

The World - Our Home

DISCOVERING OUR GEOGRAPHICAL ENVIRONMENT



EDWARD GILSON

Translated into English by Anton Quintano

The World – Our Home discovering our geographical environment

A geography textbook for the fifth year of
secondary schools

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Translated into English by Anton Quintano

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More resources for the teaching of Geography

Geography has developed widely through the years and nowadays it is considered as a social science which studies the relationships between man and the environment. The physical environment, which took millions of years to form, is quite dynamic and several processes are at work to continue its evolution. In the past a perfect balance existed between the natural environment and all the living creatures. However, due to fast technological developments, humans are today seriously threatening the harmonious relationship which existed. In the news one may hear of the damage being done: the pollution of the aquifers caused by farming practices; the pollution of seawater by toxic chemicals; the increase in waste and landfills; overfishing and the reduction of tuna fish; the overuse of pesticides which is polluting water; the loss of soil due to malpractices by farmers; global warming as a result of the increase in certain gases in the atmosphere; the exploitation of natural resources; the destruction of coastal areas due to tourist development.

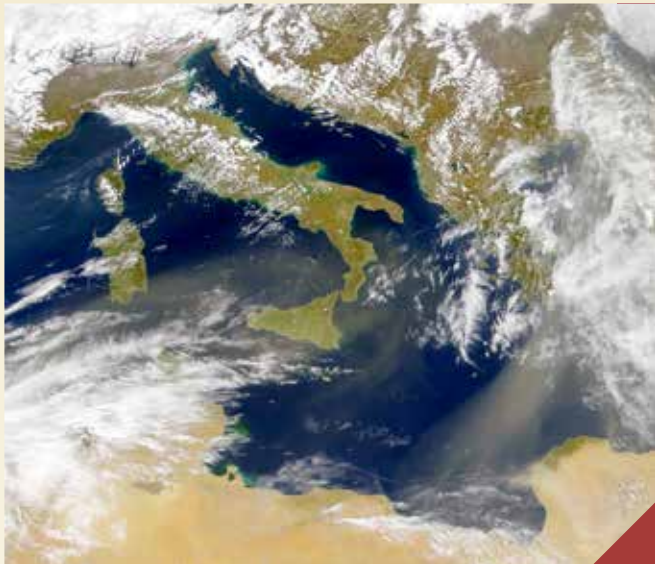
This is the second book in a series of three by which the students will be able to understand not only the physical processes which formed the Maltese Islands but also the actions of man which are quickly changing his own environment. These books provide the students with the knowledge, skills and values that are necessary for them to become good citizens who live sustainably and responsibly towards our and future generations.

These books are replete with colourful and attractive illustrations which motivate the students in their interest. Moreover, they contain many stimulating exercises about various environmental themes. The students are hereby encouraged to research, analyse and apply their knowledge especially with a view to solving environmental problems and taking decisions that lead to an agreeable environment. All teachers are advised to use the resources available in these books while minding the different abilities of their students in order to adapt for their needs. The photos, illustrations and exercises facilitate learning while making both the subject and its learning more interesting for the students. The point of departure must always be the student. Therefore the books should not be covered faithfully from cover to cover but according to the needs of the students. In fact these books are meant to be an aid for the teacher, same as the resources found in the Geography room of Fronter such as the worksheets, photos, maps, films and illustrations that are used by means of the interactive whiteboard. These books provide a pedagogical tool for the teacher since they cater for students of very different abilities. I thank all those who gave their input in this publication, most especially the Heads of Department of Geography and the National Council of the Maltese Language.

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Education Officer (Geography)



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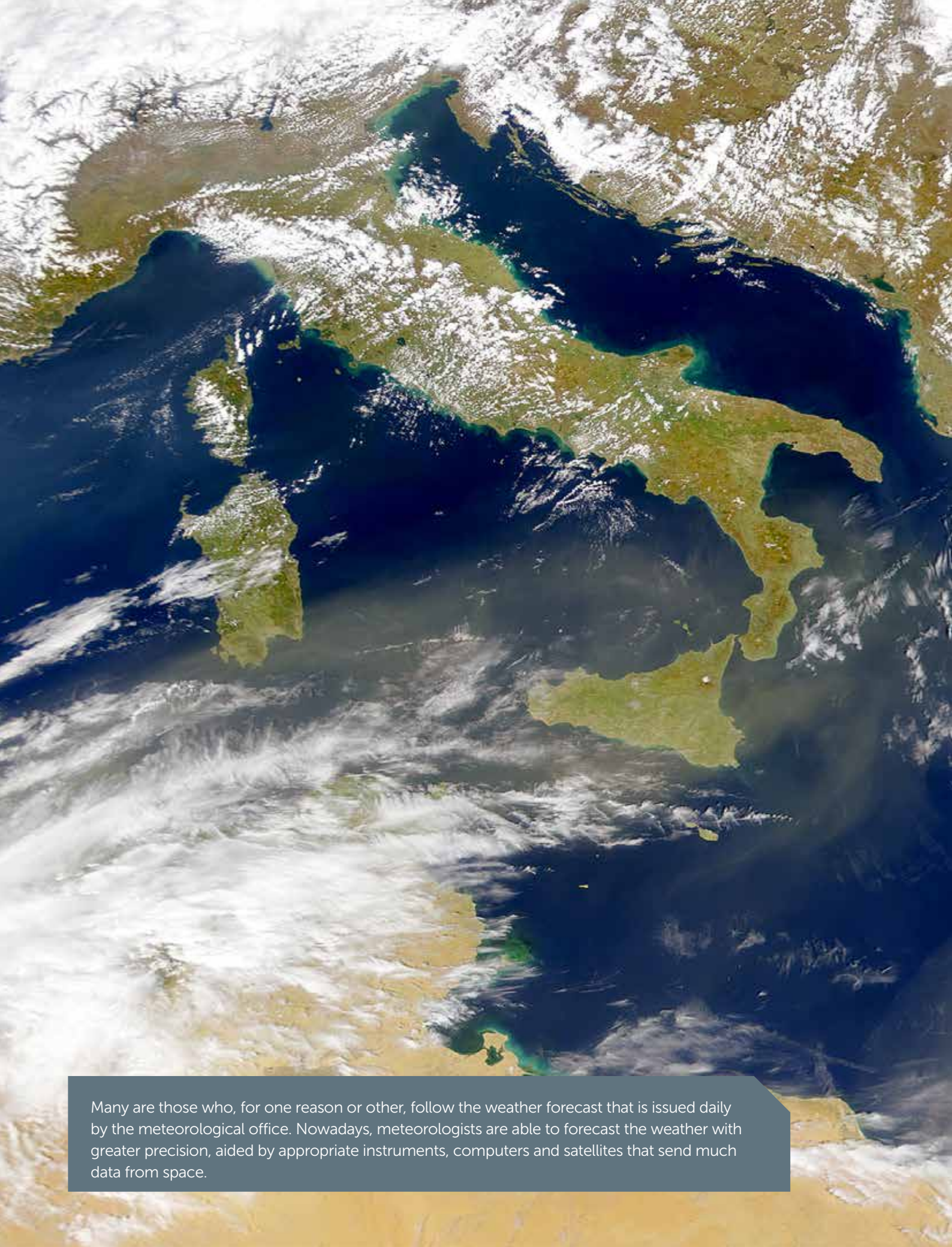
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Many are those who, for one reason or other, follow the weather forecast that is issued daily by the meteorological office. Nowadays, meteorologists are able to forecast the weather with greater precision, aided by appropriate instruments, computers and satellites that send much data from space.

Weather and Climate

1

Weather affects us all. During winter, we wear heavy clothes and turn on our heaters to warm our houses. In summer we spend a lot of time by the seaside to enjoy the fresh air and electricity bills are dear since many will switch on cooling air conditioners. Rain floods the roads, causing congestion and much work will have to stop. On the other hand, drought destroys the crops and farmers suffer financial loss. High winds cause much damage on land but are also dangerous to seamen.

Nowadays, thanks to satellites stationed in space and to sophisticated instruments, meteorologists can forecast the coming weather for many days. Before such instruments were available, many used to forecast the weather by looking carefully at the form of clouds in the sky and the behaviour of animals. Seagulls coming to shore may mean that a storm is near. The apparition of a rainbow indicates the end of rainy weather. Cirrocumulus cloud, similar to a turtle's shell, means that heavy rain or high wind is coming. Rain may also come if the moon has a halo around it.



The Weather Elements

The sun emanates an immense quantity of light energy and heat into space. Only a small part of this energy reaches our world but it is enough to raise the temperature of some places to 50°C, to cause 320 kilometres per hour winds to rise, and to evaporate millions of litres of water from the oceans.

When we study weather and climate, we look carefully at three important features of the atmosphere: temperature, air pressure and the amount of water vapour or humidity it holds. When one of these factors changes, we can be sure that weather conditions will change too. A rise in humidity means that rain will follow. This is why the scientists who study meteorology take regular measurement of the temperature, pressure and humidity, so that they may be able to forecast the weather more precisely.



Malta's climate is bi-seasonal, having a cool wet winter and a hot dry summer. The annual average rainfall is 530 mm, 85% of which falls between October and March. The months from April to August are very dry and are therefore called the dry season. The average temperature is 19°C, being considered as moderate. Many days throughout the year have long hours of sunshine. Days of totally overcast skies are very rare. All this, added to high temperatures cause high evaporation rates resulting in a very humid climate. Wind blows often in the Maltese Islands. In a whole year there are only 25 days of calm on average. Occasionally hail falls in winter but this melts in no time.

Weather shows us the continuous changes in atmospheric conditions that occur within hours or days. Weather changes often and is rarely the same for a long time. In the morning the weather may be fine and sunny but by the afternoon it may become cloudy, the wind will rise and rain may fall too. On the other hand, climate is the state of the atmosphere for a long period of time. This is the average measure of all the weather elements including temperature, pressure, humidity, rainfall, wind, sunshine and cloudiness for a period of 30 years.

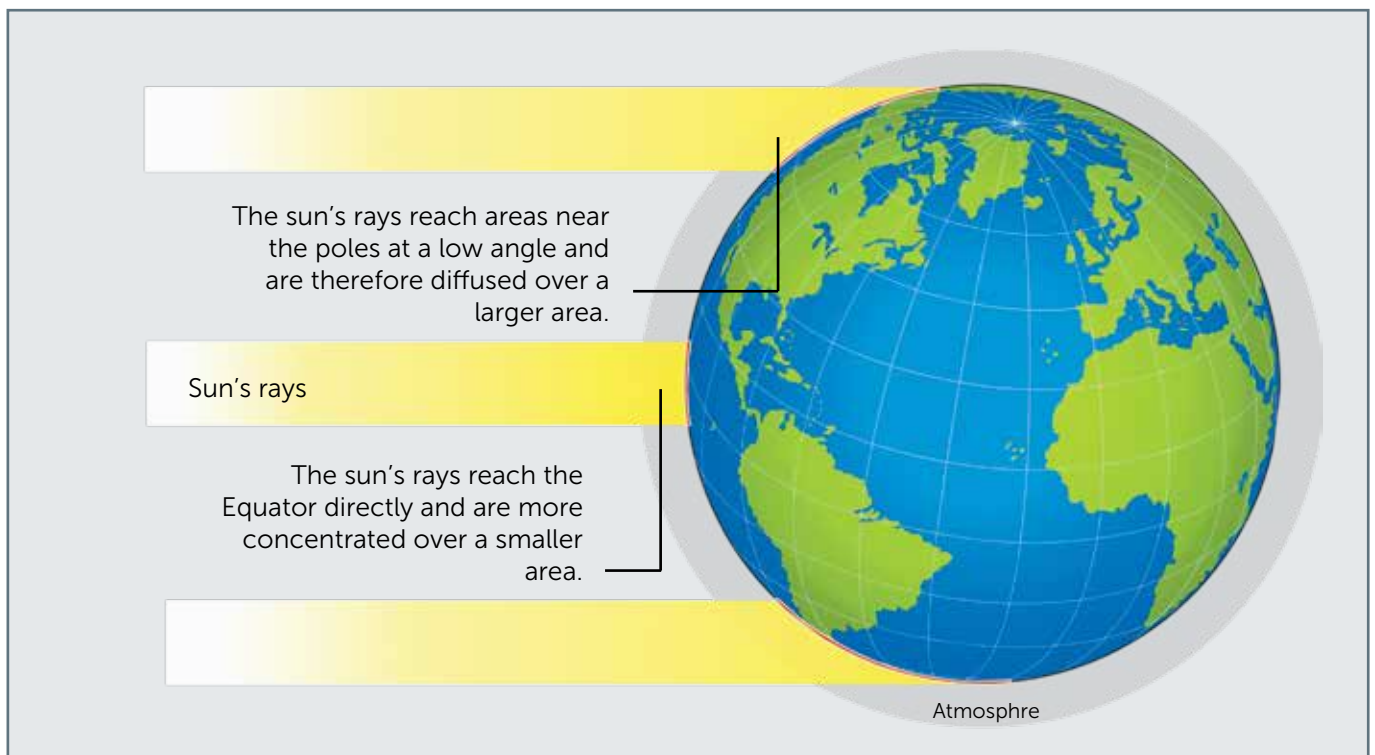
There are different types of climate around the world. Each type has the same characteristics. One main characteristic of climate is temperature.



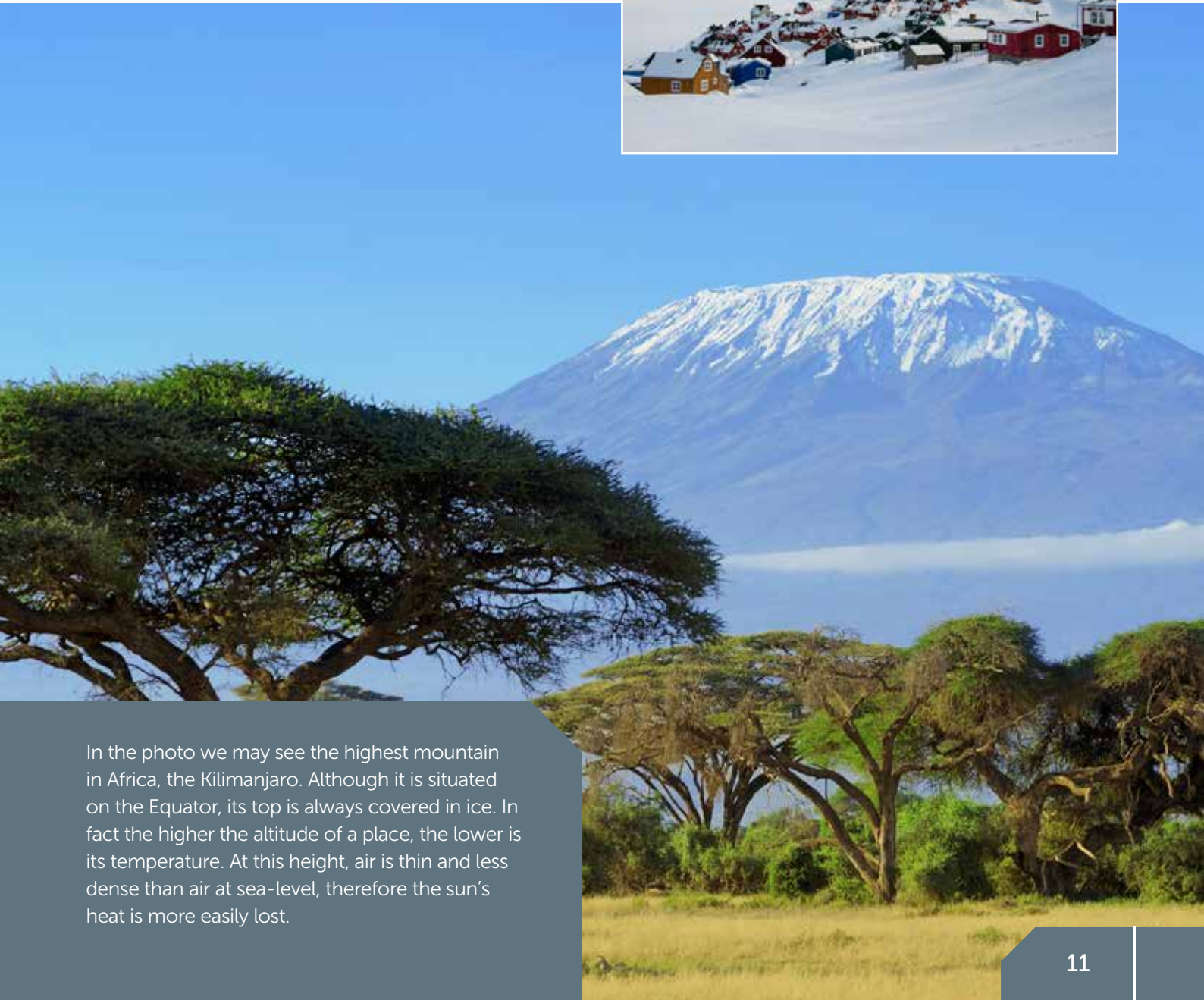
On a global scale, latitude has the greatest effect on climate. Places near the Equator are much warmer than places close to the poles. This happens due to the curvature of the earth and angle of the sun. The sun shines directly above the Equator and its rays are concentrated on a smaller area which heats up. On the other hand the rays of the sun reach the poles at a lower angle. The heat is diffused over a much larger area and therefore temperatures are much lower.



This varies very much from one place to another since some are more exposed to the sun. In fact, places that lie on, or are close to the Equator are much warmer than places near the poles. The sea has great influence on temperature too. Places that are near to the coast will be cooler in summer, while places inland will be warmer. The opposite happens in winter since places near the sea are warmer than places away from the sea. Winds can lower or raise the temperature of a place. In Malta for example, the south-easterly, southern and south-westerly winds bring warm weather, while those blowing from the north-west, north or north-east bring cool weather. Moreover, winds that blow from over the ocean are humid and may bring rain. Places that are very high above sea-level are very cold. Temperature decreases by 6°C for every 1000 metres increase in height. This is why mountain tops are always covered in ice.



We can divide the earth into zones, each with a similar climate. Those places situated just above or below the Equator have an Equatorial climate with high temperature and rainfall. In the desert the very high temperatures may reach 45°C by day (see the top photo on the right). There are places with moderate climate where the temperature is neither too hot nor too cold. Finally there are places where the temperature may fall to -51°C (51 degrees below zero). These are places with a polar climate like Alaska and Antarctica. (See the photo at the right). This type of climate can also be found on mountain tops as in the Andes or Himalaya.



In the photo we may see the highest mountain in Africa, the Kilimanjaro. Although it is situated on the Equator, its top is always covered in ice. In fact the higher the altitude of a place, the lower is its temperature. At this height, air is thin and less dense than air at sea-level, therefore the sun's heat is more easily lost.

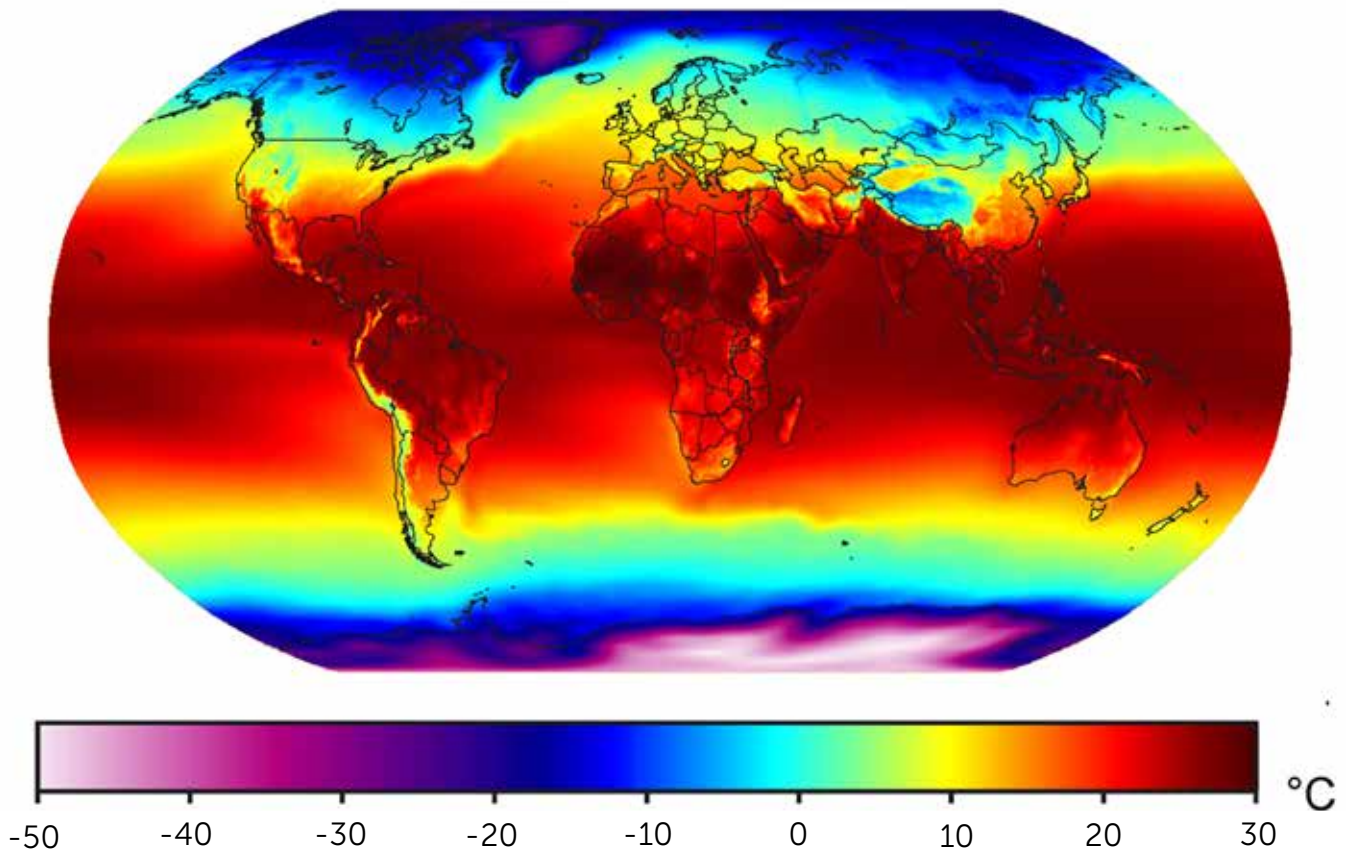
Temperature

One of the main elements of climate is temperature. This varies a lot and one can find very warm places near the Equator and very cold places close to the poles. This happens since different places receive different amounts of heat energy from the sun. The temperature of a place is also affected by its distance from the sea, its altitude and the prevailing winds.

We use the thermometer in order to measure temperature exactly. Meteorologists measure temperature in degrees Celsius at a sheltered place in the open. For this reason, thermometers are kept in an appropriate box called Stevenson screen. The maximum and minimum temperatures are measured by two slightly different thermometers.



The map below clearly shows the difference in the sun's heat energy at different places throughout the world. The red colour shows very hot places with high temperatures. The white areas in Antarctica are the coldest places on earth where the temperature may fall as low as -50°C . We note that the warmest places lie in the region between the tropics of Cancer and Capricorn.





The maximum day temperature is measured by a thermometer made out of a long and narrow glass tube filled with mercury. When the air is warmed, the mercury expands upward. The warmer the air the higher the mercury goes. In the tube a small metal piece is placed to stop the mercury from going down again when the temperature falls at night. The minimum temperature is measured by another thermometer filled with alcohol. When temperature falls during the night or in the early morning, the mercury drops down. With it a piece of metal is also pulled down. This metal will show the meteorologist the exact temperatures at which the metals have stopped.

The average air temperature in the Maltese islands is about 19°C. This is just the average and in fact temperature in Malta rises and falls much more than that. The lowest ever

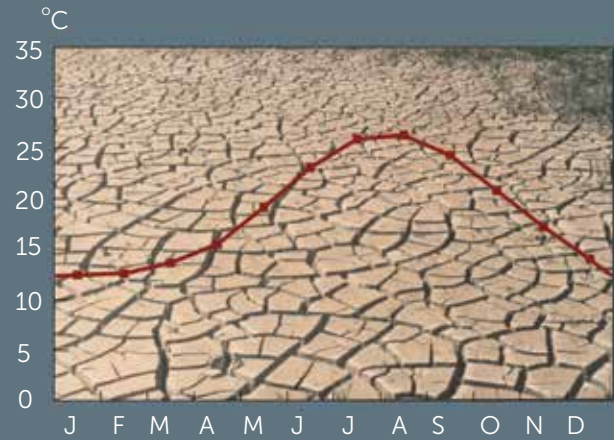
In order to measure the temperature in an open place in the shadow, the thermometers are kept in an appropriate box called Stevenson screen. The four sides of the box are louvered so that the air will still be able to enter and circulate without hindrance. The box is painted white so that it reflects the sun's heat and it is placed away from trees or walls. It is also raised by one metre so that the heat or humidity of the ground would not affect the measurement. Apart from the thermometers, one finds other weather instruments such as the hygrometer which measures humidity.

Weather elements

Malta enjoys many days of sunshine. The instrument below measures the hours of bright sunshine every day. The average in Malta is 8.2 hours a day. This varies a lot from one season to another. June, July and August are brightest, with an average 11 hours a day. December and January are most cloudy and daytime is shorter, therefore the average sunshine per day is only 5 hours. The sun gives us light and heat energy, however, exposure to sunshine for a long time may create problems. Apart from the obvious sunburn or heatstroke, the ultraviolet (UV) rays wrinkles the skin and increase the risk of contracting melanoma, a type of skin cancer.

Sometimes at the height of summer Malta suffers very hot days. This is called a heat wave and occurs when the temperature is higher than

Average temperature in Malta



The graph above shows the annual average temperature in the Maltese Islands. At first glance we notice that winter is somewhat cool while summer is hot. January and February are the coldest months with an average of 12°C while July and August are the warmest with an average 26°C. We also note that temperature increases every month from January to August. After August the temperature decreases slowly.





Death Valley in California, seen in the picture below, is one of the hottest places in the world. In July and August 1917 the temperature reached 49°C for about 43 days.

The highest temperature ever was recorded at al'Aziziyah in Libya in September 1922. That day the mercury reached 58°C.

will become. This great amount of water vapour in the air will make it feel sticky and muggy. In periods like this when the temperature is over 40°C there is great risk of fires which can destroy whole forests as can be seen in the picture above. Often the extreme heat cause high mortality among old people and young children who cannot cope with such weather.



average for a number of days. This generally happens on calm and cloudless days when the land and the air are heated up much more than usual. The warmer the air the more humid it

The coldest region in the world is Antarctica, seen in the picture below. The average temperature is -58°C. The lowest temperature ever recorded was at Vostok Station in 1983. Here the temperature dropped to -89°C.



The Wind

Wind is air in motion. In general wind blows due to differences in the atmospheric pressure of different regions. Winds blow from areas of high pressure to areas of low pressure and they tend to level off the difference in such pressure.

Temperature determines differences in air pressure. Where the land is warm the air above will warm too. This will expand, becomes light and rise. This is how a zone of high pressure is created. The colder air around this warm place with higher pressure tends to take the place of the warmer rising air. The result is wind.





A force 4 wind on the Beaufort scale is moderate with a speed of between 20 and 29 km per hour. This can move tree branches. On the other hand a gale of force 10 which has a speed of 88 to 102 km per hour can uproot trees. Winds at force 12 cause total devastation. Such winds of over 120 km per hour are called hurricanes and mostly occur in coastal areas of the tropics.



From time to time, wind changes its direction and speed. Meteorologists measure the speed of the wind by means of an anemometer, an instrument made up of three cups which turn slowly when the wind is gentle and fast when the wind is strong. The meter attached to this weather instrument records the revolutions of the cups in a given time and may therefore calculate the wind speed in kilometres per hour.

Wind force is also measured by the Beaufort scale with ranging from force 0 that is calm, to force 17 where the wind reaches a speed of over 220 kilometres per hour.

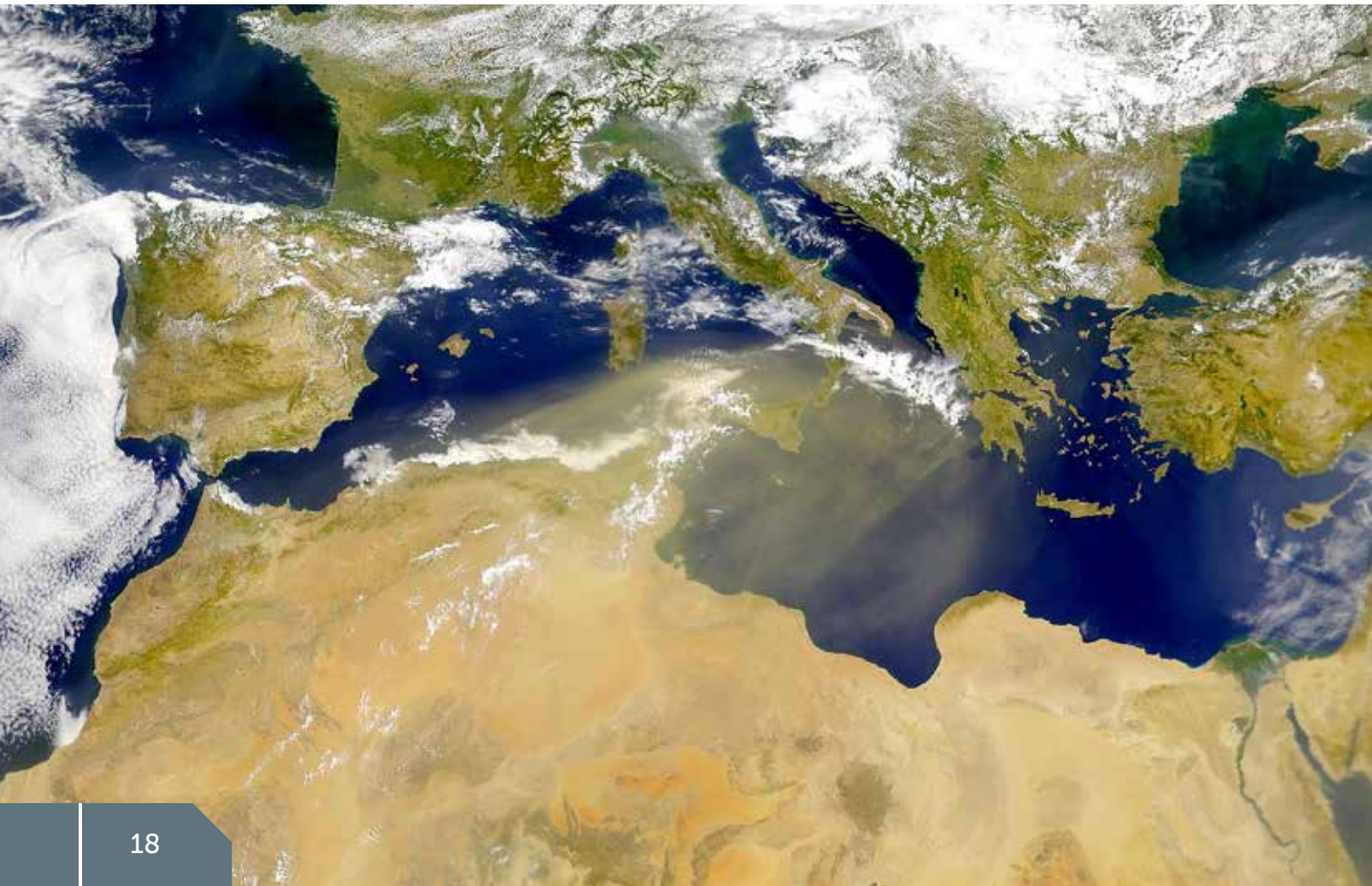
The wind-vane shows us the direction of the wind. The winds are known by their compass direction (or the wind rose), that is, from where they blow.

Weather elements

In the Maltese Islands the prevailing wind is the north-west, called Majjistral in Maltese. In fact it blows for over 20% of the days in the year, bringing cool temperatures from Europe. The north-east, called Grigall in Maltese, which blows from the Balkans, brings stormy weather, strong winds and cold air. A north-easterly storm (grigalata) is usually accompanied with heavy rainfall, strong gusts of wind and very rough sea. Otherwise the south-west, south and south-east winds (respectively Lbiç, Nofsinhar and Xlokk in Maltese) cause higher temperatures originating from Africa. These can be laden with fine dust from the Sahara Desert causing the air to become foggy and murky. They also bring high levels of humidity when the air is sticky and muggy. Strong winds, especially the north-easterly have often caused great damage



When the wind blows from the south, south-west or south-east, it can carry fine dust from the Sahara Desert. The satellite photo below, shows a large yellowish cloud full of sand. If rain falls on such an occasion, the dust too will come down with it. This is known as blood rain and will colour many surfaces in a reddish hue.





In the photo on the left we can see a waterspout, that is a tall mass of whirling air caused by high instability in the atmosphere. These winds blow at a great speed and even in Malta they may cause much damage when they occur. They are visible since they swirl like a top and raise dust when on land or seawater when at sea. Although these whirlwinds are short-lived, they still cause much damage wherever they pass from. They uproot lines of trees and electricity pylons, knock down walls and structures in farms and cause other damage costing thousands of Euros.

On the other hand the hurricanes which start over the warm tropical seas are much larger and last longer. When these hurricanes reach land at a speed of 240 kilometres per hour they wipe out whatever lies in their path and cause millions of Euros in damages. This is what happened in August 2005 in the United States when hurricane Katrina, with winds blowing at 280 km per hour, killed 1,836 persons and left hundreds of thousands of other people homeless in New Orleans and the nearby zones. The photos below show the devastation caused by hurricane Katrina.

in Malta. Winds of force 8 or over are strong enough to uproot high trees, knock down walls and blow away whatever lies in their path, be they electricity pylons, traffic signs, water tanks and television antennas on roof-tops. Whenever these winds rise suddenly they scuttle the boats from their berths and wreck them on the shore. Worse still tragedy may strike. On 12 October 1982 four people were buried under the rubble of a wall which collapsed on them.



Rainfall

Everyday large amounts of water from the oceans, lakes and rivers are evaporated by the sun's heat and are so turned into water vapour. Air can hold huge quantities of water in it until it is saturated and can no longer contain more. Warm air can hold more water than cold air.

On its way upward this water vapour is cooled and is condensed into water droplets again in the form of cloud. These droplets join together, become larger and heavier until they fall as rain, ice or snow. The circulation of water in between the sea, air and land is continuous. It is called the hydrological cycle.

In some parts of the world, rainfall is abundant and one can say that it is a daily occurrence.





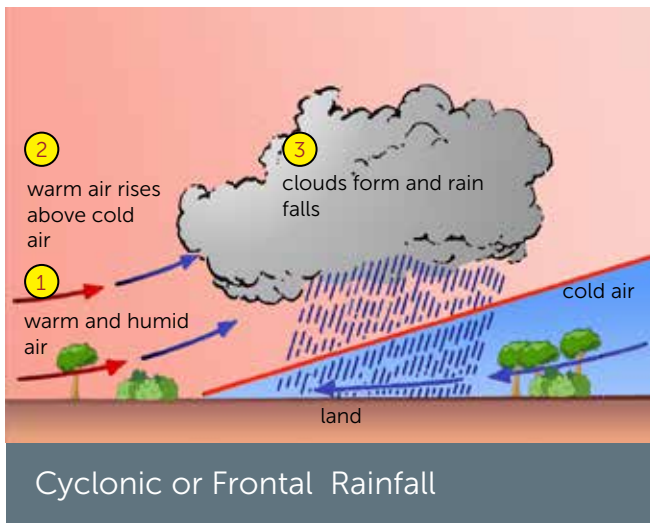
Rain is measured by an instrument called rain-gauge that is composed of a cylinder which receives the daily rainfall. This is attached to the ground so that the wind will not blow it down and it may continue to function. The rain-gauge must be placed away from buildings, trees and other objects which might hinder the raindrops from entering. The measure is taken each day at midday and given in millimetres.

This is what happens, for example, in the Amazon rainforest where the average rainfall is 2,000 mm a year. However, in South America we also find places where rainfall is scarce. In fact the driest place in the world is the Atacama Desert in Chile. In some places in this desert rain has not fallen since 500 years ago. In Malta the average yearly rainfall is 520 mm.

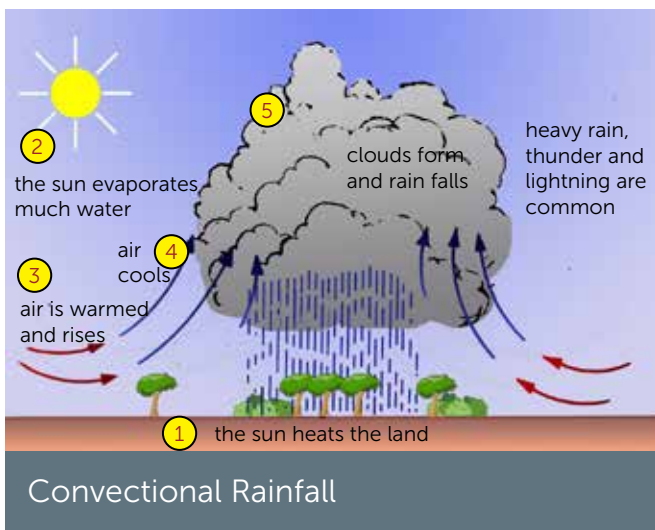
In Malta rain often falls in heavy showers during thunderstorms. These mostly happen when warm air originating in the Sahara Desert meets colder air coming from the north of Europe.



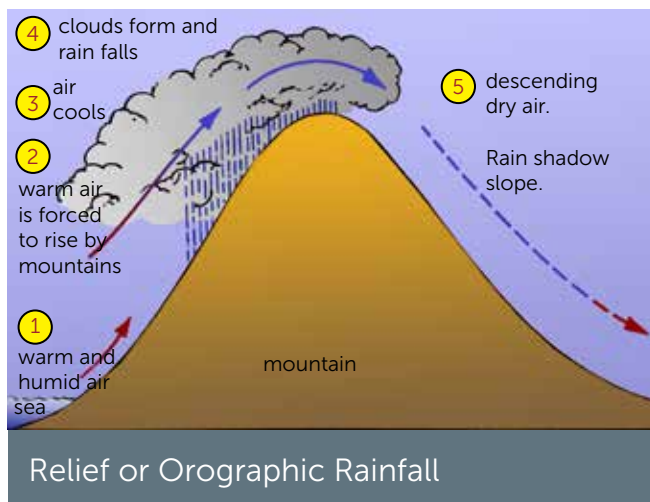
Warm and humid air is lighter than cold air. Therefore when the two meet the warmer air rises above the cold air. While rising the latter air cools and the water vapour in it condenses into water droplets in the form of cloud and rain. This type of rainfall is called cyclonic or frontal and is common in Malta in winter.



