

The geographer's toolkit

Geography is the study of the places that make up the world around us. Geographers are interested in how human activities and natural processes change the Earth – its **places** and the links between these places. In this era of rapid population growth, climate change and **globalisation**, geographers help other people understand **change** more than ever before. By gathering, analysing and presenting information, geographers explain how change affects people and places and how these changes can be managed.

Geographers have a sense of wonder and curiosity about the world and this leads them to ask questions about what they see and experience. For example, when they look at the Serengeti **ecosystem** in Tanzania, Africa, shown in Source GT.1, they ask questions like these:

- What processes formed this **environment**?
- What types of animals and plants are found in this area?
- How have animals adapted to **survive** in this environment?
- Do humans live in this **environment**?
- What do the elephants living in the **environment** eat?
- How is this **environment** significant to the local people?
- Is this a hazardous **place**?
- How is this place used by different groups of people?

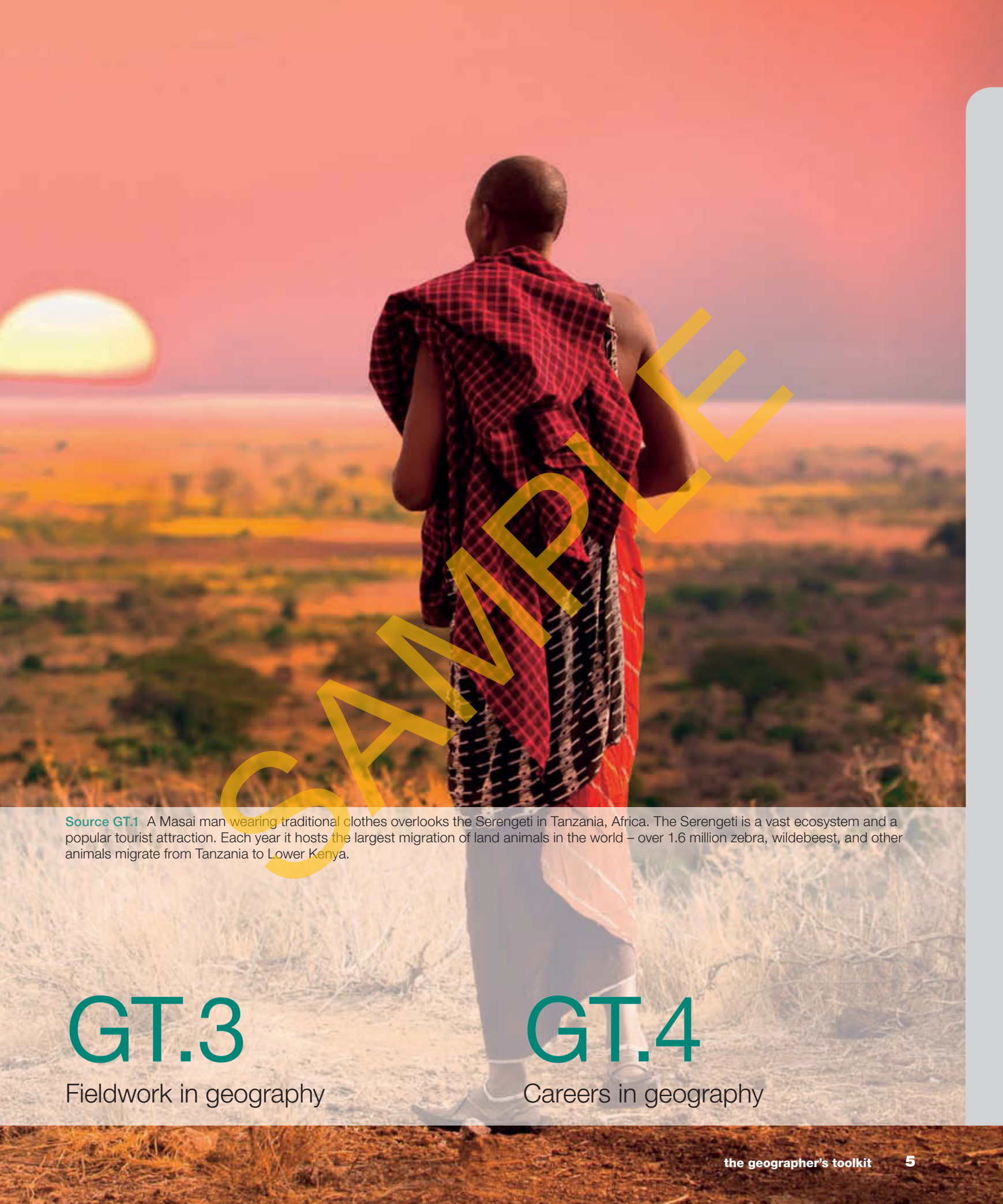
Geographers use a range of key concepts and skills to answer questions such as these. It helps to think of each of these concepts and skills as a tool that you can use to better understand your world. As you master each of the skills and concepts, you will gradually fill your toolkit. Welcome to the wonderful world of geography!

GT.1

Concepts for developing geographical understanding

GT.2

Geographical inquiry and skills



Source GT.1 A Masai man wearing traditional clothes overlooks the Serengeti in Tanzania, Africa. The Serengeti is a vast ecosystem and a popular tourist attraction. Each year it hosts the largest migration of land animals in the world – over 1.6 million zebra, wildebeest, and other animals migrate from Tanzania to Lower Kenya.

GT.3

Fieldwork in geography

GT.4

Careers in geography

GT.1 Concepts for developing geographical understanding

Geographers use seven key concepts to help investigate and understand the world. These concepts provide a framework to thinking geographically and will help guide you through every geographic inquiry. At times you will use several of these concepts at once, while at other times you may focus on just one. The seven key concepts in geography are:

- place
- space
- environment
- interconnection
- sustainability
- scale
- change.

Place

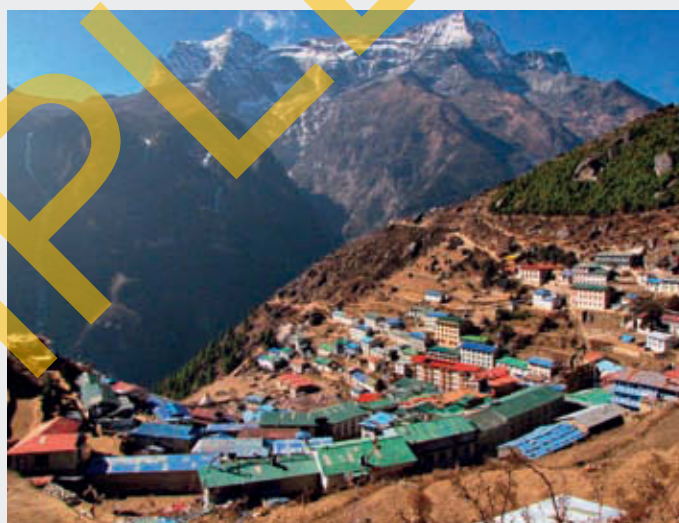
A place is a part of the Earth's surface that is identified and given meaning by people. For example, the Serengeti – which is a vast ecosystem in Africa – is a place. It is famous for its enormous plains filled with wildlife, animals and birds. Places aren't defined by size, however. They can be very large, like a whole continent, or small, like a corner of a library. Your home and school are important places for you, because they are places where you live and spend a lot of time.

Places can be natural (that is, shaped by the environment and largely unchanged by humans), or built (that is, constructed by humans). Each place is unique with its own set of characteristics.

The life of every person and animal on Earth is influenced by place. Places determine our relationships with one another. Our closest relationships are likely to be with people in places that are physically near. The environmental and social qualities of a place all influence the way we live. Climate, landscapes, types of plants and resources, transport networks, entertainment venues and workplaces all have a major impact on our daily lives.

Geographers use the concept of place when they investigate what a place is like, and when they look for explanations for what they see. For example, a geographer visiting this village near Mount Everest would be interested in the forces that have shaped these mountains.

They would look for clues and begin to ask questions, much like a detective. Why are the sides



Source GT.2 The town of Namche Bazaar lies at the base of Mount Everest.

of the mountains so steep? Why are the highest mountain peaks in a line? Why are there stripes in the mountain peaks? By seeking answers to these questions the geographer is aiming to explain, not just describe, a place.

Geographers use the concept of place when conducting any geographical inquiry. For example, a geographer visiting Namche Bazaar in Nepal (see Source GT.2) would use the concept of place to help understand why people choose to live in this challenging environment and how they overcome these challenges. They would also investigate the ways people have altered this environment, and assess the environmental and social impacts of the effects of these changes.

Space

To most people, space means the empty universe, but to a geographer it has a different meaning. Geographers use the key concept of space when investigating the way that things are arranged on the Earth's surface. They also investigate the ways people use and change the spaces in which they live.

Geographers look for patterns in the way features and structures are arranged, and the concept of space helps them to do this. It has three main elements.

- Location – where things are located on the Earth's surface
- Organisation – how and why things are arranged and managed on the Earth's surface by people
- Spatial distribution – the shapes and patterns in which things are arranged on the Earth's surface.

At first, you may find you confuse the concepts of place and space, as people often use the words interchangeably. To a geographer, however, the concepts of place and space are quite separate. It may help you to remember that places can be divided and organised into spaces. Spaces also are assigned with different purposes.

For example, a place like your school is organised into different spaces, each with its own purpose. There are spaces for learning, spaces for sports and spaces to eat. Larger places, such as your suburb, town or city, are also organised into different spaces. There are spaces for housing, spaces for businesses, and spaces for sports and entertainment – all with their own function.

Understanding of the location, patterns and planning of spaces helps geographers to make sense of our world. A geographer would look at a photograph like this one of New York City (see Source GT.3) and might examine it by using the key concept of space in the following terms.

- Location – they would observe that Manhattan Island is located in the mouth of the Hudson river and that land is limited. Clearly, there is an open space in the centre of the city. A geographer might identify that it has been designated as a space for recreation and enjoying nature. They may ask questions like, How big is the park? When was it established?

- Organisation – they would conclude that there are many tall buildings in a confined area. Were the buildings constructed around a set perimeter, after the park was established? Are the buildings mainly used for business or housing purposes?
- Spatial distribution – the geographer may investigate how many buildings there are per square kilometre, how sparsely or densely they are situated from each other, and how sparsely or densely they are populated.

Further investigation would reveal that there is a complex network of bridges, ferries, subways and walkways that link the island to surrounding areas. In fact, Manhattan Island in New York is one of the most densely populated places on Earth, with more than 26 000 people living in every square kilometre! New Yorkers would perceive and use the space around them in quite a different way than someone living on a huge block in an outer suburban area.

Geographers also investigate the ways that people use and change the space in which they live. They recognise that different groups of people use space in different ways and that this changes over time. By examining, researching and describing how spaces are used, geographers can further our understanding of the world and help manage it into the future.



Source GT.3 Manhattan Island in New York is one of the most densely populated places on Earth.

Environment

You will have heard people talk about ‘the environment’ and probably studied aspects of the environment before. In geographical terms, the key concept of environment means the living and non-living components and elements that make up an area, and the ways they are organised into a system.

Geographers are interested in investigating and describing the relationships between people and the environment. In particular they examine:

- the ways in which different groups of people perceive and use the natural environment and why these perceptions differ
- the ways in which people change the environment and how these changes can be managed
- the impact of environmental hazards on people and how the impacts of these hazards can be reduced.

The world in which we live is made up of many different environments. Some environments are natural (or physical) such as deserts, **grasslands**, mountains, coral reefs, forests, oceans and ice caps. The natural environment provides us with basic resources for living such as food, water and clean air. Natural processes such as **tectonic plate** movement, **erosion** and **weathering** have formed these environments over millions of years. In order for an environment to be considered natural its soils, rocks, climate, plants and animals must remain largely untouched by humans. Today there are very few natural environments left on Earth. The Australian World Heritage listed Heard and McDonald Islands are an outstanding example of a pristine natural environment with no introduced animals and plant species, and no human impact.

Other environments have been so changed by humans – largely for settlement and economic activity – that very few natural features remain. These are known as built (or human) environments and include

large cities, towns, suburbs and areas of farmland. For example, mountainous land in the Philippines has been transformed into terraced pond fields for rice farming by skilfully following the natural contours of the land.

Researching an environment also allows geographers to evaluate how people can best interconnect with that environment, and identify potential risks for people interacting with that environment. For example, examining the landscape, height, as well as the ascent of Mt Kilimanjaro (see Source GT.4) in Africa allows prospective travellers to know that, unlike with Mt Everest, they don’t need to bring additional oxygen for their climb, but they do need to follow one of six official routes.

The study of different environments helps geographers to better understand and appreciate natural processes, such as how weather works, how mountains are formed and how rainforests and coral reefs grow. The concept helps geographers to analyse the changes humans make to natural environments and better appreciate their impact so that they can be managed more wisely.



Source GT.4 Mt Kilimanjaro in Africa is a popular place for climbers to interact with the natural environment.

