or combination of topics within the cluster **Section B: Essay (40 marks)** Four evaluative questions will be set. Candidates answer TWO questions, one from each cluster. Cluster 1 – EITHER Question 3 OR Question 4 Cluster 2 – EITHER Question 5 OR Question 6 Each question: • carries 20 marks • is assessed using generic level descriptors There will be a **maximum of 9 resources** in this paper.	**Section A: Structured Question (40 marks)** One compulsory fieldwork question will be set. Cluster 4: Question 1 Question: • carries 40 marks • comprises no more than 8 sub-parts • includes a 10-mark evaluative sub-part assessed using generic level descriptors **Section B: Structured Question (30 marks)** One compulsory question will be set. Cluster 3: Question 2 Question: • carries 30 marks • comprises no more than 6 sub-parts • may be on specific topic or combination of topics within Cluster 3. **Section C: Essay (20 marks)** Two evaluative questions will be set. Candidates answer ONE question. Cluster 3: EITHER Question 3 OR Question 4 Each question: • carries 20 marks • is assessed using generic level descriptors There will be a **maximum of 9 resources** in this paper.