Even at the end of summer, in September and October, Malta experiences some thunder stormy weather. At this time of year both land and sea will be very warm. During the day the sun evaporates loads of water and this warm and humid air rise convectionally in a circular way. When the air is at a high altitude it cools and forms high clouds called cumulonimbus. This thick cloud brings very heavy rain accompanied with thunder and lightning. During such storms, many low-lying areas are flooded.



In some regions of the world, warm and humid air rises and cools when it meets hills and mountains. This happens mostly when air



Orographic or relief rainfall occurs when a warm and humid air mass meets, rises and cools over the hills as can be seen in the photo above.

laden with water vapour comes from over the sea and meets a mountain chain along the coast. The air is forced to rise above the mountains and will therefore cool. The water vapour condenses and becomes water droplets in the form of cloud, leading to rainfall, as can be seen in the lower photo on page 22. The air which has shed its humidity will descend the mountain on the other side which is therefore in the rain shadow. In Malta this rainfall does not occur.

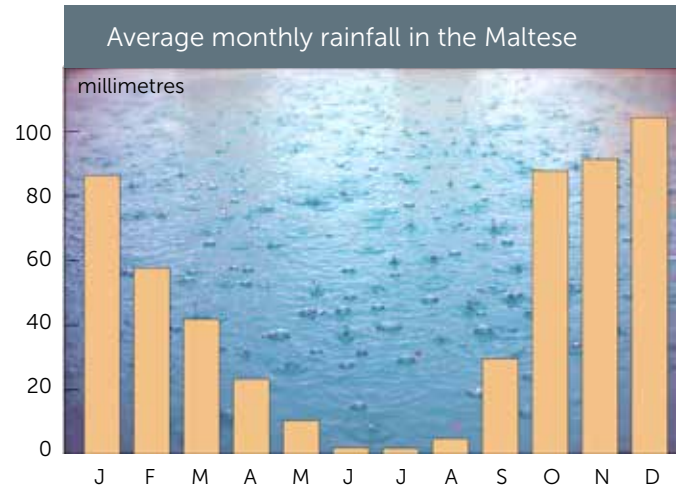


In September, October and November thunderstorms are quite common in Malta. These happen since the sea around Malta will still be quite warm when compared to the cool currents which by then will be coming from northern Europe. During such storms rain will fall copiously in a very short time. This has happened for example on 10 November 1988 when more than 162 mm of rain fell within 24 hours. As usually happens in such circumstances, low lying areas such as Marsa, Msida, Qormi and Birkirkara were hard hit. Many cars stopped and were carried by the waters (see picture below), waters flooded and damaged houses, broke up road surfaces, ruined the crops and carried away the soil and the agricultural produce. Each year these storms cause thousands of Euros in damage and worse still, they sometimes lead to the tragic loss of life as happened in the storm of 1979 when four persons were carried away by the waters and died.



Weather elements

The graph on the right shows the average monthly rainfall in the Maltese Islands. Most rain falls between the months of October and February, the other months being relatively dry. The wettest month is December with an average 94 mm of rain while July is the driest with only 0.75 mm. Often there are short thunderstorms with heavy rain. Notwithstanding this there are still many days of sunshine in winter. June, July and August are the driest months and evaporation rates increase. During this dry and hot season the soil dries up and all plants and creatures find it hard to cope.



In cold periods rain may fall in the form of solid drops similar to beads. Occasionally the Maltese Islands experience such a storm which causes much damage especially when the ice is as large as that shown in the picture below. This can damage cars, glass structures, greenhouses and crops. This ice forms in storm clouds called cumulonimbus in which strong currents push the water droplets upward to below zero degrees Celsius (0°).



High Atmospheric Pressure

Maltese meteorologists must note the weather in Europe, North Africa and the Atlantic Ocean in order to forecast the weather correctly. Often the weather as forecast on television, the internet and in newspapers is explained by means of maps that are full of signs and symbols.

The most noticeable feature on these maps are the lines which mark air pressure. These lines are called isobars and they join places with equal pressure at a particular time. The letter H on these maps shows that in that place the pressure is higher than elsewhere, while the letter L indicates low pressure. Isobars drawn close to each other indicate very strong winds. On the other hand, the wind is light when the isobars are widely spaced and distanced. Apart from the force of the wind, isobars also tell us about its direction since wind always blows from areas of high pressure to others having low pressure.



Air pressure is measured by the use of a barometer (see photo above). This instrument can be placed indoors since air pressure is not affected by buildings. At sea level the average air pressure is one bar or slight more than 1000 millibars (mb). When the barometer marks an increase in pressure, fine weather will be expected, while stormy weather often follows a decrease in pressure.

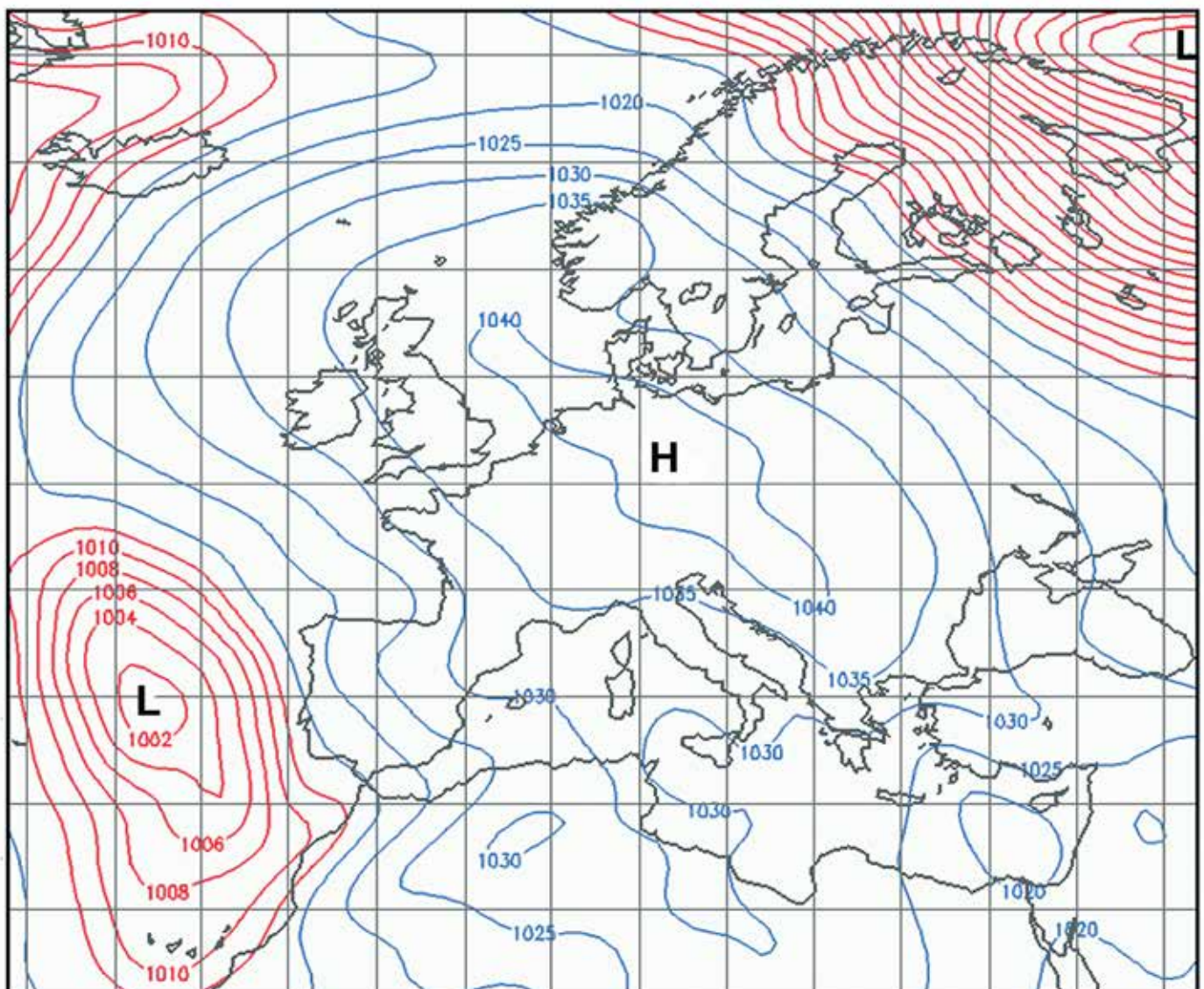


In the map below we see the Maltese Islands under the effect of a high pressure or anticyclone. Air pressure near Malta is marking 1030 millibars. Anticyclones form where air is subsiding and pressing downward. The air is heavier when it falls in mass. Pressure

increases and hence a high pressure area forms.

Anticyclones are characterised by stable, fine, rainless and sunny weather with little or no cloud. High pressure conditions last for long periods. One can safely state that during the whole summer the central Mediterranean is under the effect of high pressure. In an anticyclone, wind is light moving in a clockwise direction when seen from above or on a map. Since there are no clouds in summer temperatures rise giving way to heatwaves of 40°C for a number of days. During the night the heat is lost since there are no clouds and this causes the formation of dew.

Weather maps as published daily by the meteorological station give a clear view of the coming weather. The circular lines, called isobars, show the air pressure present in different places. Where the air pressure is high (blue lines) between 1015 mb and 1040 mb the weather is fine. Over the Maltese Islands the wind is light since the isobars are distant from each other. On the contrary wind is strong in the west and north-east regions of the map since the isobars are close to each other.





Apart from warm weather, an anticyclone also causes drought and lack of rain. Heat and the scarcity of water harm the crops. Apart from irrigated areas, the Maltese farmer cannot cultivate most fields in summer. This is why the landscape in Malta is very arid in summer.

In winter the conditions associated with an anticyclone remain the same, except that temperature will be cold by day. Since the sky is cloudless by night the land will lose to space the heat amassed by day and therefore temperature will fall considerably. In some countries temperature will be so low that water freezes and forms frost.

Anticyclones are areas of high pressure which bring fine and hot weather in summer. No wonder that so many people resort to the sea! Many creatures try to adapt to the sweltering heat of this season. Some burrow into the soil until they find shelter and humidity, while others find refuge in cracks in the rock or under a stone. The white snail seen in the picture above avoided the heat by climbing high on to a dry mast. There it passes the whole summer away from the hot ground.

In summer the anticyclone brings sunny, dry and hot weather. By night skies are cloudless and heat is easily lost to space. Hence nights may be somewhat cool. Moreover due to high rate of evaporation, the excessive water vapour will condense into droplets called dew. This happens mostly by night when temperature falls. This dew is the only source of water to many plants and creatures (see photo at right) which can survive through summer.



Low Atmospheric Pressure

Cyclones or depressions that cross over the Maltese Islands between October and April bring rainy and thunder stormy weather. Depressions are low pressure storm systems that are frequent in temperate zones such as the Mediterranean.

Depressions form when a mass of warm air meets another of cold air. Often these low pressure storms start on the Atlantic Ocean where warm air from the tropics meets cold polar air from the Arctic zone. Most of them move eastwards over northern Europe, however, many succeed in entering the Mediterranean region. In a few days they cross over the Mediterranean from west to east bringing unstable weather. Other depressions form

to the south of the Atlas Mountains in North Africa. These too move toward the central Mediterranean mostly between December and February. Some other low pressure storms also form over the Gulf of Genoa.

In temperate zones, depressions or cyclones form when warm air is forced to rise over cold air. When this happens, the warm air cools, the water vapour condenses and rain falls. This type of rainfall is called cyclonic.







These find their way south to the Tyrrhenian Sea and on to the Balkans. Although they do not reach the central Mediterranean, they are the origin of the Mistral wind which blows vigorously over the Maltese Islands.

In the satellite photo we can see one of these storms over the central Mediterranean. The large cloudy mass is causing high winds, thunderstorms and heavy showers. In such depressions the wind blows in an anti-clockwise direction when viewed from above or on a map while the whole system moves slowly eastward.

The margin of a depression which divides the warm air mass from the cold mass, is called a front. A warm front will bring warmer air when it passes, while a cold front will lower the temperature. In the weather map on the right we may see a series of fronts over Europe. Among other features, we may see a large low pressure area to the west of Great Britain and a

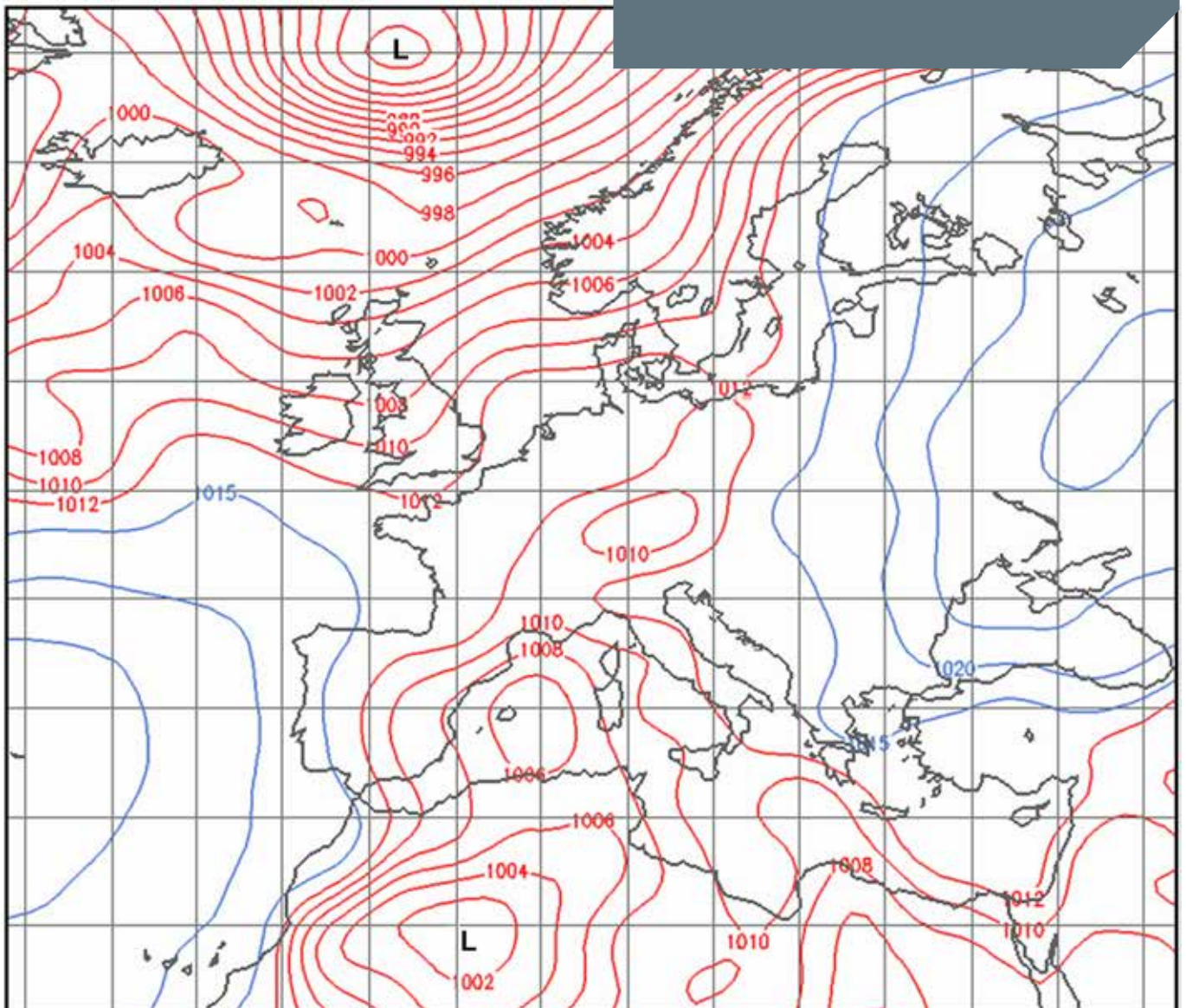
On a weather map a low pressure area can be recognised by the letter L at its centre and by closely drawn isobars. Air pressure is normally less than 1013 millibars. There may be the symbols of a cold front () or a warm front (). Most of the time low pressure systems bring about thunderstorms, floods and gale force winds.



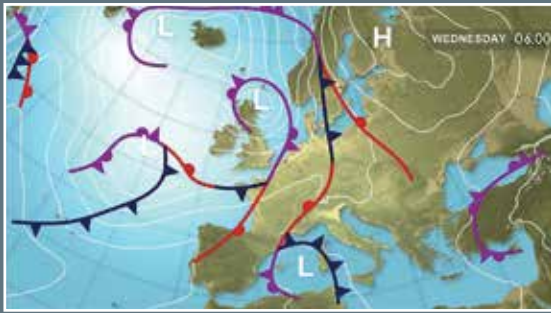
depression moving towards Europe. In front of this depression there is a warm front marked by a red line with semi-circular signs. As soon as this front comes nearer the weather becomes cloudy and light rain start falling. While it is passing the wind will be stronger and clouds will be thicker and rain heavier. When the warm front is past the rain will either stop or become very light, same as the wind and the temperature will increase. However, when the cold front reaches the place (the blue line with triangular signs) temperature drops, wind will get stronger, high cloud form and the rain will fall in showers. This cold front takes a short time to pass and when it does so, the pressure will increase, rain will stop and the sky will clear.



Occasionally rainstorms and gales cause considerable damage in Malta. The roads will be flooded and in chaos. At times even aeroplane flights to and from Malta had to be postponed because of intense low pressure depressions.



Temperate depression



The three maps on the left show us the passage of a cold front over the Maltese Islands in a period of 24 hours. The first map dated Wednesday shows an area of low pressure with an associated cold front extending from the western Mediterranean to Tunisia, moving towards the north-east. The weather in the Maltese Islands is mainly cloudy with high cloud. When after twelve hours the cold front reaches the Maltese Islands (the second map, Wednesday) the weather changes completely. The air becomes cold, it will rain in showers and the south-east wind will become stronger. By Thursday morning the cold front will have passed Malta and moved toward north-east. The air pressure will slowly rise and the rain will become light until it stops completely.

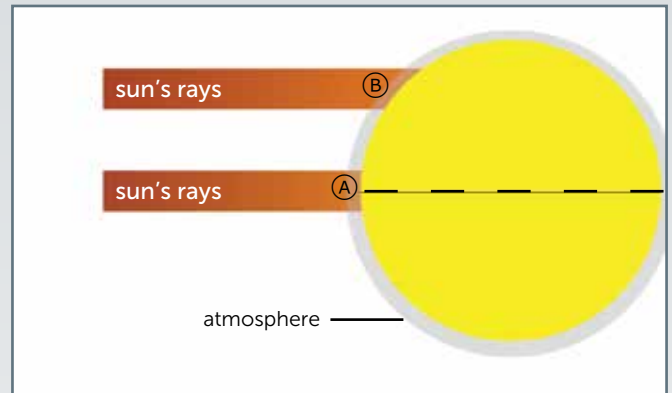


1

- Write a short report about the current weather.
- Explain how weather conditions can affect your personal activities.
- What is the main difference between weather and climate?
- Mark whether the following sentences about weather and climate are true or false.

	True	False
Weather describes the atmospheric conditions for a short time.		
All the countries in the world have the same type of climate.		
Two factors affecting climate are latitude and altitude.		
Rising air cools at the rate of 18°C every 100 meters in height.		
In summer prevailing winds blowing from land bring cool weather.		
Places close to the Equator are colder than areas near the poles.		
In summer places that are distant from the sea like Moscow are generally cooler than places by the coast.		

- Re-write the false sentences of exercise 1d correcting the mistakes.
- With the help of the diagram below explain why;
 - Places close to the Equator (A) are warm, and
 - Places near to the poles (B) are cold.



- Explain why high places on the mountains have low temperatures.
- The temperature at a place by the seaside is 10°C. What will be the temperature of the same place if it was 1,300 metres high above sea-level?
- Write the correct climate after each sentence. Choose from; tropical climate, temperate climate, polar climate.
 - In this climate we find low temperatures all year round. _____
 - We find very high temperatures in this climate. _____
 - Here we find moderate climate which is neither too cold nor too hot. _____

2

- Look carefully at these weather instruments.



- In the first column of the table below write the name of the instrument.
- In the second column write the weather element which each instrument measures, (e.g. temperature).
- In the third column write the unit of measurement used (e.g. millimetres).
- In the last column write down where the instrument should be best placed to give accurate measurement, (e.g. Stevenson's screen).

	Name of instrument	Weather element	Unit of measurement	Place
①				
②				
③				
④				
⑤				
⑥				

- b. Look at the picture on the right.
- What is this box called?
 - Why is it called so?
 - Which of these weather instruments are placed in the box?

wind-vane

rain-gauge

thermometer

hygrometer

anemometer

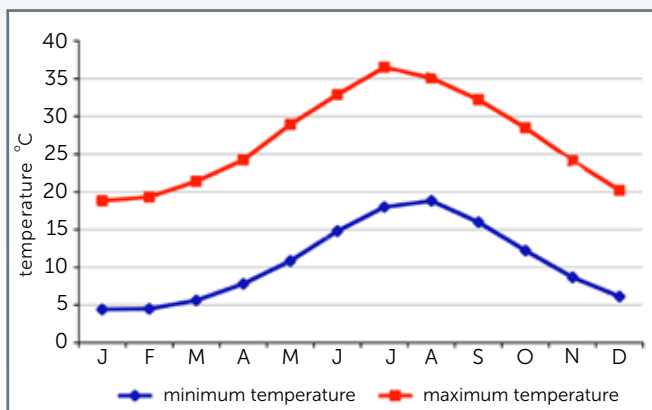
- Why is this box necessary at the meteorological station?
- Explain why,
 - this box is painted white;
 - the four sides of this box are louvered;
 - this box is elevated from the ground;
 - this box is placed away from trees and buildings.



3

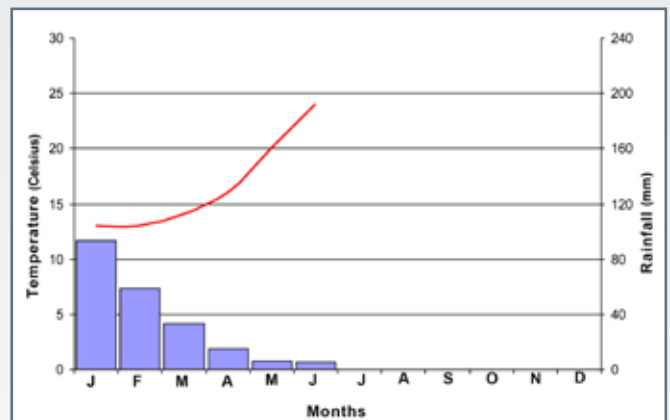
Study carefully the graph below which shows the temperature in Malta.

- What is the red line showing?
 - What weather instrument was needed to draw such a graph?
 - Explain how this instrument works.
- What is the blue line showing us?
 - What weather instrument was needed to draw such a graph?
 - Explain how this weather instrument works.
- In which month of the year does the maximum temperature exceed 35°C?
- What is the average maximum and minimum temperature in the month of January?
- If in December the average maximum temperature is 20°C and the minimum is 6°C, what is the average mean temperature for that month?



- Study carefully the climograph or climate graph of the Maltese Islands below. Part of the graph, from July to December, is missing.

Use the data given below to complete the climate graph.



month of the year	temperature (°C)	rain (mm)
July	26	0
August	27	7
September	21	40
October	21	90
November	17	80
December	14	112

g. Answer the following questions.

i. What was the rainfall in the months of:

- January
- April
- November?

- ii. What was the rainfall throughout the whole year?
- iii. Which was the warmest month of the year?
- iv. Which is the coldest month of the year?
- v. Does the temperature warm or cool from January two August?
- vi. Which month is driest?
- vii. By using the data in the graph, write a short paragraph about climate in Malta.

4

a. By what process does:

- i the sun turns liquid water from the oceans, sea and lakes into vapour.
- ii the water vapour turns into water droplets and forms clouds.
- iii water droplets fall down back to the ground.

b. Draw a diagram of a rain-gauge. Label it with the following data.

plastic or metal cylinder

funnel

glass cylinder marked in millimetres

- c. Where should the rain-gauge be placed in order to give accurate measurement?
- d. The diagram below shows how relief or orographic rainfall occurs. Label the diagram well by writing what is happening in stages from 1 to 6.



e. Cyclonic or frontal rainfall occurs when warm air meets a mass of cold air. Since cold air is heavier the warm air is forced to rise over it. Draw a well-labelled diagram to show how cyclonic rainfall occurs.

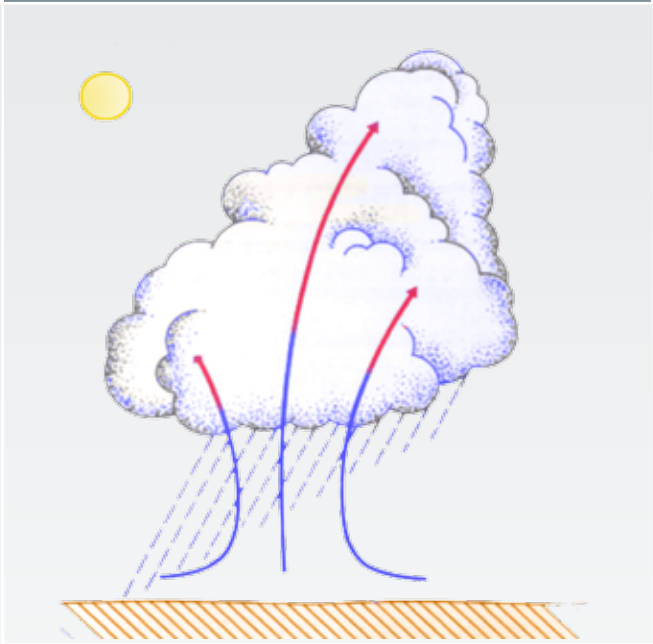
5

Look carefully at the weather top map on page 35.

- a. What are the red and blue lines in the map called?
- b. What do they show?
- c. What does the letter H on the map indicate?
- d. Which of the following weather conditions are present in Malta? Mark the correct ones.

f. Read carefully the extract and then label the diagram with words taken from the same paragraph.

Every day the sun evaporates large amounts of water from the sea, rivers and forests. This humid air cools while it is rising in circular currents. Hence the water-vapour condenses and turns to thick cloud of cumulonimbus type. This will result in heavy rain, thunder and lightning. In Malta, this type of precipitation, called convectional rainfall, is most common in the months of September and October.



heavy rain		strong wind	
fine weather		partly cloudy	
thunder and lightning		calm (no wind)	
very cloudy		sunny	

- e. Choose the correct answer in the brackets.
- The map shows that the Mediterranean is under the influence of (an anticyclone or a depression).
 - The air pressure over Malta is (low or high).
 - The wind at place X is blowing in (a clockwise or an anti-clockwise) direction.
 - At place V there may be (a gale or calm).
 - The temperature at place W is (38°C or 10°C).
 - In Malta the barometer is marking (1030 mb or 1012 mb).
- f. What type of weather conditions are associated with such an air pressure system in winter?

6

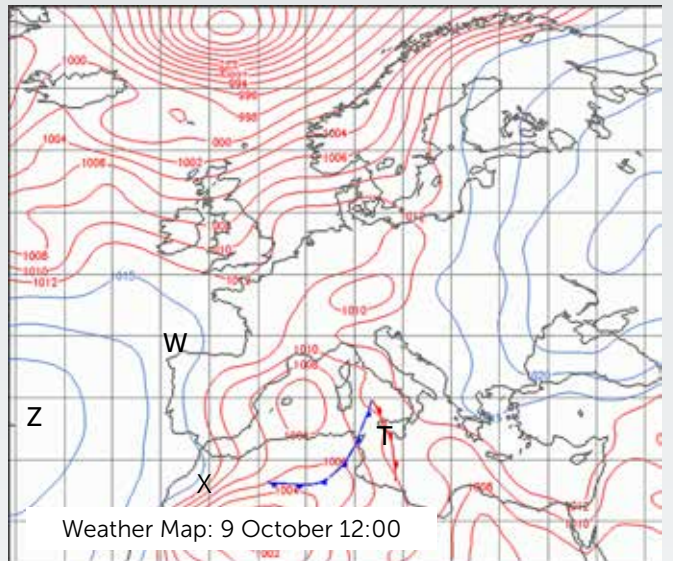
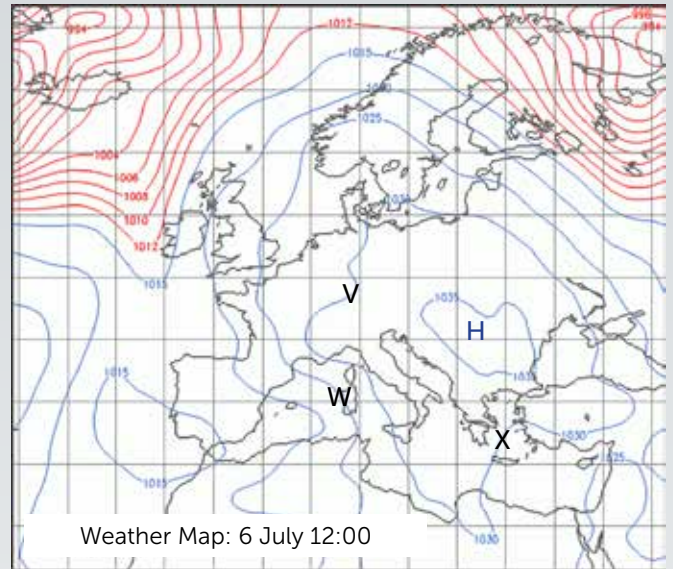
Study carefully the weather map on the right issued by the Meteorological Office on 9 October.

- a. Mark whether this information is true or false.

	True	False
In Malta the weather is fine.		
In Malta the air pressure is about 996 mb.		
A depression is moving towards Malta which will bring rainfall.		
The depression shown near Malta will move to the west.		
The depression will bring cyclonic rainfall.		

- b. In which place, X or Z will the wind be stronger?
- c. In which place, T or W is rain falling? Explain why.

7



- d. What are the red and blue signs moving toward Malta called?
- e. In a few sentences explain how the weather will change in Malta as the depression moves over the Islands.



Look carefully at the satellite photo.

- a. With letter A mark a very cloudy place on the photo.
- b. Mention four European countries that were covered by clouds the day the photo was taken.
- c. On that day, which one of the following three countries had rainfall?

Albania

Egypt

Portugal

- d. With the use of the satellite photo, prepare a weather forecast for Malta for the coming hours.



Municipal waste is that which is generated in the homes, offices, shops and streets. Most of this waste is composed of organic material like vegetable left overs or fruit skin, leaves and branches, or inorganic waste such as plastic, metal and glass. In this waste there may be dangerous materials such as used batteries, expired medicine, paint or cleansing agents.

Waste

2

Waste consists of that material which we dispose of since not useful any more. In other words it is all that is no longer used and therefore thrown away. This is something done only by humans and it is never observed in nature since here all material is recycled and transformed by the ecosystem in such a way that nothing is wasted.

All waste created by people, also called litter, is made up of many natural resources like trees, metal, water, oil, plastic and other raw materials. People turn these raw materials into products that are useful at home and at the place of work. Many such products will in time no longer be useful and are therefore considered as waste. In this way we will unknowingly be transforming the limited resources of the world into waste.

For many years we disposed of our waste simply by depositing them in a far-away site that could not bother us anymore. Indiscriminate waste disposal is a major source of pollution and is detrimental both to our health and to the environment.



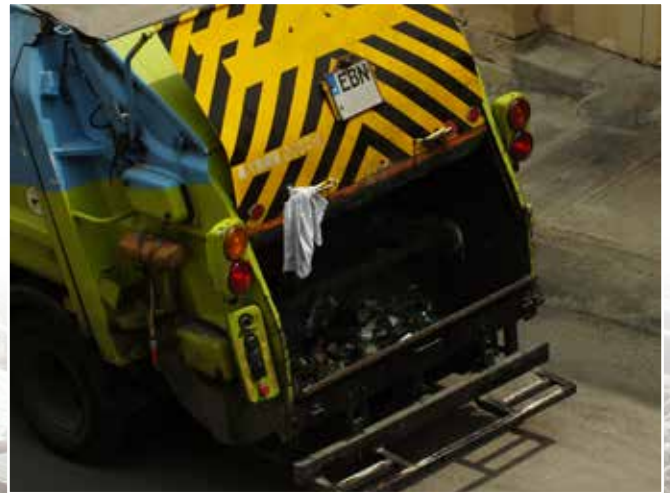
Waste as an Environmental Challenge

Each day we throw away a large number of products made from natural resources. In the past waste was not a problem since the population was smaller and most of the waste consisted in organic material.

Such biodegradable waste does not harm the environment since in time it decomposes by means of biological processes. When people moved to large towns and cities waste became a problem. Waste that was thrown away in the streets, or nearby abandoned sites, attracted insects and pests. These carried fatal diseases like plague which killed thousands of people.

It is estimated that domestic waste varies from one half kilogram per household in

poorer areas to one and a half kilograms in more affluent districts. In the Maltese Islands each person generates an average of one kilogram waste every day. This waste is composed of glass, plastic, paper, tin and





cardboard which all originate from natural resources in the environment. One must remember that natural resources and raw materials will not be available indefinitely and may one day finish.

For many years in the past, in almost all countries of the world, solid waste used to be dumped in landfills or waste tips at a distance from settlements, while liquid waste would be thrown into the sea through the sewerage system. In this way we were creating a biological imbalance in the components of ecosystems. We must change our concept of the environment as a large litter bin that can absorb all our waste. If waste is dumped unthoughtfully in the environment serious problems of pollution will result. Such waste may destroy fertile soils where farmers raise

Solid waste was thrown in waste tips, far from the towns. This was an easy and cheap way of disposing of tons of waste. Experience has shown that this was not the best solution to the problem. Apart from the use of land, visual impact and smells, waste tips created environmental problems, such as leachate which penetrated into the cracks in the rock down to the aquifer. Moreover toxic gases were emitted while the waste decomposed naturally. Most dangerous among these gases is methane which is not only a greenhouse gas but is also explosive.

crops, contaminate water springs that are necessary for irrigation or for the animals, pollute coastal areas and the adjacent sea, and ruin the natural landscape that is renowned for its scenic beauty and biological diversity.

Another way of disposing of waste is by incineration, that is, by burning it, and so transforming it into smoke and ash. This process is done in a large oven called incinerator. But even so many gases may be emitted that are dangerous to health.



The uncontrolled use of natural resources and the throwing away in a waste tip or burning of tons of waste in an incinerator are not sustainable methods of waste disposal. Although these may be a short term solution, they would be delaying the problems for future generations to solve. We must change our ways by reducing the use of raw materials and by managing waste sustainably.



In some countries sewerage is thrown into the sea from pipes. This forms patches of contaminated water that is very dangerous to health. In fact typhoid, cholera and skin infections are common where people swim in or eat seafood grown in contaminated sea. Sewerage thrown into the sea destroys organisms, increases the amount of algae and dangerous species and pollutes bays and beaches that would otherwise be popular with bathers and tourists. In Malta all sewerage is treated before being thrown to sea. (see photo above).



What happens to our waste?

Nowadays the Maltese enjoy a high standard of living. Such affluent societies generate considerable waste. In a single year the Maltese generate about 400,000 tons of waste. For many years we used to dump our waste in landfills, at a distance from inhabited areas, wishfully thinking that the problem was solved.

Every type of waste was thrown in the older waste tips of Maghtab in Malta and Qortin in Gozo; such as stones and other construction material, municipal waste and industrial left overs which could also be toxic. Everyday trucks would go there to dump the waste coming from the houses and from the factories. The waste would be crushed by means of large bulldozers and then covered with a coat of debris.





Slowly but surely the waste tips filled up and grew ever more higher with the continuous bringing in of waste. They were also expanded thus taking much needed land. The natural environment of the area was destroyed and smell, smoke, pests and insects proliferated. The visual impact was no longer restricted. After rain showers the water would percolate into the waste tip and carry with it the poisonous minerals from within the waste. This leachate would not only contaminate the soil, valleys and springs but would also percolate into the aquifer. It would even succeed in mixing with the groundwater to finally percolate into the sea, thus making it unsuitable for swimming.

The decomposition of organic waste in landfills creates greenhouse gases such as the highly effective methane (CH_4) and carbon dioxide (CO_2). Frequently in summer the waste would self-ignite due to the high temperatures. These used to emit toxic smoke which was detrimental to health. This indiscriminate waste disposal was not sustainable and left a deep impact on the environment.