Interconnection

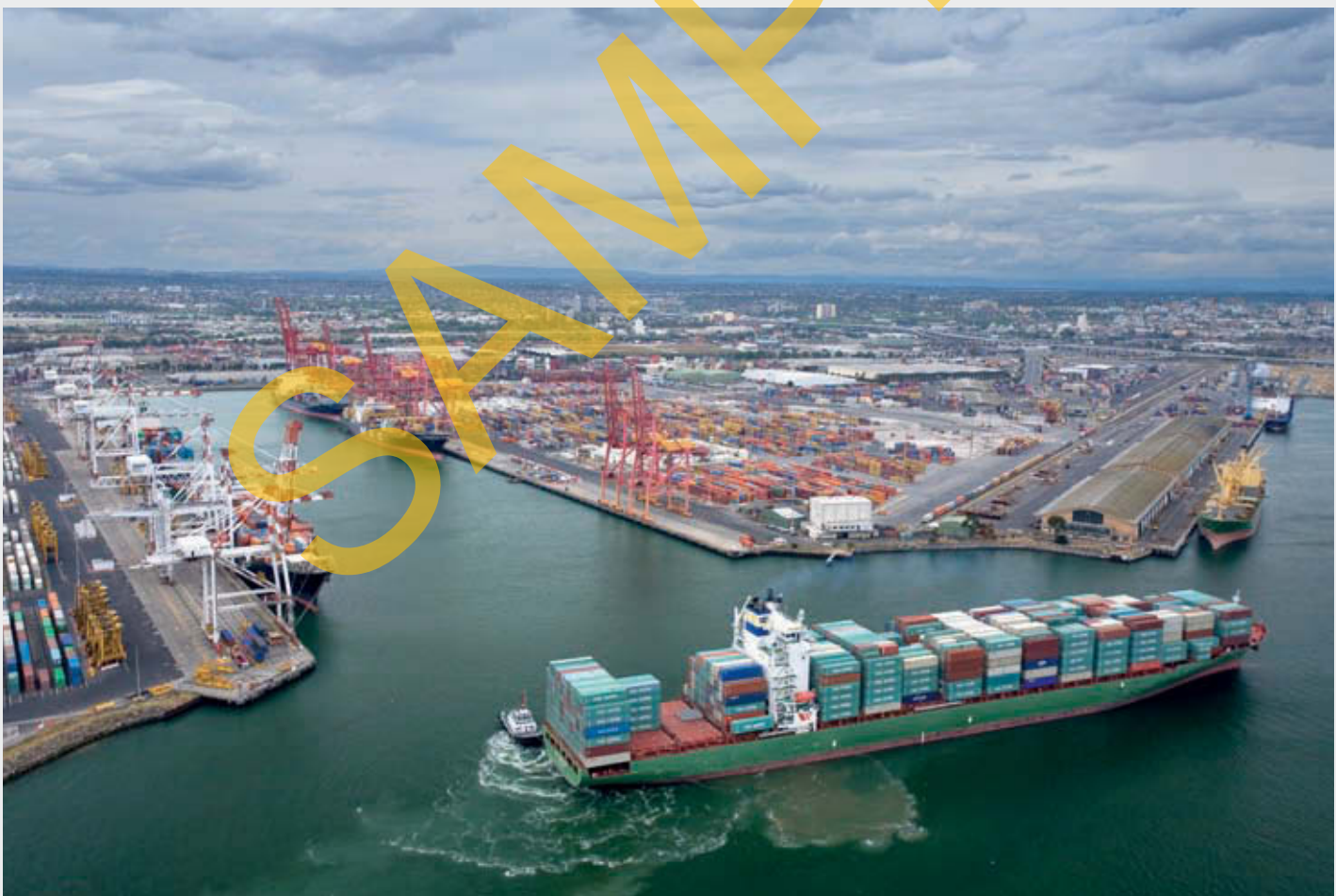
Nothing on Earth exists in isolation – all environments and every living and non-living thing are connected. Geographers use this concept of interconnection to better understand the links between places and people, and how these interconnections affect the environment and the way we live. These connections can be on a local level or a global level.

Natural processes link places and people. For example, the water cycle links the water in the oceans with the land. When it brings rain to inland areas, water flows across the land and into rivers and streams. Farmers rely on this natural link to provide the water they need to grow food.

Links between places and people can affect the way people live. In turn, the way people live can affect places. A relatively small change in one area can

have a great impact on another it is interconnected with. The melting of ice from a glacier at the top of a mountain, for example, will affect the land at the bottom of the mountain. The extra water could potentially damage crops that are being grown there, or conversely the changed conditions may benefit farmers.

Human activities such as the movement of people, the production and trade of goods, and the flow of money within and between different countries also link places and people. Interconnection through electronic means such as mobile phone and Internet is now a part of everyday life for many of us. Being consumers in a global market place also means we are connected to many places via international trade. More than 3000 ships carrying two million containers pass through the Port of Melbourne (see Source GT.5) each year. These ships and the goods they carry link dozens of countries around the world.



Source GT.5 A container ship prepares to berth at Port Melbourne.

Sustainability

The concept of sustainability relates to the ongoing capacity of the Earth to maintain all life. This means developing ways to ensure the Earth's resources are used and managed responsibly so they can be maintained for future generations.

Sustainable patterns of living meet the needs of the current generations without compromising the ability of future generations to meet their own needs. Many of the world's resources (such as oil, coal and natural gas) are non-renewable. This means that if we continue to use them they will one day run out. Other resources (such as wind, forests, solar and water) are renewable. This means that they replace themselves naturally, or can be replaced to meet the needs of society. Sustainability encourages us to think more closely about these different types of resources – the ways in which they are formed and the speed at which they are being used. It also encourages us to look more closely at renewable options and take greater care of the Earth. Actions to improve sustainability can operate at a number of levels:

- local – recycling of paper by individuals, schools and households reduces the number of trees that need to be cut down

- national – in Australia, the government has begun to encourage sustainable use of energy by offering incentives to promote the use of solar panels
- international – organisations such as the Marine Stewardship Council (MSC) are working with fisheries and retailers to promote responsible and environmentally viable fishing practices around the world.

There can be debate surrounding the sustainability of an environment, as people or organisations with different interests may put forward different points of view. A tree-logging company may protest that their practices are sustainable, as they re-plant as much as they cut down. On the other hand, a conservation group may be equally convinced that a forest cannot sustain cutting down trees. New trees may take decades to grow, in which time wildlife has moved on and the ecosystem has been altered. Many underdeveloped countries, such as Myanmar (Burma), (see Source GT.6), face enormous challenges controlling and monitoring forest clearance.

Sustainability is an important concept for geographers. They use it to investigate how natural and human systems work, and understand how resources can be managed in such a way that they will be sustained into the future.



Source GT.6 Logging in Myanmar (Burma) gives local communities a source of income but leaves hillsides bare and easily eroded by heavy rain.

Scale

The concept of scale is used to guide geographical inquiries. Geographers study things that take place on many different spatial levels – meaning from small areas (such as a local park) to very large areas (such as the use of oil and gas all over the world). They use the concept of scale to look for explanations and outcomes at different levels. For example, a geographic inquiry on climate change may be carried out at a range of scales (from smallest to largest) (see Source GT.8):

- local – such as an inquiry into increased electricity use (for air conditioning) in your neighbourhood due to higher than average temperatures. Increased energy consumption may result in power outages.
- regional – such as inquiry into coral bleaching on the Great Barrier Reef (see Source GT.8). Warming ocean temperatures can trigger coral bleaching often resulting in coral death.
- national – such as an inquiry into changing weather patterns and increased frequency of extreme weather events in Australia. This impacts on government allocation of resources across many sectors (water security, agriculture, emergency services, coastal communities and infrastructure).
- international – such as inquiry into drought in Africa. Rains have become less reliable in many places as the climate has changed and many African nations have been hit by a series of devastating

droughts that have brought widespread hunger and starvation.

- global – such as an inquiry into the reduction in Arctic sea ice due to global warming. This reduction in white ice means that less of the Sun's energy is reflected back into space and more is absorbed into the earth and sea resulting in further increases in temperatures globally.

Some geographic studies investigate a large area. For example, something that affects a whole country, such as a severe drought, would involve a study at the national scale. If an event or phenomenon affects the whole world, such as climate change and rising sea levels, it would be examined at the global scale.

It may be necessary to use different scales when studying the same thing. For example, as mentioned above, climate change is occurring globally and should be examined at the global scale.

However, it can be examined at other scales too.

Source GT.7 Geographical inquiries can be carried out on a number of different scale levels.

Scale	Example of climate change inquiry
Local scale	Electricity consumption in your neighbourhood (increased use of air conditioning)
Regional scale	Coral bleaching on the Great Barrier Reef
National scale	Frequency of extreme weather events across Australia
Global scale	Reduction in Arctic sea ice; rising temperatures throughout the world



Source GT.8 The Great Barrier Reef off the coast of Queensland is the world's largest coral reef system. A geographical inquiry of the reef could be undertaken at a range of scales.

Change

The Earth is constantly changing. Some changes occur very rapidly and are easy to observe, while others take place over millions of years and are almost undetectable to us.

The concept of change is important in geography because it helps us to understand what is happening around us and to see the world as a dynamic place. Change refers to both time and space, and allows geographers to examine how environments develop, transform or disappear.

Change can be the result of natural forces. For example, the Earth has been shaped and changed by climate, earthquakes, volcanoes and running water over millions of years. It can also be the result of human activity, such as the building of a new bridge or clearing of forest for farmland.

Changes also take place on many levels, from local through to global. Local changes that happen quickly, such as storm damage in your street, are easy to observe and explain. Regional or national changes resulting from a bushfire or an earthquake can also happen quickly and their effects can be widespread with devastating impacts on places and people.

Changes that take place on a global scale can take much longer to occur. Global warming, for example, is a long-term change that happens slowly. Global warming has widespread effects that are not easily explained.

Observing and understanding changes that are natural and have occurred over time or changes that have been made by humans over time, is an important part of any geographical inquiry. Geographers need to look at different types of changes, why they have occurred, over what time period they have occurred and what further changes may take place as a result.

Sometimes changes can be positive, such as the regeneration of vegetation, while other changes can have negative consequences, such as the pollution of waterways from industry. Geographers play an important role in ensuring that change is managed in a sustainable way.





Source GT.9 In preparation for the 2012 Summer Olympic Games, Newham, in East London was transformed from a suburb of derelict buildings and polluted rivers into a vast sporting complex.



Source GT.10 The resources and buildings for the London 2012 Olympic Games were planned with sustainability as a primary concern, adopting a Zero Waste Games Vision. The Velodrome in this photo was built using 100% sustainably sourced timber.

Check your learning GT.1

Remember and understand

- 1 Is Namche Bazaar an example of the natural, or built environment?
- 2 List three natural environments and three built environments. Your answers can be drawn from the photographs in this section, or you can use your own observations.
- 3 At what scale would a study of Mount Kilimanjaro's glaciers take place?

Apply and analyse

- 4 Examine Source GT.6 of the hillside in Myanmar (Burma).
 - a What evidence of change can you identify in this picture?
 - b How might this change impact on the natural environment in this place?
 - c How might it impact on the people in the nearby village?
- 5 Examine Sources GT.9 and GT.10 of Newham in London.
 - a Describe the arrangement of the sporting facilities. Using the key concept of sustainability, what factors do you think would need to be considered when planning the development of this area?
 - b What examples of interconnection can you identify in these satellite images?
- 6 Examine Source GT.3 of New York City. With a partner, construct four questions you could ask to investigate why so many people live in such a small space. Share your questions with your classmates.
- 7 A geographer examining the changes that occurred at Newham in preparation for the 2012 Olympic Games would be interested in assessing the impacts and sustainability of these changes at the local scale. Describe some possible links between:
 - a environment and sustainability
 - b space and interconnection
 - c place and space
 - d scale and environment
 - e environment and interconnection.

Evaluate and create

- 8 Conduct some research online into the upgrades being made at the Port of Melbourne. Choose three of the geographical concepts discussed in this section that could be used to better understand this project. Jot down two points for each concept.
- 9 Research the host city of the next summer or winter Olympics. What changes are being made to the natural and built environments in and around the city in preparation for the games?
- 10 Choose one of the key geographical concepts outlined in this section. Find a photograph in a magazine or on the Internet that illustrates this concept. Explain your choice of photograph and how you think it describes the concept.

GT.2 Geographical inquiry and skills

Geographers are investigators. They explore the world around them by asking questions about what they see. These questions begin an investigation that requires them to collect and analyse information and to communicate what they have discovered. To complete an investigation they need a set of skills such as drawing **maps** and cross-sections, surveying, sketching and presenting information. To complete a full geographic inquiry there are five sets of skills. These are listed in Source GT.11.

To become a better geographer you should try to learn new skills as you continue to practice, use and develop the skills you have already learnt. It might help you to think of each of these skills as individual tools in your toolkit. For some geographical inquiries, you may only need to use one tool; for others, you may need to use many. As you develop each new skill you will have gained another important tool in explaining the natural processes and human activities that shape our amazing planet.

Observing, questioning and planning

Observe the world and its geographical characteristics

Understanding our world begins by observing the processes that are taking place all around us. Geographers look at people, land, air, water, plants and animals and the connections between them to understand what is happening. They also seek to investigate where, why and how natural, managed and constructed environments are formed and changed. These observations often include identifying any problems or issues that need to be investigated and resolved.