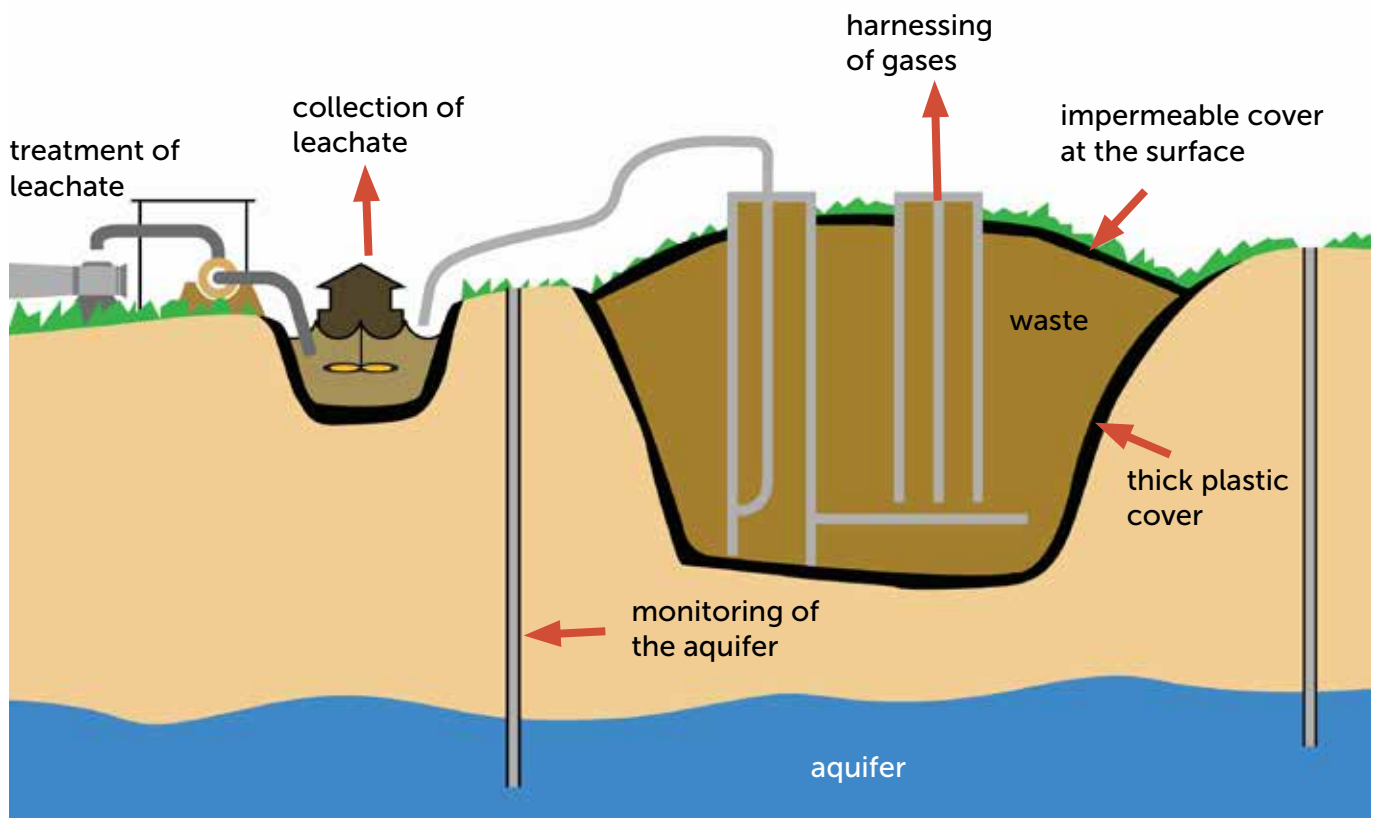




In modern landfills waste is thrown into large holes covered with thick plastic. The toxic liquid which emanates from the waste collects at the bottom of the landfill and is then pumped up and treated so that it does not pollute the aquifer. The gases are also harnessed to produce electricity.

Nowadays there are controlled landfills in Malta where precautions are in place so that no environmental damage is caused. The land used for dumping material is covered in a thick coat of plastic so that the leachate will not percolate into the aquifer. These coats of plastic are in turn covered and protected by a covering of spalls which also act as filter to leachate waste. This liquid will then be pumped up the landfill, filtered and thrown away. The gases that emanate during the decomposing of organic waste are used to produce electricity.

When the landfill is full it is covered with another impermeable carpet like the one at the bottom, so that rainwater will not enter the landfill and mix up with the waste.



Landfills

This will then be covered by soil so that the land will be rehabilitated by the planting of trees and shrubs. Nonetheless our minds should not be at rest regarding the final solution to waste disposal in Malta. These landfills still take up precious space and cost dearly to operate in such a proper way. Therefore we must find out ways and means to reduce the amount of waste thrown away by reducing waste generation, as well as reusing and recycling waste.



The uncontrolled landfill at Maghtab was closed and is being rehabilitated. The toxic gases emanating therefrom are being harnessed not to pollute the air. Methane collected there is being used for electricity generation. The whole landfill will be covered in appropriate materials so that rainwater will not mix with toxic materials and pollute the aquifer, valleys and the sea. Finally a covering of soil will be made and trees will be planted so that the areas may serve for recreation and leisure.



Waste Reduction

In waste management the best solution would be to reduce the amount of waste generated daily. An added boon would also be that of reusing waste or separating it according to kind before recycling.

Waste collection and recycling is necessary since it helps in limiting the amount of waste that is thrown into the landfills. Since litter takes much space it is better to generate less waste. Waste reduction helps in preserving raw materials and the energy needed to manufacture products. The major aim should be to extend the economic lifespan of products before they





are thrown away. In this way we would make sure that some resources will serve for much more time since the rate of their extraction will be slower.

This is possible by the reuse of certain products such as glass bottles before being definitely dumped in landfills. This is what happens in Malta for example with regard wine bottles. After returning them to the shopkeepers, they are collected, washed and reused. Such systems help in the conservation of raw materials, in this case, glass. Electricity is also saved since producing many more bottles uses much energy.

This is not always possible. Therefore some products are recycled into different secondary products. For example, cans, like those of tomatoes, may be collected and melted down for the recycling of their material by the manufacture of other tin or aluminium products. Recycling helps in the conservation of raw materials and the energy needed to manufacture new products.

Waste separation is necessary so that the waste products are collected according to kind and recycled. In Malta there are many bring-in sites where domestic waste is brought and disposed of in four separate containers, one each for plastic, glass, paper and metal waste. Moreover the public is urged to separate waste at home. According to the 'recycle on Tuesday and Friday scheme', people are encouraged to collect plastic, paper and metal waste in a grey or green plastic bag to be collected on these two days of the week.





The separated waste which is collected in the grey bag, from the bring-in sites and from the civic amenity sites are taken to Sant'Antnin or Ghallis. There it is separated, treated and sold for recycling. Different types of waste are exported to large recycling companies. Paper and cardboard which cannot be recycled is mixed with organic waste to form compost. After being cut into small pieces, plastic too is exported. Thus plastic is re-used for the manufacture of other products such a garden furniture, plastic containers, carpets and other objects. After being broken into small pieces, glass is also re-used in the production of tiles and concrete, among others. Metal objects are collected, crushed, melted and sold to Maltese recycling companies.

On the other hand domestic bulky refuse may be separated and disposed of in controlled sites. In these bulky refuse centres many kinds of waste are deposited, including furniture, mattresses, carpets, tiles, garden waste, oil, batteries, computers, tyres, household appliances such as fridges, and many other objects. This recyclable waste is taken from these sites to Sant'Antnin recycling plant at Marsascala where it is separated, treated and packed into bales for export. Both in this plant and the one at Ghallis the domestic black bag waste is also separated and treated. This is done by means of appropriate machinery which can separate for recycling waste in kind such as organic and biodegradable, metal, plastic and cardboard.



Another way of disposing of litter is by thermic treatment or incineration. In the incinerator the separated waste is burned at a temperature of 800°C. 90% of the waste turns to smoke and the remainder settles at the bottom as ash. Today's incinerators use modern technology which cleans the smoke that comes out of the



All biodegradable waste such as paper, leftover food and leaves are being recycled at the plant in Sant'Antnin at Marsascala. This waste is put into closed tanks so that by means of anaerobic digestion it is broken into small pieces. While this process is going on energy is generated enough to provide 1,400 households with electricity. The organic matter that is left is turned into compost which is then used for the rehabilitation of landfills and the embellishment of the environment.





About 80% of waste generated in Malta comes from construction material such as stone chippings, stones, construction sand and debris. This is inert waste and nowadays it is used to fill up the disused quarries. The dumped material should not be mixed up with other forms of waste so that the aquifer will not be polluted. In this way quarries are being rehabilitated and put to other uses such as farming. However, the best solution would be to reduce the amount of waste generated and to re-use the old stones of knocked-down buildings for new constructions.



chimneys so that it will not be a hazard to the health of people living nearby. These modern incinerators also clean the ash that remains at the bottom before it is taken to the landfill. Moreover these incinerators generate electricity while in operation.

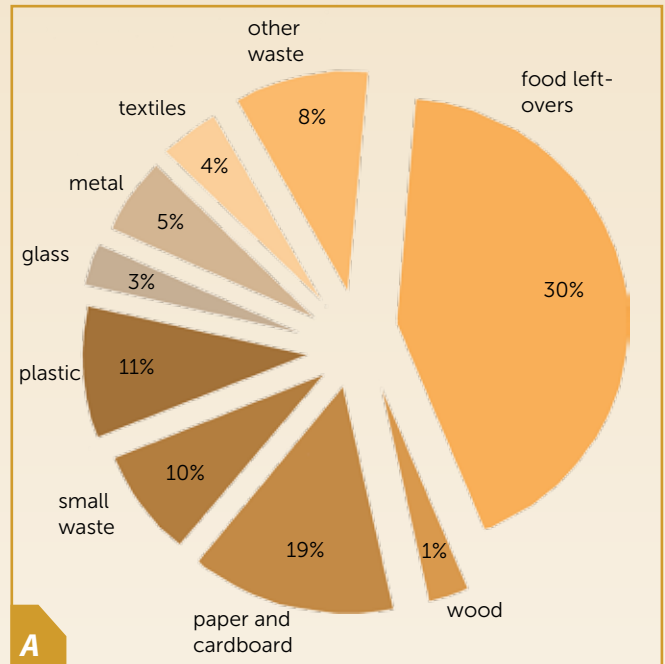
In Malta there is such an incinerator which burns the hospital's waste, as well as that of the abattoir and animal farms. This incinerator is useful since much land would otherwise be taken in order to dump all this waste material.

However, many are of the opinion that the gases that emanate from the chimney of the incinerator is detrimental to our health and to the environment. Moreover these incinerators cost dearly in order to build and use efficiently. In order to reach this goal, incinerators need a large supply of waste daily in order to keep in operation. This may lead to a demand for, rather than a reduction of waste.

1

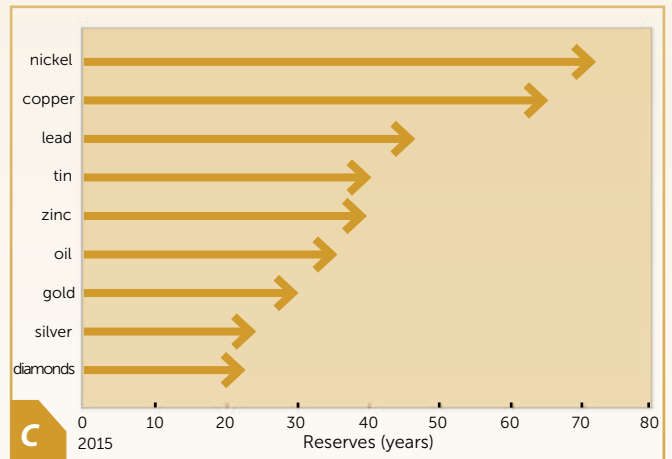
The graph on the right (Figure A) shows the composition of our daily domestic waste.

- With the help of the graph write a short paragraph about the composition and percentage amount of waste generated in our homes.
- Use a pair of gloves to examine the waste thrown away by your family in a particular day.
 - List the objects thrown away in the dustbin as in Figure B below.
 - Are there any objects not included in Figure A?
 - These products are made out of natural resources. Find out the origin of each product and in the third column of Figure B write down the name of its natural resource.



- On a personal level, what do you think can we do to save on the natural resources that are left? (e.g. use of bicycle, waste recycling, buy products with little packaging).
- d. 'We are slowly transforming the natural resources of the earth into waste and throwing them away into the landfill'. Discuss this statement by referring to different types of waste generated in Malta.

Domestic waste			
Object	Raw material	Renewable resource	Non-renewable resource
milk carton	trees	✓	
tomato paste can	tin		✓
plastic bag	oil		✓
newspaper	trees	✓	
aluminium can	bauxite		✓



- Graph C clearly shows the reserves of certain resources at the current rate of extraction.
 - From the graph mention the resources which will have been depleted in 50 years' time.
 - What do you think can be done when resources such as oil and tin will be depleted?
 - How can our life-style change if such a thing occurs?

2

- Our waste may be solid, liquid or gas. Give two examples of each kind.
- Complete the table on the right by giving four examples of waste generated by each type of activity.

Waste generated by			
manufacturing industry	construction industry	shops	hospitals

4

Pictures A and B show two different ways by which the public can dispose of separated waste.

- b. Mention some bulky domestic waste that can be left in the site in picture B.
- c. Give three reasons why these sites are necessary in the Maltese Islands?
- d. Give two other ways in which separated waste is being collected in Malta.



- e. In a few words explain what happens to the separated waste that is collected at the bulky refuse sites and in the civic amenity sites.

5

- a. Fill in the blanks with the given words to complete this paragraph about the re-use and recycling of waste.

raw material

bales

pieces

mixed

Sant'Antnin

space

mechanical

civic amenity sites

manufacture

secondary

Part of the _____ waste that we throw away in the black bag is also being treated at Sant'Antnin plant. Here waste separation is done in a _____ way to extract recyclable materials like cardboard, plastic, glass and metal.

As soon as separated waste is collected from homes, from _____ and from bulky refuse sites, it is taken to the Recycling Plant at _____. This plant can treat 36,000 tons of recyclable waste and material every year. Much waste is crushed in order to take less _____ and is packed into large _____ to be sold. Much of it is exported so that _____ products can be manufactured in large recycling factories. Other material like tyres, glass and plastic is cut into small _____ by appropriate machinery to be exported too. In this way waste recycling helps us save on _____ and on energy needed to extract and _____ products.

- b. Find some information from websites about,

- How paper and cardboard are recycled.
- What natural resources we would be saving by recycling paper and cardboard.
- How many trees must be cut to produce one ton of paper.
- How we may be assured that the paper we are using is recycled.

- c. Choose one of the following separated material collected in Malta,

- glass,
- metal or
- plastic.

Explain how this material can be recycled and what secondary products can be manufactured from it.

6

Look carefully at pictures A and B.

- a. What is the container shown in the pictures called?
- b. What can we leave inside it?
- c. What is the kind of waste that can be left in it called?
- d. Explain how the waste inside this container turns to compost.



e. Look carefully at picture C and then join these sentences about the production of compost and energy at the Recycling Plant of Sant'Antnin.

At Sant'Antnin plant waste

Materials like cardboard, plastic and metal are separated

Organic material such as food left-overs,

Here waste is exposed to high temperatures

While this is happening

The remaining material forms a type of compost which improves the physical structure of

dry leaves and dirty paper are taken for cleaning in large closed tanks,

from organic waste.

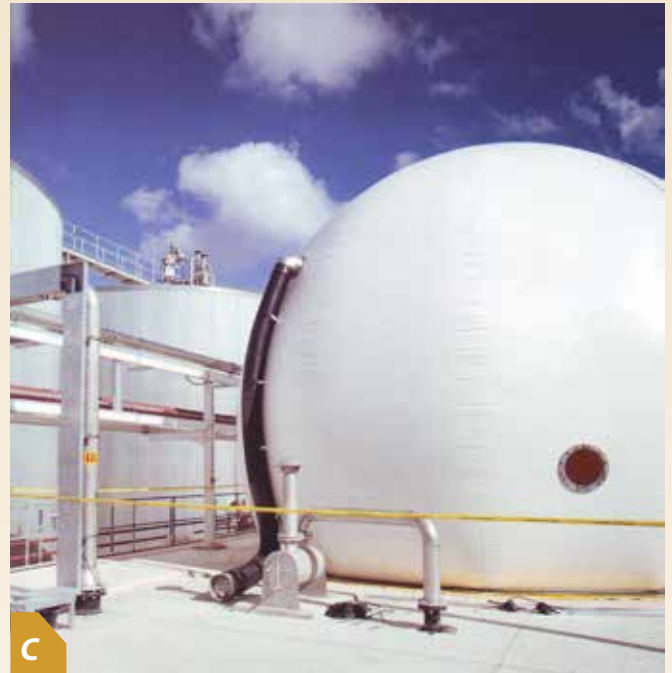
and so the material is broken into small pieces.

soil which is mostly used for environmental embellishment.

is separated mechanically.

biogas forms which is then used for electricity generation.

7

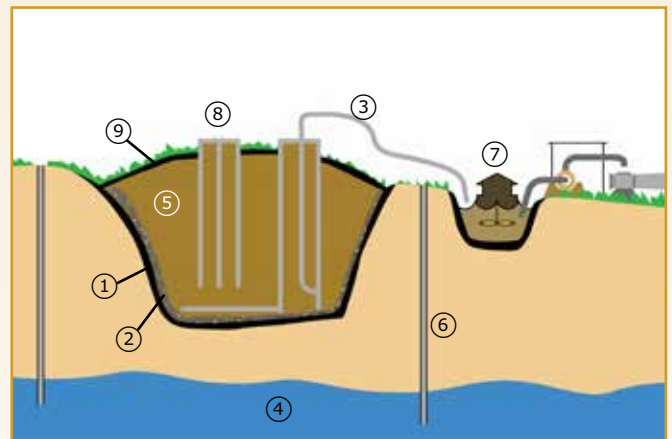


- 'The landfill is the most unsustainable method of waste disposal.' Comment.
- Why is an uncontrolled landfill, such as that at Maghtab and Qortin, harmful to people and the environment?
- Look carefully at the diagram on the right which shows a modern and controlled landfill. Write what is found at the places marked 1 to 9. Choose from:

- waste
- aquifer
- membrane – a thick plastic carpet
- borehole to check the quality of the water in the aquifer
- leachate
- extraction of methane gas
- treatment of leachate
- pipe for the extraction of leachate
- a covering of spalls to protect the membrane
- surface cover to seal the landfill

- Where does the liquid marked 3 on the diagram come from, and why is this harmful to the environment?
- Explain fully how the application of modern systems in the construction of controlled landfills can lessen the risks to health and the environment.
- Non-recyclable waste can be burned in a modern incinerator where precautions are taken so that it may not pose any risk to health or the neighbouring environment. Many countries are still wary about incinerators due to risks for the people's health.
 - Write the following statements in two columns under the following titles:
BENEFICIAL EFFECTS or DISADVANTAGES

- Heat emanating during the burning of waste can be



- used for electricity generation.
 - Reduces about 90% in the volume of waste.
 - They cost much money to build and utilise properly.
 - Much remaining ash will still need to be thrown away in landfills.
 - A large area of land for dumping waste will be saved.
 - Gases like nitrous oxide, sulphur dioxide and dioxins that are emitted are dangerous to health.
 - All gases are treated and therefore all gases emitted from the chimney are clean.
 - In order to keep it running, it needs a large amount of waste daily.
- Many people think that for a small country like Malta, waste incineration is the best solution. Others are concerned since large plants like these are not as secure as they seem and create serious environmental problems. What is your opinion?



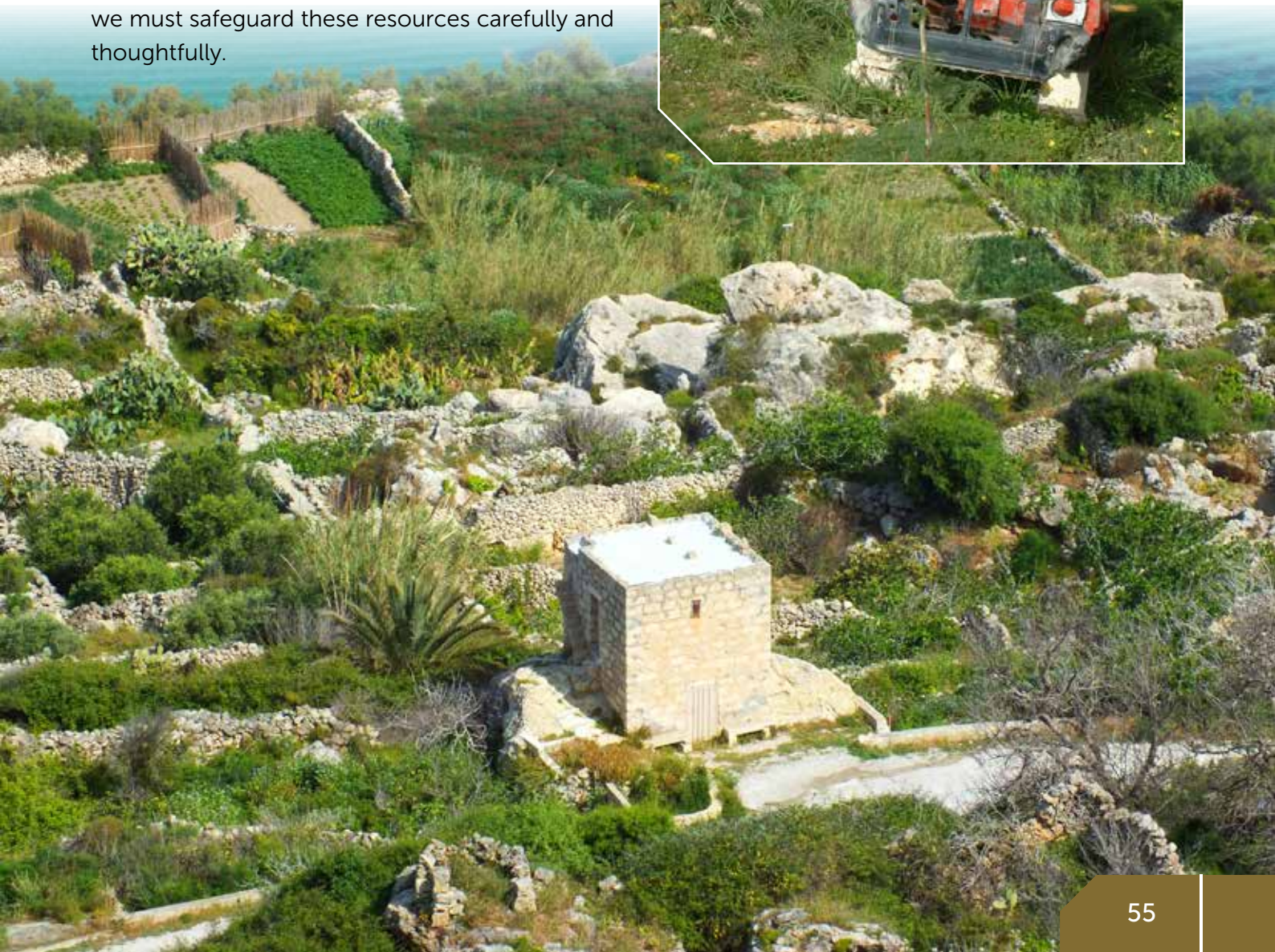
By means of conservation measures we can limit the damage done to the environment and to safeguard the natural resources for future generations. We must take urgent steps to conserve the air, sea, woods, soil, flora, fauna and the natural landscapes of the Maltese Islands. Conservation must be properly planned and managed. By careful planning we should be able to use the remaining resources without damaging the environment and avoiding conflict between interested groups.

Maltese Ecosystems

3

The environment is the natural habitat where people, plants and other creatures thrive. In this environment we find a diversity of resources that are necessary for living comfortably. The sea, coal, uranium, oil, water, soil, trees, sandy beaches and mountains are all vital natural resources for humans.

Throughout the years, people have turned to these resources fully exploiting them. Due to carelessness and lack of insight, some resources have been exhausted and others are causing much pollution. Pollution harms the natural environment and can lead to the loss of many species of plants and animals. This means that we must safeguard these resources carefully and thoughtfully.



The Elements that Form the Natural Environment

All creatures living in the Maltese Islands and around the world need each other to live and thrive. All these creatures, starting from the smallest microscopic organism to the largest whale in the ocean are related to each other and to their habitat. This ecological system which includes the natural habitat and the community of plants and other creatures is called an ecosystem.

Each ecosystem is built on a series of biotic factors, including all the relationships between the creatures themselves.

Moreover, for an ecosystem to survive, the community needs the physical elements or abiotic factors available in the place.

These factors are not living, however, they are necessary, and include among others, the type of rock that provides nutrients, the

depth, acidity and fertility of the soil, the intensity of sunshine (which is the prime source of energy), the air (which provides the necessary oxygen for all life forms), as well as the quantity and quality of water available.

Ecosystems are of very diverse sizes – there are very large ones such as the tropical





Plant-eaters such as grasshoppers, beetles, butterflies and caterpillars, are called herbivores or primary consumers. These are then eaten by larger predators such as frogs, lizards and birds. We can call these secondary consumers or carnivores. Often these are eaten by snakes and vipers or by small mammals like hedgehogs and weasels. Hence these may be eaten in turn by larger and stronger predators such as birds of prey.

rainforests and the dry deserts, and there are medium sized ones like saltmarshes.

Each ecosystem depends on two basic processes: the energy cycle, as well as the mineral and nutrient cycle. Plants are the primary producers of energy and therefore all other creatures are directly or indirectly dependent on them for their livelihood. Through a process called photosynthesis, plants are able to turn carbon dioxide and water into food by means of the sun's light energy. These plants are then eaten by animals, and these animals are later eaten by others.



The Ecosystem

In other words, each link in this chain feeds and gives its energy to the next link. In turn even the surviving creatures will be eaten and will provide energy to others. This process is called food chain and is at the basis of life in any ecosystem.

Species are creatures of the same kind that have common characteristics.

A population includes all the members of the same species that live in the same ecosystem.

A community is made up of different populations of species living in the same ecosystem.

An ecosystem is composed of a community of creatures interacting with the environment in which they live.



Each ecosystem depends on its own energy-cycling. In all cycles we find plants which extract nutrients from the soil. These are used by the same plants to grow or by other animals that eat plants. When plants and animals die, they leave the nutrients in the soil being readily available for other plants to grow. This process is continuous and nothing is wasted. Here one can see the importance of small plants such as fungi and types of bacteria and mould which decompose the dead organisms or detritus thus making the nutrients available again for seedlings.



Maltese Natural Environments

In the Maltese Islands, the natural environment is made up of different ecosystems. A large number of creatures (flora and fauna) have to adapt to the often harsh conditions of the Islands in order to live therein. They have to face drought, hot weather, shallow and infertile soil, and frequent winds.

Some plants grow and bloom all the year round having means to cope even during the hot summer season. Some have small thick and hard leaves, while others have shiny and slippery leaves which avoid transpiration. Other plants have hairy leaves or are capable of storing water in their thick leaves. These perennial

plants live for many years and by means of their adaptations, they can withstand the drought and heat of summer and the strong winds in winter. Other plants only survive summers buried as seeds in the soil. These are called annuals and they only blossom and bloom for a short time in spring.



Maltese ecosystems

One of the largest ecosystems in the Maltese Islands is garigue. This environment is made up of hollowed, cracked and pointed coralline limestone rock. At first glance the garigue looks like a poor, dry, void and useless space. However, this is the richest ecosystem found in Malta with regard to plants and creatures. Due to over-grazing and fire, Malta's garigue soon deteriorates into Mediterranean steppe. Most common in this environment are bulb plants like squill asphodel and prickly plants.



The garigue is made up of hard, pointed coralline limestone rock. In the little soil found in these potholes, small and thick shrubs grow such as thyme, heather and spurge. These grow low and thick in semi-circular form with woody trunk and hardy and thick leaves. Their roots are also thick and strong, climbing down through cracks in the rocks to find water. We also find bulbous plants like french daffodil and squill, as well as annuals which depend on their own seeds to grow each year.





Where the soil is deeper and moister we find another ecosystem called maquis in which grow short trees and high shrubs like the carob, olive, fig, lentisk, as well as creepers. This ecosystem is common on the steep scarps of deep valleys and at the bottom of dry valleys.

Another ecosystem which is now very rare in Malta is woodland. In olden times large areas of the Maltese Islands were covered by high trees like the Aleppo pine, holm oak, carob, poplar and others.

In the woodland among the trees, many creatures live under the soil, the dry leaves and the wet stones, as well as on the trunks and leaves of evergreen trees. There live reptiles like lizards, chameleons and vipers, insects such as butterflies and hawk moths that fly from one branch to another, as also wild rabbits, weasels and hedgehogs. Apart from these many birds nest in the shelter of the trees.





Nowadays only a few clumps of such trees remain as in Wardija and Buskett. Many woods found around the Maltese Islands such as the ones at Marfa Ridge, Miżieb, and Mellieħa Ridge are not natural but planted by people during the past sixty years or so.

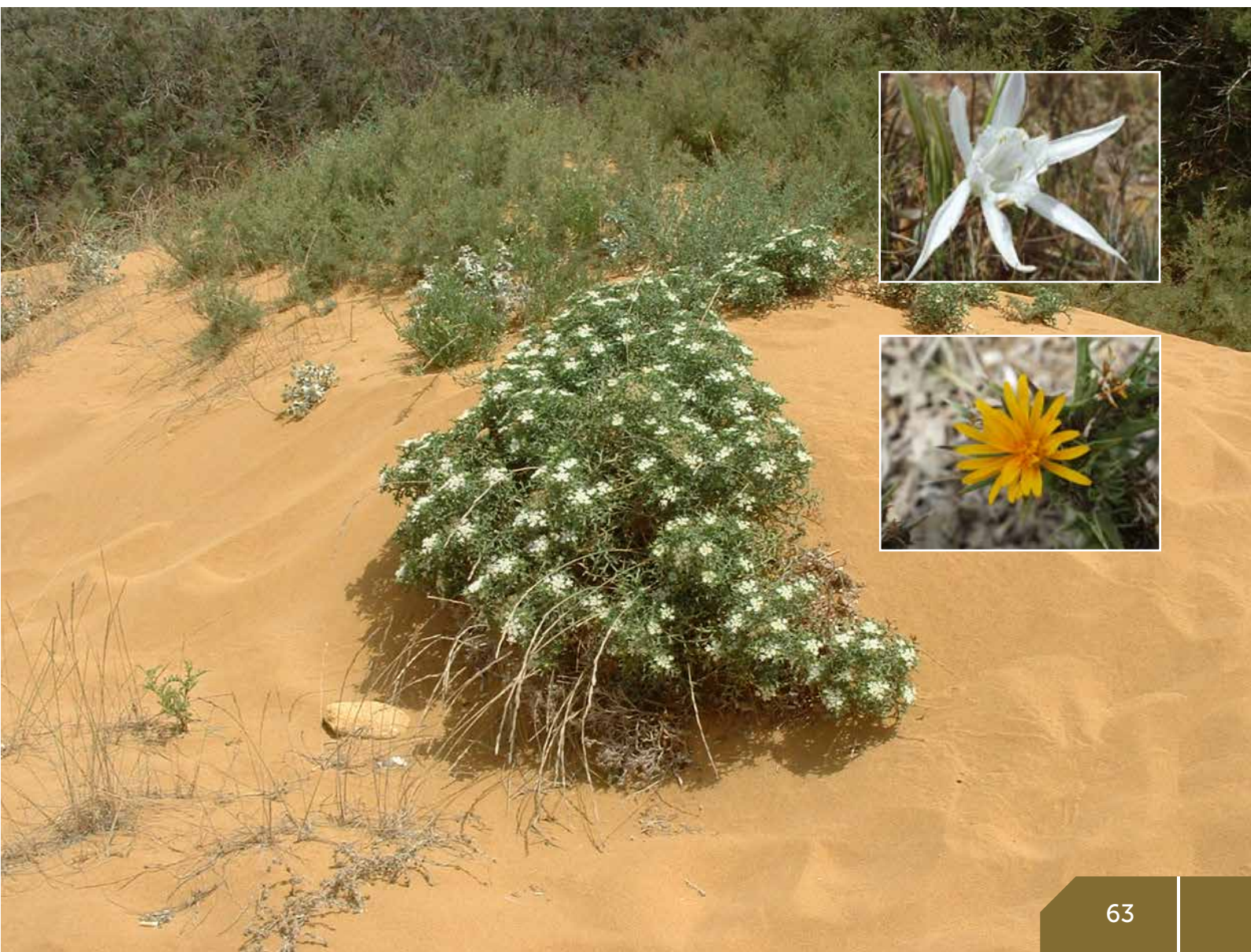
Along the southern coast of the Maltese Islands where cliffs and clay slopes rise steeply from the sea we find another type of ecosystem. Notwithstanding the harsh environment which is exposed to the wind, sea-spray, sunshine and drought, many species of flora and fauna find refuge there in spite of the thin soil. Here we find the Maltese Cliff-Orache, Maltese Rock Centaury, the Maltese Everlasting and a number of other species.

Since people cannot reach the cliffs many sea-birds such as Cory's and Yelkouan shearwater and Blue Rock Thrush, find shelter here. The Maltese rock centaury, which is the Maltese national plant is an endemic plant that hangs on to the cliffs of southern Malta and Gozo.



Valleys offer shelter for many plants and animals. At the bottom of some wet valleys one can find deciduous trees which shed their leaves in autumn. Among these we find the poplar, hoary elm and large tracts of reeds. The watercourses are home to insects such as butterflies, hawk moths, dragonflies, worms and amphibians like tadpoles and frogs.

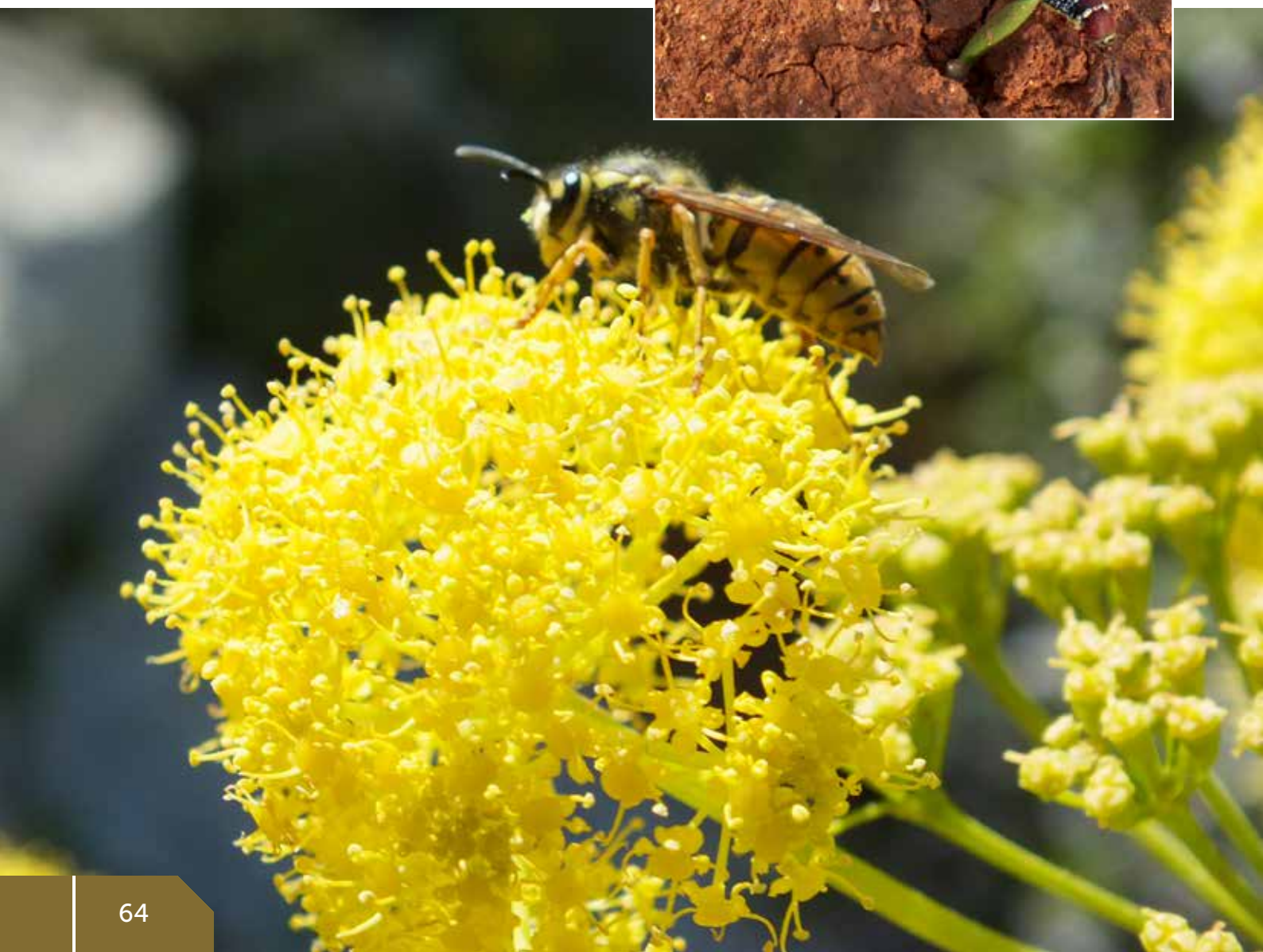
Widely dispersed throughout the Maltese Islands we find small but threatened ecosystems. Among these are the blue clay slopes, caves, sand dunes at the back of sandy beaches, and small saltmarshes.



Biological Diversity

Perhaps many think that in Malta nature is poor when compared to other countries. However, Malta is endowed with a rich biodiversity with many different creatures. This diversity in flora and fauna is the result of the geographical position of the Maltese Islands, lying in the centre of the Mediterranean and separated from the continents of Africa and Europe.

It is worth mentioning that in the Maltese Islands there are no less than one thousand different plant species that grow and bloom naturally in the wild. There are many other non-flowering plants such as fungi, algae and lichens. Moreover we also find about two thousand different species of fauna such as molluscs, birds, reptiles, mammals, amphibians and many kinds of insects.





The Maltese Everlasting (see photo above) has yellow flowers and is endemic to the western cliffs and the Fungus Rock in Gozo. It is found nowhere else in the world.

The surrounding sea also holds great biodiversity, from microscopic organisms to large mammals such as the cetaceans. It is worth noting that in Malta there are many indigenous creatures. An indigenous species is one that has lived in Malta naturally since before the coming of man, like the thyme or the juniper tree. There are other species in Malta that are endemic, that is, they do not live anywhere else on earth. There are about eight, including Maltese Rock Centaury, Maltese Everlasting, Maltese Pyramidal Orchid,



Indigenous plants or animals are those species which lived in any place before the advent of humans there. The thyme, shown in the above photo, is indigenous to the Mediterranean. This grows in the garigue and blossoms in spring. The shrub is made up of a number of small dark-green aromatic leaves.



Lentisk, Maltese lizard, Calypso Sicilian Shrew, the fresh-water crab and others. We are therefore responsible for the safeguarding of these species, not only because they are part of our heritage being endemic to the Maltese islands, but also because they are part of the world's heritage.

Many species, including endemic ones are threatened by development with the use of more land. The destruction of natural habitats such as saltmarshes, sand dunes by the beaches, the garigue, valleys and cliffs has a grave negative effect on Malta's biodiversity. These natural habitats host most of the species which live in Malta.



Many species are becoming rare and seriously threatened with extinction. This is due to the destruction of environments of high ecological value by new construction, the overuse of pesticides and herbicides; by over-grazing, over-hunting and too much bird-trapping; by the picking up of flowers like French daffodils and uprooting of shrubs like thyme; and the catching of protected species like frogs and for many other reasons.

Biodiversity in Malta is also threatened by the introduction of alien species. These foreign species compete with indigenous species and slowly take their place. Two alien plants which were introduced into Malta and are still thriving are the Cape Sorrel and the Prickly Pear Cactus. Often these species are invasive. They occupy large areas and take the place of indigenous plants. This is the case of Castor Oil tree which has invaded many wet valleys where it is causing much harm. Other foreign trees like Acacia and Eucalypt spread in the same way too. These Australian trees have harmed the earlier Maltese indigenous trees, the environment and people's health.



Imported trees or plants may carry disease or be infected by worms or insects which once dispersed, can destroy indigenous plants. The red palm weevil was inadvertently introduced into Malta by way of newly imported palm trees. This small insect bores into the trunk of the tree, erodes it from the inside and thus slowly kills the tree. In a few years, this Asiatic insect succeeded in killing a lot of palm trees and it seems that no insecticide is effective enough to stop it from spreading even more.





The indiscriminate dumping of debris and other waste harms large natural environments and has serious consequences on all creatures living thereabout. It is estimated that in the last 100 years, Malta lost more than 100 different species. Apart from the crow and other bird species that no longer nest in the Maltese Islands, many plant species have become extinct, including the Hairy Spurge which used to thrive on the banks of watercourses.



If we do not make a serious effort at safeguarding them, other plants such as the wild tulip and the white willow will be at risk of extinction.

The exploitation of creatures for recreational or other purposes is also detrimental to biodiversity in Malta. Whole ecosystems are being impoverished by the picking of Frech daffodils, Erika, orchid and southern star of Bethlehem plants. Many frogs, tadpoles and freshwater crabs are caught from the valleys. Creatures like these are also being threatened by the chemicals originating from pesticides, which find their way into watercourses.



For many years uncontrolled hunting and bird-trapping destroyed many land and seabirds which used to migrate from over Malta.



The Need to Safeguard the Environment

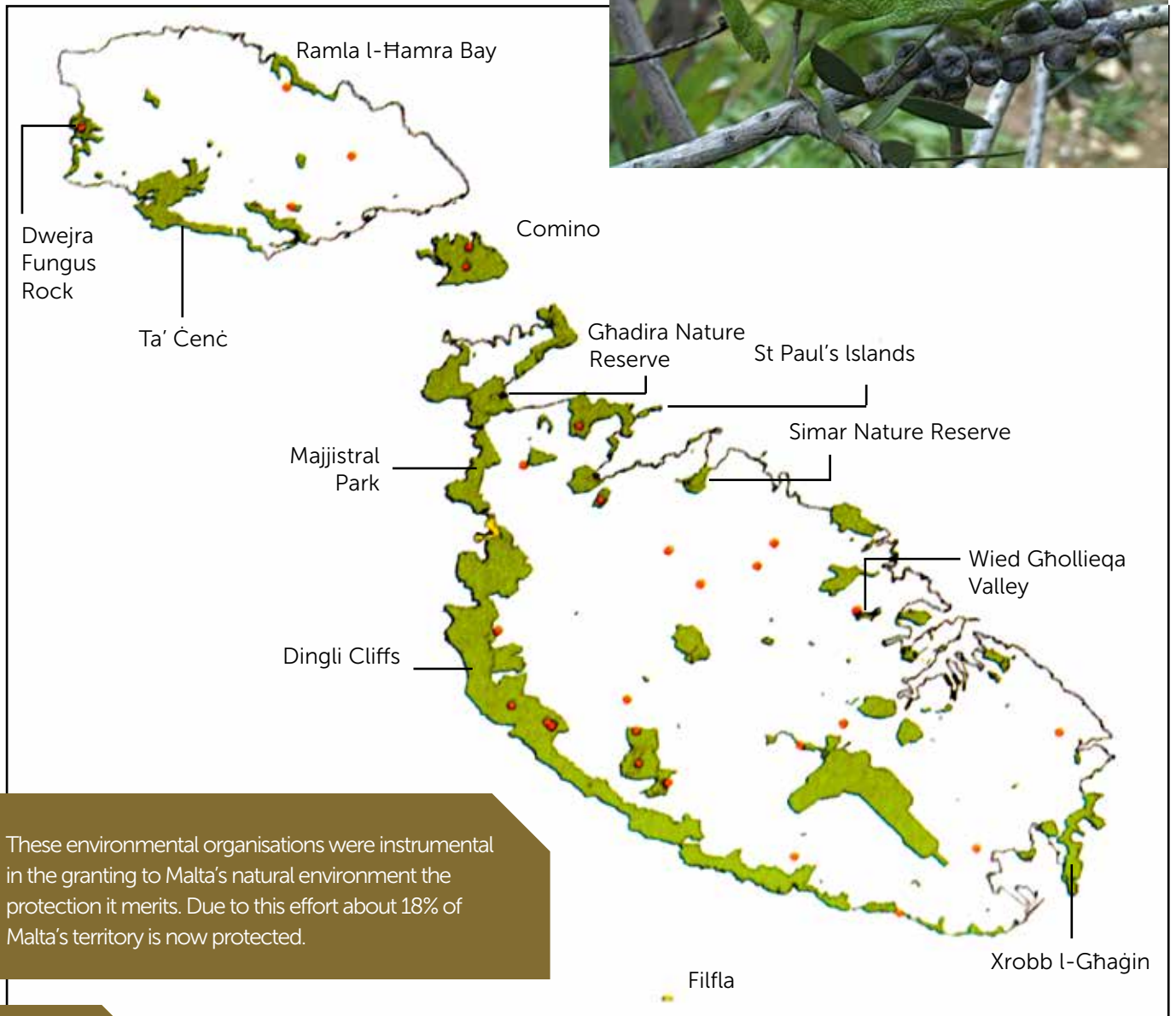
During the past few years the Maltese authorities together with various environmental groups, have given their part in safeguarding the natural environment and biodiversity of the Maltese Islands. Many educational projects were launched in schools; laws were passed for the conservation of the environment; international environmental conventions were signed; and the Malta Environment and Planning Authority was established to try to find a balance between the economic development, proper land use and improvement of the natural environment in Malta. All these measures have somehow helped the protection and conservation of the natural environment.

We may say that environmental consciousness was raised in Malta when the first voluntary environmental organisations were founded. These included the Malta Ornithological Society (MOS) now known as Bird Life, and the Society for the Study and Conservation of Nature (SSCN) which later joined other societies to form Nature Trust. These groups have organised many lectures and courses, and have also published

many books for the propagation of information and interest about the natural heritage of Malta among its citizens. These organisations have published periodicals including scientific data on the biodiversity of the Islands. They have also issued stickers and posters featuring threatened creatures. Above all they have been quite vociferous in opposing unsustainable development.



Presently these organisations, together with many others, actively give their share in schools when they organise competitions about the natural environment; excursions and visits to the countryside or in nature reserves; bird observation; and tree planting. Two educational programmes in schools include EcoSkola, organised by Nature Trust, and Dinja Waħda (One World), run by Bird Life. The aim of these projects is to offer the opportunity for the young students to take an active role in decisions regarding the environment of the school or the community.



These environmental organisations were instrumental in the granting to Malta's natural environment the protection it merits. Due to this effort about 18% of Malta's territory is now protected.



Natural areas that are protected by law include bird sanctuaries like Ghadira and Simar; nature reserves such as Buskett and Filfla; and specially protected zones; and areas of ecological, scientific and geological importance. Moreover some directives of the European Union, such as Birds and Habitats, bind the Maltese authorities to provide adequate protection to areas which include rare species of flora and fauna by declaring them Special Areas of Conservation (SAC). In particular, Birds Directive requires that areas where rare bird species migrate and nest be protected. Such areas are called Specially Protected Areas (SPA). Hence most cliffs along the coast are protected by these directives.



Apart from the European Union directives, Malta signed many international conventions including those of Barcelona, Bern, Ramsar, Bonn, Natura 2000 and CITES, all of which insist on the safeguard of flora, fauna and the natural environment in which they live.

By way of all these measures many creatures are now protected. These include birds like the red and night herons; trees like the carob and holm oak; reptiles such as the viper and chameleon; flora such as the orchid and thyme; as well as other creatures such as the frog, weasel, bat, freshwater crab and sea mammals.



Ghadira Nature Reserve

Ghadira Nature Reserve is run by BirdLife Malta, an environmental Organisation. It is considered as a Ramsar Convention on Wetlands site of global importance. This reserve is considered as a Specially Protected Area (SPA) and Special Area of Conservation (SAC) under the European Environmental Protection Law.

In 1978 Ghadira was declared a bird sanctuary, that is hunting or bird trapping were no longer allowed there. Sometime later with the help of World Wildlife Fund (WWF), the area was landscaped by the digging of small lakes, the forming of small sandy islets, and by the planting of hundreds of indigenous trees. The place was declared a nature reserve and flora and fauna were protected. This is a special place since

there we find a very rare environment. Here the rainwater which flows down from the ridges mixes with salty water which percolates from the sea thus becoming brackish water. Such an environment is called a saltmarsh.

The level of salinity at Ghadira changes according to the season. In summer when there is no rain, freshwater decreases and the saltmarsh becomes





In the water among the reeds lizards and frogs live. These prey on insects which live among the trees, plants, mud and water of the reserve. The lizards and frogs are in turn eaten by larger animals like snakes, weasels and wild rabbits. Fish like killifish and leaping mullet are also linked to the creatures that live in the waters of Għadira and the environs.

very salty, while in winter freshwater is available and it becomes much less salty.

The most common tree at Għadira is the tamarisk since this is resistant to salty conditions of the sea and sea spray. Other sturdy shrubs grow such as the shrubby Maltese cliff-orache and seablite, jointed rush, golden samphire and sea daffodil.

Every year, many migratory birds, such as egrets and herons visit the site to feed and rest. Many spend a short time at Għadira, before continuing their journey, while others spend the whole winter here before returning to Europe in spring. You can here also see grebes diving in order to catch killifish and water insects, as well as other large birds such as the black-winged stilt or the little ringed plover with their long necks and legs in the water to catch





worms. One can also see many kinds of heron which descend to the reserve to eat frogs, insects and fish with their pointed beak.

The reserve offers the opportunity to anyone who wants to observe and study birds in their natural environment. From inside a small room among the trees and vegetation, one can observe the behaviour of birds, the food they prefer, the way they look for food, the way they build their nests, the way they feed their nestlings, and many other things. In order to appreciate all this, there are specially-trained persons who give information. This place is opened for visitors and school children.

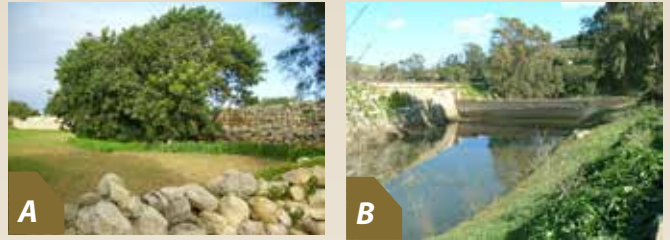
At Ghadira one can also find common moorhen and common cooth hidden among the reeds eating worms and insects. Some have also succeeded in nesting there.



1

Look carefully at the photos on the right that show typical Maltese habitats.

- Name some creatures commonly found in these environments.
- Mention some abiotic (non-living) factors that are needed by the creatures which live in these environments.
- What is the place where a community of organisms lives?
- Write these physical (abiotic) elements and the living ones (biotic) in the proper place in the table on the right.



fauna

climate

light

competition (for food)

water

flora

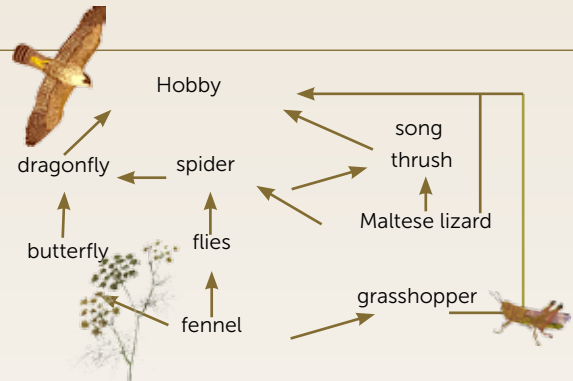
rocks and soil

people (human activity)

Ecosystem	
Abiotic factors (non-living)	Biotic factors (living)

2

- What do we mean when we say that plants are the primary producers of energy in the world?
- What are those creatures that eat plants or producers called? Give three examples in the Maltese environments.
- The work of some creatures is to decompose dead matter. What are these creatures called? Give one example of such an organism. Why are these creatures necessary in all ecosystems?
- The diagram below shows us how an ecosystem works. Complete the diagram by inserting two examples in each label. Choose from:



fungi • thyme • grasshopper • owl • daffodil • mould • water • weasel • farfett tal-kromb • air

- The chart on the right shows a food web found in Maltese ecosystems. Five of the sentences written under the chart are true. Write them down.

- The grasshopper eats the fennel.
- All the animals and the Hobby eat the fennel.
- All the energy required by these species comes from the sun.
- In this ecosystem the producer is the fennel.
- The Hobby eats the grasshopper.
- The grasshopper is a herbivore.
- The spider that eats flies is a decomposer.
- The Hobby is a herbivore because it eats the dragonfly.

Abiotic factors (non-living)
e.g.
.....

producers
e.g.
.....
.....

herbivores
e.g.
.....
.....

carnivores
e.g.
.....
.....

decomposers
e.g.
.....
.....



3

The trees shown on the right are called Maltese or indigenous trees.

- Why are they called so?
- In the table below mark whether the listed trees are indigenous or foreign to Malta.

	Maltese Trees	Foreign Trees
Sandarac gum tree		
Prickly pear cactus		
Castor oil tree		
Oak tree		
Carob		
Laurel tree		
Reeds		
Judas tree		
Aleppo pine tree		
Acacia		
Tamarisk		
Eucalyptus tree		



- Write the names of the Maltese trees shown in photos from A to D. Their names are listed in the table on the left.

A		C	
B		D	

- Your local council is planning to plant many seedlings in a public garden that will be opened soon. Would you advise that Maltese trees or alien/foreign trees be planted? Why?

4

Look carefully at the pictures on the right that show four alien plants that grow in the Maltese natural environment.

- What are alien plants?
- Try to recognise the species of plants that are shown in pictures A to D. Write their names in the table below.

A		C	
B		D	

- Read this extract entitled *Invasion by non-Maltese Trees*, adapted from a local review, then answer the questions.



Invasion by non-Maltese Trees

In our country there are more than 11 species of alien trees. Perhaps the most common are the acacia and castor oil trees. These create competition with indigenous trees and moreover their seeds are easily spread. Hence the typical Maltese environment is changing with new trees, imported from abroad, taking the place of Maltese trees. Many of

these trees are firstly imported to decorate the streets and public gardens. However, once their seeds spread widely, no one will be able to stop them. They invade valleys and whole ecosystems and out-compete Maltese trees. The same happened with other plants imported in the past, like the Cape sorrel, which was imported from South Africa, and prickly pear tree from Central America.

- i. What is the main reason for importing foreign trees into Malta?
 - ii. Why do these plants and trees spread quickly?
 - iii. Why do you think that the introduction of these alien plants in the Maltese natural environment may be considered a threat to Maltese indigenous plants?
- d. Foreign species may also be imported by mistake. Read this extract to see how some creatures that were introduced to Malta wrought a complete havoc on other species. Then answer the questions about the extract.
- i. Which two insect species were introduced in Malta by mistake?
 - ii. Explain how they were introduced in Malta?
 - iii. Which trees were victims of these insects?
 - iv. Why must the infected trees be cut and burnt?
 - v. What precautions could have been taken so that these insects not be introduced in Malta?

5

In the Maltese Islands there are about 87 **endemic species**, 23 being flowering plants and all others being animals. Some of these creatures are seriously **threatened** and in danger of **extinction**.

- a. Explain what the words written in bold mean.
- b. Which of the following species are endemic to Malta?

Maltese lizard • thyme • caper tree • Maltese Everlasting • French daffodil • Maltese rock centaury • cliff orache • chameleon • freshwater crab • hedgehog • Maltese sea lavender • Maltese pyramidal orchid • olive tree • carob tree

- c. The freshwater crab, which lives in freshwater-courses is one of these threatened creatures.
 - i. Why is the population of this crab diminishing?
 - ii. What do you think can be done to safeguard and conserve the freshwater crab?

6



Il-Bumunqar l-Aħmar tal-Palm

Since the red palm weevil was introduced in Malta in 2007 more than 2000 palm trees died. This 2 to 5 cm long small beetle was introduced in Malta in palm trees imported from Egypt and Italy to decorate the streets. The beetle had already spread in these two countries killing many trees. The red palm weevil is winged and can fly long distances. It has a pointed curved beak. In a short time the larva of the beetle burrows and eats into the trunk of the palm tree. Soon the leaves become yellowish, rotten, and fall. Since there is no cure to this pestilence, the tree will have to be cut and burnt. Another species introduced in Malta is the mulberry long-horned beetle which firstly almost destroyed the blackberry trees and now is threatening the fig tree. This beetle was introduced inside the wood imported in Malta.



- iii. Mention two other creatures in Malta that are threatened with extinction. Explain why.
- d. What can be done so that natural environments and threatened creatures be safeguarded?
- e. In the pictures below we can see human activities that are causing the decrease in the biological diversity in Malta. Explain how each activity can have a negative impact on the natural environment and the creatures of the place.



The Malta map shows some natural environments that are protected by law.

- a. Write the name of each site and give some information about the natural environment of the place.
- b. Explain the need for protecting these sites.
- c. Some of these sites are run by environmental organisations. Mention some environmental organisations and explain their role in the safeguard of the Maltese natural environment.



The photo taken from NASA satellite Terra shows the confluence of River Amazon and Rio Negro near Manaus in Brazil. Rio Negro, the river in dark blue, reaches the place after a 2,300 km journey from the highlands of Colombia. The colour is derived from high levels of tannin in the water. River Amazon waters contain more sediment, hence the brown and purple colours in the photo. The city of Manaus which, with over a million people is the largest in the forest, is shown on the left.

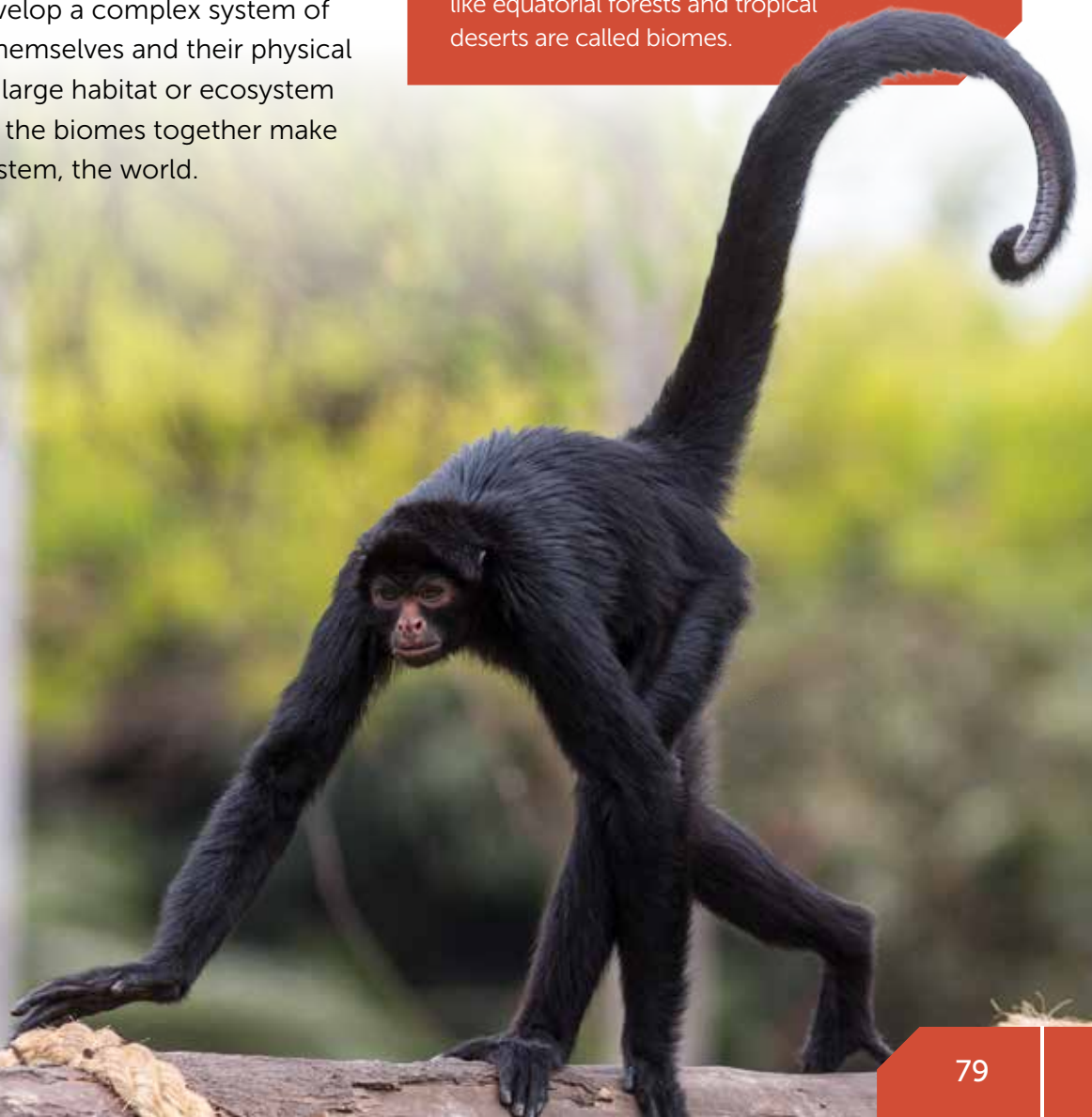
Large Global Ecosystems

4

The world is divided into zones each having similar climatic characteristics. For example places near the Equator have hot and humid climate. Further north or south, rainfall diminishes but the climate is still hot. Here we find the large dry deserts of the world. Further from the tropics, temperatures become cooler whereas near the poles the land is covered in perennial snow.

The place where plants and animals live is called a habitat. Habitats may include seas, rivers, mountains, forests and deserts. Any group or community of plants and animals that live in a particular habitat develop a complex system of networks between themselves and their physical environment. A very large habitat or ecosystem is called a biome. All the biomes together make up the largest ecosystem, the world.

The weather elements such as temperature, sunshine and rainfall have a great effect on the type of creatures and plants which live in this particular climate. Very large habitats like equatorial forests and tropical deserts are called biomes.



Equatorial Climate

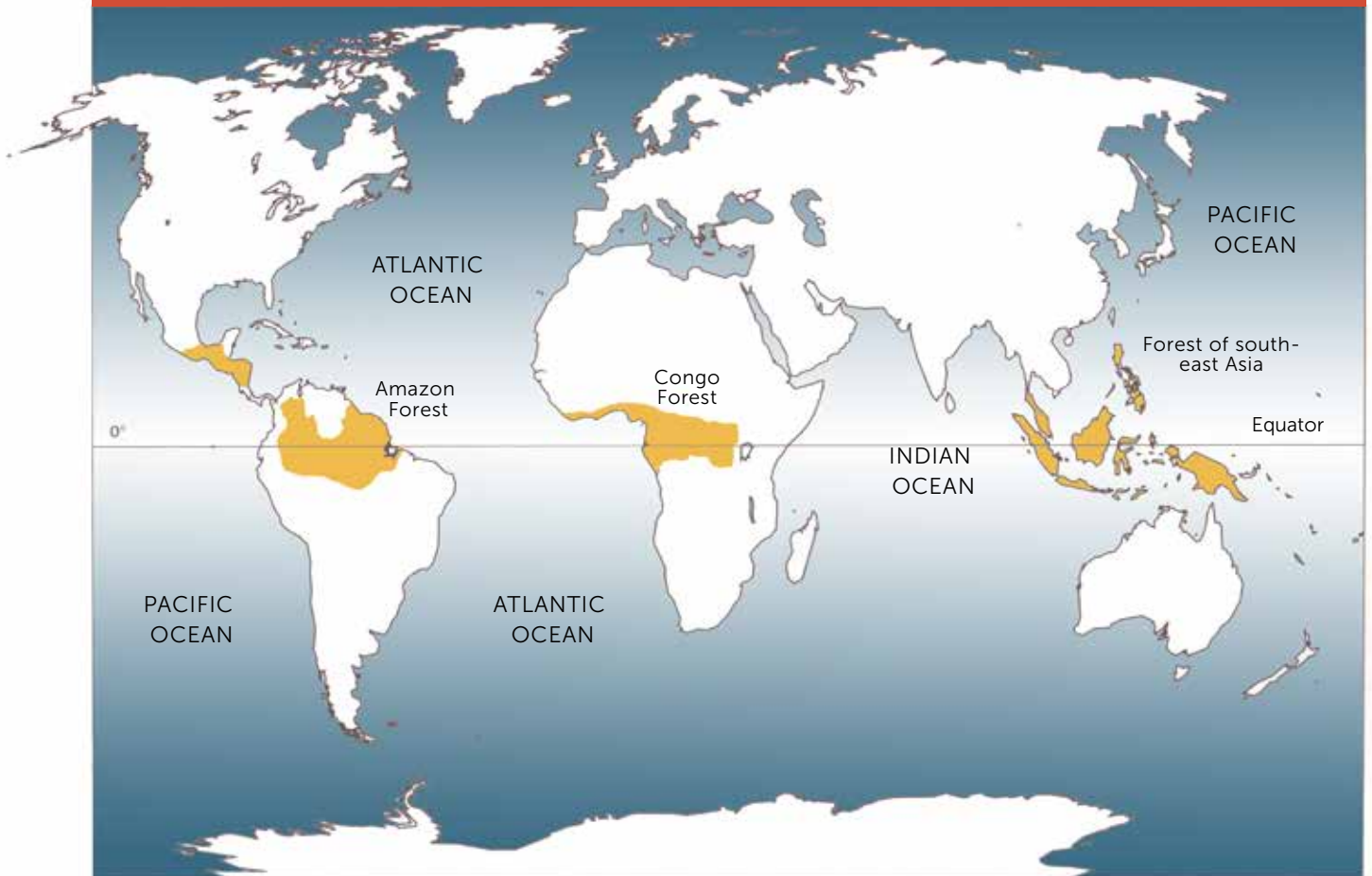
The hot and humid Equatorial habitats are situated between 10° North and 10° South of the Equator, dispersed in three continents. Typically there is very high temperatures and abundant rainfall. Here we find the tropical rainforests, the richest biome on earth with an immense variety of creatures and plants.

In South America the tropical rainforest is spread out on the Amazon River basin, from the Atlantic Ocean in the east, to the Andes Mountains in the west. This enormous forest, almost 7 million km² in area, covers a large part of Brazil and spreads out into Venezuela, Colombia, Ecuador, Peru, Bolivia, Surinam, Guyana, and French Guyana. In Africa too, the equatorial forest covers the basin of another great river, the Congo. As happens in South

America, the forest does not extend over the highlands which here are in the east of the continent near the Indian Ocean. The islands of south-east Asia are also covered with tropical rainforests. The seas around the Indonesian Islands of Java, Sumatra, Borneo and New Guinea contribute in raising humidity so that the vegetation is here very dense, having so many intertwining and close trees and plants. In these regions the forest is called jungle.



Tropical rainforests



The tropical rainforests are situated near the equator in South America, Central Africa and South-east Asia. South America has the largest land area occupied by these tropical forests. Much of it lies in the Amazon river-basin and 60% is in Brazil. The map clearly shows that these forests lie in a narrow strip of land about 1,500 km on either side of the Equator. We also note that this strip of land is not continuous. It is interrupted by the Andes Mountains in South America and the East African Plateau.

We may say that at these latitudes, between 10° north and south of the Equator, the sun is always high in the sky by day and therefore its rays are concentrated and bring hot weather. The sun's rays are strong and the average temperature varies between 27°C and 30°C.

These temperatures are lower than one would expect at the Equator. This happens because of the cloudy skies which act as cover and keep the temperature from rising further as happens in the desert.



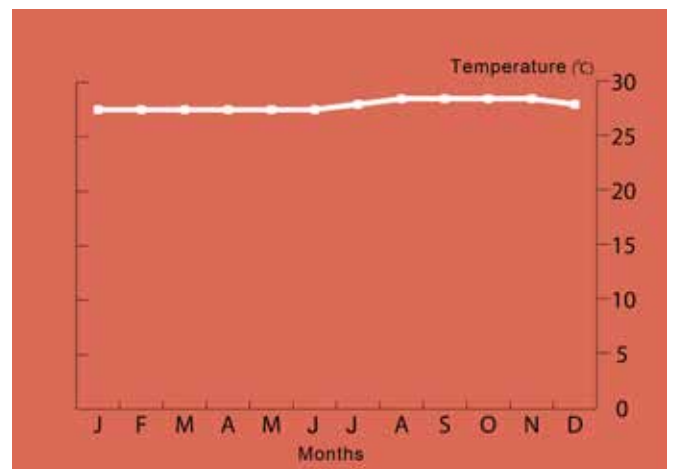
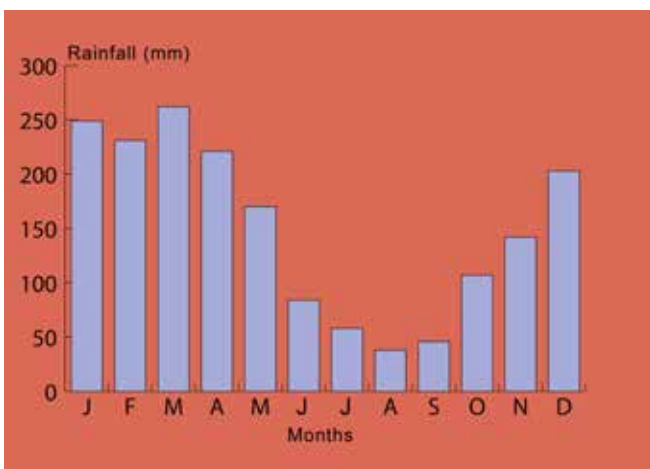
Tropical forests

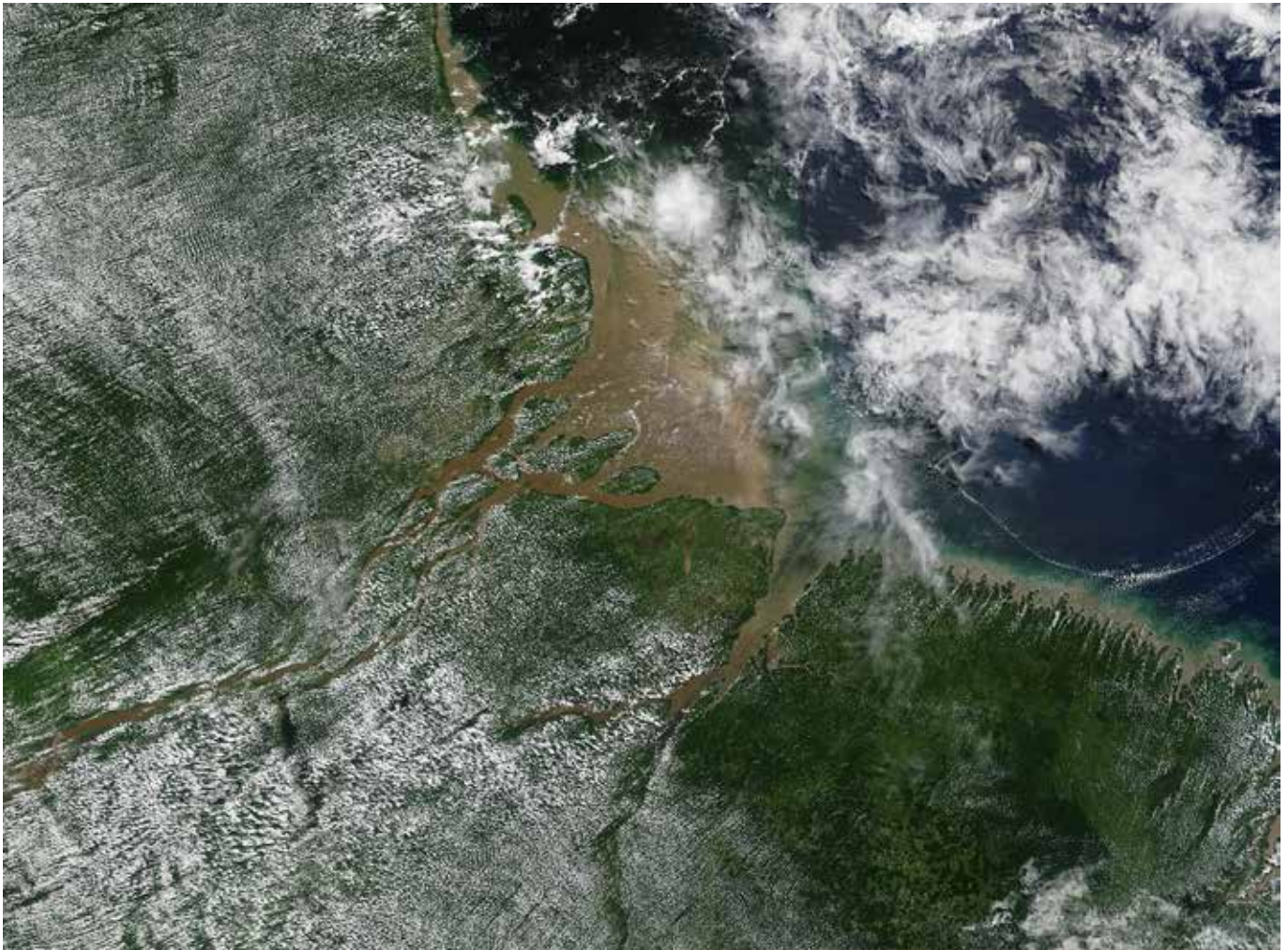


Since these areas are very humid and wet, cloud forms quickly and it does not take long to thicken and darken, producing convectional rainfall daily. The average rainfall is 2,000 mm yearly, but in certain areas it may reach 5,000 mm. Much of the water that turns to cloud is evaporated from the trees by the process of transpiration. In fact the trees are the main factor of the climate of these zones and without them the water cycle will no longer function, rainfall will decrease, the land will dry up, and the forests will vanish.

The graph shows that in equatorial places temperature is hot with an average of 26°C and that it varies little between the months.

There are no warmer or cold seasons and one may say that all through the year the day is divided into 12 hours of daylight and 12 hours of dark. Rainfall is plenty and regular, reaching over 2,000 mm a year. Every day at dawn the weather is fine with no cloud. From early in the





morning the sun heats the land and evaporates considerable amounts of water from the rivers, lakes and the forest. So the warm and humid air rises in circular or convectional currents. On its way upwards, the air cools and forms cumulonimbus type of cloud. Until about two



The photo from NASA satellite Terra shows the place where Amazon River drains its waters into the Atlantic Ocean in the north of Brazil. The brown colour shows the great amount of sediment which the river carries on its way from the Andes Mountains in Peru to the coast, a journey of over 6,500 km. The river carries a huge volume of water and every second it drains millions of litres of freshwater into the Atlantic. The rest of the photo shows the tropical forest covered in white clouds which daily pour hefty amounts of rain.

in the afternoon the sky will be covered in thick and dark clouds which cause rain showers with thunder and lightning. At about five in the afternoon the storm will have passed, the sky will be clear and fine.

Equatorial Rainforests

The equatorial forest is the richest biome due to the hot and humid climate which dominates this band around the world. Two-thirds of the known species live in these forests where rain is abundant and temperature is high. By these conditions plant growth is all year round; all the time trees shed their leaves while growing others.

In the rainforest biodiversity is amazing. For example in the Amazon Forest there are more than 2,500 different species of trees. A recent study has shown that for every 10 square kilometres of forest there are more than 750 different species of trees, 1,500 types of flowering plants, 400 kinds of birds and more than 100 types of reptiles. Insects are the most common species. In fact 90% of all different species in the equatorial rainforests are

insects of all shapes. The diversity of life-forms is so vast that until now, scientists have only succeeded in studying 1% of all the creatures that live there!



Since the climate is favourable trees grow very tall. Trees grow so close to each other that their leaves and branches entangle and create a canopy about 40 metres above ground. In the canopy one finds a lot of sunlight, water, fruit, seeds and flowers and therefore about 90% of all creatures live up here. This canopy of branches and leaves covers and shadows the plants that grow low in the forest. Some trees succeed in growing taller still than the canopy of leaves and branches. These are called emergents and some are 60 meters tall. Many plants called lianas creep up the tree branches so that they may also find the sunlight, water and nutrients which they need.

Since the ground level of the forest is dark, the plants and shrubs have to strive to find some light.



In the tropical forest the trees grow so tall that the roots of many of them stand above the soil. This can be clearly seen in the picture below. By these buttress roots above the ground, the trees will be more stable and they will not fall easily, notwithstanding their height. These roots are also important for the trees' water and nutrient supply. The face of the leaves has striations that lead to their tip. This helps water to run off the leaves to avoid disease. Many of the leaves are also poisonous so that insects will not come near them.





Unfortunately some of these creatures are threatened with extinction due to the reduction of the rainforests.



Birds of different shape, colour and size inhabit the high branches of the tropical trees. We also find a large number of butterflies, insects and apes, some of which with long hair. Reptiles, hidden among the trunks and branches always find abundant food. One reptile is the strong anaconda of the Amazon which is longer than 10 metres. On the tree trunks, grow many orchids, ferns and bromeliads with beautiful flowers. On the ground mammals such as the long-nosed tapirs and armadillos gather the fruit which fall from the trees. In the waters of the rivers one finds frogs, crocodiles, turtles, fish of different size and the white freshwater dolphin.





Tropical forests are disappearing at a faster rate than previously thought. It is estimated that every second, one hectare (an area slightly larger than a football ground) is being cut down. This means that every day about 86 thousand hectares of forest are disappearing from the face of the earth, enough to cover Poland in a year. These forest are being cut for timber and also to make way for new fields. Many people in Brazil cut the trees in order to cultivate the land. However, the soil is not very fertile and without the binding of the trees, it is easily lost and eroded by the waters. Yet the population of Amazonia still increased by 30 million people in the past 40 years. Many new roads were built in the forest in order transport wood.