Observing, questioning and planning	<ul style="list-style-type: none"> Develop geographically significant questions and plan an inquiry that identifies and applies appropriate geographical methodologies and concepts
Collecting, recording, evaluating and representing	<ul style="list-style-type: none"> Collect, select, record and organise relevant geographical data and information, using ethical protocols, from a range of appropriate primary and secondary sources Evaluate sources for their reliability, bias and usefulness, and represent multi-variable data in a range of appropriate forms, for example, scatter plots, tables, field sketches and annotated diagrams, with and without the use of digital and spatial technologies Represent the spatial distribution of geographical phenomena by constructing special purpose maps that conform to cartographic conventions, using spatial technologies as appropriate
Interpreting, analysing and concluding	<ul style="list-style-type: none"> Evaluate multi-variable data and other geographical information using qualitative and quantitative methods, and digital and spatial technologies as appropriate, to make generalisations and inferences, propose explanations for patterns, trends, relationships and anomalies, and predict outcomes Apply geographical concepts to synthesise information from various sources and draw conclusions based on the analysis of data and information, taking into account alternative points of view Identify how geographical information systems (GIS) might be used to analyse geographical data and make predictions
Communicating	<ul style="list-style-type: none"> Present findings, arguments and explanations in a range of appropriate communication forms, selected for their effectiveness and to suit audience and purpose; using relevant geographical terminology, and digital technologies as appropriate
Reflecting and responding	<ul style="list-style-type: none"> Reflect on and evaluate the findings of the inquiry to propose individual and collective action in response to a contemporary geographical challenge, taking account of environmental, economic and social considerations; and explain the predicted outcomes and consequences of their proposal

Source GT.11 The five categories of skills used in a geographical inquiry.

Developing geographical questions

One of your greatest assets as a geographer is curiosity. Geographers look at the world around them and ask questions about what they see, experience or have thought about. You may, for example, see a news item about a volcanic eruption or hear a report about the world's most liveable cities. Or you may visit the centre of a large city on a field trip or a national park on holiday. As you begin to think like a geographer you will begin to ask questions about these events and places and these questions may be the starting point for a geographic inquiry.



Source GT.12 Zebras grazing on the plains surrounding Mt Kilimanjaro.

skilldrill

How to develop geographical questions

You can learn to develop geographical questions which will help you begin an inquiry about a particular topic or place. Start your questions with the words 'what', 'where', 'how', 'why', 'what impact' or 'what should' when thinking about your topic.

Your questions should examine ideas such as:

- Where is it?
- How big is it?
- What pattern or shape is it?
- Why is it like this? Is it like this because something else is at this location?
- How does it interact with other things in this place?
- How is it changing?
- How should people best manage this change?

The very best questions open up an exciting area for you to explore. Examine Source GT.12. A visitor to this place might ask a simple question, such as 'How much snow is there on the mountain?'. This is a question with a relatively straightforward answer.

A better geographical question would be to ask 'Does the amount of snow on the mountain change over time?'.

This question opens up a whole new area to explore, because the answer to that question will lead on to further questions and greater depth of understanding. Some other example questions are:

- Is this a volcano?
- Why is it green on the ground but there is snow on the mountain?
- Are the animals all eating the same things?
- Is there more or less snow than in the past?
- How do people use the mountain?

Apply the skill

- 1 Why is 'Does the amount of snow on the mountain change over time?' a better geographical question than 'How much snow is there on the mountain?'.
- 2 Examine Source GT.6 which shows forest clearing in Myanmar. Work with a partner to develop a set of geographical questions about this place.
- 3 Where could you begin to find the answers to your questions?

Plan a geographical inquiry

Asking geographical questions is a good way to open a range of possibilities for further research and investigation. It is usually best to narrow your investigation by selecting one of the geographical questions you have written as the basis for your inquiry. You should select a question in which you are interested and to better help you understand the environment you are investigating.

Planning an inquiry about Mount Kilimanjaro

Having chosen to investigate the key geographical question ‘how does this mountain affect the climate?’, it is time to consider what information you are going to need to answer this question. You also need to decide where you are going to locate the information you will need to collect. A good way to this is to use a planning table like the one below.

Source GT.13 Planning is a key stage in conducting a geographical inquiry.

Key inquiry question	Information needed	Possible sources of this information
How does this mountain affect the climate?	Climate data, particularly temperature and rainfall for places at various distances from Kilimanjaro including the summit	Atlas map to locate towns and cities at various distances from Kilimanjaro Encyclopaedia entry for the climates of Kenya and Tanzania Online search for climate data for selected towns and cities
	Observation of photographs and satellite images of the region	Photographs and satellite images of Kilimanjaro from throughout this chapter Google Earth, including historic imagery
	An understanding of the impact of landforms on temperature and rainfall	Printed resources such as geography textbooks, encyclopaedias and Bureau of Meteorology (BOM) books and leaflets BOM website

Check your learning GT.2

Remember and understand

- 1 What are the five sets of skills in a full geographical inquiry?
- 2 Imagine that while watching the news on television this evening you see an item about a large earthquake in China.
 - a How could this news item be the beginning of a geographical inquiry?
 - b Write a series of geographical questions about this earthquake.

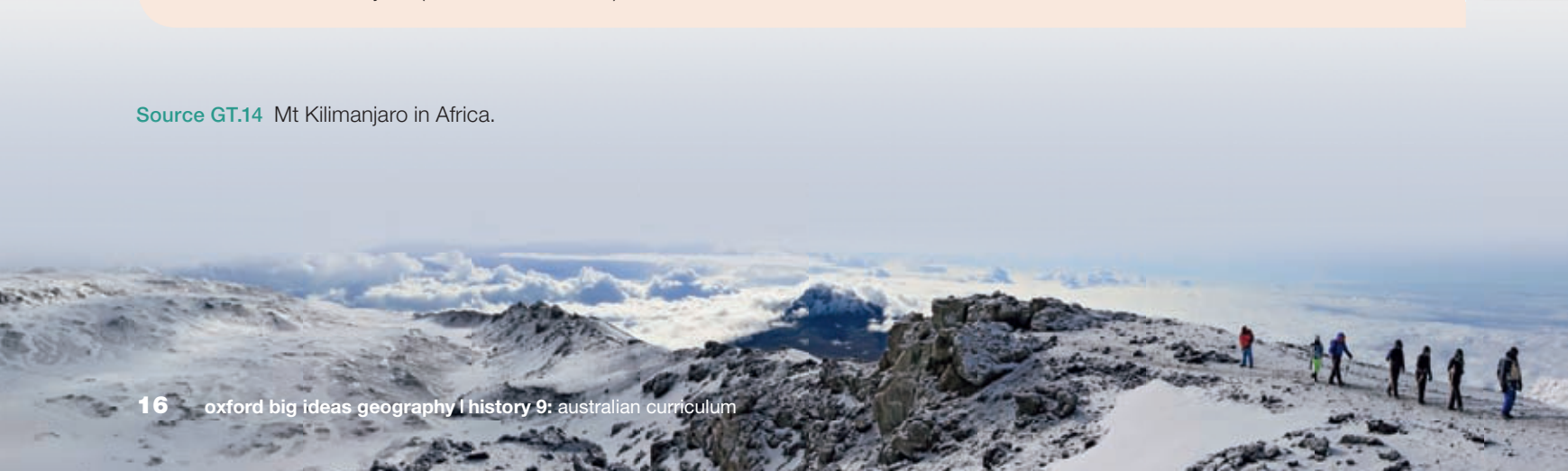
Apply and analyse

- 3 For the geographical questions that you have written, develop a planning table similar to the one shown here for Mount Kilimanjaro (see Source GT.14).

Evaluate and create

- 4 Bring a copy of your local newspaper to class. Search through the newspaper, or think about your local area, and identify examples of stories or issues that could be investigated as part of a geographical inquiry. Examples may include a shopping centre extension, or a proposal for a new set of traffic lights or a pedestrian crossing. Choose one local issue and work with a partner to develop a series of geographical questions about it. Then, complete a planning table for one of your questions.

Source GT.14 Mt Kilimanjaro in Africa.



Collecting, recording, evaluating and representing

Collect, record and evaluate primary and secondary data

Good planning and preparation will ensure that your geographical inquiry will run smoothly, be relevant and give you the answers you are looking for. Once you have identified the issue, formulate your key inquiry question. You can conduct a sound, useful inquiry by following these steps:

- collect and record the information you think you will need to answer your key inquiry question
- evaluate this information and data to determine that it is accurate and relevant
- represent your findings in an interesting and appropriate way (such as tables, graphs, maps and sketches).

Geographers find answers to their questions in many places. They may collect information themselves by interviewing people, taking photographs, making sketches out in the field or conducting surveys and questionnaires. This kind of information will generally only be relevant to a particular inquiry and is called **primary data**.

Often a geographer collects information that supports his or her inquiry but has not been specifically collected or designed by the geographer for the inquiry. This type of information is called **secondary data**. Secondary data sources include maps, graphs, statistics, and websites that someone else has developed. One of the best secondary sources of information may be photographs from newspapers and magazines and satellite images from Google Earth. It is important to always evaluate any secondary sources for reliability, relevance and bias. This is particularly true for information accessed through the Internet. Unlike a printed source such as a book or atlas it can be very difficult to establish who has written and published information online.

Reliability

When undertaking an inquiry, geographers need to evaluate the sources they use for reliability and potential bias, as well as usefulness. In the case of collecting data from primary sources, such as interviewing subjects directly on a topic, the information gathered will be

reliable, as it is gathered first-hand. It is important for the geographer to keep in mind, then, any potential bias that may be influencing an interviewee's response. An interview that a geographer is conducting on the potential effects of turning local parkland into an industrial park, for instance, would have very different responses from a representative of the industrial developer, compared to a member of a local wildlife conservation group. It is important for a geographer to evaluate this kind of bias, and remember to ask questions about the motivation behind it.

When selecting secondary sources, such as maps, graphs, photographs or other data, the geographer also needs to ensure the data is reliable and unbiased. This includes evaluating the creator of the data – is the data from a recognised source like a government body, such as the Bureau of Meteorology or a research agency like the CSIRO? Is the data provided without bias? Or is it presented on a website for a company that might have a vested interest in influencing public opinion?

Ethics in geography

When conducting research and obtaining data for an inquiry, it is important for a geographer to be mindful of issues that are likely to raise ethical concerns. This may include being aware of privacy concerns, ensuring anonymity if required, and obtaining informed consent for research participants. Geographers may also need to outline where and how the information obtained will be used or published, and special attention may need to be given for relational data where geographical references or co-ordinates might disclose a participant's location and/or identity.

If a geographer is undertaking an inquiry that involves consulting with Aboriginal and Torres Strait Islander communities, they should be aware that there are guidelines and protocols that should be followed. While these are not necessarily rules, it is important to know that Aboriginal and Torres Strait Islander people have distinctive regional and cultural identities which require respectful consideration for meaningful consultation. This may involve preferred terminology, cues for cultural communication, and other means for making consultation harmonious and productive. If conducting such an inquiry, it is advisable to do further reading, such as the *Aboriginal and Torres Strait Islander Peoples Engagement Toolkit*, which can be found online.

Evaluating the reliability of websites

There is an enormous amount of information available online, but it is important to keep in mind that not all websites provide reliable information. You must be careful not to naively accept all information published online as being from a reliable source. Websites should be critically evaluated for reliability by following these steps:

Step 1 Find out how old the information is. When was it first published? This will help you decide whether it is useful for your inquiry or not.

Step 2 Find out who published the information. Is it possible they have a bias? You can often find out more about the organisation publishing these statistics by going to their 'home' page or 'about us' page.

Step 3 Look at the extension at the end of the website address as this gives you an important clue about the

origin of the information. For example .com is used by commercial organisations such as online stores, .org is used by non-commercial organisations such as NGOs and welfare groups, .gov by government departments, .edu refers to schools and universities, .biz by businesses and .mil by military groups.

Step 4 If you cannot find out when the information was published or who published it, it is probably too unreliable to use in a geographic inquiry. Look for a more reliable source of information.

Apply the skill

- 1 Common websites used for reference information include the CIA factbook (see Source GT.15), the Australian Bureau of Statistics, National Geographic and the United Nations Development Programme. Using the steps listed above, assess the reliability of the data found at these websites.

The screenshot shows the CIA website's 'Library' section. The main heading is 'THE WORLD FACTBOOK'. Below it, there is a search bar with the text 'Please select a country to view'. The page is categorized under 'AFRICA :: TANZANIA'. It features a map of Tanzania, a list of cities (Dar es Salaam, Mwanza, Zanzibar, etc.), and a section titled 'VIEW 31 PHOTOS OF TANZANIA'. The page also includes a sidebar with links to 'The World Factbook', 'World Leaders', 'CIA Maps', 'Historical Collection Publications', 'Additional Publications', 'Center for the Study of Intelligence', 'Freedom of Information Act Electronic Reading Room', 'Kent Center Occasional Papers', 'Intelligence Literature: Suggested Reading List', 'Reports', 'Video Center', and 'Related Links'. The page is dated 'PAGE LAST UPDATED ON SEPTEMBER 11, 2013'.

Source GT.15 This web page describes Tanzania. How do you know if it contains reliable information?

Evaluating and representing geographical data visually

Geographers often present the information they gather during their inquiries in a number of different ways. They make maps, create graphs and tables or even draw diagrams to help them look for patterns in the data they have gathered. These tools help the geographer analyse and interpret the information they have gathered, and also present the information to other people (the general public, the government, the media) and help them understand the geographer's findings.

Maps

One of the most useful tools that geographers use to process information is a map. A map is a simplified plan of an area. Maps are drawn in the plan view (directly from above) because this ensures the scale will be the same across the entire area. If maps were drawn from an angle, some parts of the mapped area would look distorted and so it would not be an accurate representation of the area. When properly used, maps can reveal a great deal about our planet and the ways in which we use it.

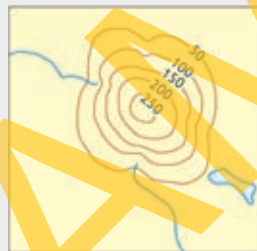
Topographic maps

A piece of paper only shows two dimensions: width and length. However, the Earth's surface has a third dimension: height. Cartographers (map drawers) use a variety of methods to show this third dimension.