Many trees of the tropical forests are cut in order to make way for large cattle ranches, often run by big multinational companies. The cutting down of the forest at such a high rate is having tragic results; many plants and creatures become extinct, the soil is eroded and lost, and the indigenous tribes who have always lived there are forced to abandon their land.



The Dry and Hot Desert Climate

Tropical deserts are the hottest and driest places in the world. Without water or shelter, few are those creatures and plants that withstand the scorching heat of the day. For the same reasons one finds a very low density of population in the tropical deserts.

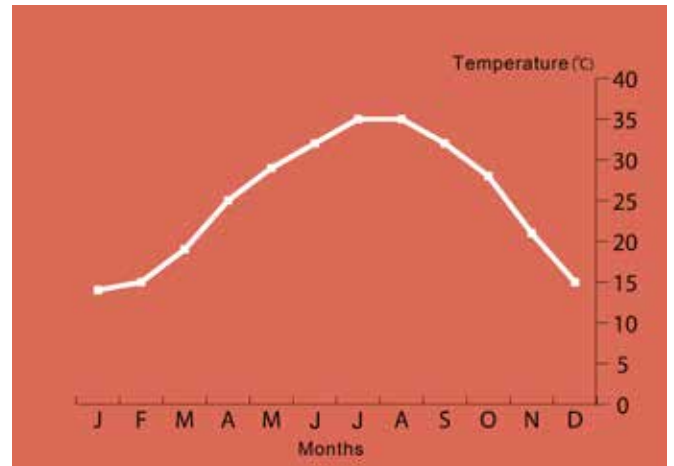
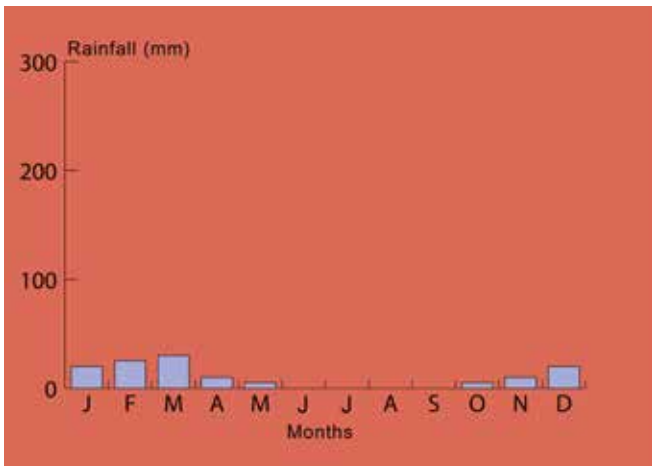
About 20% or one-fifth of the world's surface area is covered by deserts. These can be found in Africa, Asia, Australia, and North and South America. Apart from the Sahara Desert which stretches from one side of Africa to another, all other deserts are found on the western sides of continents. The hot deserts are all found between 10° and 30° North or South of the Equator. In these latitudes the winds blow from the land and bring dry and hot air to the desert.



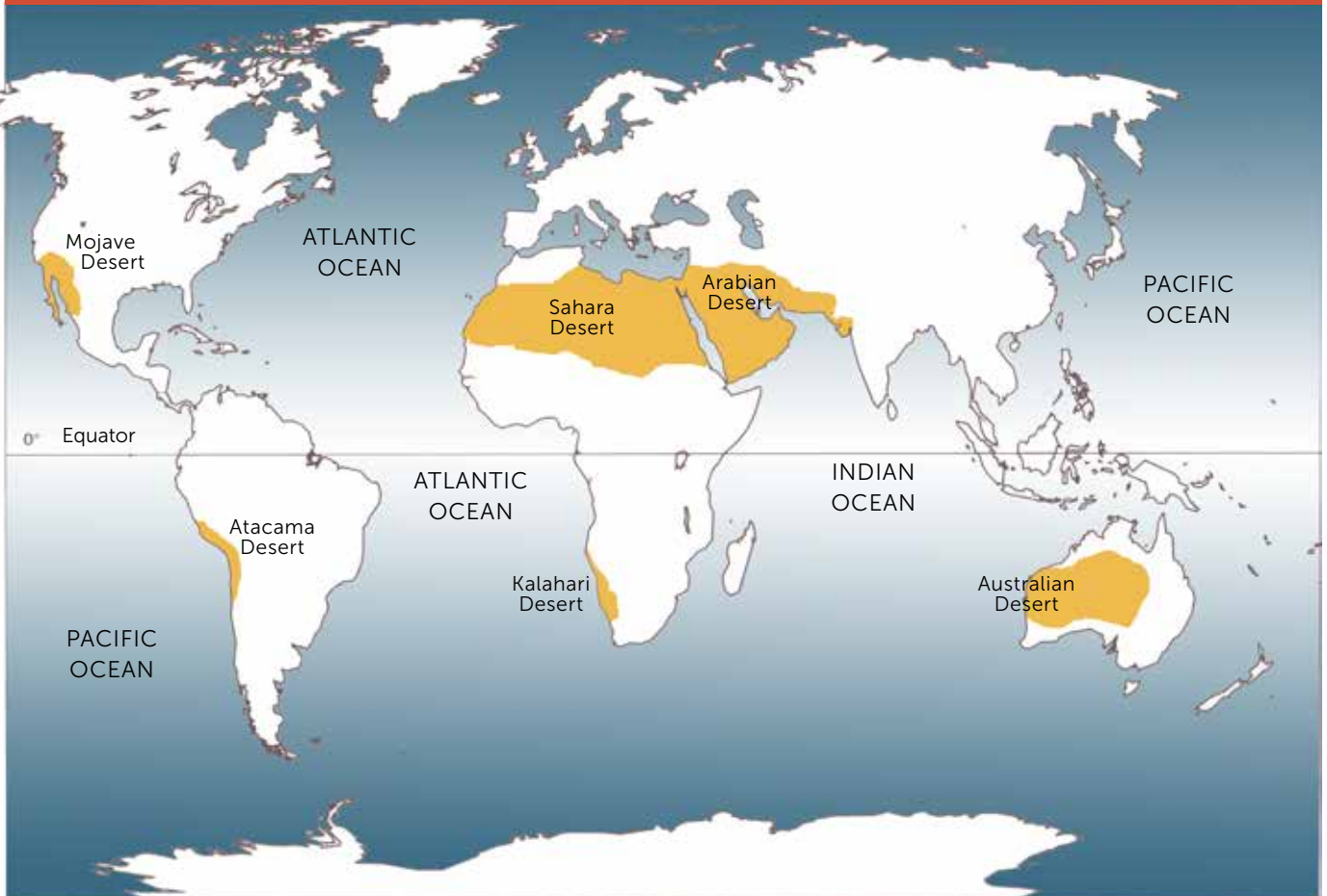


Deserts are very hot by day and cool by night. During the day the heat is unbearable since there will be no cloud to stop or diffuse the sun's rays. Temperatures may reach 52°C. For the same reason temperatures fall rapidly by night and the air is very cool. In the deserts the prevailing winds are from the east that is from land, bringing dry and hot weather to these regions. This belt of land between 10° and

30° latitudes is mostly under the influence of high pressure and therefore there is no cloud or rain. Rainfall varies a lot in the desert but the average is 250 mm a year. In Kuwait for example rainfall rarely reaches 200 mm a year, however in Death Valley in California, rainfall is more abundant reaching an average of 350 mm. The driest desert is the Atacama in Chile where the average rainfall is only 5 mm a year! In such places



Tropical Deserts



The Sahara Desert extends over an area of 5,000 kilometres from east to West Africa, and for about 1,650 from north to south. It covers an area of 9 million km², almost as much as the United States of America. The Australian Desert occupies the central region of the Australian continent and it is the second largest desert in the world. The Atacama is the driest place in the world and it occupies a coastal strip between the Pacific Ocean and the Andes Mountains in South America. Other deserts include the Mojave in the south-west of North America, situated in the states of California, Nevada, Arizona, and extending into Mexico; the Kalahari Desert in south-west Africa; the north-west desert of India; and the Arabian Desert which can be considered as an extension of the Sahara Desert.

years may pass without a drop of rain but then suddenly there will be heavy storms.

In these sandy deserts, the sand often forms mounds called sand dunes. Some of these hills reach a height of 300 metres and since they are dynamic, they change their shape and size because of the wind. Sometimes the winds blow very strongly and create sandstorms which affect

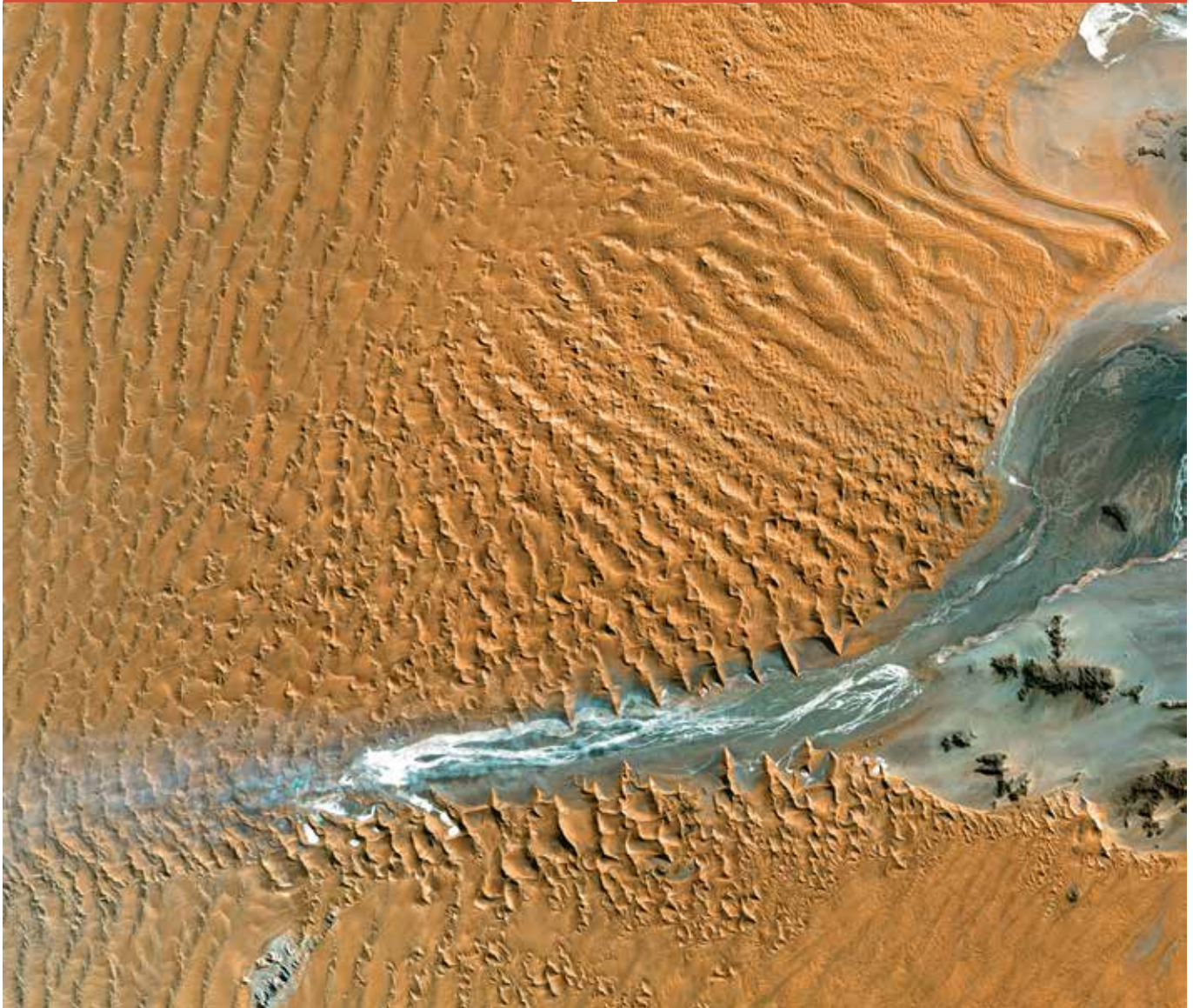


whatever and whoever happens to be in the place. In time the rocks are weathered and eroded forming very strange and rare shapes.

Below we can see a photo taken by Landsat satellite showing part of the Kalahari Desert in Namibia. Here one finds the highest sand-dunes which reach a height of over 300 metres. In these places rain is scarce, mostly falling February and April. The winds that come from the ocean bring some fog and dew which help the creatures survive in this hot and dry environment.



Most desert areas are covered by stone and rock outcrops with little or no vegetation. Only 25% of the deserts are covered by the yellow and golden sands.



Life in the Tropical Deserts

All plants and creatures that live in the tropical deserts must strive in order to survive and surmount such great difficulties as the strong heat of the day, the cold of the night and the perennial drought.

In the desert many plants are inactive sometimes even for years on end. But after some rain the seeds germinate quickly and bloom, so within a few days the desert is covered in beautiful colour. Before the plants dry and die they disseminate the seeds so that the cycle may start again.

Succulent plant species live in the desert by storing water in their thick trunks and leaves so that they may survive

throughout the year. Cacti are an example of such plants. Moreover these are full of thin and pointed thorns which keep





In the photo above we can see the saguaro, a type of cactus which lives in the Mojave Desert of North America. Such a cactus lives for 200 years and can reach a height of 15 metres. This cactus has a green shiny bark which reflects the heat of the sun and decreases the loss of moisture. The saguaro can store 8,000 litres of water in its trunk and since it is covered by a great number of prickly thorns, animals rarely come close.



away other creatures. Other plants have thin, shiny and waxy leaves that reflect the strong heat of the sun and thus avoid loss of moisture. Many desert plants have developed deep roots that can tap water from the rocks. On the other hand some others spread their roots just under the surface to quickly absorb rainwater. Few are those creatures sturdy enough to live in the harsh conditions of the tropical deserts. One may say that many animal species such as the long-eared fox, snakes and scorpions only come out by



night and by day they find shelter under some stones or in a deep hole burrowed under the sand. Other animals like the antelopes, desert fennec, long-tailed mice

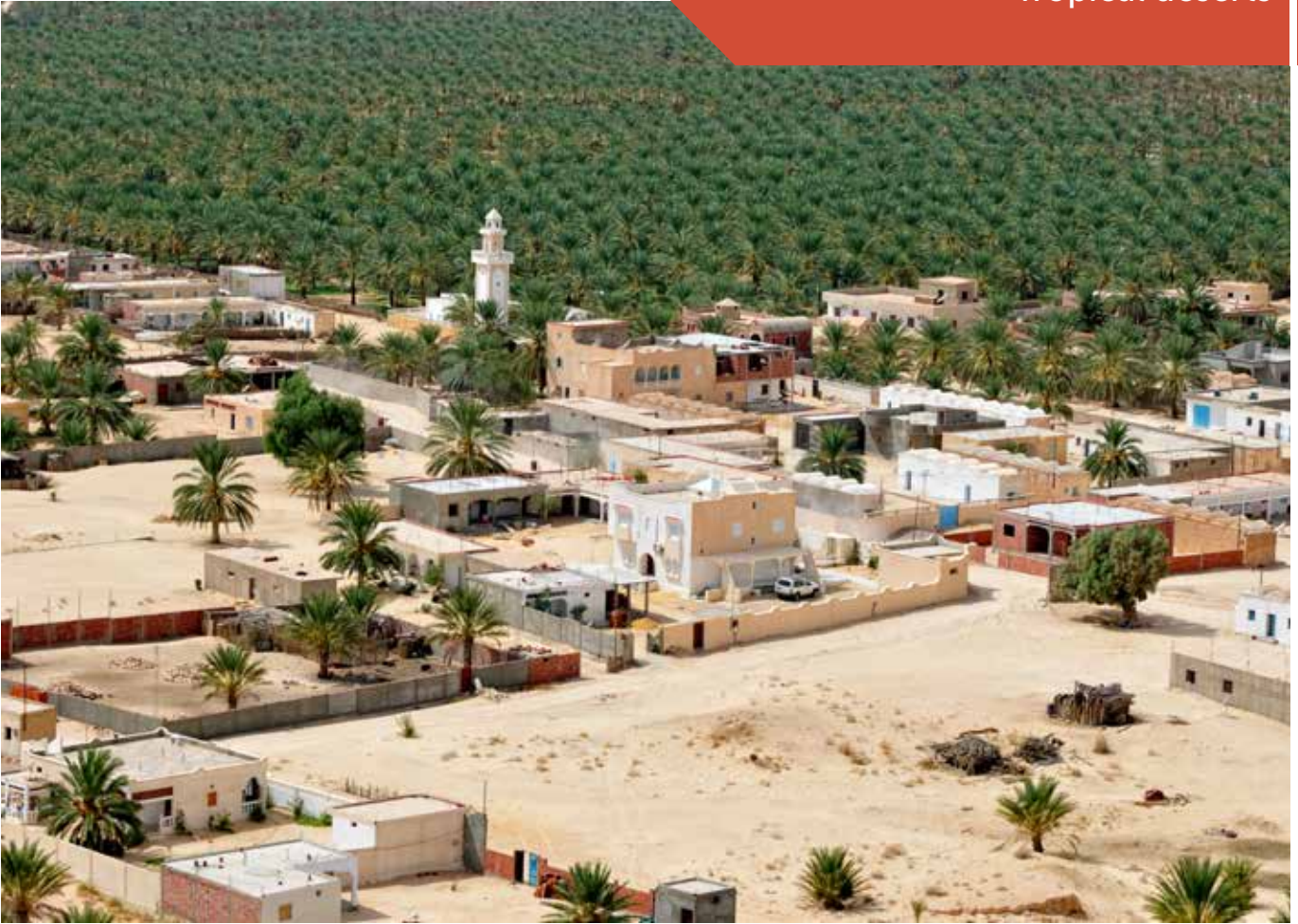
and the mice with long hind legs, do not need to drink at all since they take water from the plants and seeds which they find on the sand. On the other hand the camel can store about 115 litres of water which serves it for a number of days. In many deserts like the Sahara, there are large

Camels are well adapted to live in the deserts. The palm of their feet is shaped in a way that they are never tired after walking for long periods over the sand or pointed rock. The long eyebrows and nose hair protects them during sandstorms. The camel can store large amounts of water and food in their bodies that can serve them for three weeks. The hump is full of fats so that the camel can fast for days. Its mouth is very rough such that it is the only animal which can eat thorny plants like the cactus.

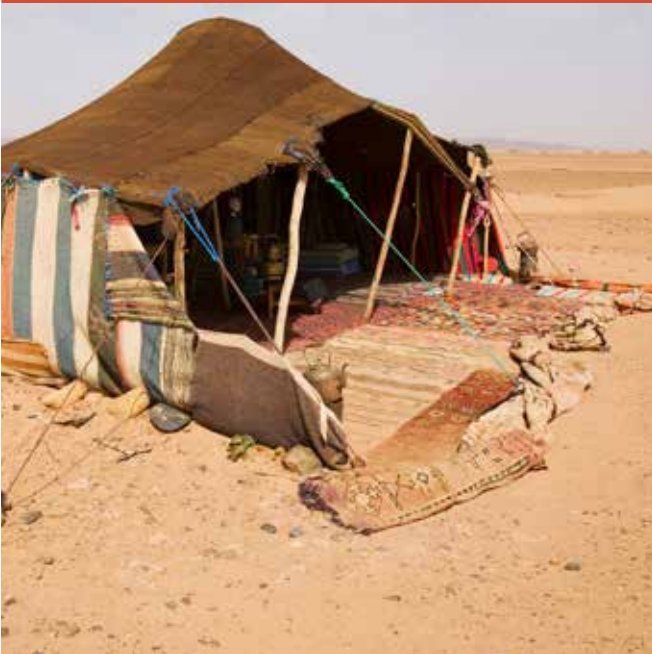


reserves of water underground. Sometimes this water finds its way to the surface and forms an area of freshwater called an oasis. Around the oasis one may find large villages and towns where many farmers cultivate dates, figs, olives and apricots.





The Bedouins travel from one oasis to another in the tropical deserts. These nomads usually live in tents made out of animal skin and they normally travel by night in order to avoid the intense heat of the sun.



It would be a mistake to think that deserts are useless regions. There we find a number of minerals and necessary metals. Many people work in difficult conditions to extract these resources from under the desert. For example in the Australian Desert one can find large quantities of gold and uranium. In the Atacama Desert of Chile, one can find extensive mines of copper and sodium nitrate. Millions of tons of crude oil are pumped up daily from beneath the Sahara and Arabian Deserts. The profit made by the sale of these products has helped these countries develop as also to build large and modern cities in the desert. This is what happened in Bahrain, Kuwait, Saudi Arabia and other countries of the Arabian Desert. Instead of the golden sands and stony desert there are now large cities where millions of people live in high-rise buildings, luxurious hotels, wide streets, beautiful airports and many other attractive areas.



In some deserts workers toil in difficult conditions to extract natural resources.

Many deserts are expanding. This process is called desertification and happens when marginal fertile land is destroyed. The people who live by the desert margins need land where to graze their herds and to take firewood for their daily needs. This human activity which involves grazing of dry land by many animals on dry land where rain is irregular, together with the cutting down of trees, quickens the process of soil erosion and the land turns to desert. Long periods of drought accelerates this process, the deserts advance and even trees and cities are covered by the sands as seen in the picture below.



Mediterranean Temperate Climate

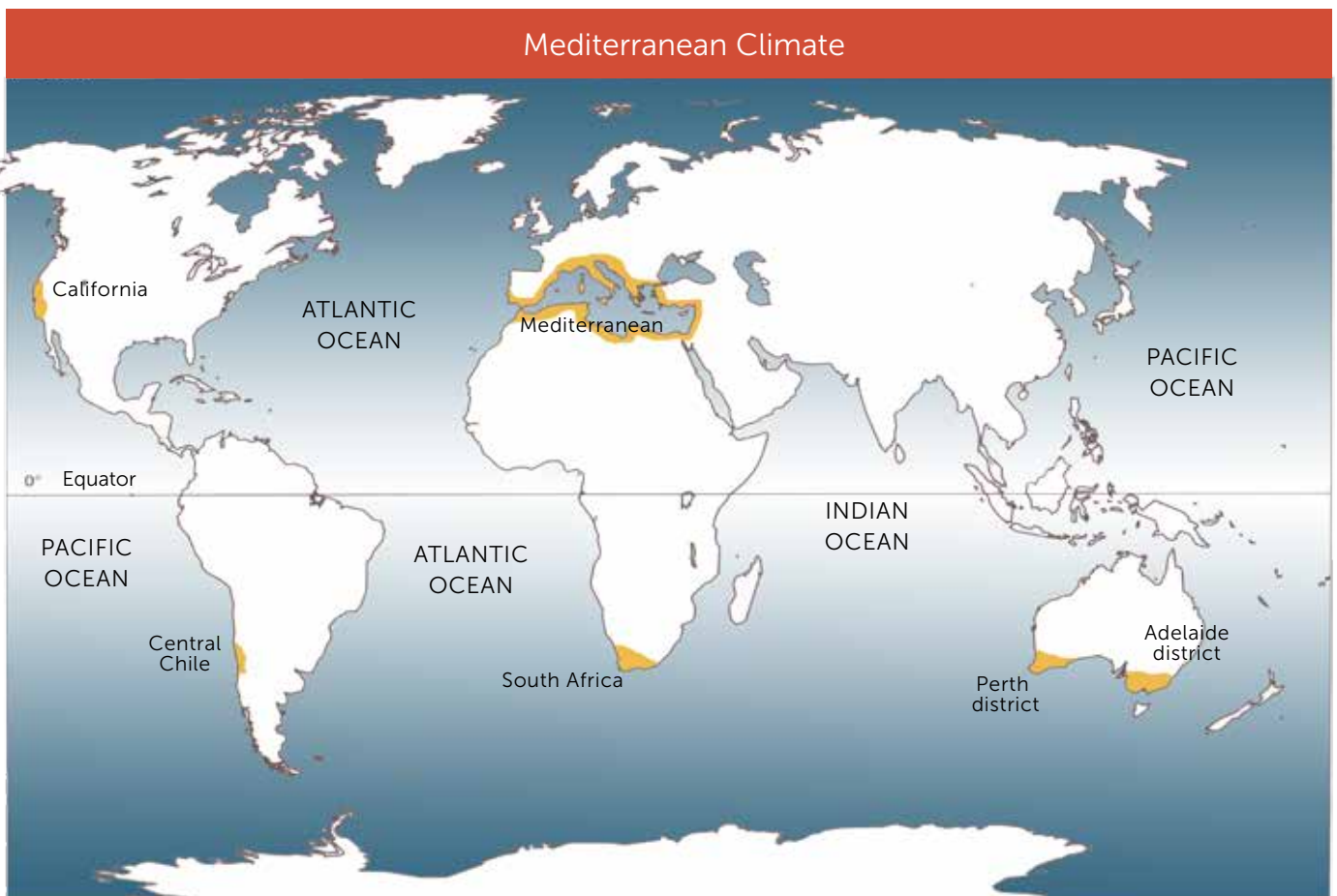
The temperate Mediterranean climate is not restricted only around the Mediterranean Sea but is also found in other areas around the world. These include the districts of Adelaide and Perth in Australia, central Chile, the southernmost point of Africa around Cape Town, and central California in the United States. These are all situated on the west side of continents between 30° and 45° north and south of the Equator.

The Mediterranean climate can be divided into two very different seasons. Summers are hot and dry while winters are cool and rainy.

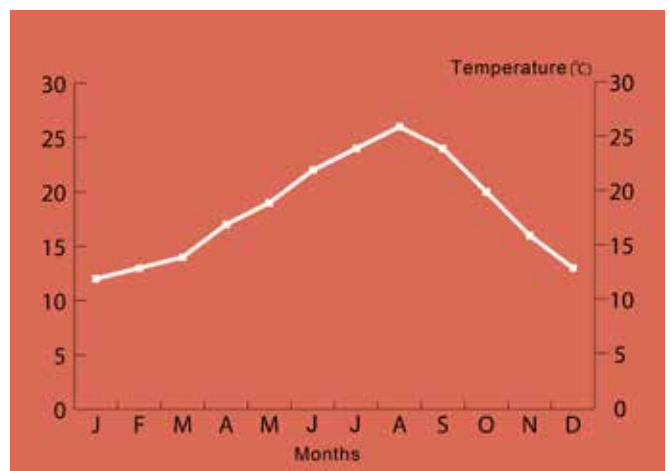
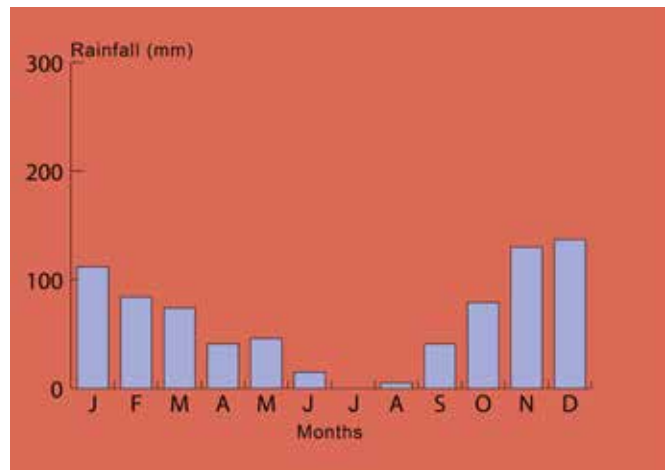
In summer the sun is never overhead as on the Equator, however, it is high enough to give hot weather. Moreover in summer the prevailing winds come

from over the dry lands in the east bringing dry and hot weather.

Winter months are cooler since the sun is lower in the sky. However, it is still high enough to give warm and fine days. The sea bordering these regions has a great effect on the weather of these places.



The graphs show the climate of Algiers, the capital of Algeria. It is a Mediterranean type of climate with two different seasons. Weather in summer is hot and dry while in winter it is cool and rainy. The warmest months are June, July, August and September when the average temperature is 24°C. At the same time there is little rain and the effect of drought is felt. Evaporation rate is high and farmers must resort to irrigation to grow any crops. In winter rainfall increases and at Algiers it reaches 760 mm a year. November, December and January are most humid when normally there are days with heavy showers as well as some other sunny and fine days. It is important to note that the average annual rainfall varies greatly in different areas of the Mediterranean. For example Lisbon, situated on the Atlantic coast receives more than 760 mm of rain each year, while the western coast of Spain which lies in the shadow of the Meseta plateau gets less than half that much. In cities of the eastern Mediterranean such as Tripoli in Libya or Alexandria in Egypt rarely get 300 mm a year.



The sea which warms up during summer, only loses its heat very slowly. The coastal areas are thus kept warm and therefore snow or ice is very rare. The winds now blow from the opposite direction, that is, from the oceans and these keep the temperatures warm and not cold as inland areas. These winds are humid and therefore they bring rainfall in winter.

In summer the long hours of sunshine raise the temperature to over 25°C. The hot and dry weather are a gift for the tourist but a worry for the farmer since the fields dry up. Rarely does average temperature fall below 8°C, therefore the growing season is all year round. Around the Mediterranean Sea the rainy season starts in September. This starts as short torrential showers. In between these showers there are usually many days

of sunshine. Much rainfall comes with the warm and moist western winds from over the Atlantic Ocean. These cause orographic rain on the coastal mountain ranges as well as many depressions which bring rain as they move from west to east.



Farmers of the Mediterranean region grow very good quality vines for wine production. The vine is well adapted to this type of climate since it has long roots which tap water and does not need to be irrigated in the dry summer months. About 80% of all the vines grown in this region are dedicated to wine production. Moreover three quarters of all the world trade in citrus fruit, such as oranges, lemons, mandarins and grapefruit, comes from this region. These fruits need the sun's heat to mature and their thick skins help them remain fresh, moist and juicy.



Thanks to their hot and dry summers, some countries of the Mediterranean like Greece, Malta, Spain, Italy and southern France have become very popular especially with northern European tourists. In these countries, as also in all others of the Mediterranean, many people earn their living by working in the tourism industry directly or indirectly. Many tourist resorts have grown along the coast and near sandy beaches.

In order to solve the problem of water shortage in summer, many countries have invested for the retention of surplus winter rainwater by building dams. In the photo on the left we can see the Shasta Dam in California. The water behind this dam is used not only to satisfy the needs of the city of Los Angeles, but also for irrigation during the summer months when rain is scarce.



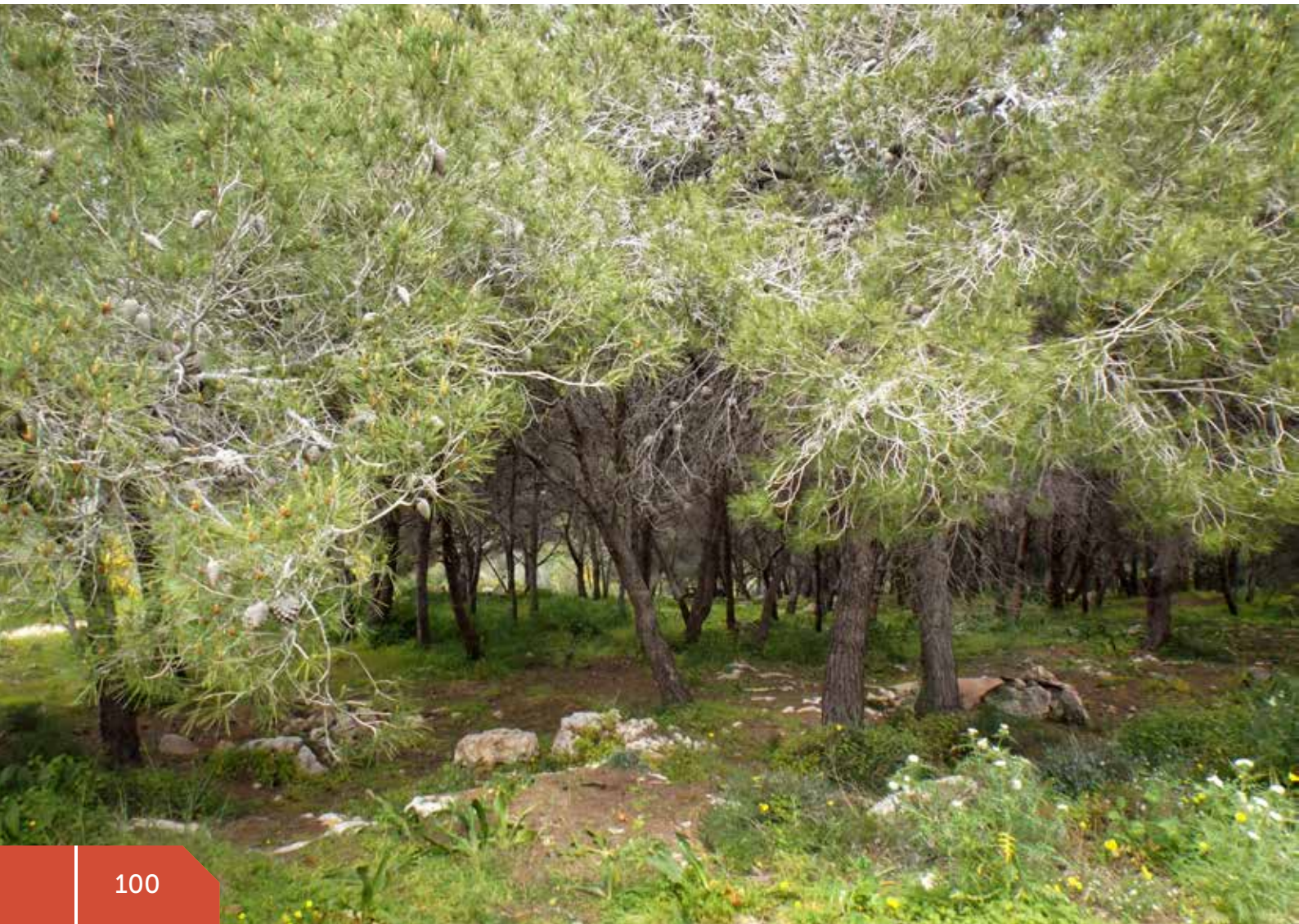
Habitats of the Mediterranean

In the past Mediterranean climate regions were all covered by evergreen forests. Throughout the years this vegetation has been cut and laid waste by people and many woods have disappeared, except for some limited areas.

In the areas where the original woodland has not been totally erased, there grow evergreen trees such as the holm oak, cypress, Aleppo pine, cork and sequoia in California. On the other hand where the woodland has been laid waste by people or where it has somehow been destroyed by fire, a different type of habitat has developed made up of short or herbaceous trees and shrubs. These are the maquis

and garigue ecosystems that are both very common in the Mediterranean climate zones.

The maquis is full of small and low trees and shrubs that grow more than one and a half metres, such as the carob, olive and laurel. There are also creepers going up anything they meet. On the other hand the garigue is less dense having many aromatic plants and



Before the coming of man the areas bordering the Mediterranean were all covered in evergreen trees. These woods were full of large trees such as the holm oak, Aleppo pine (see photo in page 100), carob tree (see photo on the right), cork tree, juniper, olive (see photo below) and many others. Unfortunately in many areas these woodlands have disappeared except for some patches. These trees are well adapted to the hot and dry climate since they have small, thin, shiny and slippery leaves that prevent loss of moisture. Moreover they have thick roots which penetrate in between the rocks to help them in summer. In many places these woodlands with typically Mediterranean trees are being protected in natural reserves so that they might grow naturally.



low shrubs such as thyme, heath, rosemary, spurge and many others. The trees, shrubs and plants that can be found growing in woodland, maquis and garigue are very well adapted to the Mediterranean climate, so





much so that they are resistant to summer heat and to the strong sunshine. Some trees like the Aleppo pine, have needle-shape leaves that reduce loss of moisture, others have shiny and thin or white leaves that reflect the hot sunshine. Many are evergreen so that they avoid wasting moisture and nutrients that would be needed

Trees in the Mediterranean woodlands have suffered through the activity of man and due to natural causes. When people first settled in these regions, they cut the trees to build their huts and to produce their implements. They also cut trees that used to grow on fertile soils in order to cultivate them. Later on, until the mid-nineteenth century, whole woods were cut for Aleppo pine, juniper and olive wood for the construction of ships. Among the natural causes one may mention climatic drought and fires that rage in the dry summers, as can be seen by the side.



The garigue environment is found in areas with pointed and razor-shaped rocks. At first glance the garigue (xaghri in Maltese), seems like a poor, dry, denuded ecosystem of no value. However, here live a large number of plants and animals. The garigue is a harsh and difficult environment for many reasons. It is exposed to high winds, to heat and drought in summer, and above all the plants must grow in very thin and poor soil. Three types of plants grow in the garigue: perennial shrubs, bulbous plants and annual plants that grow for only one season. The photo below shows how garigue can be rich with a large variety of flowers that colour and decorate this type of environment that is unique for zones with a Mediterranean climate.

for regrowth of leaves. Others have long and thick roots that penetrate in the cracks of the rocks to search for water. Shrubs grow low to the ground in a semi-circular fashion with a large number of small, hard and dense leaves. All this shelters them from the wind and from loss of moisture through transpiration from their leaves. Other shrubs have shiny and slippery leaves, others have hairy ones, whereas others can store water in their thick leaves. Other plants only grow in the rainy season and they are inactive in the dry one. Among these are plants that spend the summer in the form of seeds or bulbs in the soil. By the first rains while the soil is still warm and wet, they germinate, grow and bloom.



1

The three graphs give us information about the climate of three different places. Use the information given in the graphs to answer the following questions.