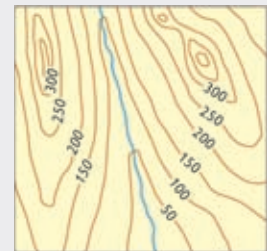
Topographic maps are one of a geographer's most useful tools. Because most topographic maps are drawn of a small region they can show that region in

great detail right down to individual buildings and rocks. They also show the height of the land above sea level through the use of **contour lines** which join together all places of an equal height. By learning to interpret the contour patterns made by these lines you can work out the shape and height of the land that has been mapped (see Source GT.16).

ROUND HILL OR VOLCANO



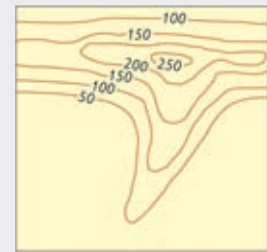
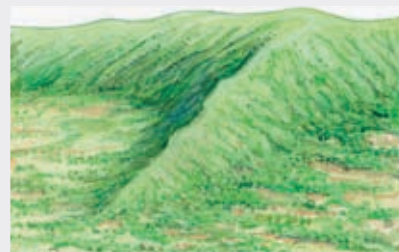
VALLEY



RIDGE



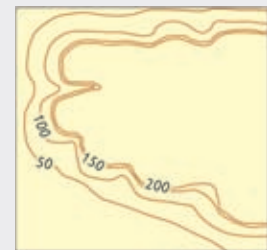
SPUR



CLIFF



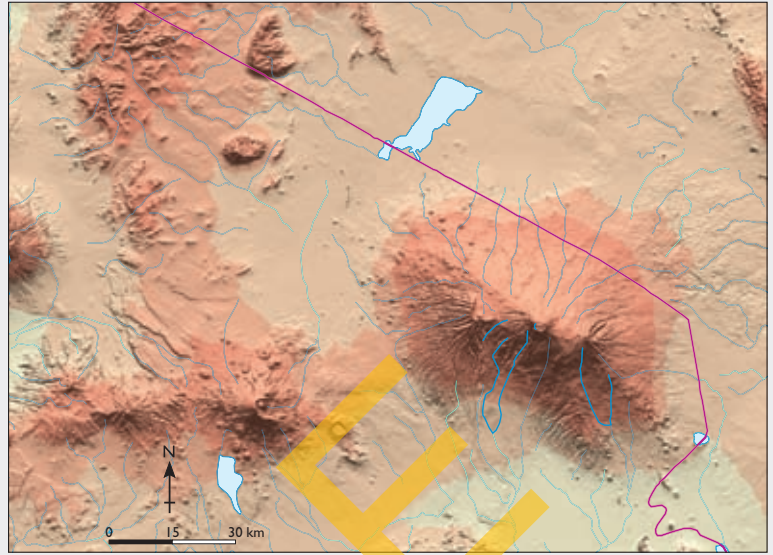
PLATEAU



Source GT.16 Common contour patterns

Digital maps and terrain models

There are about 6000 man-made satellites orbiting the Earth. Many of these collect digital data about the shape and height of the land and transmit it back to computers on the ground. This data is then interpreted and can be used to draw maps. Cartographers can use computer programmes to add colours to these digital maps to highlight certain aspects of the environment. In Source GT. 17, for example, the land has been shaded according to its height. The data can also be manipulated in other ways. In Source GT. 18 it has been used to create a side view of the landform being mapped. This type of illustration is known as a digital terrain model.



Source GT.17 In this digital map of the Mount Kilimanjaro region land has been shaded according to its height above sea level. Shadows have also been added to help map users understand the shape and height of the land.

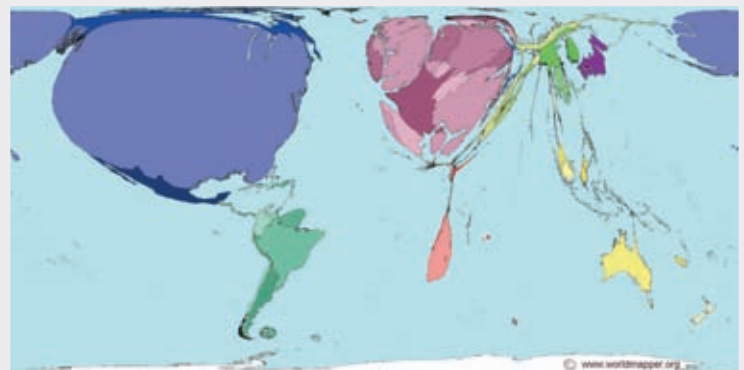


Source GT.18 This is a digital terrain model of Mount Kilimanjaro and the surrounding area. The data was collected by a NASA space shuttle and an orbiting satellite. Cartographers have exaggerated the height of the landform so that it appears twice as high as it actually is.

Cartograms

You will have already seen cartograms in the course of your geography studies. These are the maps which look distorted and have areas that appear thinner or more enlarged than they would normally be, depending on what they are showing. Cartograms are sometimes called 'value by area' maps, which means the spaces on the maps are distorted to show a representation of a value rather than land area.

For example, while Vietnam is a relatively small country in terms of land area, it is the fifth largest rice growing country, so it would be exaggerated to a much greater relative size in a cartogram. The United States of America, which actually has a much larger land mass than Vietnam, is the 10th largest rice producer, so would appear much smaller than actual size on a cartogram.



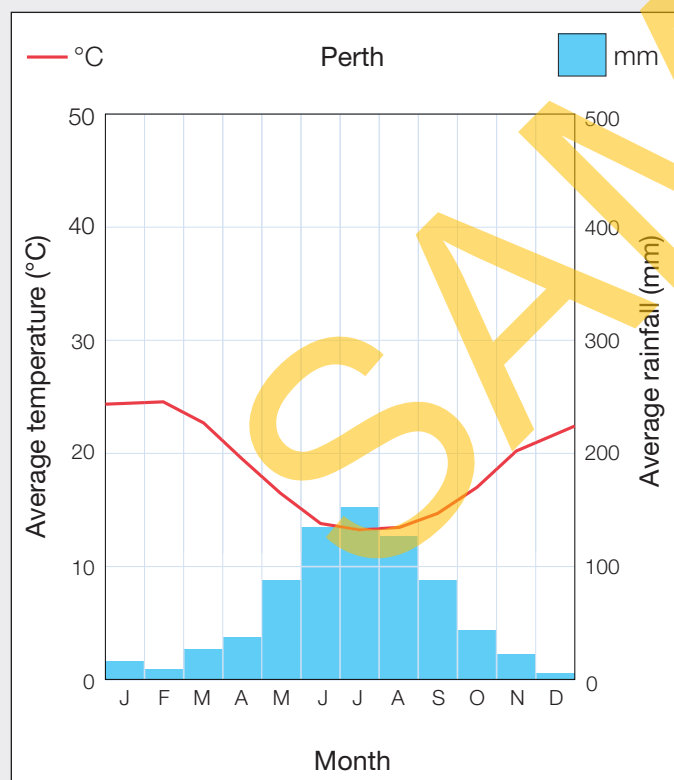
Source GT.19 This cartogram shows the percentage of the population living on more than US\$200 a day. The distortion shows that the United States has many more people living on this amount than Asia does.

Graphs

In Years 7, 8 and 9 you will have learnt how to create and interpret simple graphs, such as **bar graphs**, **column graphs** and **pie charts**. In Years 9 and 10 you will be working with more complex graphs. You won't necessarily be creating these kinds of graphs yourself, but you will be learning how to interpret them and make sense of the information they provide. A range of complex graphs are described below.

Climate graphs

Climate graphs show the general climate of a place – what the weather is like overall in a certain location, graphing the average monthly temperature and over the course of a year (or other set period of time) (see Source GT.20). Climate graphs combine line and column graphs. Temperature is recorded as a **line graph** and rainfall is recorded as a **bar graph**.

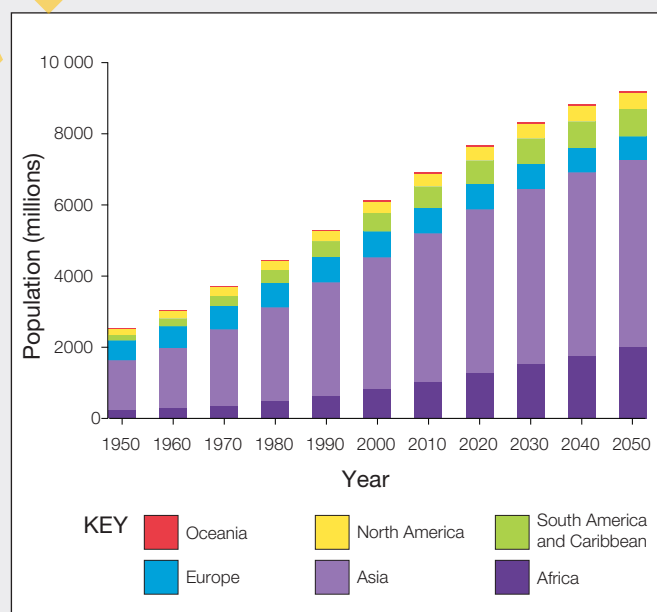


Source GT.20 A climate graph showing the average monthly temperature and rainfall in Perth.

Compound column graphs

A **compound column graph**, sometimes called a stacked column graph or stacked bar graph, is used by geographers to compare the parts of something to the whole. They are a more complex type of column graph in which each column is split into sections. The results are then stacked on top of each other, in different colours or different shades of a colour, so that results can be easily compared (see Source GT.21).

Each column in a compound column graph represents a total, and each different coloured segment represents a part that makes up that total. The graph in Source GT.21, for example, shows the total increase in world population, from 1950 projected up to 2050. Of the total increase in population, it is immediately clear that Asia, coloured light purple, has experienced and will continue to experience the greatest growth. It is also immediately clear that Oceania, coloured red, has experienced very small population growth in comparison. Presenting the information in this way means we can quickly see and compare a number of figures that contribute to a total.

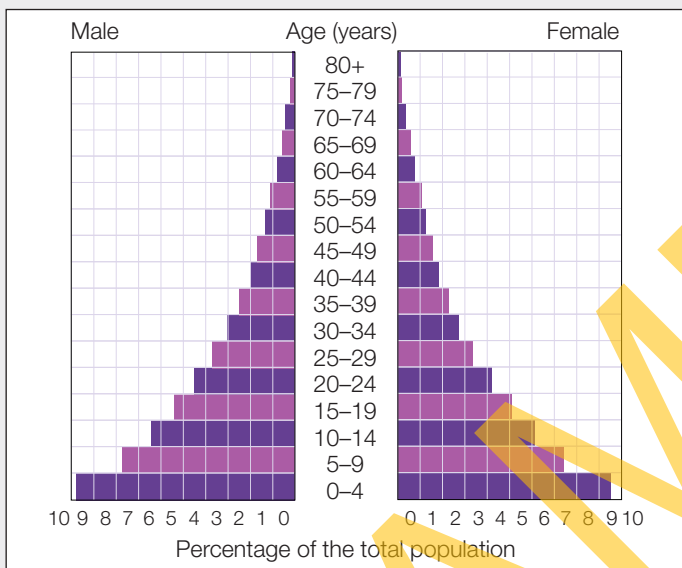


Source GT.21 A compound column graph showing the increase in world population by region, 1950–2050 (columns on the right provide projections).

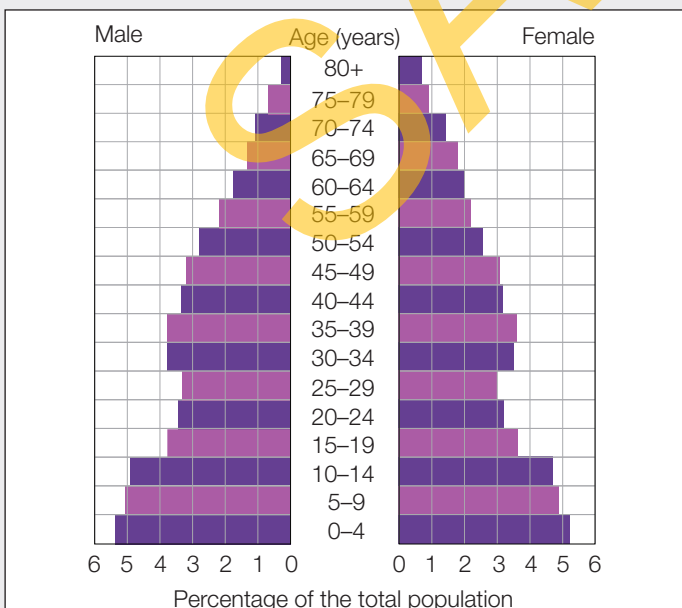
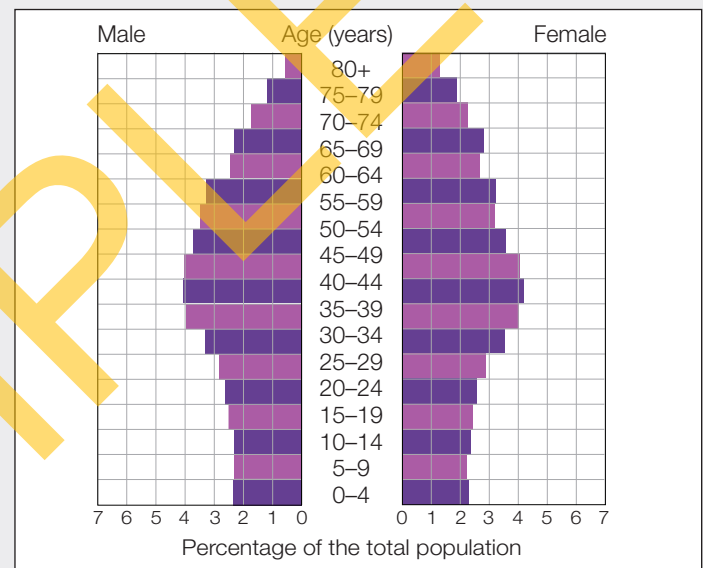
Population pyramids

Population pyramids are horizontal bar graphs that show the proportion of men and women in different age groups in a population. They can be used in a number of ways. Most commonly, they are used to compare the population structures and growth rates of different countries. A triangular-shaped graph shows a population with a high birth rate – that is, the population in that country is growing – while a graph that tapers in (is narrower) at the younger ages indicates a population that is contracting or declining (see Source GT.22).

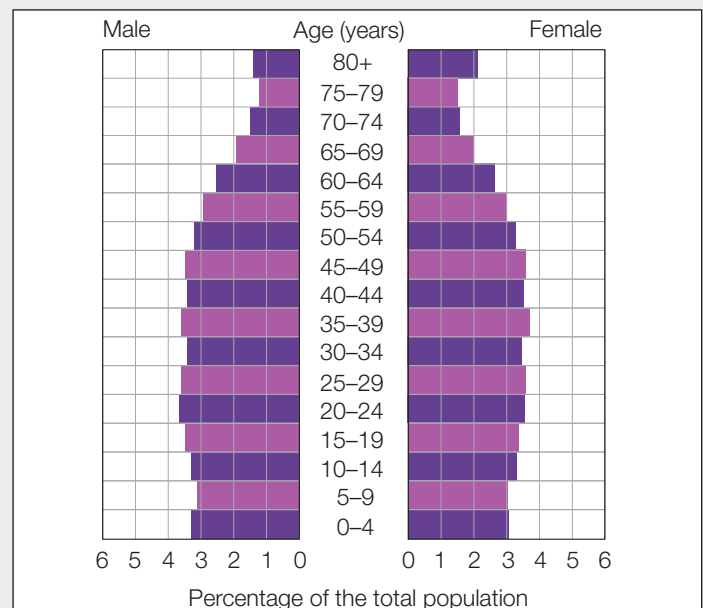
Population pyramids can also help geographers to identify the ways in which the population in a single country is changing over time. In these population pyramids of Australia's population, for example, it is clear that the percentage of Australia's population over the age of 65 increased between 1960 (see Source GT.23) and 2009 (see Source GT.24). Geographers describe this change as the ageing of the population.



Source GT.22 Population pyramids showing growing (left) and contracting (right) populations



Source GT.23 Population pyramid for Australia, 1960



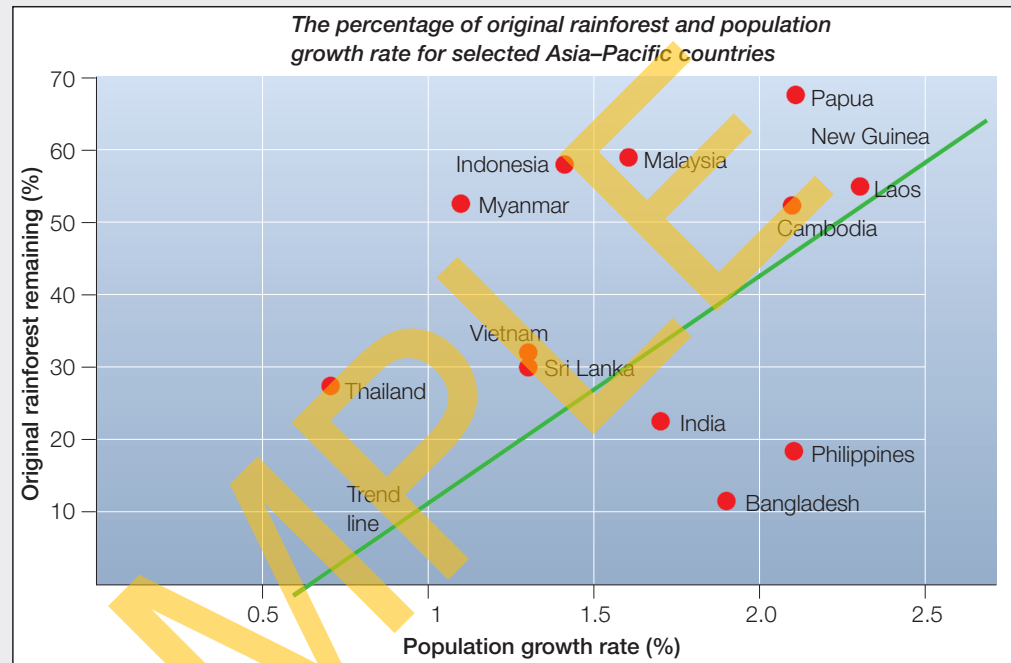
Source GT.24 Population pyramid for Australia, 2009

Scatter plots

Maps can be useful to show a pattern but they don't really explain that pattern. A special type of graph, called a **scatter plot**, or scatter graph, is a better way of doing this. A scatter plot compares two sets of data in a visual way so that connections between them can be easily seen. They are also called a scattergram. The following scatter graph compares the amount of original forest cover remaining in selected Asian countries with their population growth rate. It is essentially testing the theory that forests are more endangered in countries where the population is growing rapidly.

Because most of the countries lie close to the trend line in this graph it is possible to say that there is a relationship between the amount of forest in a country and the rate at which its population is growing. Countries with the

fastest growing populations have the most rainforest remaining. Those countries that lie apart from the general trend such as Bangladesh are called outliers. A geographer studying this graph might use it as the beginning of a geographical inquiry into deforestation in Bangladesh.



Source GT.25 Scatter graph showing remaining forest and the population growth rate.

Check your learning GT.3

Remember and understand

- 1 Why is a website that ends with .edu more reliable than one that ends with .com?
- 2 What advantages do scatter plots have over maps?
- 3 What do population pyramids show? Why are they a useful tool for geographers?
- 4 Examine Source GT.25. In which of these countries is the population increasing most rapidly? How much original forest cover remains in this country?

Apply and analyse

- 5 What is the difference between primary sources and secondary sources of information? Is the CIA Factbook (see Source GT.15) an example of a primary or secondary source?

- 6 Using Source GT.17, describe the terrain of the region surrounding Mount Kilimanjaro. Do you think Source GT.17 is more useful for this task than Source GT.18?
- 7 Describe the differences between the population pyramids in Sources GT.23 and GT.24. What do these differences reveal about the populations at these two times?

Evaluate and create

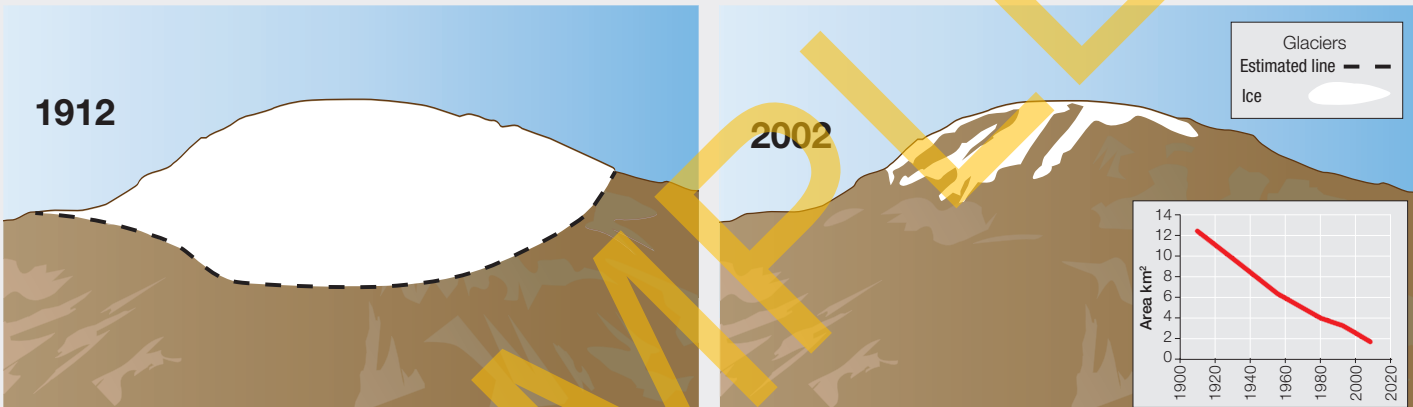
- 8 Examine Source GT.18. Sketch the probable contour pattern of the landscape shown. Use Source GT.16 as a guide to common contour patterns.
- 9 Research the size of the population of a country other than Australia over a ten-year period. Create a graph or graphs to present your findings.

Other graphic representations

In addition to maps and graphs, geographers use a range of other visual representations to communicate information they have collected. These include geographic diagrams, sketches, tables, geographic photographs and geographic information systems (GIS). These ways of presenting information allow geographers to communicate their findings in the most clear and appropriate manner.

Geographic diagrams

Geographical diagrams are simplified drawings of the real world. They allow geographers to show the features or characteristics of places or things much more directly than describing them in words. Certain interesting or complex processes can also be easily explained and demonstrated in a diagram, and communicated quickly and effectively by simple visual representation (see Source GT.26).



Source GT.26 This diagram shows the dramatic rate at which snows have melted on Mt Kilimanjaro.

Tables

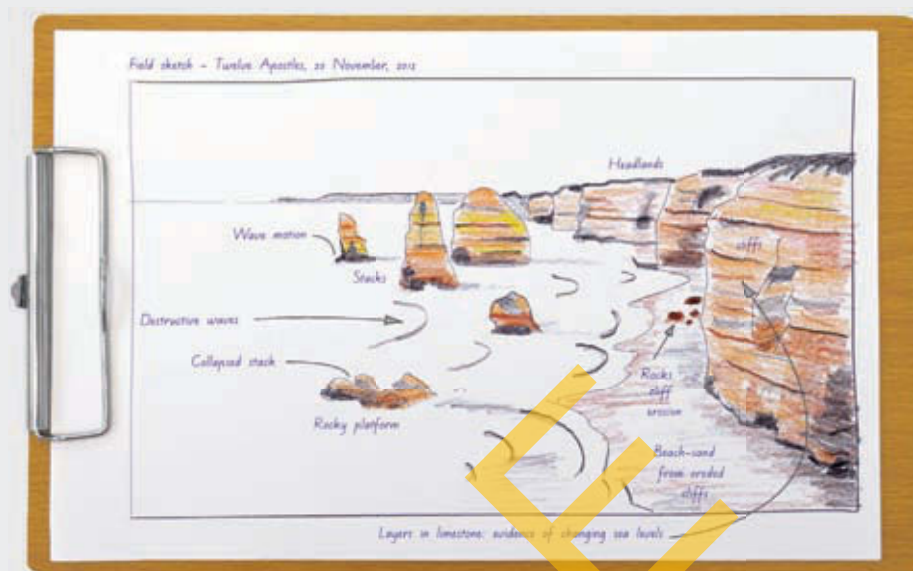
Tables allow geographers to present and compare data by organising it under different headings. Tables can be useful for presenting information over a range of time periods or locations.

Source GT.27 This table, based on data gathered by geographers in 2006, shows the change in area of seven glaciers (A–G) on Mount Kilimanjaro, 1912–2003.

Areas (10 ³ m ²)	Glacier Area A	Glacier Area B	Glacier Area C	Glacier Area D	Glacier Area E	Glacier Area F	Glacier Area G	Total
1912	5676	3	27	5011	811	372	158	12058
1953	3829	0	16	2156	493	181	0	6675
1976	2440	0	0	1409	209	113	0	4171
1989	1900	0	0	1168	147	90	0	3305
2003	1304	0	0	1025	132	49	0	2510

Geographic sketches

A geographical sketch can be an extremely useful way of collecting information, and presenting it in a straightforward and immediate way. They are often completed in the field (and are known as field sketches) or are sketched from photographs. The aim of a geographic sketch is to focus on those parts of the environment that are relevant to the current geographic inquiry. For example, a geographer studying the role of waves in the erosion of a coastline would sketch the rocks and landforms of a beach (see Source GT.28) while another geographer studying tourism at the coast would sketch the buildings and roads at the same beach. Sketches allow the geographer to simplify information to make it easier to understand.



Source GT.28 Field sketches are useful for capturing information quickly and directly.

Geographic information systems (GIS)

A geographic information system (GIS) is a way of collecting, storing, presenting and using geographical data. GIS encompasses collecting geospatial data – real-world distance between landmarks, depth of sea level, height and width of buildings, layout of streets and suburbs – and presenting it through digital means. A car's GPS uses GIS data to allow you to navigate through the real world, using data that has been gathered using computer technology. GIS has many different applications and is used for planning, telecommunications, transport and logistics, to name just a few.



Source GT.29 Geographic information systems gather and present real-world geographical data using computer technology.

Geographic photographs

Geographic photographs differ from other types of photographs in that they are taken to depict and present a place or particular feature of the landscape for the purpose of demonstrating an aspect that you are studying. This is quite different from taking photos of you and your friends for fun, or even from taking an attractive picture of a landscape. Geographic photographs are used as a source of data.