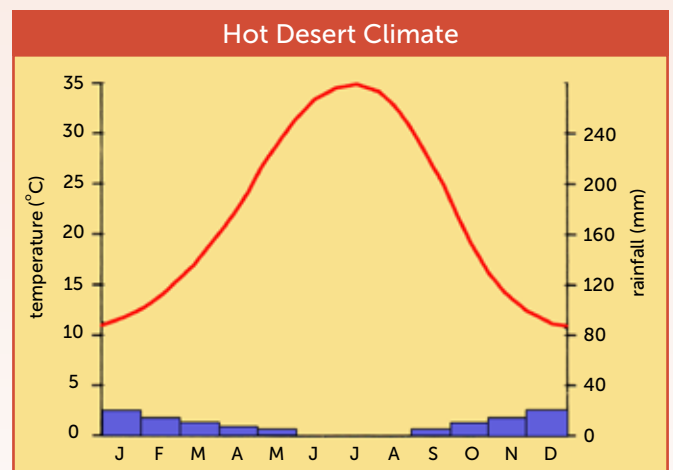
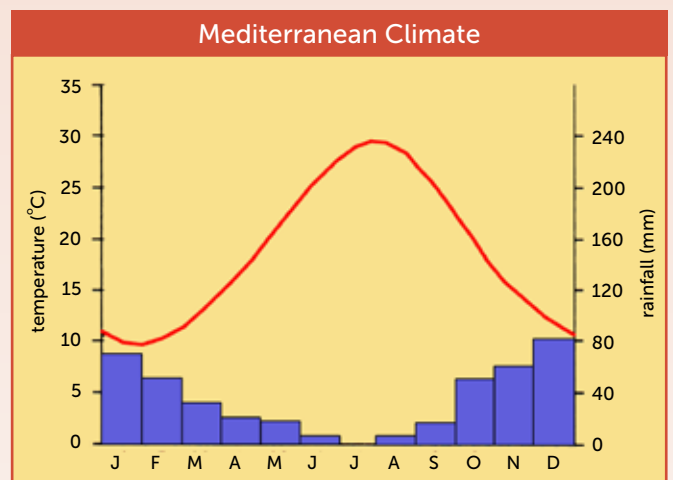
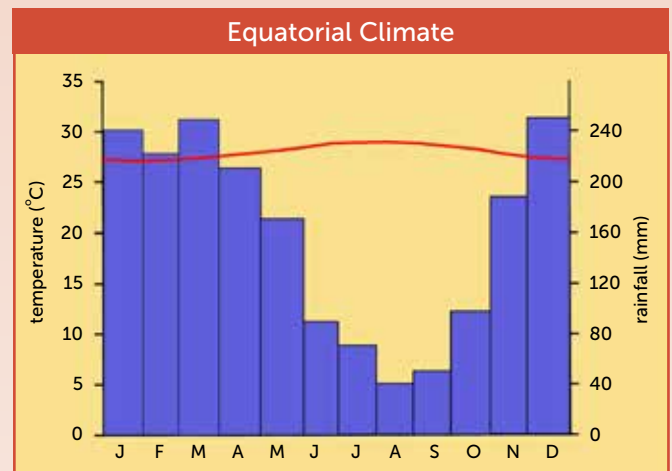
- What is the average temperature in each place in February?
- What is the average temperature in each place in August?
- What is the rainfall in each place in December?
- What is the rainfall in each place in July?
- Read the following information about each climate. Underline the correct answer from the brackets.

Equatorial climate is (moderate/cold/very hot) all the year round with an average temperature of (27°C/12°C/36°C). It is also (humid/dry) with an annual rainfall of (300 mm/1800 mm/3000 mm). Rain falls mostly (at dawn/in the afternoon/in the evening).

The Mediterranean climate is (hot and dry/cold and humid/hot and humid) in summer. In winter it is cool and (dry/humid). In summer the (westerly/easterly) winds bring along hot air. Because of this places with Mediterranean climate suffer (floods /drought/high winds). In winter prevailing winds blow from the (west/ east/south) and bring (dry/ humid) air. In summer temperature is usually higher than 25°C and the annual rainfall total is about (1800 mm/480 mm/900 mm).

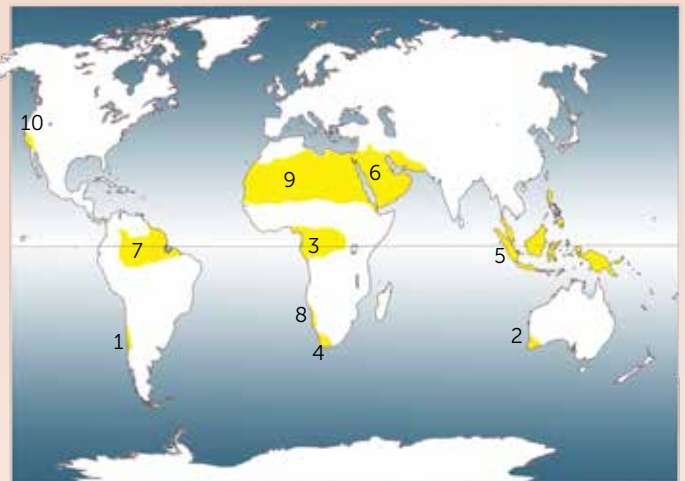
In tropical deserts the climate is (cold and humid/ hot and dry/moderate and humid). The average temperature is seldom less than (20/10/35)°C and in summer it is higher than (20/10/35)°C. Since by day there is little (wind/cloud/air), the temperature (rises/ falls) very much. For the same reason, the temperature rises/falls) quickly by night and the air cools very much. Since in these regions the winds blow from the (sea/land/mountains) they bring dry air and therefore the amount of rain is ((low/high). Often when it rains, it falls (slowly/in showers) and this is called (convictional/orographic/cyclonic) rainfall.

- Look carefully at the World map in page 105.
 - On the same map draw the Equator and mark it as 0°.



- With the help of an atlas, also mark the following lines of latitude 10°, 30° and 40° north and south of the Equator.
- Name the type of climate that is found in every place marked 1 to 10 in the map of page 105.

iv. Write the following place-names in the correct place on the map.



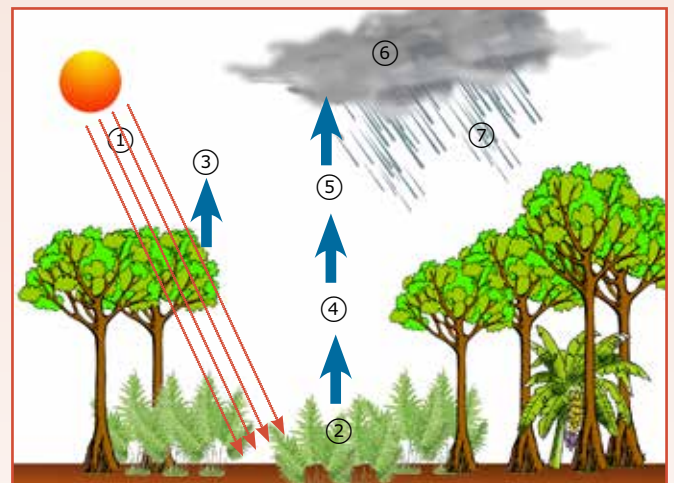
v. What type of climate do we find between:

- 0° and 5° latitudes North and South of the Equator,
- 10° and 30° latitudes North and South of the Equator, and
- 30° and 40° latitudes North and South of the Equator?

2

- Explain why places with equatorial climate have high temperatures all year round.
- Mention in brief the main characteristics of equatorial climate.
- In equatorial regions, rain falls mainly in the afternoon. In the table below write the numbers of the diagram near the correct information.

There are heavy showers in the afternoon.	
Air cools and condensation takes place.	
The sun warms the land since early in the morning.	
Thick storm cloud of cumulonimbus type forms.	
The warm and humid air rises.	
The sun evaporates the water from the trees, lakes and rivers.	
The sun warms the land.	



- What is this type of rain called?
- In the picture on the right we can see Cotopaxi Volcano. This volcano lies on the Equator but as we can see it is covered in snow and it has no Equatorial climate.

Why do you think is this possible?

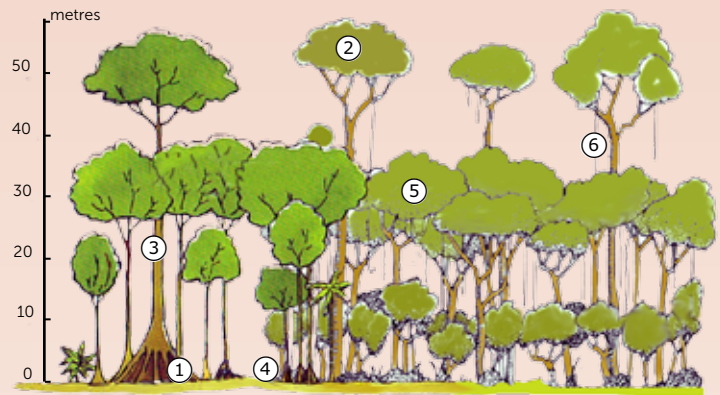
3

Look carefully at the diagram on the right which shows a view of the tropical rainforest.

a. In the table below write the numbers near the correct main characteristics of the tropical rainforest.

emergent trees	
buttress roots	
lianas	
canopy made up of intertwining tree branches	
tall branchless trees	
dark place with few plants	

- b. Mention some species of creatures (such as birds, reptiles and amphibians) that live in such an environment. Why do you think is there such a large biological diversity.
- c. With the help of the diagram above right, describe the typical scene of a tropical rainforest.
- d. The picture on the right shows one way how forest vegetation has adapted to the environment.
- What are the roots shown in the picture called?
 - What are the trees that need such roots called?
 - Give at least two reasons why these roots are necessary.



e. Explain why in the tropical rainforest like the Amazon,

- Plants grow rapidly
- Trees are evergreen
- Few plants grow under the trees
- Some trees are very high
- The leaves have a drip tip.



4

The tropical rainforests are disappearing at an alarming rate. The trees are being cut for wood and to make way for fields or for other development. Read what these Brazilians' have to say about the cutting of trees.

The burning of large areas of forest is creating many greenhouse gases that cause climate change.

With the cutting of trees the soil is being impoverished and easily eroded.

We earn much money by selling wood.

Medicinal plants are disappearing.

Trees are not being replanted to compensate for those that are cut.

The indigenous tribes are being forced out of the forest.

We need large areas of land to raise animals. The meat is being sold to multinational companies.

Together with the trees many plants and creatures that depend on them are being exterminated.

We need to build new roads in the forest to reach new mining areas there.

- Why are these forests being cut at such a fast rate?
- What is this activity called?
- What environmental problems is this activity causing?
- What do you think can be done to preserve the tropical forests and their biodiversity?

5

Look carefully at the two main environments found in places with a Mediterranean type of climate.

- What is the type of vegetation seen in pictures A and B called?
- Mark (✓) the points which help plants shown in the pictures live in the Mediterranean climate.



These plants have buttress roots above the soil.	<input type="checkbox"/>
These plants have small, shiny and slippery leaves.	<input type="checkbox"/>
Some of these plants have thick roots that grow deep.	<input type="checkbox"/>
The trees grow up to more than 40 metres to find sunlight.	<input type="checkbox"/>
Some of the plants that grow here have their bulb in the soil.	<input type="checkbox"/>

- By referring to points which you chose in exercise b, explain how the qualities which these plants possess help them survive the hot and dry summers of the Mediterranean.
- Give the names of three typical plants which grow in a Mediterranean wood.

- Explain briefly how the natural vegetation of the Mediterranean changed in time.
- Give one reason to explain why:
 - Mediterranean summers are dry;
 - Rain falls in winter in the Mediterranean;
 - In the Mediterranean, winters are not very cold;
 - In the Mediterranean we rarely get snow or frost;
 - Mediterranean summers are hot.
- What does the word drought mean? In which period of the year do Mediterranean countries experience a drought?
- Why do many Mediterranean countries attract many tourists especially from northern European Countries?

6

The creatures and plants that we see in pictures A to D all live in tropical deserts around the world.

- Mention two tropical deserts in Africa, one in Asia and another in America.
- What type of climate can be found in the hot deserts like the Sahara?
- Why are deserts very hot by day but cold by night?
- Why are tropical desert so dry?
- What are the plants in pictures A and B called?
- Explain how these plants succeed in surviving such a hot and dry climate.
- What is the animal seen in picture C called? Explain how this animal is very well adapted to live in the desert environment.
- What is the animal pictured in D called? What does this creature do to avoid the heat of the sun?
- Mention some other creatures that live in the desert and say how they face the difficulties of such a climate.



- Many deserts are growing in size especially at their margins. What is this process called?
- What are the natural and human processes that are causing such a growth of deserts?



It is difficult to calculate the exact number of people who live in a particular country since every day thousands of babies are born and thousands of people die. Therefore in many countries, including Malta, a census of population is held once every ten years in order to have an official count of the number of people who reside in the country. Apart from the count of people, the census gathers other necessary data, especially regarding the quality of life of the people. The statistics that are collected help in the social and economic planning of the country, such as the provision of schools, health centres, homes for the elderly and other facilities.

Population

5

Population consists of people living in a particular place as a community. Throughout the centuries the world population increased slowly. However, nowadays the increase is very fast, especially in developing countries. So much so, that in some densely populated regions it has become difficult for a person to find work, food and decent housing. It is also true that in some countries the increase in population is causing considerable pressure on environmental resources; such as water, forests and land. Each and every year thousands of people have to move home and leave their country for these reasons.

All over the world people gather and live in communities in houses, apartments, tents or huts. In fact most people live in cities considered as urban areas. These places attract people since they provide necessary services such as shops, places of

entertainment, schools, banks, hospitals, efficient means of transport and many jobs. On the other hand fewer people live in the country villages (rural areas). Here, life is more quiet, there are fewer services and jobs are somewhat scarce.



The Increase in Population

The world population is increasing every year. Every minute 160 babies are born. This means that the population is increasing by 230,000 people every day, or 82 million each year. This increase equals the whole Maltese population every two days!

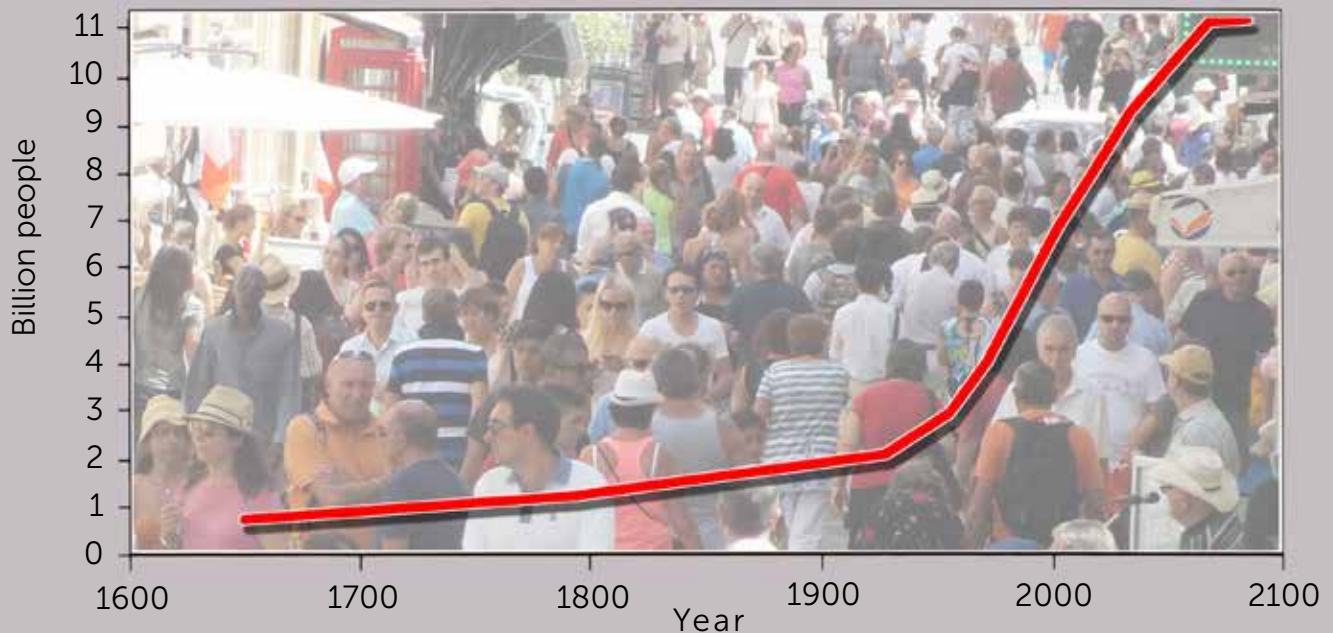
In 2011 the world population reached seven billion (7,000,000,000) and by 2025 it is expected to reach 8 billion people. The increase in population is so fast that it is sometimes referred to as the population explosion or demographic explosion.

The population of a place increases when the number of babies born outreaches the number of people who die. This is called natural increase

in population and happens when the birth rate is higher than the death rate. In 2011 the world birth rate was 20 for every 1000 persons, while the death rate stood at 8 persons per 1000.



World demographic history since 1600



The above graph shows the global population increase throughout the centuries. It is clear that for a long time the population was stable and that increase was slow. In 1800 for the first time, the world population reached one billion people. It doubled in the next 100 years and since then demographic increase took a faster pace. At such a rate it is estimated that the population will reach 8 billion in 2025.

This amounts to a natural increase of 12 persons for every 1000, or 1.2%. No wonder that the global population is increasing at such a fast rate!

Population increase is higher in developing countries than in the richer developed ones. We may say that the richer countries have passed through a demographic transition or change in a short time. The graph above shows us the birth and death rates of developed countries for the past 200 years. In the first stage both birth and death rates were high. Many babies were born but many people died too so that the population remained stable. People died of illness, disease, unhygienic conditions, and lack of clean water and food. The infant mortality rate was high and therefore parents used to have more children hoping that a few might survive. Children were needed to help in the fields and to provide support for elderly parents.



In the second stage, population started to increase rapidly. This happened not so much because of an increase in birth rate, but due to a lowering of the death rate. During this time there was rapid progress in science, especially in medicine, leading to a decrease in the death rate. With the help of better trained doctors, inoculations, pills, and antibiotics, fatal diseases were successfully reduced or totally eliminated. Great progress was also made in cleanliness and hygiene, especially by the introduction of running water and sewerage systems. More importantly agricultural production increased with the use of fertilisers, pesticides and modern machinery, resulting in a better diet for people. Infant mortality rate decreased, thus waiving the need for families to have many children.

In the third stage birth rates fell rapidly mostly

due to better family planning, the use of contraceptives and the emancipation of women. Nowadays, many developed countries lie in the fourth stage since their population has reached some stability with low birth and death rates. Life expectancy is higher and therefore in many countries there is a high proportion of elderly people. This fact, added to a very low birth rate, has led to certain countries entering a fifth stage in which the population is decreasing.



Demographic transition in developed countries during the past two hundred years

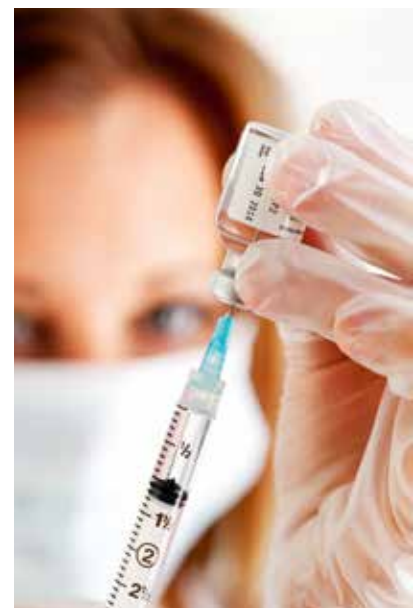




Poor African and Asian countries are in the second stage of demographic transition. However, with the help of richer countries, these have recently made substantial progress and therefore the death rate has decreased and life

expectancy is higher. But since the birth rate remained at the levels of the first stage, the total population has increased. In some countries the population is doubling every forty years or even less!

Four countries compared				
	Malawi	Bangladesh	Italy	Japan
population 2013 (in millions)	16.7	163.6	61.4	127.3
Birth rate (per 1000)	39	20	8.9	9
Death rate (per 1000)	12.5	6	10	9
Natural increase (per 1000)	26.5	14	-1.1	0
Infant mortality rate	77	47.3	3.3	2.1



Population Distribution and Density

The Earth's 7 billion people are not evenly distributed on the land. There are densely populated areas and others that are uninhabited or sparsely populated. Population distribution shows us how people are spread out around the world, while density of population tells us the average number of people that inhabit a particular region for every square kilometre. This is worked out by dividing the total number of people who live in a country by its area in square kilometres.

The physical features of a country, such as climate, landscape, vegetation and soil type, have a great influence on the spread of population. These physical factors may either attract people to a place or push them from it.

One may argue that in every continent there are extensive areas that are either too dry or too cold for people to live in large numbers. The arid deserts of the world are hot and dry and the land is unsuitable for cultivation. For this reason, all along the Tropic of Cancer in Africa, the Arabian Peninsula and central Australia are almost void and very sparsely populated. The same applies

to cold regions of high latitudes. For example Antarctica is covered in ice and no one can permanently live in that cold habitat.





The same happens in the Arctic regions, in the tundra of Alaska, Siberia and northern Canada. The cold temperatures and the very short growing season found here make it most difficult for people to live in. There are only some hunters who have adapted themselves to these extreme conditions.

Alternatively one finds very densely populated regions, especially where the growing season is perennial. South and south-east Asia are densely populated due to the abundant annual rainfall and warm climate. This allows for the cultivation of many crops, including rice which sustains the largest populations in the world. Other favourable regions for human



habitation include Europe and central and eastern United States. People prefer to live in flat land where water is abundant and soil is fertile, but avoid mountainous or dry regions where soil is thin or even scarce. The Alps and Himalayas are scarcely populated, while in the deltas of Rivers Nile and along Rivers Ganges, Indus and Mekong, the population is very dense.

Densely populated or uninhabited

The map below shows us the distribution of population by means of dots. At first glance one may notice a great concentration of people in south-east Asia, Europe, and eastern coast of the United States. These are densely populated regions, due to favourable factors that determined advantageous conditions. Among these one may include moderate climate, flat land, fertile soils, and adequate provision of water and food. These areas are endowed with natural resources through which many jobs are created.

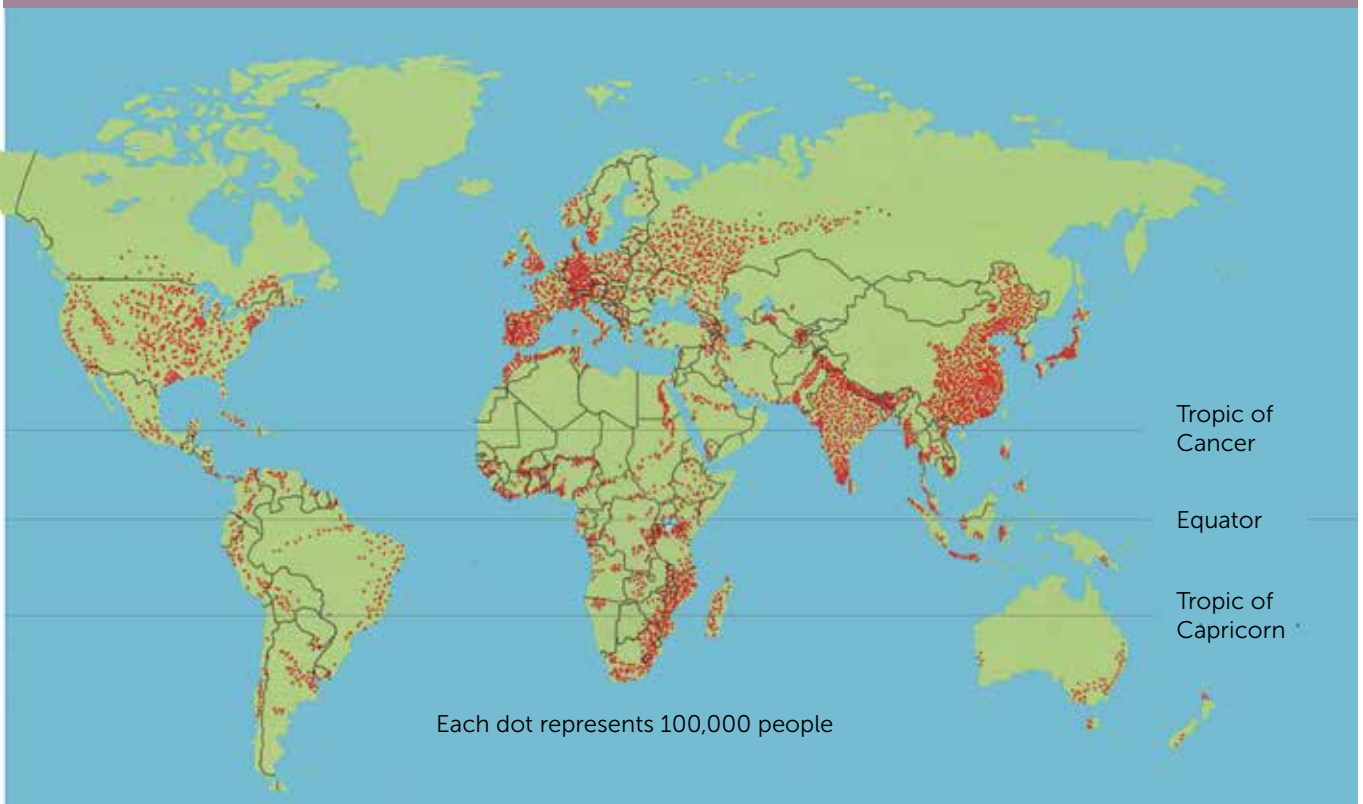
On the other hand, it is clear that extensive regions are almost empty. Many negative factors have created disadvantageous conditions that discourage people in settling there. These include considerably cold or hot temperatures, drought, mountainous terrain, infertile soil, dense tropical forest and water or food shortage.

Moreover little economic investment is directed to these regions and therefore there is a lack of roads, other means of communication and jobs. Due to these physical factors the regions of the Amazon tropical forest, the Himalaya Mountains and the Arctic have a very low population density.

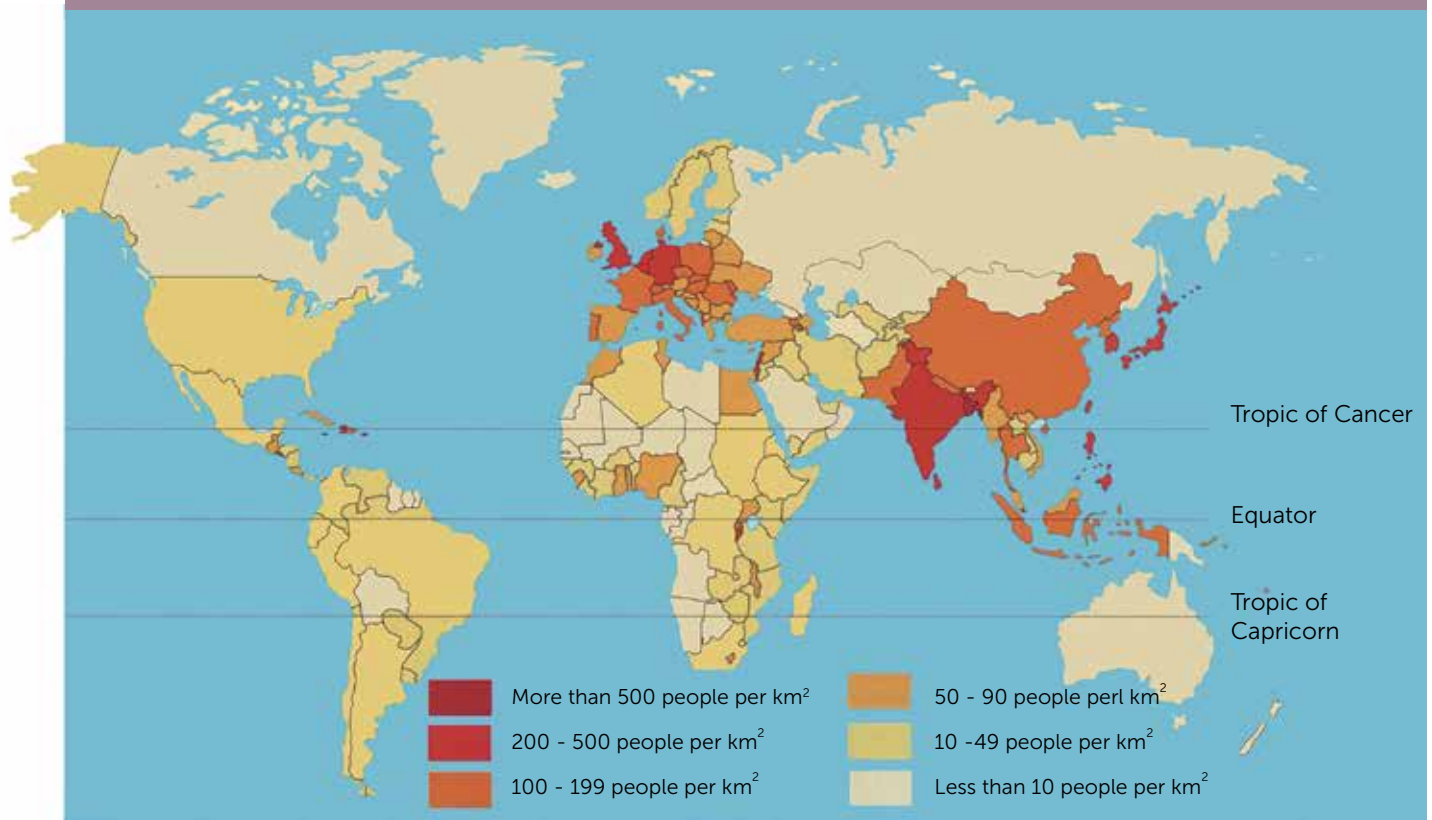
With 84 million people, Egypt has the largest population in Africa after Nigeria and Ethiopia. All these people live in a large area of slightly more than one million square kilometres. This means that the population density is 84 persons per square kilometre. However, the great majority of Egyptians live along the banks and the delta of River Nile, in Cairo, Alexandria and near the Suez Canal. With 2,136 people per km², Cairo, the capital city, has the highest population density.

This distribution of population in Egypt is the result of the physical advantages offered

Distribution of population

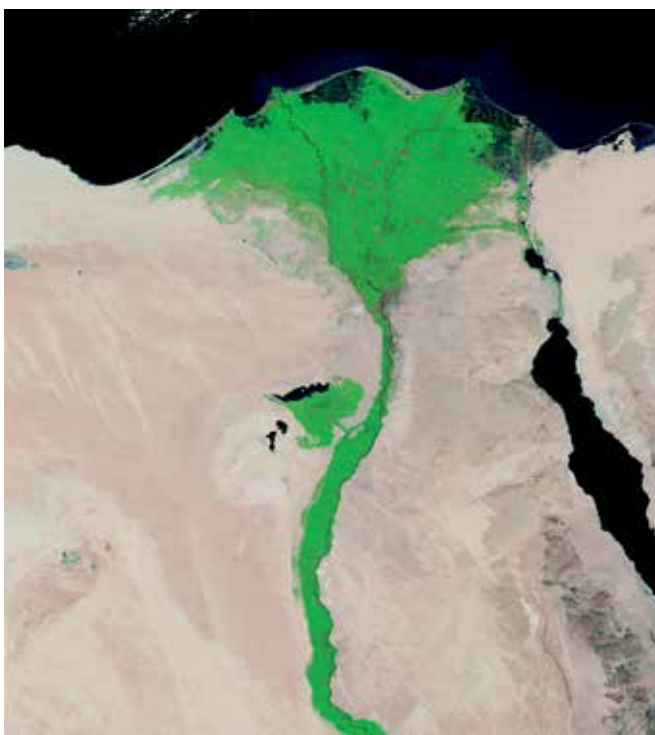


Population density



by River Nile. It provides water for drinking and for irrigating the fields. In the past it also provided loads of alluvial silt that is so necessary for the cultivation of crops. This used to settle in the fields after each annual flood. The river was also the only means of transport along the whole of Egypt. This led

The population density map shows us the number of people per square kilometre in each country. For example Australia has a very low population density of under 10 people per square kilometre, while in India more than 500 people live in every km². This does not mean that the populations in these countries are evenly spread in each square kilometre. This is just an average and there may be areas with a higher or lower density than that. Usually in urban areas, the density may be as high as 5,000 people per km² while in rural areas it is generally much less than the average.



to a very high population density along its banks. On the other hand, the rest of the country is desert and almost empty due to lack of water and great heat. The green areas in the map on the left denote the cultivated and densely populated areas of Egypt. The rest of the country is scarcely populated.

Malta's population

During the past century the population of the Maltese Islands has doubled and by the end of 2012 it stood at 421,400 people. 28% of the people were under 24 years while 17% were 65 years or older. The life expectancy is 80 years, women living somewhat longer. Malta's population will increase since birth rate is slightly higher than death rate. The National Statistics Office forecasts a population of 450,000 by 2025, and over 508,000 by 2050.

Same as in many European countries Malta has passed through a demographic change or transition. In the first stage there were high birth rates and death rates. The birth rate was a little higher than death rate and therefore the population increased slowly. Standard of living was low since there were no medical or social services as of today. Many people lived in dirty environs and most houses lacked

lighting, running water and sewerage. All this, added to lack of personal hygiene, brought about many infectious diseases and illnesses such as plague, cholera, smallpox, tuberculosis and Mediterranean fever, all which left a trail of fatalities. Therefore many families had many children in the hope that some of them survived childhood to help in the fields and support the parents when they grew old.





In the mid-1940s infant mortality rates decreased and therefore Malta's population entered the second stage of demographic transition. This was a time when many diseases were controlled or eliminated due to progress in medicine and personal hygiene. With this decrease in death rate, the population of Malta increased rapidly. Consequently many people could not find a job. The economy of Malta was not developed enough to sustain such a large population and therefore many young men had to emigrate to find jobs. Many emigrated to the neighbouring countries of North Africa like Tunisia, but most went to Australia, Canada, Great Britain and the United States. Slowly Malta entered the third stage of demographic transition, when both death rate was reduced and birth rate was decreasing. Many factors led to this lowering of birth rates, among which the

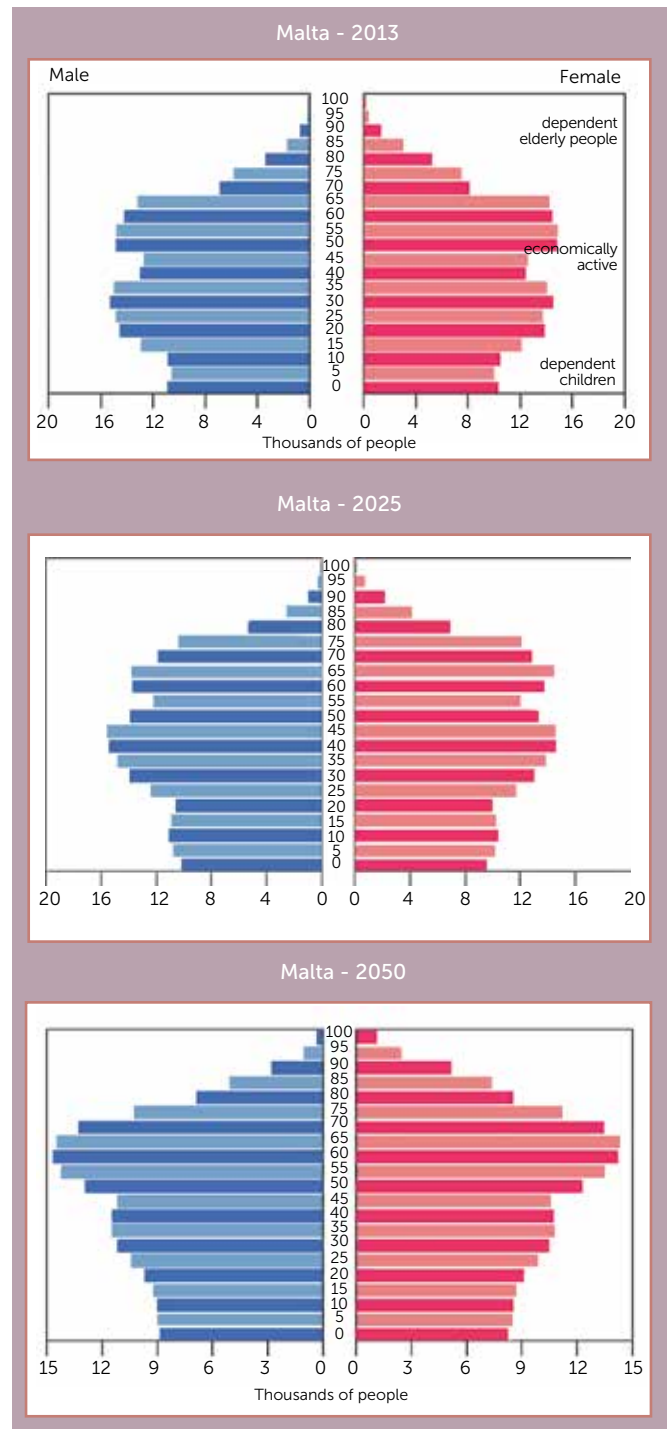


progress in education, the introduction of new social services and family planning, the use of contraceptives and emancipation of women. Thus in a short period of time, Malta entered the fourth stage of demographic transition in which both birth rates and death rates are low. Due to better quality of life and medical services, life expectancy in Malta is now very high and there is an increasing number of elderly people.