Source GT.30 A geographic photograph demonstrates a particular aspect of a place or environment, like this one of the Mt Kilimanjaro glacier area.

skilldrill

Collecting and evaluating geographic photographs

Geographers take photographs with the purpose of capturing a specific visual reference. This skill in geography is learning to capture a scene on camera that shows exactly what you want it to. You will not necessarily be taking the prettiest picture – you will be taking the picture that is relevant to your inquiry. Then, you can show the key features by adding notes or labels to your photograph. This is known as annotating the photograph. Annotating your photograph will help with your evaluation of the subject, too.

Step 1 Prepare for your session. Read the manual for your camera and get to know what your camera is capable of doing. Learn about exposure and how to frame your

subject – there are plenty of tips online to help you with this. It is important to hold your camera steady, or you can practice using a tripod. This is especially useful when collecting photographs of the same place over a period of time.

Step 2 Decide on your subject and ensure you are photographing the relevant parts you want to feature. Select the features of the landscape that show important aspects of your geographic inquiry. Remember your key inquiry question. It could be something like, 'How does tourism impact on this environment?' If so, ensure you include evidence of any impact, like rubbish left along a shoreline. In the case of the photo shown here, the key inquiry question was, 'Are the glaciers becoming smaller because of natural or human factors?'

Step 3 Evaluate photo drafts as you go. Remember that your photograph is part of your geography **fieldwork** or study, and ensure that your photographs include the aspects you want to show. You might need to try photographing your subject from different angles, or from above or below it to capture what you are after.

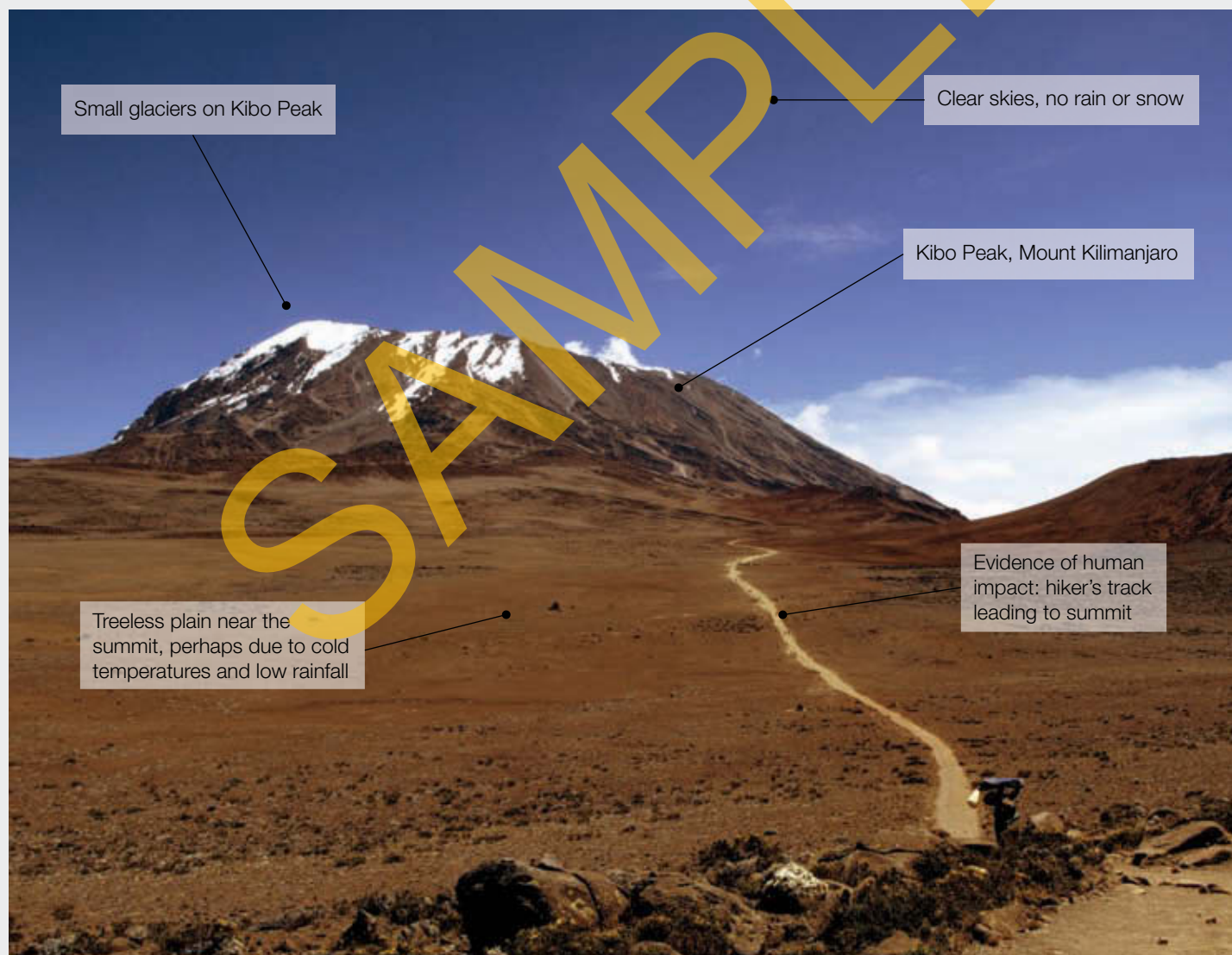
Step 4 Annotate your photographs, remembering to focus on the topic of the inquiry. Write short labels that include the key features of the landscape. Keep your labels neat, relatively short and relevant to your inquiry. Note any observations you have and possible causes for changes or damage you note in the environment.

Step 5 Place your labels, taking care not to obscure important parts of the photograph. Space the labels around the photograph without making them too cluttered. Avoid having the lines from the labels crossing

each other. If you think you have too many labels, go over them again and delete any you think aren't really relevant to your inquiry question.

Apply the skill

- 1 Prepare for a geographic photo session. Decide on a subject and head out to a natural environment such as a forest, stream or coastline with your camera. Evaluate your photographs as you go to ensure you are collecting the information you are seeking.
- 2 Annotate your photographs following the steps listed above. Choose your best three photos and set up a digital display on the school computer network or print them out and set up a wall in your classroom as a photo gallery.



Source GT.31 An annotated image of Mt Kilimanjaro

Interpreting, analysing and concluding

Once you have collected, recorded, evaluated and represented your information, it is time to make sense of it all so that you can reach some conclusions about the geographic questions that began your inquiry. Geographers look for order, diversity, trends, patterns, anomalies and relationships in their information. It can often help to classify information by sorting it into groups.

Using models to identify trends, patterns and relationships in geographical data

There are a number of methods and models that geographers use to help them during this stage of their inquiries. These include the:

- PQE method
- SHEEPT method

Using the PQE method

PQE is a tool used by geographers to describe the data they have gathered (particularly on maps) and look for patterns in this data. The letters PQE stand for pattern, quantify and exceptions.

P – Pattern

In this step, you need to give a general overview of any patterns you may identify.

When looking at any form of data, look for things that stand out or form patterns. A pattern may be a group of similar features on a diagram, a concentration of a particular colour or feature on a map, or a particular shape that is created by data on a column graph. For example, when looking at a map of Africa (see Source GT.32) you might say, 'the forests seem to be located mainly in Central Africa and Southern Africa'.

Q – Quantify

In this step, you need to add specific and accurate information to define and explain the patterns.

Quantifying involves using statistics, amounts, sizes and locations to give specific details. For example, rather than just saying, 'The most forest is located in the centre of the continent', you would need to quantify this statement. You might say instead, '240.3 million hectares of forest has been recorded in Central Africa, compared to 35.4 million hectares in East Africa'.

E – Exceptions

In this step, you need to identify everything that does not fit your patterns.

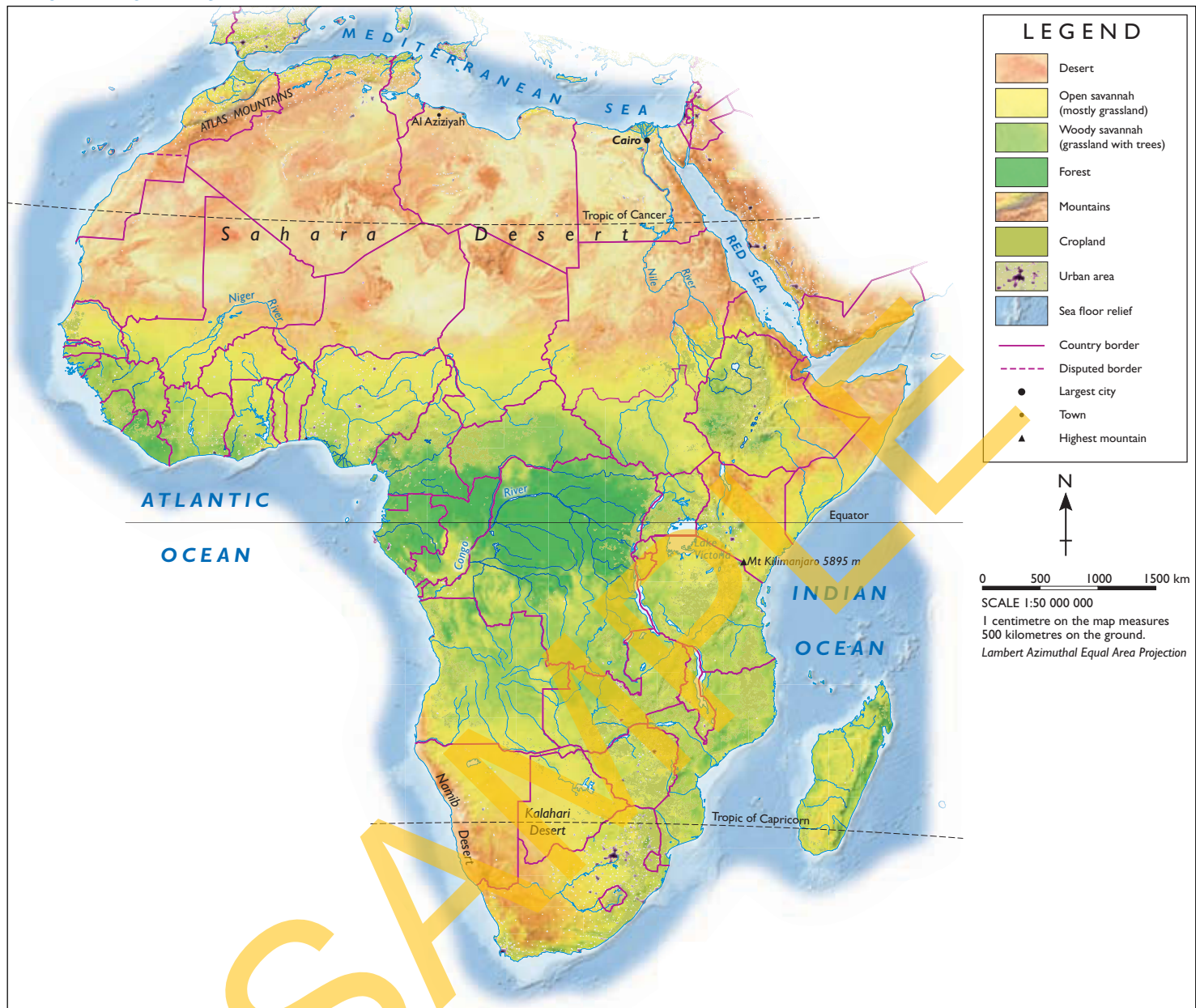
Often, you may find that there are things in your data that do not fit into a pattern you have identified. These are called exceptions. They also need to be identified and quantified. For example, you might say 'There are also forest regions located in North Africa and Western Africa'.

Using the SHEEPT method

SHEEPT is a tool used by geographers to help them consider the many factors that may contribute to the patterns identified in their data. When you are examining issues related to your inquiry, it is useful to think about them in terms of these six factors and rank them in order of importance. This will help you reach your conclusions. The letters SHEEPT stand for:

- social (S) – factors relating to culture and people
- historical (H) – factors relating to past events
- environmental (E) – factors relating to the natural environment (including climate, landforms and vegetation)
- economic (E) – factors relating to the earning or spending of money (including income earned from industry and tourism and the cost of building a dam or highway)
- political (P) – factors relating to governments (including laws, regulations and policies)
- technological (T) – factors relating to the availability and use of different types of technology (including the development of greener technologies, alternative energy sources and GIS).

AFRICA: ENVIRONMENTS



Source GT.32

Source: Oxford University Press

Check your learning GT.4

Remember and understand

- 1 What do the letters PQE stand for?
- 2 What do the letters in SHEEPT stand for?

Apply and analyse

- 3 Look at Source GT.32. Use the PQE method to think about Africa's deserts.
 - a Can you identify a pattern?
 - b Can you quantify this pattern?
 - c Are there any exceptions in this pattern?

Evaluate and create

- 4 Conduct your own Internet research on the way in which Mt Kilimanjaro is managed and use the SHEEPT method to think more closely about the factors that impact on it.
 - a List at least one point for each of the SHEEPT factors.
 - b What conclusion(s) can you make about the way in which Mt Kilimanjaro is managed?
- 5 Create a colourful and informative pictogram to help you remember what SHEEPT stands for using an image or picture for each of the 'SHEEPT' letters.

Distinguishing between quantitative and qualitative data

Primary and secondary data provide either **quantitative data** or **qualitative data**.

Quantitative data includes anything that can be recorded as numbers (for example, Mt Kilimanjaro is 5,895 metres tall and has an area of 753.5 km²).

Qualitative data, on the other hand, includes anything that can be recorded in words (for example, Mt Kilimanjaro is the tallest mountain on the African continent).

Quantitative data

The PQE method uses mainly quantitative data.

Examples of quantitative data include:

- climate and temperature statistics
- tourist numbers
- population figures (including birth and death rates)
- types and amounts of food grown
- plant and animal species and wildlife in certain areas
- forest clearance rates
- numbers of people killed in natural disasters
- numbers of volcanic eruptions and earthquakes.

Qualitative data

The SHEPT method uses mainly qualitative data.

Examples of qualitative data include:

- opinions
- points of view
- personal stories
- likes and dislikes
- feelings.

Good geographical inquiries will always be based on a combination of primary and secondary data that is both quantitative and qualitative. Even though qualitative data is an important part of any geographical inquiry, quantitative data is considered to be more valuable because it is less open to personal interpretations and can be more accurately represented in graphs and charts.

Before you move to the next stage of your inquiry, it is important to check that you have recorded all your data without errors and that it is balanced and fair. Your data should not reflect your personal opinions, emotions or attitudes; instead it should present the facts in a clear and concise way.

Using other methods to interpret geographical data

Analysing geographic photographs

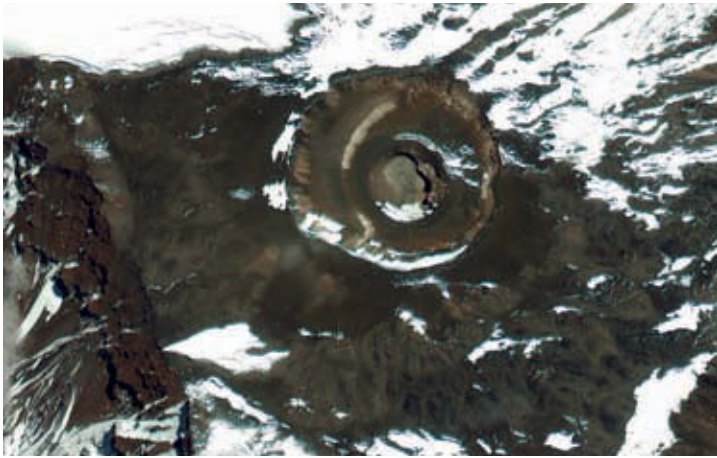
Landscapes can be photographed from several different angles depending on the position of the camera at the time the photograph was taken. Each angle makes some features of the landscape easier to see and interpret than other features, so you need to carefully consider at which angle the photograph has been taken.



Source GT.33 This is a **ground level photograph** of Mount Kilimanjaro. The camera is being held by someone at the same level as the landscape being photographed. This angle allows you to clearly see the height of any object and the detail in vertical surfaces. However, objects such as the mountain and the tent hide the landscape behind them.



Source GT.34 In this **oblique aerial photograph** the camera is positioned above the landscape, but is angled towards the scene being photographed (oblique means 'at an angle'). This allows you to see both the foreground and the background of the scene. You can also see both the height of an object and its width or area. Objects in the background, however, seem much smaller than those in the foreground.



Source GT.35 In a **vertical aerial photograph**, the camera is positioned directly above the landscape. This vertical (or plan) view allows you to see the extent of any feature such as Kilimanjaro's crater. It is very difficult, however, to judge the steepness of the mountainside or the depth of the crater. Plan views are used for making maps, as the scale is the same over the area shown and similar objects look the same size.

Analysing satellite images

A satellite image is taken from space. It allows us to see large areas of the Earth's surface. These images are often used to investigate patterns such as the streams and rivers that radiate from Mount Kilimanjaro. It is difficult however to see smaller features of the environment.



Source GT.36 This image of Mount Kilimanjaro was taken by a satellite orbiting at 830 km above the Earth's surface.

Analysing false colour images

You may have heard the terms '**false colour image**' or '**false colour map**' before. The term '**false colour**' does not mean the colours used in an image are incorrect, it just means different colours have been used to make the image or map easier to interpret. The cartographer or person working on the image has chosen colours that

make some aspects easier to see or understand than a normal 'natural' photograph or map would be.

The colours used in a false colour image can be quite exaggerated and unnatural-looking. This is because the colours of the natural features are too similar to demonstrate a particular point or aspect. If someone is trying to show where a muddy brown river meets a brown-coloured riverbank where there are brown rocks and some brownish shrubs, they might decide to use false colour to clearly show where the different elements are. In that case, they may decide to make the shrub areas bright green, the river a neon yellow and the rocks a bright red, leaving just the river bank brown.

You should examine the accompanying legend to interpret the colours used in a false colour map.

Check your learning GT.5

Remember and understand

- 1 What is an oblique aerial photograph?
- 2 What are some of the advantages and disadvantages of using a vertical aerial photograph?

Apply and analyse

- 3 Which type of photograph would you take on a field trip?
- 4 Some geographers are very interested in the amount of snow and ice on Mount Kilimanjaro, as it has been gradually declining for several decades. Which type of photograph do you think would be most useful to show the decline of the total area of the mountain's snow and ice?

Evaluate and create

- 5 The oblique aerial photograph (Source GT.34) was taken in 1991 and the ground level photograph (Source GT.33) was taken in 2009.
 - a How has the mountain top changed in this time?
 - b With a partner, discuss some geographic questions you could ask to investigate why the mountain has changed in this time. Don't worry about the answers; just concentrate on writing some good questions.
 - c Share your questions with the class. List three questions from the class discussion that you think could be the beginning of a geographic inquiry.
 - d Where could you find information to help you investigate these questions?

Communicating

During a geographic inquiry you may discover something new that other people should know about. It is important that you are able to communicate your findings clearly and effectively. There are several ways of doing this and you should select the method that best suits your audience and purpose:

- verbal methods, such as oral reports, discussions and debates
- audio methods, such as radio reports
- graphical methods, such as graphs, annotated photographs, sketches and satellite images
- visual methods, such as annotated visual displays or PowerPoint displays
- maps
- text-based methods, such as essays or paragraphs.

Check your learning GT.6

Remember and understand

- 1 Why is communicating an important part of a geographic inquiry?
- 2 List three ways you could communicate the findings of your geographic inquiry.

Apply and analyse

- 3 What do you most enjoy about other students' oral presentations? What do you least enjoy?

Evaluate and create

- 4 Imagine that you are preparing a PowerPoint presentation for your class on the decline of the glaciers on Mount Kilimanjaro. Write some notes outlining a rough plan for your presentation, including answers to the following.
 - What are some of the main points you would raise in your presentation?
 - What images from this toolkit would you use to illustrate these points?
 - What would the focus of your presentation be?

skilldrill

Creating and delivering a PowerPoint presentation

Follow these steps to create and deliver a PowerPoint presentation with confidence.

Step 1 Gather the research for your geographic inquiry. This will include any written research materials, the sources you have used, results of any surveys or interviews, and a range of relevant images, graphs, maps or photographs.

Step 2 Plan your presentation. Decide what you would like to focus on.

Step 3 Time yourself. Your teacher will be able to tell you how long your presentation should be, so you should plan your presentation accordingly. For a 10-minute presentation you may need to include 10 slides and talk for about a minute on each one.

Step 4 Once you have worked out the length of your presentation and the content you would like to include, create your slides. If you aren't too familiar with PowerPoint there are plenty of online guides to help.

Step 5 Include a couple of bullet points on each slide. You can progress through the points quickly or take a bit more time on some points as you move through your presentation.

Step 6 Include a question caption with any photo slides. Having a question presented along with a photo helps engage the audience and promotes discussion.

Step 7 Practise your presentation. Practising will help you with your timing, and get you used to talking through your key points using the slides to support you. Make sure you are confident with the technology before you do your presentation in front of the class.

Step 8 Deliver your presentation, working through the PowerPoint slides you've prepared.

Step 9 Invite your audience to ask questions and do your best to answer them. Don't make up answers if you are unsure, just do your best.

Apply the skill

Prepare and deliver a PowerPoint presentation on an area of geography that you find interesting. It could be the local issue that you researched in the previous section, or something you have noticed in the news, such as the United Nations Intergovernmental Panel on Climate Change. Ensure you include some interesting visual elements like photographs or graphs, as well as your key points.

Reflecting and responding

Reflecting

The final steps in completing a geographical inquiry are to reflect on the results of your inquiry and the methods that you used. This is an essential step as it allows you to learn important lessons from any mistakes that you have made and apply these lessons in your next geographic inquiry. There are several ways to reflect on your geographic inquiry: looking at what you have learned, thinking about how it was learned, and asking critical questions about the way your geographic inquiry was conducted. One of the best methods to help you reflect is to complete a self-evaluation checklist.

The title of my geographical inquiry is: _____						
My geographical inquiry set out to investigate: _____						
GENERAL POINTS	My rating					Comments
	1	2	3	4	5	
I was able to complete all stages of my geographical inquiry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I was able to answer all my key inquiry questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I was able to plan my inquiry effectively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
My maps, graphs, tables and diagrams were clear and accurate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I was able to analyse my data and reach a conclusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I was able to communicate my findings in an interesting and appropriate way	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Source GT.37 A self-evaluation checklist is a very useful way of revising your geographic inquiry.

Responding

Geographers often use the information gathered and analysed in their inquiry for a specific purpose. This could be to report on an issue and educate people, to raise awareness of a potential problem, or to lobby local, state or federal government about a particular concern. This can be done via various means, from presenting official reports or studies, to using social media and starting an online petition. The work you do as a geographer can contribute to your environment, and responding and acting is an important part of this work.

If the results of your geographic inquiry lead you to recommend a plan of action, there are some important things to consider.

- Is it environmentally sustainable? Does the plan impact in a negative way on the natural environment and natural processes?
- Does it bring more economic benefits than it costs? Is it affordable in both the short term and the long term?

- Does everyone affected by this plan of action benefit from its outcomes or just a few people?

Case study

A geographic inquiry on the lower slopes of Mount Kilimanjaro found that many schools lacked a reliable supply of clean water for sanitation. Based on this inquiry, the members of several non-government organisations along with the local villagers laid hundreds of metres of new pipes and installed tanks and taps so that children at the schools could wash their hands before preparing food.



Source GT.38 Children at school near Mount Kilimanjaro using newly installed taps to wash their hands before preparing food.

Check your learning GT.7

Remember and understand

- 1 The self-evaluation checklist is one way to reflect on a geographic inquiry. What are two other ways?
- 2 Why are the findings of a geographic inquiry often useful to the community?

Apply and analyse

- 3 What geographic questions do you think began the inquiry that resulted in the new taps in the Tanzanian school shown in Source GT.38?
- 4 Why is it important that an action plan for change consider the issue of sustainability?

Evaluate and create

- 5 Create a checklist to assess your map-drawing skills.

GT.3 Fieldwork in geography

Why is fieldwork important?

A historian studying a period in the past will try to find primary sources of information such as letters or diaries to better understand that period. For geographers the field is an essential primary source of data. Books, websites and maps can give you some information about a particular place but they are usually secondary sources of information. To really understand a landscape or issue you need to go and see it for yourself.

A field trip can be a fun and exciting experience as you spend time with your classmates in an interesting place. As well as being fun, field trips are an essential part of your geography course. This is because **fieldwork**:

- helps you to better understand how the world 'works' as it builds a bridge between what you learn in a classroom and the world outside that classroom
- teaches you new skills, particularly in collecting information. Many of these skills, such as surveying and digital mapping, are in demand in the workplace.
- allows you to learn about the world in a new and different way. Not everyone learns well by reading books or answering questions in the classroom. Many students learn more by completing practical, hands on activities such as fieldwork.
- gives you the opportunity to discover how other people feel about their environment and to compare this to your own values and ideas about your world

- requires you to be organised and to work together with other people.

The skills associated with fieldwork

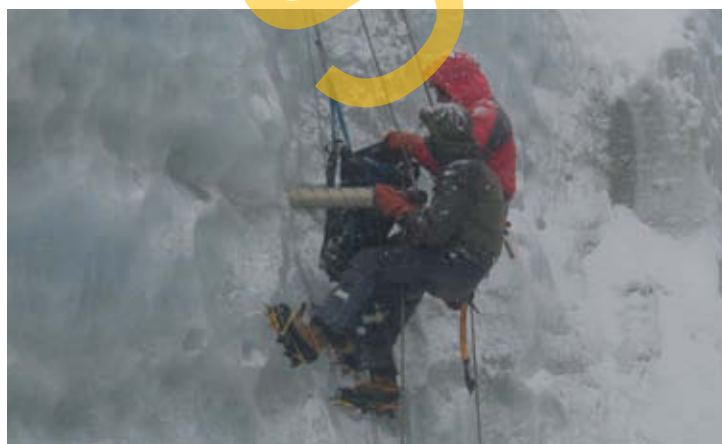
The aim of all fieldwork is to enable you to develop the skills of observation, information gathering, analysis and interpretation of different forms of data and communication of your results. The types of fieldwork you conduct will differ according to your chosen topic and the fieldwork site. All fieldwork is activity-based and inquiry-based. You will be:

- identifying different types of environments and the features within them
- describing what you see around you in geographic terms
- recording data from different sources
- sampling things like water quality and wind speed
- investigating why things are where they are
- comparing different features to see if there is a pattern
- calculating amounts such as water flow, number of different species of plants and animals, visitor numbers
- analysing different forms of data
- forming a more complete picture of the area you are studying
- communicating your findings.

All these activities are aimed at developing and improving your geographic skills and understanding

Fieldwork locations and inquiry questions

Fieldwork can take place in many locations and for a wide variety of purposes. The best locations tend to be where change is happening before your eyes. Rivers and coasts are popular fieldwork locations as the constant movement of water in these places changes the natural environment, often resulting in a response from people. Shopping centres, parks and city streets are also popular as the constant movement of people creates patterns, flows and changes. Source GT.40 provides examples of fieldwork locations and inquiry questions that can be the beginning of an investigation at some of these locations.