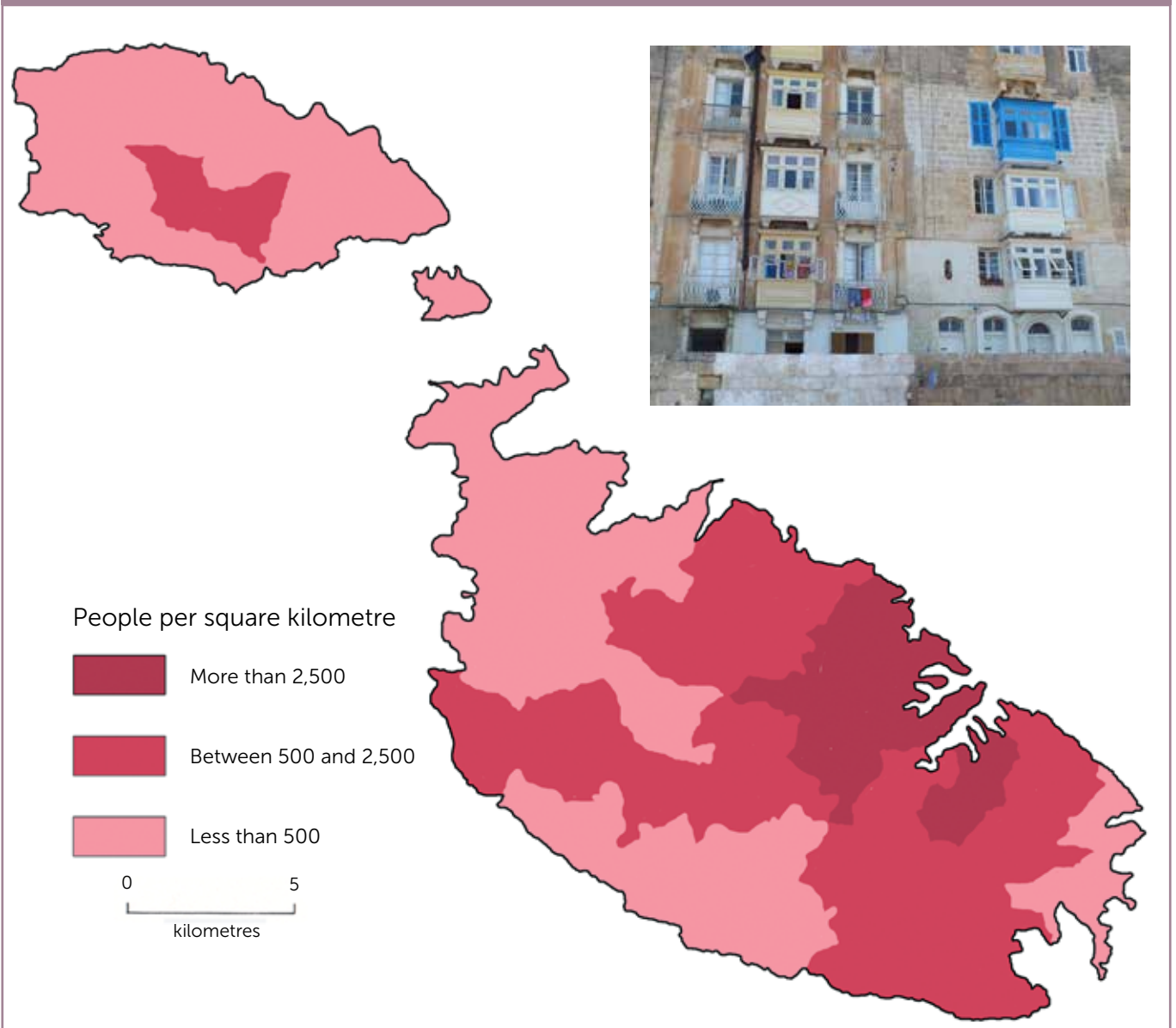
Population density and distribution

The best way to illustrate the population structure of Malta is by means of a population pyramid graph. This type of graph is divided into two with numbers for females shown on the right and males shown on the left. The number of people is shown in horizontal bars. If one looks at the population structure for Malta in 2013 one would see that there were more than 11,000 boys between the ages of 5 and 9 years, and roughly the same amount of girls. This accrues to a total number of 22,000 children between 5 and 9 years old. The graph shows that in the coming 5 years the number of births will drop and the number of elderly people will increase.

Same as for most developed countries, the population structure of Malta is becoming older. This is due to two main factors. Birth rate has decreased and less babies are born than in the past. Moreover, life expectancy is now higher and therefore the elderly are living longer. The population of old people is fast increasing in Malta and it is estimated that it will double by 2025. Malta's population structure also shows that the number of young people is decreasing and by 2025 there will be many less youngsters than today. This means that as



time goes by there will be an added pressure on medical services and on government finances, such as the issuing of pensions. It will also entail more taxes on the economically active workers aged 16 to 65, who will have to sustain those who will be dependent on them, that is children under 16 years and people aged 65 years or older. This problem is called the welfare gap.



The population of the Maltese Islands is one of the densest in the world. With more than 421,400 people (2012) the Islands have a population density of 1,333 people per square kilometre. In fact Malta is the most densely populated country in the European Union. The Netherlands come next with 495 people per square kilometre! As can be seen in the map population density varies in between different localities. The darker the colour, the higher is the density. It is clear that the highest densities with over 2,500 people per km² are in the eastern

or harbours regions. There are some areas in this region where the density is over 10,000 per km². This happened since for many years these areas around the harbours were the hub of most economic activities in the Maltese Islands. For example here thousands of people worked in the dockyard which was the largest enterprise in Malta. The map shows that the density of population decreases in the north-western parts of Malta and in Gozo, where there are less than 500 people per square kilometre, which is much lower than the national average.

Migration

Migration is the movement of people from one place to another, mainly to better their living conditions or to escape famine or war. All over the world there are about 150 million people who live and work outside their own country. Most of these left their country legally, but about 20 million of them are living in another country without permit and are therefore called illegal immigrants.

Some people leave their country only temporarily, for a few months or years. These are called temporary or semi-permanent migrants. Others go and live in another country intending to settle there permanently. There are different reasons or pull factors which induce a person to leave his native country and emigrate, to try for a better life elsewhere. For most it is an economic decision, to find a better job, earn more money and live a better quality life. An immigrant may

be enticed by better opportunities in education, medical services or a wish to join relatives who had settled in the country of destination before him. Apart from these social reasons, there may be cases of people who flee their own country because of push factors such as religious, ethnic or political persecution, or as a result of natural disasters or war. Such people who are forced to leave their own country to seek shelter in another are called refugees.





The number of people who were forced out of their own country is more than 33 million. Thousands had to leave all their belongings in Afghanistan, Iraq, Ruanda, Burundi, Sudan, Congo, Syria, Colombia and many other countries. Often these refugees never make it backhome and live permanently in refugee camps run by the United Nations High Commission for Refugees (UNHCR).

One also finds environmental refugees who had to permanently or temporarily leave their country due to natural disasters such as floods, drought, hurricanes, earthquakes, tsunamis and volcanic eruptions. This is what thousands of persons formerly living in the Sahel countries, that is, Ethiopia, Mauritania, Somalia and Chad, went through when drought ravaged their land for years causing a great famine. There

The dam which controls the waters of River Yangtse is 2.3 kilometres wide and is called the Three Gorges Dam. Behind the dam a 660 km long lake formed which flooded 632 km² of land. More than one thousand towns and villages were submerged and about 1.3 million people were evacuated and re-settled in other parts of China.

are cases of people who are forced to leave their homes because of some large project as happens when large dams are built across rivers for the production of hydro-electric power. Due to a similar project in China more than a million people had to evacuate their homes since their villages were submerged by the waters. People also move because of industrial accidents. The worst occasion was at Chernobyl in the Ukraine when more than 135,000 people had to leave their city and

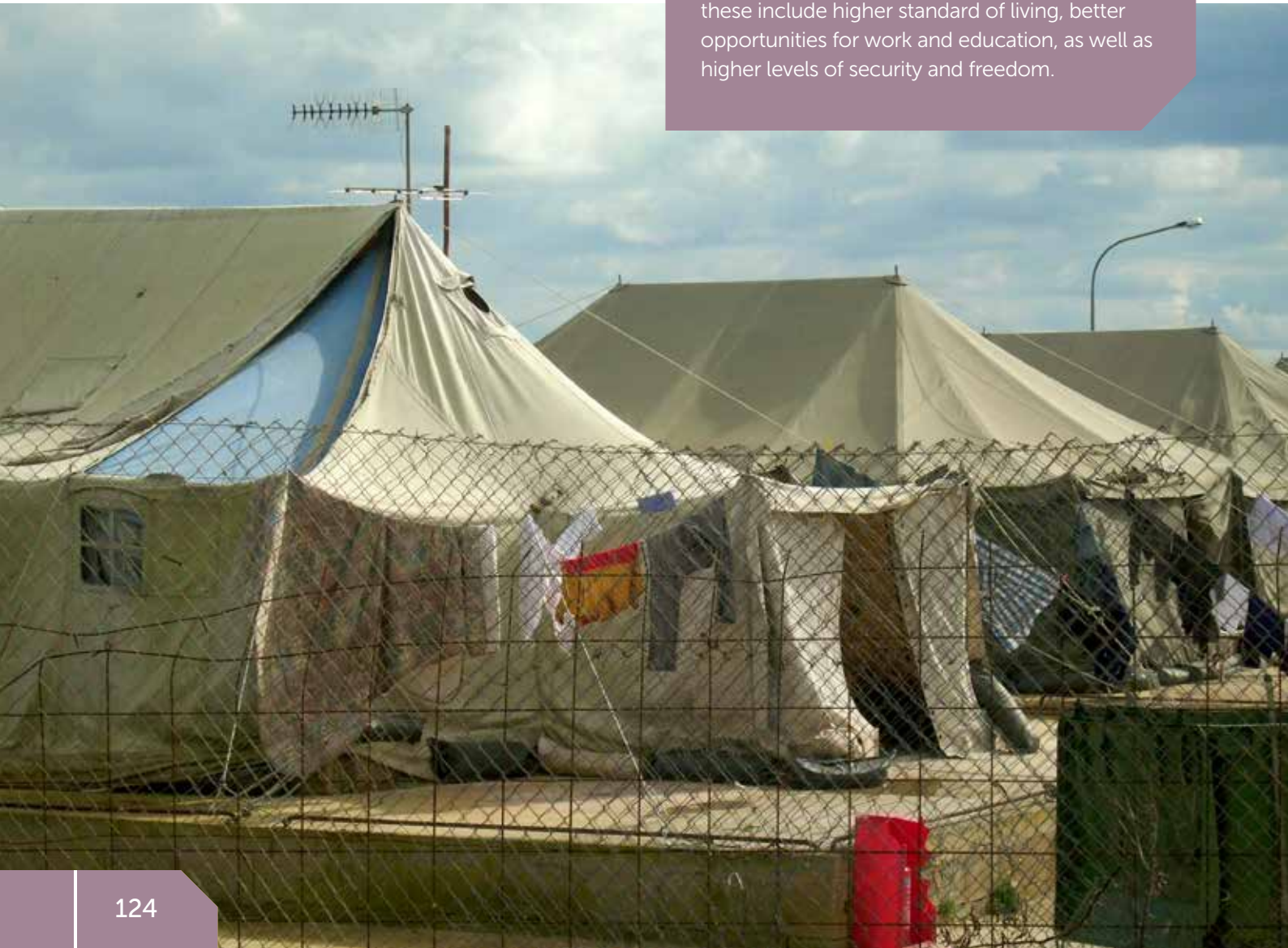
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all their belongings behind them after a nuclear reactor exploded.

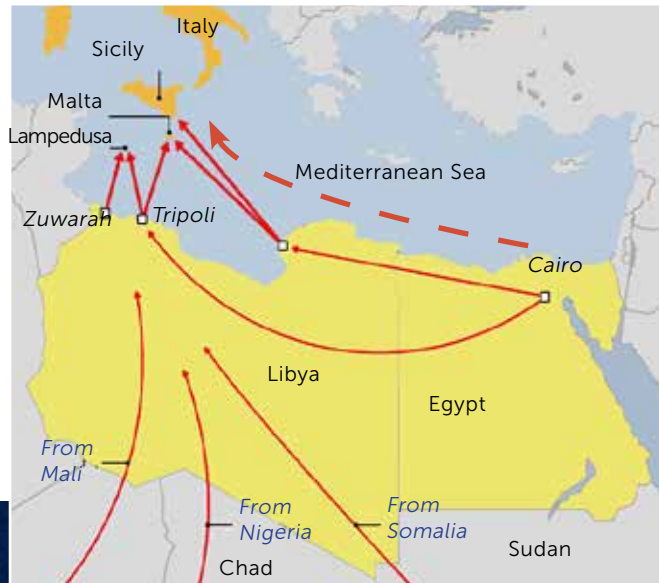
For many years thousands of Maltese emigrants went to Australia, Canada, the United Kingdom and the United States. They went there to find a better life for themselves and their families since in Malta there weren't enough jobs. However, nowadays, contrary to what happened in the past, Malta is receiving immigrants from poor countries of Africa. Many arrive on heavily laden boats after a long and dangerous journey and voyage across Africa and the Mediterranean. Their final aim would be to settle in Europe. It may be said that the European Union countries have become like a magnet for immigrants,



The push factors are those negative characteristics which induce a person to leave his country or place of residence. Among others one may mention conflict and political instability, religious persecution and lack of economic opportunities. On the other hand there may be positive factors which attract people to certain countries. Among others these include higher standard of living, better opportunities for work and education, as well as higher levels of security and freedom.



and each year thousands try their best to start a new life in one of these countries. The pull factors that attract these immigrants to Europe are many, however, the major ones are the economic opportunities, higher levels of sanitation and education, and above all respect for human rights.



During the voyage from Africa to Europe some migrants are shipwrecked and drown during storms. In 2011 more than 1,500 migrants died while crossing the Mediterranean. Between 2004 and 2014 more than 17,000 immigrants came to Malta. These come from Libya, tightly packed on small vessels after that they would have somehow crossed the Sahara desert. Many come from Somalia, Sudan, Liberia, Eritrea, Mali and other African countries. Many are those whose intention is to find work, while others would have fled wars and persecution. These last have a right to protection and are called refugees. Every year about 200,000 immigrants are granted refugee status by the European Union. Many others are sent back to their home countries or to the place through which they had travelled.



The Impact of Population Growth on the Land

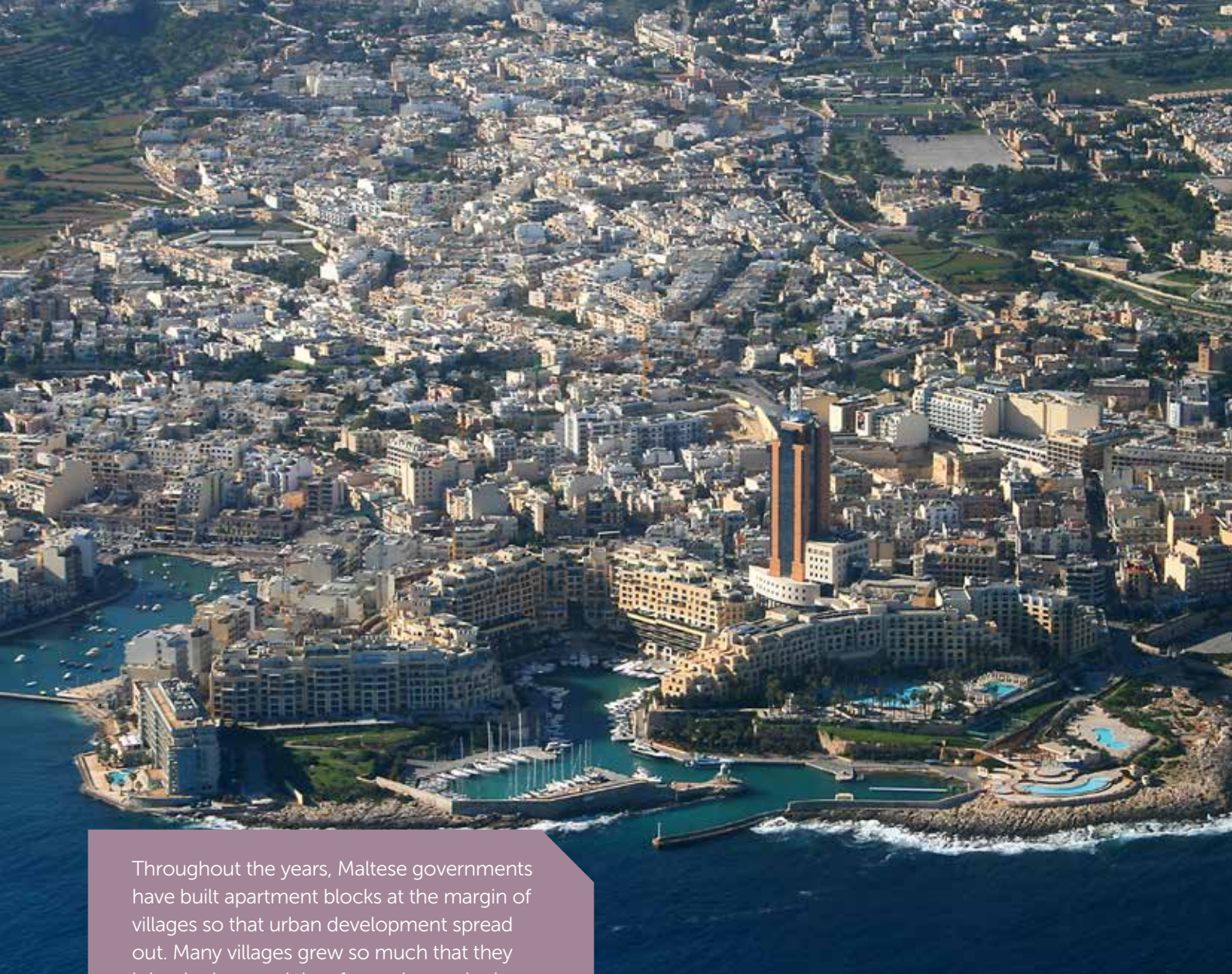
As has already been seen, Malta's population has grown substantially in the past few years. We also saw that with birth rate slightly higher than death rate, the Maltese population will keep on increasing in the coming years. Demographic projections forecast a population of 450,000 in 2025. This increase will continue to have an impact on the country's resources especially land-use.

The built-up area grew at a fast rate in a few years. In 1962 the built-up area covered 6% of Malta's territory. Nowadays buildings have engulfed more than 23% of the land and it has become extremely difficult to find an area without buildings.

During the past years the small villages with narrow winding streets have grown into small towns. This has happened because

The growth in population and industry such as tourism, have created a need for more houses, hotels, factories, places of entertainment and commercial premises.





Throughout the years, Maltese governments have built apartment blocks at the margin of villages so that urban development spread out. Many villages grew so much that they joined others and thus formed conurbations. This is what happened at Sliema, Gżira, St Julians, San Ġwann and Pembroke: they grew so much that it is difficult to make out where one ends and the other starts. Other new towns were developed such as Santa Lucija, Mtarfa and San Ġwann.

much private land has been given over to construction development.

Many permits were issued for the building of government housing estates in the outskirts of villages. Therefore much farmland that had been cultivated for centuries was taken for such projects and the villages spread outwards. Other new localities were built, such as Santa Lucija, San Ġwann, Pembroke and Mtarfa. Often housing spread out more than necessary since governments were lavishly issuing subsidies to anyone who intended to build a house. Farmland decreased due to the economic development of the country. Many factories and industrial estates were also built,





In the picture above we may see attractive and luxurious apartments with nice views that are attracting large numbers of Maltese and foreign residents. These new apartments are occupying virgin land while in Malta there are so many unoccupied buildings. The 2011 census has revealed that in the Maltese Islands there are 41,232 empty houses.

as well as new roads, places of entertainment, schools, hotels other large infrastructural projects which all took their toll on the land.

The spread of land which was given over to the construction of houses, roads, hotels and factories destroyed not only the farmland that had sustained whole generations, but also large tracts of the Maltese natural environments. Habitats of high ecological value were given over to building and thus much indigenous flora and fauna was lost. It is estimated that in the past few years Malta has lost 80 species of plants and 30

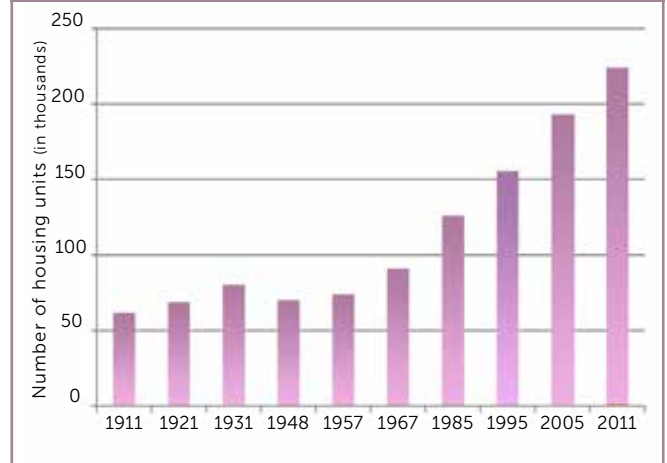


Due to Malta's small size and in order to save on farmland, high-rise flats are now being built. Such high buildings can limit urban spread since a large number of people can live in a restricted area.

animal species due to urban development. There was a high demand for building materials in Malta. For this reason many new quarries were opened and others were expanded for the procurement of softstone building blocks and

The graph clearly shows the increase in the number of buildings in the past few years. It is clear that between 1911 and 1967 the increase was slow but after 1967 it was very considerable. Since 1957 the number of housing units trebled in Malta. Some people have more than one house, since they own a second home, mostly used as a summer residence. These summer residences are mostly found in St Paul's Bay, Mellieħa, Birżebbuġa, Marsascula and Gozo, especially Marsalforn and Xlendi. One must also note that many old houses lie abandoned in the cores of the old cities of Malta.

Growth of housing units in Malta (1911 - 2011)



hardstone spalls and sand. Unfortunately many of these quarries are situated in areas of high ecological and scenic value; in valleys, near the coast or on the garigue, and hence the damage to the natural environment is immense.



1

Study carefully table A which shows the increase in world population since 1650.

- Draw a graph in order to show the increase in population for every 50 years.
- On the graph write the following labels in the correct place.

Slow increase
till 1930

population explosion
1950-2050
- By how much did the world population increase between
 - 1650 and 1800
 - 1930 and 1985
 - 1985 and 2011?
- In your own words explain how the rate of population growth increased over the years.
- What is the meaning of 'demographic explosion'? Why did it happen and what problems has it brought about?
- Study carefully table B which shows the Birth rate and Death rate of some countries.
 - In brief explain the words,
 - birth rate
 - death rate.
 - What are the necessary conditions for a population to increase?
 - Complete the table by filling in the third column. Ethiopia is done for you.

World population in select years	
Year	Population (in billions)
1650	0.5
1800	1.0
1930	2.0
1960	3.0
1975	4.0
1985	5.0
2000	6.0
2011	7.0
2025	8.0*
2050	9.5*

* projected

Country	Birth rate	Death rate	Natural increase
India	21	8	
Italy	9	10	
Bangladesh	20	6	
Ethiopia	34	8	26
UK	13	9	

- Sort the countries in table B according to natural increase. Start with the country with the highest natural increase.
- What difference is there between the population of Italy and all the other countries?
- Is there any correlation between the wealth of a country and its natural increase of population?

2

The world population is not evenly distributed. Some regions are densely populated while others are almost empty. Population distribution is affected by positive factors which attract people and negative factors which discourage people from settling there.

Write the following factors in the right column in the table.

fertile soil

drought

extensive forests and jungles

steep hills and mountains

poor soil

many factories

favourable climate

few jobs

very hot or cold temperatures

abundant water

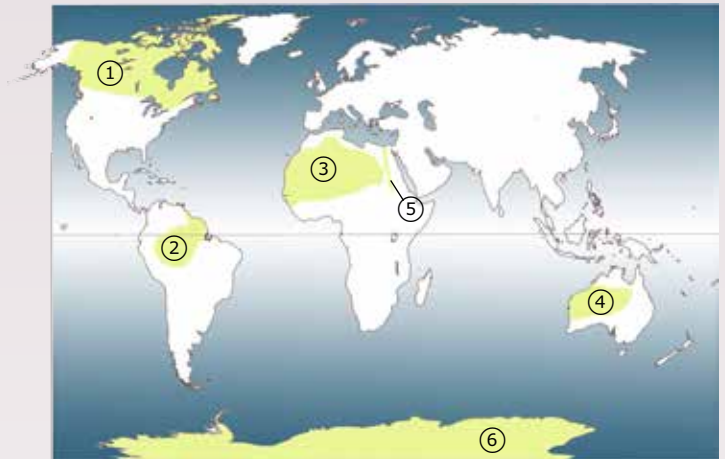
flat land and plains

Population distribution	
Positive factors	Negative factors

3

Look carefully at the world map.

- What country is marked 1?
- The country marked 1 is sparsely populated. Explain why.
- Name the countries marked 3 and 4. What is their common characteristic and why are they sparsely populated?
- Explain why country marked 2 also has a small population.
- Which country is marked 5? Is this country densely or sparsely populated?
- Mention and explain the factors that affect the distribution of population in country 5.
- Mention the negative factors that make country 6 sparsely populated.



- On the map mark two other countries that have a high population. Explain why this is so.

4

Look carefully at the Population Density Map of the World in page 117.

- What does population density mean? How is it calculated?
- Mention two countries that have a population density of over 500 people per km².
- Mention three countries that have a population density under 10 persons per km².
- Work out the population density of each country in the table on the right.

Country	Area (km ²)	Population (thousands)	Density (people/km ²)
Libya	1,759	6,154	
Malta	0.3	423	
Norway	304	5,084	
Bangladesh	130	163,694	

- Which two countries in the list have the highest population density?
- What problems may a high population density create for the country's people?

5

Look at graph in page 132 which shows the population structure of Malta in 2014.

- Write the following information in the right space on the graph.

The bars on the right show the female population

The bars on the left show the male population

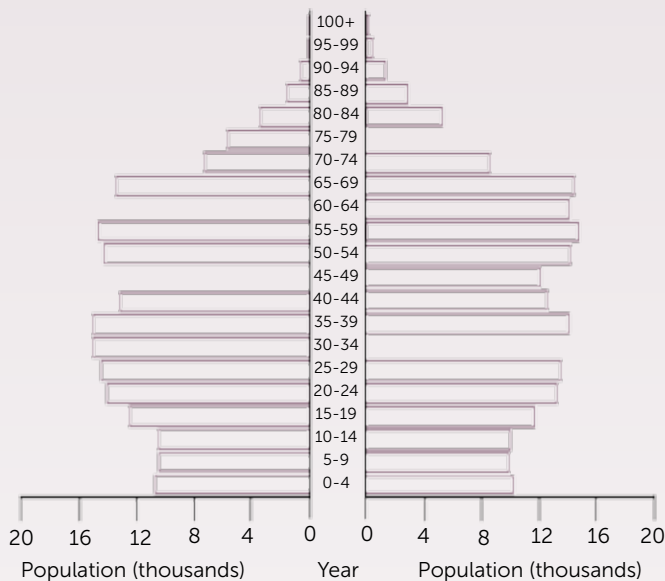
In the middle the 5-year age groups are shown

Here are given the totals or percentage of total population

- The graph has some missing bars. Complete it by using the following data:

Age	Females (thousands))	Males (thousands)
45 - 49	12	
75 - 79		8
60 - 64	14	
30 - 34		15

Malta 2014



- All men and women between the ages of 16 and 64 are considered economically active. On the graph draw the bars of these persons in green.
- On the same graph draw the bars of elderly dependent persons (64+) in blue and those of dependent children in red.
- Mark whether the information about the population of the Maltese Islands in the table below is true or false.

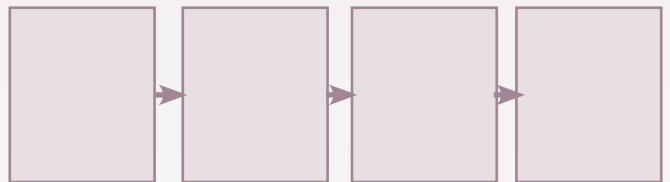
	True	False
In Malta there were more than 10,000 girls between the ages of 0 and 4 in 2014.		
In Malta there were 16,000 men between the ages of 55 and 59.		
More baby boys than baby girls are born.		
Between 1995 and 1999 more babies were born than in 2014.		
In 2014 there were 14,000 elderly men and women between the ages of 75 and 79.		
In Malta there are more elderly dependent people than dependent children.		
Men live longer than women.		
In future the number of elderly people will increase.		

- Re-write correctly the wrong sentences in the above exercise (e).

6

Same as in other countries, the population of elderly persons in the Maltese Islands is increasing.

- What will Malta need in order to meet the exigencies of the growing numbers of old people?
- Suggest three reasons why the Maltese are living longer than in olden times.
- Write the following statements in the correct labels to explain the causes and effects of a longer life expectancy.



- Better quality of life
- Longer life expectancy
- Better medical and health services
- More cleanliness and hygiene
- Higher financial expense on pensions and health care
- More elderly of over 65 years of age

7

- Fill in the last column in table in page 133 by writing the following descriptions near the correct type of migration.

for a few weeks or months

forced to leave due to some natural disaster

intending to find a better job and improve the financial position of the family

enters a country without the necessary permits

immigrates into a country intending to settle for good

fled his country because of war or persecution

Type of migration		Description
A	Temporary migration	
B	Permanent migration	
C	Refugee	
D	Economic migrant	
E	Illegal migrant	
F	Environmental migrant	

b. Read carefully these examples of different types of migration. In the second column write the letters from A to F according to the type of migration as described in the table on the left.

Many Moroccans enter Spain in secret to find work.	
A university student went abroad for a six-month work experience.	
A group of Syrians arrived in Malta after fleeing the civil war in their country.	
A Maltese doctor went to work in a London hospital since wages are higher there.	
Many people left everything behind when they fled during a volcanic eruption.	

8

Read the following personal story of a migrant who narrates his journey from Somalia to Europe.

My name is Ayan. After five days at sea we were saved by the Maltese Armed Forces. We were 750 people on board when we left, however, only 569 of us survived. Among those who did not make it there were women and children who could not cope with the harsh conditions on the boat.

Life is difficult in Somalia. There is famine and many people die of hunger. Water is scarce and potable water is only available to the few. There are also many infectious diseases such as hepatitis and rabies. Because of this the infant mortality rate is 102 babies per 1000 and many more die before they reach the age of 5. The life expectancy in my country is 51 years. One cannot live in peace since the civil war between Muslim groups and many tribes has been waging for years. There are few jobs and children stay only for three years at school. No wonder that many are illiterate. This is why I decided to come to Europe in order to find a job and live in peace.

I started from Mogadishu. We crossed all over Ethiopia and Sudan by truck and finally entered Libya. During this time I worked as a barber in order to gain some money.

I paid Euro 600 in Libya to find a place on the wooden

boat heading for Europe. There was no space at all on the boat. The boat's engine stopped frequently and meanwhile we were carried by the sea currents. Due to the heat and lack of food and water some people died and we buried them at sea. Finally the Armed Forces saved us from certain death.

Answer the following questions about Ayan.

- Where is Ayan from?
- Why did he decide to leave his country?
- On a map of Africa draw the probable route taken by Ayan. Write the name of the countries he crossed in order to arrive at Malta. Approximately how long was the journey from Mogadishu to the Mediterranean coast of Libya?
- What dangers might Ayan have faced while crossing,
 - North Africa
 - The Mediterranean Sea?
- Why do you think that Ayan and the other Africans decided to leave their home countries and cross over to Europe?
- Regarding these immigrants, must we:
 - keep them in our country,
 - send them to other European countries,
 - send them back to their home country?

Why do you think so?

9

In the past few years the built up area in Malta increased at a fast rate.

- Why did this occur?
- What were the positive effects of such a growth?
- Explain the damage caused to the Maltese countryside by this development.
- What measures are being taken, or should be taken, to control the urban spread?



The tourism industry has gone through many changes. Not only was there a substantial increase in the number of tourists but also in the variety of destinations. Nowadays tourists are seeking far away destinations where the environment and culture are totally different from home. Places that are mostly benefiting from this changing fashion are in developing countries like Kenya, Egypt, Sri Lanka, Mauritius and Thailand, among others. Most of these countries consider tourism as a motor for their economic development and for the raising of their people's quality of life.

Tourism

6

During the past few years the tourism industry has expanded at a fast rate and has now become the world's largest economic activity. It contributes for about 11% of the world's gross domestic product and is the largest source of investment and work globally. It is estimated that every year more than 700 million people go for a holiday abroad and this number is increasing.

As of any other economic activity, tourism depends very much on the natural resources of the place. Countries like Greece, Italy and the Mediterranean islands have a warm sunny climate and sandy beaches. The Alps offer scenic views of mountains, glaciers and lakes, while East African countries possess extensive plateaus inhabited by wild animals. These

natural resources offer the opportunity for whoever wishes to spend a period of leisure in an environment that is different from the usual one. Human resources are also needed for the growth of this industry. Thus for example a visitor to Paris or Rome will be impressed by the fine buildings, culture, history and entertainment spots.



The Tourism Industry in Malta

Tourism is the main motor of Malta's economy, so much so that thousands work in this sector. The economic system of all countries is divided into three main types. The first one is the primary sector, which involves the extraction of raw materials from the land or sea, and which includes farming, fishing and quarrying. The secondary sector employs thousands of persons in the factories where raw materials are processed to manufacture objects and new products. The third type is the tertiary sector by which workers give a service to the rest of society.

Due to developments in the tourism industry, the workers employed in the tertiary sector have increased in the past few years. About 10,000 people work directly in tourism, that is, in hotels and restaurants. Another 30,000 work in jobs indirectly related to tourism such as in museums, travel agencies, lidos, souvenirs, transport and other services.





Others like farmers and fishermen also profit indirectly from tourism since their products are also needed by the tourists. The Maltese Islands benefit from a larger number of tourists and the increase in the number of bed-nights spent in Malta. In fact tourism may be considered as a means of exportation of invisible services rather than visible goods.

In Malta tourism took an upturn from the early 1960s. Air transport was fast improving and travel became quicker and safer. Many more people were thus encouraged to travel. Moreover employees started to benefit from a number of days' paid leave of absence from work. These improvements in transport and working conditions made it easier for European tourists, especially British, to spend a holiday in the Maltese

Presently in the Maltese Islands there are more than 140 hotels with 40,000 beds and every year more than 1,800,000 tourists visit the Islands from all over the world.





Throughout the years many large and luxurious hotels were built, many of which by the coast and enjoying lovely views. These four or five star hotels offer many facilities, professional service and lovely environs conducive to a relaxing holiday for the tourist. In these hotels one can find outdoor and indoor heated swimming pools, restaurants and discotheques, air conditioned rooms with a view to the sea, tennis courts, gyms, spas, shopping centres and many other facilities. These hotels offer excellent service by employees who are trained at the Institute for Tourism Studies or at University.

Islands. The best attractions were always the guaranteed months of warm and sunny weather and the sandy beaches. In order to attract more tourists, many luxurious hotels and other facilities were built and along the years the number of tourists, especially from northern Europe, constantly increased.

Tourism triggered an improvement in Malta's infrastructure. One can mention the airport and the national air carrier Air Malta, which brings thousands of tourists to Malta every year. For the tourists who come by sea, a new sea terminal was also inaugurated. This terminal serves more than 500 thousand visitors a year, arriving by cruise liners. Many panoramic roads have been rebuilt and resurfaced while some bays have been replenished with sand or even enlarged. Moreover, many historical sites have been





The number of visitors to Malta by sea is increasing. In fact the Mediterranean is the region experiencing the highest increase in this kind of tourism after the Caribbean. This is why modern facilities have been built at Grand Harbour so that ships can easily berth there. A new sea terminal has also been built and Malta can now become the centre for cruises in the Mediterranean, both as a starting point and final destination.

preserved and restored. Here one can mention the restoration carried out on the fortifications of Malta, the canopies erected for the protection of Ħaġar Qim and Mnajdra Neolithic temples and the restoration of Hypogeum underground neolithic temple at Ħal Saflieni in Paola. The good maintenance and safeguard of such historical sites are essential so that both Maltese and tourists will enjoy and enhance their visit.



Along the years many attempts have been made so that the local tourist market will no longer be dependent on the British tourist. Great efforts were made to enhance and upgrade the product offered to tourists since competition was being felt from neighbouring countries and others further away which have now become more accessible through improved transport. This was also done by better marketing of Malta in many countries so that it became better known among prospective holiday makers. The information about Malta especially that given on the Malta Tourism Authority website VisitMalta, helps attract many more tourists to Malta. The dependence on the British market is also diminishing thanks to the expansion of air routes both by Air Malta and low cost air companies to many other different destinations. These low cost air companies are offering cheap



flights that help in spreading tourist arrivals throughout the year. This will also lead to less crowding by tourists in summer months. Malta's tourist attractions are no longer exclusively sun, sand and sea, but efforts have been made to promote the cultural and historical heritage of the Maltese Islands. Apart from this scuba diving, conferencing, sporting activities and English language schools have also been developed.



Tourism and the Environment

Same as for other sectors of the economy, the tourism industry causes considerable levels of pollution and uses substantial amounts of natural resources. In fact tourism leaves a negative effects and added pressure on the environmental resources, the infrastructure, the quality of life and our way of life.

Mass tourism is the culprit of all this. Although profitable for the economy since creating many jobs, such mass tourism attracts a large number of tourists in a concentrated area, and is therefore harmful to the environment. Mass tourism adds pressure on water resources, increases the amount of waste and sewerage generated, increases the risk of pollution in bays and the sea and creates a demand for virgin land. In other words, mass tourism increases environmental damage and is not sustainable.

The number of tourists who visit Malta yearly is four times as many as the local resident population. One must realise that most of them visit Malta in summer and they are not evenly spread throughout the year. Therefore the high density of population in summer as well as the small size of the Islands is giving rise to problems of infrastructure especially the provision of electricity, water, sewerage and waste collection. There is also increase noise pollution especially in areas such as Buġibba, Sliema, St Julians and Paceville.



Perhaps the most sought after environmental resource by the tourism industry is coastal land that is endowed with nice views. Throughout the years the coast has been developed for tourism and more than 5% has been lost since it is now occupied by hotels, lidos, apartment for hire and other facilities. Panoramic coastal roads have also been constructed and by their side many apartments with a sea-view.

Moreover some natural habitats like the garigue, clay slopes, saltmarshes and sand dunes have become seriously threatened by this touristic coastal development. If these ecosystems are destroyed, the flora and fauna therein will become extinct.

Mass tourism is also not sustainable since it increases pressure on our social, cultural and environmental resources. Alternatively sustainable tourism works hand in hand with the natural environment, the community and culture of the locality thus being of mutual benefit. Presently most tourists seek high quality destinations, where they feel welcome by the local people who have the natural environment at heart.





This is the reason why Mellieħa was awarded the title of European City for Excellence, by promoting historical, cultural and environmental tourism. The aim was for tourists to appreciate the historical, cultural and environmental beauty of the locality and in some instances to give a helping hand in the daily chores of the farmers. The product offered included local country walks, visits to nature reserves, and experience in agro-tourism where the tourists were exposed to the pristine countryside. The archaeological and historical sites of the locality were restored, thus further enhancing the tourists' appreciation of Mellieħa. Traditional festivals were organised, thus varying the touristic product.

Agrotourism is fast becoming more popular and is also being introduced in the Maltese Islands. The tourist experiences the daily and traditional way of life of the Maltese and sometimes also helps the farmer at work. The activities include the harvest or crushing of olives or grapes, a walk in the countryside, producing cheese lets from fresh milk, picking capers or other agricultural tasks. This type of tourism help keep the traditions of the rural community and is thus sustainable since it does not harm the environment. It also helps in cleaning the countryside and in the laying out of footpaths by the fields and in valleys so that tourists may enjoy their natural beauty and appreciate their biodiversity.