Source GT.39 You never know where fieldwork will take you! These geographers are using a drill to examine the age of the glaciers on Mount Kilimanjaro.

Source GT.40 Examples of fieldwork locations and inquiry questions for a range of topics

Unit	Fieldwork locations	Inquiry questions
Biomes and food security	Local farm	What crops or animals are grown on this farm? What makes this place suitable for this type of farming? How has the farmer changed the natural environment? What new technologies is the farmer using? How does this impact on the farm's productivity?
	Rural urban fringe	Is the city growing in this region? What are the main drivers of this growth? How has this impacted on food and fibre production in the past? What evidence is there for changing land use patterns?
Geographies of interconnections	Local business	How is this business connected to people in other places? How have new communication and information technologies changed this business? What is the size and shape of the region served by this business?
	Major shopping centre	How many businesses in this centre are foreign owned? Where are the goods offered in the shops in this centre manufactured? Where do the customers who use this centre come from? How is this shopping centre connected to people in other places?
Environmental change and management	River or stream	What natural processes are shaping this riverine or coastal environment? How do these natural processes impact on human activities? What human activities have changed the natural processes and environment in this place? How have these environmental changes been managed? How effective has this management been? What further management strategies could be used to better manage change in this place?
	Coast	
Geographies of human wellbeing	Two contrasting suburbs	What are living conditions like in these two suburbs? What are the similarities and differences? How can these differences be mapped? Why do these differences occur? How can wellbeing be improved in these places?
	Programme to improve wellbeing	What are the aims of this programme? Why does this programme exist? How successful is the programme in reducing inequalities in wellbeing? How could it become more successful? Could this programme be applied in other regions and places?

Conducting successful fieldwork

Fieldwork is a type of geographical inquiry, so whenever you take part in fieldwork you will need to follow the stages that are outlined in this toolkit, namely:

Stage 1 Observing, questioning and planning

Begin by looking at an issue or location and compile a set of related inquiry questions that you would like to answer. There are some suggestions in the previous table to get you started. Plan what information you will need to answer your key questions, how you will collect it and what equipment and skills you will need.

Stage 2 Collecting, recording, evaluating and representing

Plan your fieldwork so that you can collect the evidence and data that you will need. There is a range of geographic skills that are well suited to fieldwork. These include taking photos, drawing field sketches, conducting surveys and collecting data such as stream and pedestrian flows. You need to consider ethical principles such as people's right to confidentiality and the right to refuse to take part in a survey. If your class is planning a field trip to a natural environment such as a forest or beach, you will need to ensure you do not damage the environment by trampling on plants or animals, or by dropping litter.

Stage 3 Interpreting, analysing and concluding

Analyse the evidence you have collected and look for patterns or clues that will help you to answer your inquiry questions. This is usually done in the classroom where you can more easily draw maps and graphs to interpret your information and reach some conclusions.

Stage 4 Communicating

Communicate what you have found to an audience in the form of a written report, an oral presentation or an annotated visual display (AVD).

Stage 5 Reflecting and responding

Think about your fieldwork findings and reflect on ways to improve your investigation process. Finally, decide on a course of action, if this is appropriate. This should take into account environmental, economic and social factors.

A fieldwork example: Lowecroft Vegetable Farm

In the following example, the Year 9 geography class (9GEO) at Gumtree College conducted fieldwork at a vegetable farm in their local area as part of a geographic inquiry into food security in Australia. This site was chosen because it is reasonably close to Gumtree College and the farmer's children attend the school.

Stage 1 Observing, questioning and planning

The students in 9GEO discussed a range of problems and issues that they could investigate and this led to a brainstorm based on the unit of inquiry they were completing in class. They used the ideas generated from this brainstorm to develop a list of possible inquiry questions:

- How does food production on this farm impact on the natural environment?
- How does the natural environment impact on food production?
- What technologies does the farmer use to increase his food production?
- How does the food grown on this farm reach the consumers?
- How will food production in this region change in the future?

The students decided that all of these questions could be used for a geographical inquiry but they decided to focus on the second question about the role of the environment in influencing food production. This linked with their study of 'the environmental, economic and technological factors that influence crop yields in Australia and across the world'.

While some of the students in the class were from farming families, most were not. They had only limited understanding of the importance of environmental factors such as rainfall, frosts, temperature, seasons, drainage and soil type on food production.

Students planned what information they would need in order to investigate this issue. They decided that some information about rainfall and temperature could be researched using the Bureau of Meteorology website. They decided that they would only visit the vegetable farm once and during this time they should speak to the farmer and record the ways in which the natural environment has impacted on his production of food.

Stage 2 Collecting, recording, evaluating and representing

To investigate the impact of the natural environment on food production students set out to collect and record a range of geographical information.

- Before their field trip students collected data about temperature and rainfall from www.bom.gov.au ('climate and past weather'). They also used Google Earth and maps of the region to locate the farm in

relation to environmental features such as streams and hills. They used these maps to draw a sketch map of the farm.

- Based on this data students wrote a series of questions to ask the vegetable farmer about how factors such as the seasonal pattern of rainfall and temperature highs and lows impacted on his crops. They also added questions about the type of soil and soil drainage to the local creek. They emailed these questions to the farmer before their visit.
- On the field trip students asked the farmer their questions and recorded his answers in their notes.
- They took photographs of the different crops grown on the farm and added these to their sketch map along with the location of irrigated paddocks, glasshouses and other buildings.
- They recorded environmental factors such as wind speed and direction, temperature and rainfall during their visit. They also sketched a soil profile that could be seen where a track had been cut through a low hill. Students also collected some soil to test the clay and sand content as well as the soil pH in class.



Source GT.41 Students from Gumtree College speak to the vegetable grower about the impact of climate on his food production.

Stage 3 Interpreting, analysing and concluding

Once they had converted their primary data into a range of tables, graphs and maps, the students analysed it much more easily and looked for patterns and trends that would help them answer their key inquiry question: How does the natural environment impact on food production?

They decided to break their inquiry into different environmental factors to simplify their analysis. This

also allowed them to conclude that some environmental factors were more important than others. The key conclusions were:

- Rainfall is a key environmental factor that affects this farmer and his ability to grow food. The seasonal pattern of rainfall in this region means that he must purchase water to irrigate his crops during summer. During winter and spring he captures water in large dams and uses this water in drier times of the year.
- The air temperature influences the type of crops he grows and the times of the year in which he grows them. Leeks and parsnips are mainly a winter crop whereas his other main crop, lettuce, grows best in summer.
- The farmer has large areas of hedges that are habitat to insects and birds. These help to control harmful insect pests. He also plants crops that naturally control some soil diseases.
- This farm is part of a much larger farming region that grows large quantities of food for Australia's cities. Farmers in the region, including the vegetable farmer visited by 9GEO, have flat land with fertile soil. In the

past the area often flooded during heavy rains but a system of drainage ditches and levees have reduced this hazard. The farmers and local council maintain these ditches.

- There is little natural vegetation remaining in the region as it has been cleared for farming.



Source GT.42 Students doing fieldwork



Source GT.43 A student's sketch map of the farm showing the location of crops and other key features.

Stage 4 Communicating

Students prepared individual field reports based on their inquiry. Most completed this as a display folder containing their sketch map, photographs, climate graph and written conclusions. Several students presented their field reports as an Annotated Visual Display (AVD) and two gave an oral presentation to the class. One of these students included a short film that he had made while on the field trip.

This film and several of the written reports were sent to the farmer along with a letter thanking him for his time and expertise. A group of students wrote a report on the field trip and their conclusions for the school newsletter.

Stage 5 Reflecting and responding

Following the submission of their field report students reflected on their findings and the methods they used to reach their conclusions. They decided that the key inquiry question they had chosen was a good one because it allowed them to explore a range of factors rather than just one or two. Many students felt that visiting a farm on a field trip helped them better understand how farmers use both the natural environment and their own ingenuity to produce food they eat.

Some of the students felt that they would like to have explored the impact of this farm on the natural environment, particularly the impacts of fertilisers on the soil and streams of the region. They suggested that the class who visited this farm next year could explore this in more detail.



Source GT.44 An auctioneer sells a mob of sheep in Jamestown, South Australia. Saleyards such as these can be a great fieldwork destination as you can investigate the ways in which people and places are interconnected as well as where our food comes from.

Check your learning GT.8

Remember and understand

- 1 Is the information collected by the geography students an example of primary or secondary information?
- 2 Why do you think the geography students emailed their questions to the farmer before the field trip?

Apply and analyse

- 3 Examine Source GT.43. What features of the farm has this student chosen to focus on in her sketch map? Why do you think she has chosen these features?
- 4 Why would investigating the type of soil on Lowecroft Vegetable Farm help to answer the inquiry question?
- 5 What other information could the students have collected on the field trip to help them answer the inquiry question?

Evaluate and create

- 6 Why is fieldwork sometimes better than investigating an environment through secondary sources such as books and films?
- 7 Students from another geography class at Gumtree College visited a sheep sale as part of their investigation into food security in Australia.
 - a What inquiry questions could they investigate at a sheep sale?
 - b Work in a small group to describe the steps you would undertake to explore one of these questions using fieldwork.

GT.4 Careers in geography

In recent years there has been a marked increase in the number and range of jobs and careers that are linked to geography. This is likely to continue well into the future as there is a growing awareness of the importance of understanding our fragile environment. Many employers are also becoming more aware of the many skills that geographers have and the usefulness of these skills in a wide range of careers. Many geographers find that their skills and expertise are in such demand that they can easily find employment all around the world. There are many jobs and careers that are linked to your study of geography at school. Some of these are listed in Source GT.45.

Source GT.45 Studying geography can lead to many different careers.

Working outdoors	Caring for the environment	Other
Geologist	Coastal zone manager	Emergency management
Hydrologist	Wildlife conservation & management	Cartographer
Forestry	Community programme organiser	GIS/geospatial sciences officer
Farming	Environmental impact analyst	Geography analyst/strategy consultant
Landscape architect	Environmental planner/consultant	Social data analyst
National park ranger	Zoologist	Urban planner
Freshwater scientist	Defence (e.g. military planner)	Medical geographer/health services planner
Surveyor	Heritage officer	Foreign affairs

Working outdoors

Many geographers spend most of their working life outside. Many of them had their first experience of this while at school during geography fieldwork. They are employed in a wide range of jobs in some of the world's most interesting environments. You will find geographers on oil platforms at sea, in outback areas of Australia, national parks, farms, forests and even on active duty as members of our defence forces.

Career profile: Daniel Moore – Surveyor

Daniel Moore surveys the ocean floor to locate ideal locations for structures such as oil rigs and wind farms. He uses a variety of methods and instruments including sonar, Remotely Operated Vehicles (ROVs) and GPS systems. This work takes him around the world, to locations such as the North Sea in Europe and the Timor Sea, between Australia and East Timor. As Daniel himself states, this is an important role as 'the world uses lots of energy and having good geographic data makes it much simpler to find'.

Daniel enjoyed studying geography at school 'because it wasn't just about maps, it was about analysing and using spatial information to find answers that weren't always easily accessible'. He completed a Bachelor of Geomatic Engineering and has found geomatics to be an area that is in high demand in the workforce. Daniel advises students to continue their study of geography into Years 11 and 12 as it helps each student 'learn critical thinking skills and analysis skills that can be transferred to limitless other applications. Students will learn how the spatial aspects of any situation can help explain the world.'



Source GT.46 Daniel Moore works on a survey ship off the Western Australian coast.

Caring for the environment

Many of the Earth's natural environments are facing pressure from human activities. As the world's population and its thirst for resources increases, environments face an uncertain future.

Many geographers work to assess the impact of human activities on the natural environment and make recommendations about lessening these impacts. They work to make our use of resources such as water, soil and land more sustainable. This is one of the fastest growing areas of employment, not only in Australia but in many places around the world.



Source GT.47 These geographers are assessing the potential impact of an oil spill on the coastal environment. Caring for the environment is an important reason many people pursue a career using geography skills.

Caring for people

Geographers are interested in issues of social justice as well as environmental issues. They are informed, responsible and active citizens with an understanding of variations in living conditions and wellbeing.

This understanding, and a desire to help other people, helps them to find employment in a range of jobs. Many of these are involved in government and non-government organisations (NGOs) that work to improve wellbeing in local communities both in Australia and in other countries.



Source GT.48 Geographers have a vital role to play in disaster recovery and in helping communities to prepare for future disasters. This AusAID disaster specialist is explaining the importance of building earthquake-resistant buildings in Indonesia.

Check your learning GT.9

Remember and understand

- 1 What reasons does Daniel Moore give for continuing to study geography in Year 11 and Year 12?
- 2 Why is the number of careers in geography likely to increase in the future?

Apply and analyse

- 3 What geography careers shown in Source GT.46 are connected to the concept of sustainability?
- 4 What skills do geographers have that make them useful in helping communities recover from natural disasters?
- 5 Why do you think it is important for an environmental planner to have skills in geography? What key concepts do you think might be used frequently in this kind of career?

Evaluate and create

- 6 Select one of the careers from Source GT.46 that interests you. Research this career and prepare a one-page fact sheet that includes at least one picture. Include answers to the following questions in your career fact sheet.
 - a What qualifications are needed in this career?
 - b How does someone working this career use geographic skills and concepts?
 - c What aspect of this career do you think is most attractive?
 - d What kinds of tasks might be included in a typical day's work for someone in this career?