Buġibba and Qawra – A Tourist Resort

Until a few years ago St Paul's Bay was just a small fishing village. In 1961, its population was only 3,000. This increased just a little bit in summer since some Maltese people owned or hired a summer residence there. They used to spend summer enjoying the quiet and beautiful views of the environs.

Things have radically changed and Buġibba is nowadays one of the most popular tourist resorts in Malta. Each year travel agents, mostly the British ones, bring along thousands of tourists to Buġibba. The organised holiday is all inclusive, with the flights, board, lodging and other activities all paid for in advance.

Buġibba has much to offer to tourists. Summer months are hot and dry. Nowhere can one find such beautiful views with the fine coast by the blue sea, St Paul's Islands and the colourful Maltese fishing boats.





Many hotels and apartments have been built during the past 50 years and the area from Salina to St Paul's Bay is a continuous stretch of buildings. Extensive patches of coast have been covered in concrete to make space for swimming pools, lidos, restaurants, pizza houses and other tourist facilities. The hotels themselves also offer many services and organise activities



most of which related to the sea. While at Bugibba, tourists may learn scuba diving, hire a canoe-boat or windsurf, or cruise around the coast in a traditional Maltese boat or luzzu. Many spend hours sun-bathing or swimming in the clear sea. The shops, restaurants, bars, pubs, clubs and casinos keep open, sometimes till the early hours of the morning, providing music and dancing.

Negative and beneficial impacts

Many tourists are attracted to St Paul's Bay, Bugibba and Qawra with their panoramic views and their Mediterranean climate. In order to have a comfortable and relaxing holiday tourists seek the best facilities and service available. They pretend to find luxurious hotels, clean sea, parking spaces, restaurants serving good food and other high quality services. The increasing number of tourists who came to these places necessitated the provision of modern facilities. This accounts for the rapid expansion of hotels, aparthotels and fully furnished flats in the Bugibba, and later Qawra areas, starting from the late 1960s. The construction industry profited too from this development, so much so that more people were employed therein. Many more people were employed in the tourist sector, especially summer workers. The tourist facilities were expanded especially along the coast. But the infrastructure gave way at



this rapid development. The sewerage system could not cope with such a large number of tourists and would frequently overflow into the sea. Water and power cuts became frequent and the roads at Bugibba were filled with traffic, waste and noise. The loud volume of music could be heard till the early hours of the morning. Whatever had attracted tourists to Bugibba in the first place deteriorated and these shied away from Malta to find better destinations. Between 1980 and 1984 the number of tourists in this area fluctuated by almost one half.





In the past few years both the governments and hoteliers have tried hard to improve tourism in the Bugibba and Qawra areas. New roads were opened leading into the resort, infrastructure was improved so that water and electricity supply are regular and sewerage keeps up with the flow. In order to attract more tourists, many hotels were refurbished and upgraded to four- or five-star categories, while some others were knocked down completely and rebuilt.



The touristic product improved and the resort was embellished; the panoramic pavement around the coast was resurfaced, gardens were replanted, facilities for divers were laid out, as well as a new sandy beach near to the hotels. A large square was fashioned out of an empty space, a large fish aquarium was built, many more trees were planted along the roads and more pedestrian areas were established. Such projects helped in the rejuvenation of St Paul's Bay, Bugibba and Qawra resort to become once again a high quality tourist area.

1

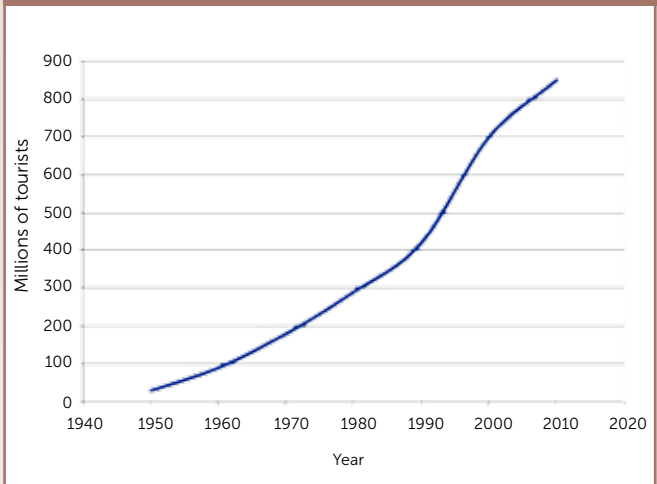
Look carefully at the two graphs on the right.

- a. Which of the following statements is correct? Mark (✓) near the right ones.

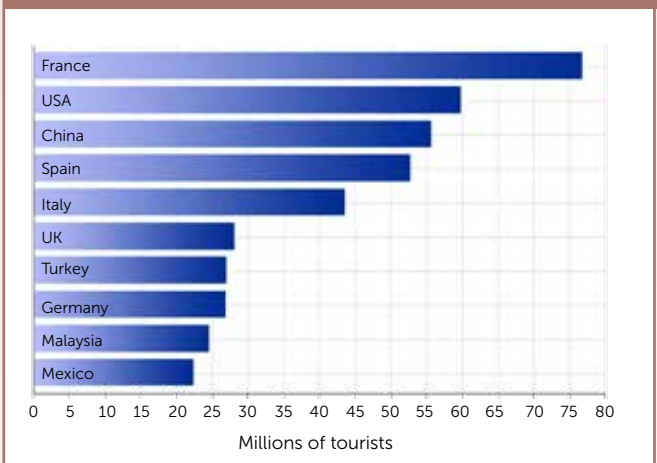
The number of tourist is increasing in time.	<input type="checkbox"/>
The number of persons who go for a holiday is decreasing.	<input type="checkbox"/>
In 2005 there were more than 400 million people who took a holiday abroad.	<input type="checkbox"/>
Between 1970 and 2010 the number of tourists increased.	<input type="checkbox"/>

- b. Which country is most popular with tourists?
 c. In which continent is it?
 d. How many tourists went there in 2010?
 e. Mention some tourist attractions in this country.
 f. How many of the 10 most popular countries with tourists are in Europe?
 g. By using the internet, find out why so many tourists visit Malaysia.
 h. The graphs show that many people go on holiday. Explain how each of the following points has helped in this rise.
- advances in transportation
 - better working conditions
 - better facilities (e.g. hotels) and services for tourists
 - better advertising
 - increase in the number of senior citizens in developed countries
 - better standard of living

Increase in the number of tourists 1950-2010



The 10 most popular countries with tourists – 2010



2

Answer the following questions with the help of the table at right.

- a. How many tourists came to Malta in 2012?
 b. In 1963 less than 30,000 tourists came to the Maltese Islands. Why has the number of tourists increased so much since then?
 c. Where did most tourists come from? What percentage of all tourists is this?
 d. Why do you think that so many tourists come to Malta from that country?
 e. Is a good thing or a bad thing having so many tourists coming from just one country? Why do you think so?
 f. How many Italian tourists came in 2012? Give one reason why so many tourists came from Italy?
 g. With which economic sector does tourism form part? Why is this so?

Number of Tourists in Malta 2010-2012

	2010	2011	2012
Austria	19,908	19,536	19,779
Belgium	24,296	31,594	27,360
France	86,516	103,332	107,530
Germany	128,193	133,930	137,214
Ireland	25,186	26,881	27,665
Italy	219,663	201,253	201,790
Netherlands	33,425	38,892	39,351
Russia	22,727	24,261	31,726
Scandinavia	92,881	93,899	97,203
Spain	67,842	62,882	60,389
Switzerland	21,522	25,039	25,771
UK	415,099	437,686	440,316
USA	16,418	16,543	18,153
Others	167,164	198,775	209,726
Total	1,338,841	1,414,503	1,443,973

3

A survey was held with a number of tourists before they left Malta in order to find out what attracted them to Malta and what they liked most during their stay. These were their responses.

clear and clean blue sea and sandy beaches

museums, historic towns and megalithic temples

restaurants, bars and discotheques

friendly people who can speak English

traditional feasts

warm climate, sunny weather and rainless summer

water sport and scuba diving

lovely countryside and coast

to study and learn English

quiet villages

beautiful churches

hotels endowed with most facilities including spas

Write a paragraph about Malta's attractions for tourists using their own responses to the above study.

Give a list of activities or places that are popular with tourists and explain how these can be improved. Find pictures of places and activities that are popular with tourists and under each write a note of information.

4

In 2012 Malta's income from tourism accrued to Euro 1,344,963,000. The photos on the right show some jobs directly or indirectly dependent on the tourism industry.

- Picture A shows a hotel which serves tourists. Mention five jobs that one finds in hotels.
- Picture B shows taxis waiting to carry tourists. Mention other workers employed in transport, which also depend on tourism.
- Picture C shows locally produced souvenirs. Mention some different types of souvenirs which tourists buy in Malta.
- Why does the farmer who grows many food products (picture D) also profits by the tourism industry? Mention some other workers who like the farmer indirectly benefit from tourism.
- Why is the money gained from tourism called 'invisible income'?



- Thanks to the tourism industry the infrastructure of the Maltese Islands was improved. The restoration of historical places was also furthered. Both tourists and Maltese benefit from these. Mention some projects carried out during the past years by which the touristic product was improved.

5

During a conference held in Malta a few days ago, some problems caused by tourism were mentioned. Read what some delegates who attended the conference had to say.

- What damage is this industry causing:
 - to people
 - to the environment?
- Choose three points raised in this conference and say what can be done to mitigate these problems.
- What is 'mass tourism'? Why is this considered an unsustainable form of tourism?
- What does agro-tourism mean? Mention some activities which can be included in this type of tourism.

much noise until late at night

waste of scarce water

new hotels right on the coast

building of lidos on the coast and sand

crowded beaches

construction of high apartments opposite the promenade

crowded promenades

an upsurge of waste which is difficult to dispose of

large volume of traffic in tourist centres and lack of parking lots

destruction of natural environments for touristic development

A

abiotic factor

fattur abijotiku

All the non-living features of an ecosystem.

acid rain

xita aċiduza

Rain mixed with toxic gases originating from human activities that generate sulphur dioxide and nitrous oxide. This rain kills trees and fish in lakes, weakens the soil and quickens the rate of weathering.

active volcano

vulkan attiv/ħaj

A volcano which erupts regularly.

afforestation

afforestazzjoni

The planting of many trees in an area to form a wood or forest.

agriculture/farming

agrikultura/biedja

The cultivation of the fields and animal husbandry farmers.

agro-tourism

agroturiżmu

Farm which welcomes tourists for a working holiday.

alfalfa

alfalfa

A crop raised for fodder.

algae

algi

Water plants, mostly microscopic. They are very common at sea, in water and in humid places.

alien species

speċi aljena

A creature which is introduced from a foreign country and which can harm the present ecological balance. Two alien species that were introduced in Malta were the chameleon and the prickly pear cactus.

alluvial soil

ħamrija alluvjali

Fine and fertile soil derived from silt deposited by rivers.

altitude

altitudni

The height of a place above sea level.

amphibian

amfibju

A creature which can live both on land and in the water, e.g. the frog.

anaconda

anakonda

The largest and longest snake in the world that lives in the Amazon rainforest.

anaerobic digestion

digestjoni anerobika

The process that takes place in an oxygen-free space by which biodegradable material is turned into biogas.

anemometer

anemometru

An instrument which measures the speed of the wind.

animal fodder

ġwież

Animal food.

animal manure

demel

Dry animal waste that is mixed with soil for fertility.

annual plant

pjanta annwali

A plant which has a life span of only one year.

aquaculture

akkwakultura

The raising of fish, such as seabream or seabass, in large tanks or pens either on land or off the coast.

aqueduct

akkwadott

A channel which may be laid underground or built on arches that carries water from one place to another. In Malta the aqueduct built by Grand Master Alof de Wignacourt brought water from Rabat to Valletta.

arable farmer

bidwi

A person who cultivates the fields.

arid

aridu

A place which suffers from drought.

atmosphere

atmosfera

The gaseous layer which covers the earth, made up of a mixture of nitrogen, oxygen, carbon dioxide, water vapour and other gases.

atmospheric pressure

pressjoni tal-arja

The weight of the atmosphere, measured by a barometer in millibars (hectopascals).

B

bacteria

batterju

A microscopic organism, present in various environments, which breaks up and decomposes organic matter.

barometer

barometru

The instrument that measures atmospheric pressure.

bay

bajja

An inlet along the coast.

Beaufort scale

skala Beaufort

A scale from 0 (perfect calm) to 12 (great storm) which measures the speed of the wind in grades.

biodegradable

bijodegradabbli

A material which decomposes by natural means, such as food, paper and leaves.

biodiversity

bijodiversità

The variety of different species which live in a particular environment.

biofuel

bijofjuwil

An alternative fuel made out of oil extract of sunflower, soyabean, maize and sugar cane.

biogas

bijogass

Gas which is emitted by decomposing organic waste.

biomass

bijomassa

Organic matter like animal dung, waste, maize and sugar cane which store light energy from the sun in chemical form. This material can be refined into fuel or gas that can be used to generate energy.

biome

bijoma

A very large global ecosystem such as the tropical rainforest biome.

biotechnology

bijoteknoloġija

The processes by which seeds, crops and animals are modified. In this way seeds which can grow quickly and sturdier animals have been developed.

biotic factor

fattur bijotiku

A living thing, such as an animal or plant, that influences or affects an ecosystem.

bird sanctuary

santwarju tal-għasafar

A place where birds are protected from hunting.

birth rate

rata tat-twelid

The number of babies born in a country in a given year as per thousand of total population.

blood rain

xita tal-ħamrija

Rain which leaves reddish dust on surfaces since originating from the desert areas.

blowhole

minfes

A vertical fissure or crack in the coast through which seawater rushes through like a water spout when rough.

blue clay

tafal

Soft rock coloured light grey which darkens when wetted. It breaks easily and when wet slides down slopes covering the underlying layers of rock. It is the only impermeable rock in the Maltese Islands. Consequently many natural springs flow out of this layer.

borehole

spiera

A deep hole in the rock purposely dug to pump up water.

boulder scree

tirxa

A large rock that collpses from the cliff face and rolls down the slope to sea.

brackish water

ilam salmastru

Slightly salty water, not quite as seawater.

breach (in rubble wall)

selħa

Parts of a rubble wall that have collapsed mostly because of heavy rain and lack of proper maintenance.

bromeliad

bromeliad

A plant which has large and sturdy leaves as well as beautiful flowers, growing in the tropical rainforest of South America, such as the pineapple.

bulb

basla

Part of the root of a plant where nutrients are stored for annual consumption by the plant.

buttress roots

għerq riffied

Large thick roots, typical of ficus Bengalisensis, that develop high above ground and grow downwards to provide added support for the large tree.

C

cactus

kaktus

A thorny plant often found in arid region. It stores water in its trunk. The thorns keep animals from eating the plant.

calcareous

kalkarju

Rock that contains a high percentage of lime or calcium carbonate, like globigerina.

cape/headland

ras ta' art

A promontory or narrow land jutting out at sea such as Ras il-Qarraba or Ras id-Dawwara.

carbon dioxide

diossidu tal-karbonju

A colourless, odorless gas (CO₂) present in the atmosphere and produced mostly from respiration but also through combustion of organic matter and minerals. It is a greenhouse gas.

carbon footprint

marka tal-karbonju

The average amount of greenhouse gases such as carbon dioxide that a person or building produces and emits every year into the atmosphere.

carbonate raw soil

ħamrija tal-bajjad

A whitish soil derived from the blue clay layer. It includes calcium carbonate.

cargo/reight

merkanzija

Loads of products for transport or sale.

carnivore

karnivoru

Animals that eat meat.

cattle pen

maqjel

A place where cows are reared.

cave

għar

A natural cavity or hollow in the ground such as those at Ghar Dalam or Ghar Lapsi near the sea.

census

ċensiment

The count of people and other important social and economic indicators of a country, usually done every ten years in most countries.

cereal

ċereali

Edible seeds like wheat, barley, maize and rice.

channel/strait

fliegu

A narrow stretch of sea which divides two islands or countries, such as North Comino Channel between Gozo and Comino.

chlorine

klorin

A substance which is added to water to render it bacteriologically pure.

chlorofluorocarbon

kloroflorokarbons

Artificially produced gas made out of chlorine, fluorine and carbon which were until recently used in the production of spray-bottles and refrigeration. This gas is now prohibited since it damages the ozone layer.

cholera

kolera

An infectuous disease which comes from drinking contaminated water. The most obvious symptoms include fever and diarrhoea which cause dehydration and death.

cirrocumulus clouds

šħaba ċirrukumulo

A high feathery cloud, usually preceding a warm front of a depression.

cistern

ġiebjja

A wide and deep store for irrigation water.

citrus

ċitru

Slightly acidic fruit including oranges, lemons and mandarines. The citrus fruit trees are evergreen. Their leaves are shiny dark green and quite fragrant when crushed. Citrus trees bloom in March and April.

city

belt

A very large settlement where hundreds of thousands of people live. Some cities are called so for historical reasons.

civic amenity site

ċentru għall-iskart goff

A place where one can dispose of large unwanted objects. These are later recycled or properly destroyed.

clay slopes

żurżieqa tat-tafal

Sloping part of a cliff where the clay outcrop has slid down and covered the underlying outcrop rock giving the impression that the whole slope is clayey.

cliff

sies

High perpendicular rock rising from the sea.

climate

klima

The average weather conditions for a long time.

climate change

bidla fil-klima

A change in the average global temperature due to natural causes such as a volcanic eruption or to human activities that increase greenhouse gases in the atmosphere.

cloud

sħaba

Water-vapour that has condensed into buoyant tiny water-droplets at different altitudes. When loaded it becomes heavy and rain follows.

coast

kosta

A land immediately close to sea.

cold front

front kiesaħ

A front of cold air pushing into a mass of warm air (warm sector of depression). This front is characterised by the sudden decrease in temperature, wind that veers from south-south west to north-west and sudden short thunderstorm.

collision margin/boundary

xifer ta'kollizjoni

The edge of two plate margins that are moving towards each other. When they collide, they press each other upward to form high mountains such as the Himalaya and the Alps.

compass

boxxla

An instrument which shows directions, especially the magnetic north.

compost

terriċċju

Fine organic material composed of leaves, tree stems, tree branches and rotten fruit which fertilises the soil.

condensation

kondensazzjoni

When water changes its state from water vapour gas to liquid droplets in clouds.

conglomerate

konglomerat

Sedimentary rock made up of a mixture of pebbles, particles and dust.

conservation

konservazzjoni

The protection and care of various environments.

conservative margin/boundary

xifer konservattiv

The edge of two tectonic plates that are moving past each other. The crust is neither being created nor destroyed.

constructive margin/boundary

xifer kostruttiv

The edge of two tectonic plates that are moving away from each other. New crust is thus being formed by the magma which is outflowing from the mantle.

consumer

konsumatur

The client who buys products or services.

continent

kontinent

One of the large land-masses in the world such as Europe, Asia, Africa, America and Australia.

continental shelf

blata kontinentali

The seabed of less than 200 metres deep, next to the coast. On it a large number of creatures live since the rays of the sun penetrate to the bed and photosynthesis can take place.

conurbation

konurbazzjoni

A very large populated area usually developed when several cities grew so much as to join each other.

convection currents

kurrent konvezzjonali

Currents of magma flowing under the earth's crust caused by the great heat present in the mantle and which are strong enough to move and carry the tectonic plates above them.

convectonal rainfall

xita konvezzjonali

Rain which results from hot moist currents rising, cooling and condensing.

coral

qroll

Creatures having calcareous cover that live in shallow warm seas. Often these aggregate to form coralline reefs.

coralline limestone

blat tal-qawwi

The topmost, being youngest, and lowermost, being oldest, sedimentary hard rock layers of the Maltese Islands, usually giving rise to karstic or garigue environments. This rock is mostly composed of the conglomerated remains of marine organisms.

crater

bokka ta' vulkan

Deep hole on the surface of a volcano from where lava, ash and cinder are emitted during an eruption.

crop rotation

newba

Arable farming by which different crops are cultivated every season in the same field.

crops

għelejjel

The edible plants which the farmer grows in the fields.

crustacean

krustaċju

Sea creatures like prawns and crabs. Some others live in freshwater, brackish water or even in humid places (like the slug).

cumulonimbus clouds

sħaba kumulonimbu

A very high towering cloud, the result of strong convectonal currents. It often produces thunderstormy weather.

cyclonic/frontal rainfall

xita ċiklonika

Also called frontal rain, is the result of the meeting of a warm and a cold mass of air in a front. The warm air is forced to rise and its moisture is condensed when cooled with height.

D**dam**

digà/milqgħqat

A high wall built across a river or watercourse so that water is stored, floods are controlled and hydro-electric power generated. It can also be a wall built in a valley across a watercourse to retain the waters behind it such as can be found at Qlejgħa Valley.

death rate

rata tal-mewt

The number of people who die in a given country every year as per thousand of total population.

debris

terrapien

Material such as construction waste and soil which is usually dumped as part of the foundations of a house.

deciduous tree

sigra ħofrija

Tree or bush which sheds its leaves in autumn.

deforestation

deforestazzjoni

The cutting of trees in woods and forests so that the land may be used for other purposes.

delta

delta

A triangular region at the mouth of a river, made up of silt that had been carried and deposited by the same.

demography

demografija

The study of human population.

dense population

post iffullat bin-nies

A place or country where many people live in a relatively small area.

deposition

depożizzjoni

Silt that had been weathered, transported and deposited by means of running water, glaciers, waves and wind.

desalination

desalinazzjoni

A process by which seawater is turned into potable freshwater.

desert

deżert

A large and dry expanse of land upon which few creatures can live. Some deserts like the Sahara are mostly made up of fine sand deposited in high sand dunes.

desertification

deżertifikazzjoni

The process by which a region becomes arid with characteristics of a desert.

destructive margin/boundary

xifer distruttiv

The edge of two tectonic plates that are moving towards each other. As they press against each other one of the plates will slide under the other and be destroyed in the mantle.

developed country

pajjiz żviluppat

An industrialised country where most people enjoy a good standard of living.

developing country

pajjiz li qed jiżviluppa

A country that is industrialising and increasing its standard of living.

dew

nida

Tiny water droplets usually seen at dawn. It is the result of water vapour turning into droplets when it comes into contact with a cool surface.

dockyard/shipyard

tarzna

A seaside industrial zone furnished with docks, cranes, workshops and other equipment for the building and repair of ships.

doline

dolina

A deep hole formed by the collapse of a cave such as the one at Maqluba in Qrendi.

dormant volcano

vulkan rieqed/inattiv

A volcano that shows no sign of activity, but which still can suddenly erupt in future.

drip irrigation

tisqija bil-qatra

A way of watering the crops by means of pipes punctured near to the roots of the plants so that the water drips slowly one drop at a time.

drought

nixfa

A long rainless period, also resulting in the drying up of rivers.

dumping place/dumpyard

radam

Places such as abandoned quarries where clean construction waste is thrown away.

dust of globigerina limestone

xaħx

Fine dust that is a by-product of the quarrying and cutting of lower globigerina limestone (softstone). The stone masons mix it with a little cement and water to place in between the building stones.

E

earth tremor

thezziza sismika

An earth movement which shakes the ground.
earth's crust

qoxra tad-dinja

The solid layer of hard rock at the surface of the earth.

earthquake

terremot

An earth tremor that can cause much damage.

ecosystem

ekosistema

The interaction between a community of organisms and their environment.

emergents

siġra emergenti

A very high tree, characteristic of the tropical rainforest, which successfully competes with other trees for sunlight.

emigrant

emigrant

A person who settles in another country, usually to find a job.

endangered species

speċi mhedda

A kind of animal or plant that has become so rare that it may become totally extinct.

endemic

endemiku

A species which is only found in a particular place and nowhere else in the world. For example the fresh-water crab is endemic for Malta since it is only found there.

energy saving bulb

bozza tiffranka l-enerġija

A light bulb which uses only 20% energy of a normal bulb. It also lasts much longer than a traditional filament bulb.

engineered landfill

mizbla kkontrollata

A place where the waste is dumped in an efficient way so as not to harm the environment. In such a place the liquid effluent will not enter the underlying rock or the sea and the gases are used for energy production.

environment

ambjent

The natural place and the surrounding areas where people, plants and animals live.

environmental refugee

refugjat ambjentali

A person who flees his country due to a natural disaster.

epicentre

epicentru

The place on the surface of the earth closest to the focal point of an earthquake and where the tremor is strongest.

epidemic

epidemija

An infectious disease that spreads quickly from one place to another.

epoch

epoka

A long stretch of time in the geological history of the world. We are now living in the Holocene epoch of the Quaternary period.

Equator

Ekwatur

Parallel of latitude 0°, which runs around the globe at its widest horizontally. It is a great circle of about 40,000 km and separates the northern from the southern hemispheres.

erosion

erożjoni

The natural process by which rock is broken and carried away. This is done by means of seawaves, wind, rivers and ice. The rock is weathered, transported by these agents and later deposited in another place.

estuary

estwarju

A wide inlet where a river drains into the sea.

eutrophication

ewtrofikazzjoni

The process by which algae proliferate in polluted waters, decompose and absorb all the oxygen. This happens mostly when chemical substances like nitrates are used in farming.

evaporation

evaporazzjoni

The process by which water turns to gas by heating.

exportation

esportazzjoni

When products or merchandise are sold in a foreign country.

extensive farming

biedja estensiva

Farming that is carried out on very large fields.

extinct

estint

Anything which no longer exists since totally destroyed.

extinct volcano

vulkan mejjet/estint

A volcano which has not erupted for the past two thousand years at least.

extrusive volcanic rock

blat ignijuż estrużiv

Magma which is emitted by the volcano and solidifies into lava or basalt.

F

factory

fabbrika

A large workshop where products are manufactured or processed, usually by extensive use of machines.

family planning

pjanar tal-familja

A way of having children by choice rather than by chance.

farmstead

razzett

A large country house where the farmer and his family used to live on the first storey while the animals lived on the groundfloor sties and barns.

fauna

fawna

All animal species.

fern

felċa

Any seedless, nonflowering vascular plant of tropical to temperate regions, characterised by true roots produced from a rhizome, triangular fronds that uncoil upward and reproduction by spores.

fertiliser

fertilizzant artifiċjali

Chemicals that are mixed with soil by the farmer so that it produces better and more abundant crops. Fertilisers are useful in order to replenish the soil with the nutrients which had been used up by the plants or crops.

fish market**pixkerija**

The market where the fisherman sells his fish, usually by auction.

fishing float**kannizzata**

A fishing method used by Maltese fishermen to catch dolphin fish and pilot fish. It is made up of pieces of polystyrene and cork attached to palm leaves and anchored to the seabed by means of stones. The fish shelter under the float and are rounded up by means of a seine net.

fishing gear**rkaptu**

All the implements used by the fishermen such as nets, long-lines, traps, cork pieces and flags.

fishing pot**nassa**

A fishing gear made of cane or metal wire mostly used to catch bogue and pilot-fish. Their shape is like that of a pear and they are dropped into the sea with bait inside them. Fish enter the pot for the bait but are unable to find their way back. There are other larger pots that are lowered without bait on to the seabed to catch picarel. Other special pots are used to catch octopus.

fishing vessel**skuna tas-sajd**

Any large seacraft used for fishing.

fission**fissjoni**

The breaking up of uranium atoms in a nuclear reactor to produce much energy.

fissure**dagħbien**

A very steep and deep crack in the rock.

flash floods**għargħar tal-ilma qerriedi**

Occur after a great storm when heavy rain falls. Many places, more especially urban areas, are covered by water.

flat land**wita**

A stretch of flat country.

floodplain**pjanura tal-għargħar**

Flat country on each side of a river, mostly composed of alluvial soil.

floods**għargħar**

This happens when the land is covered by water especially overflowing rivers. Floods may also occur when onshore high winds push waves ashore, during a hurricane or tsunami and after ice melts in Spring.

flora**flora**

All plant species.

focal point**punt fokali**

The precise underground place where the rock movement which causes an earthquake takes place.

fog

ċpar

Low cloud as a result of condensation into tiny droplets of moist air through closeness to the cold ground.

foliage

faxxina

Branches and leaves of plants and trees.

food chain

katina tal-ikel

The sequence by which the nutrients and matter in food is transferred from one organism to another by way of feeding.

forest/woodland

bosk/masġar

A large area full of trees.

fossil

fossila

The remains or the mould of a creature deposited in sedimentary rock.

fossil fuel

fjuwil fossili

Fossil fuels are the remains, in the form of coal, oil and gas, of creatures that lived millions of years ago. These are mostly used in power stations.

frost

ġlata

When water in the rocks or soil turns into ice in cold weather.

frost shattering/freeze-thaw weathering

tnermir bil-ġlata

The process that is frequent in cold climates by which water in the rock freezes and expands by night, thus breaking up the same.

fungus

fungu

Plants which do not bloom, like mushrooms and mould. Some fungus are decomposers of organic matter while others take their nourishment from other plants and animals.

furrow

radda

A shallow trough dug by the plough in fields.

G

gabion wall

gabbjun

A wall constructed with a number of boxes made of wire mesh filled with stones. Such walls were built at Wied il-Qlejġha and Fiddien to replace rubble walls since they withstand storms better. They also allow water to pass through.

gale

riefnu

A very high wind of 14 to 23 metres per second.

gallery

passaġġ/mina taħt l-art

A mine dug horizontally at sea-level in the lower coralline limestone as can be found at Ta' Kandja. The water which filters through the ceiling of this gallery is channelled by gravity to a central reservoir and pumped up to the surface.

garigue/scrubland**xagħri**

A limestone ecosystem with low and dense shrubs. The landscape is full of holes and pointed or razor-shaped rock.

geologist**ġeologu/ġeologist**

A scientist who studies the origin, structure and formation of rock.

geothermal energy**enerġija ġeotermali**

Energy used mostly in volcanic regions as in Iceland, New Zealand and parts of the United States. Geothermal power stations use the internal heat energy of the earth to produce electricity.

geyser**geyser**

A water or steam spout which is emitted regularly with force from a volcanic fissure.

glacial period**perjodu glaċjali**

An age when the global average temperature decreased and ice covered many regions.

glacier**glacier**

A river of ice which flows slowly down a valley in between mountains.

global warming**tishin globali**

The process by which the temperature of the earth's atmosphere is becoming warmer mostly due to the greenhouse effect.

globigerina limestone**globigerina**

A common layer of rock outcropping in the east of Malta and the west of Gozo. This rock is subdivided into three members called lower, middle and upper globigerina limestone. The lower globigerina is used for producing building stone in Malta. This is porous rock and its colour varies from white to grey according to the minerals and chemicals it may contain.

gorge**ħondoq**

A narrow and deep steep-sided valley.

grazing/pasture**raġħa**

Taking the animals to the open country where they can eat fresh grass.

greenhouse**serra**

A structure situated in fields, that has a cover of plastic or other material which allows the sun's rays to penetrate. Crops are grown in a controlled environment.

greenhouse effect**effett serra**

The process by which some gases such as carbon dioxide keep much of the earth's heat energy from being lost to space. The same as happens in a greenhouse where the plastic cover allows the sun's rays to filter in but keeps the heat from escaping.

greenhouse gas

gass serra

Atmospheric gas which absorbs the heat energy that is reflected back from the earth. The most common are carbon dioxide, methane and nitrous oxide.

greensand

rina

A thin and soft layer of orange-coloured rock. It is also called 'rina' (sandy) or 'ġebbla safra' (yellow stone) in Maltese. It is easily weathered and large greensand boulders collapse and roll down slopes.

groundwater

ilma tal-pjan

Water stored underground.

H

habitat

abitat

The non-living environment that is most natural for any species or population in an ecosystem.

halo

qawwara

The large circular ray of light which the moon or the sun project on cirrus cloud, respectively also called 'qiegħa' or 'loġġ' in Maltese.

harbour

port

An inlet where people have developed quays for the sheltered berth of ships so that they may load or unload cargo and people.

headland

lsien ta' art

A long piece of land jutting out into sea such as Ras il-Fenek or Qawra Point.

heat wave

mewġa ta' sħana

A period of much higher than average temperatures during which the land dries making forest fires possible.

heavy metal

metall tqil

Metals such as chrome, zinc, copper and mercury which may be harmful to the environment and people's health.

hemisphere

emisferu

Half the world, as divided into two from the Equator forming the northern and the southern hemispheres. The world can also be divided into two by the Greenwich meridian and the 180° meridian forming the western and eastern hemispheres.

herbicide

erbicida

A chemical used to kill plants.

herbivore

erbivoru

An animal that eats only plants.

high pressure

pressjoni għolja

When the air is heavier than average, that is more than 1013 millibars. This is due to descending cool air from high altitude. Since it is warming, condensation will not take place and the weather is usually fine.

housing estate

qasam tad-djar

An area which is taken up by residences, usually built in the same period and style.

humidity

rtuba/umdità

The amount of water vapour in the atmosphere. It is measured by the hygrometer giving the result of humidity as percentage at saturation level.

humus

humus

Organic matter made up of dried leaves parts and other dead creatures which make the soil fertile.

hurricane

uragan

Tropical storm of the Americas with high winds and heavy rain.

hydroelectricity

enerġija idroelettrika

Clean energy produced by the force of water. Hydroelectric power stations are mostly found where rivers flow swiftly down steep mountains.

hydroponics

biedja idroponika

A modern system of cultivation where the crops are grown in large panels with much water and nutrients rather than soil.

hydrosphere

idrosfera

All the waters of the oceans, seas, lakes, rivers, ice-caps, glaciers, as well as groundwater.

hygrometer

igrometru

The instrument which measures humidity.

ice/hail

silġ

Water that solidifies at below 0°C. It can also consist of icy raindrops similar to beads.

ice age

żmien is-silġ

A very cold period of time when the ice-caps at the Poles and on mountains expands and spread over vast territories.

igneous rock

blat ignijuż

Volcanic rock which forms when magma solidifies.

immigrant

immigrant

A person who settles in another country is called so in the receiving country.

impermeable

impermeabbli

A type of rock which absorbs water without letting it flow further downward, for example, blue clay.

incinerator

inċineratur

A large furnace which burns waste at very high temperatures.

indigenous

indigenu

Organisms that had always inhabited a particular place, for example, Aleppo pines and oak trees in Malta.

industrial estate

qasam industrijali

An area which is purposely given over for factories, usually at a distance from residential areas. For example, Marsa, Bulebel, Xewkija and San Ġwann industrial estates.

industrial revolution

rivoluzzjoni industrijali

The age in when machines were introduced in manufacture which was no longer done exclusively by hand. Factories were built and coal was the prime source of energy. This change started in Great Britain in the eighteenth century and then spread to Western Europe and the United States.

inert waste

skart inert

Construction waste such as stone chipping and sand. This waste does not decompose and is usually dumped in disused quarries.

infiltration

infiltrazzjoni

The process by which water goes down the soil until it reaches the bedrock.

infrastructure

infrastruttura

All the buildings, communication facilities and features needed for economic development.

inlet

qala

A small bay.

inner core

qalba ta' ġewwa

The innermost layer at the centre of the earth, made up of solid rock with a temperature as high as that of the sun's surface.

inorganic waste

skart inorganiku

All materials that do not decompose when thrown away since not derived from living things.

insecticide

insettiċida

Chemical poison, in liquid or particle form, which is used to kill insects and worms that are harmful to crops.

intensive farming

biedja intensiva

Farming that is normally carried out in small areas and which involves huge investment of human resources, technology and work.

interglacial period

perjodu interglaċjali

An interval between one ice-age and another in which the global temperature rises and the ice-caps melt down, being only left in the Poles and mountain-tops.

intrusive volcanic rock

blat ignijuż intrużiv

Magma which solidifies slowly underground, for example granite.

invertebrate

invertebrat

Creatures that have no spinal cord, for example, octopus and insects.

irregular immigrant

immigrant irregolari

A person which enters a foreign country without permit.

irrigated fields

raba' saqwi

Fields that are provided with water all year round.

irrigation

irrigazzjoni/tisqija

Watering the fields.

island

gżira

A land or country totally surrounded by sea. For example Malta.

isobar

isobar

Imaginary lines drawn on a weather map joining places with equal barometric pressure, usually at intervals of 4 millibars.

J

jungle

gungla

Thick forests of tropical biomes.

K

kajjik

A fishing boat having a pointed bow and a flat stern. Since it is rarely more than six meters long, it is only used for fishing near to the coast.

karst

karst

A stretch of land that is made up of calcareous and porous rock, characterised by cracked and razor-shaped rock. Underground there are usually many caves and passageways.

L

lake

għadira

An area covered by fresh water.

lampara

A fishing method by which a large lamp's light is used to attract fish which is then easily caught.

landfill

mizbla

A place where all type of uncontrolled waste is thrown.

latitude/meridian

latitudni/meridjan

Imaginary horizontal and parallel lines drawn on a map showing the angle of elevation or depression of the place from the centre of the world and the angle of the sun during the equinoxes. 0° latitude is the Equator, while 90° latitudes are the North and South Pole.

lava

lava

Molten rock that is emitted by a volcano and which cools and solidifies in time.

lava flow

nixxieġha ta' lava

A river of molten rock or magma flowing down the slopes of a volcano.

leachate

meraq tossiku

The rainwater which mixes with the chemicals that are emitted from waste in landfills. These may percolate into the rocks thus polluting the aquifers.

legumes

legumi

Crops such as beans, chick-peas and peas.

lianas

lijana

A creeper plant of the tropical rainforest, similar to the vine, which climbs up the trunks of trees.

lichens

likeni

Small plants made up of white, grey, black or yellow blobs which grow flat upon rocks or tree trunks.

life expectancy

tul medju tal-ħajja

The age which a person is expected to live in a particular country. Life expectancy in Malta is currently 80 years.

lightning

berqa

The intense flash of light which occurs during thunderstorms as a result of the electric charge in the atmosphere.

lime

ġir

A fine dust derived from coralline limestone which is used for plastering and painting.

lithosphere/crust

litosfera/qoxra

The earth's crust made up of the continents and the oceanic floors.

longline fishing

konz

A fishing gear made up of long lines with hooks used to catch large fish such as tuna and swordfish.

lower coralline limestone

qawwi ta' taħt/żonqor

The oldest calcareous rock layer to develop, made up of hard rock, also called 'żonqor' in Maltese, which forms sheer cliffs rising from sea-level and also large expanses of garigue with many holes and razor-shaped rock.

lower globigerina limestone

gebla tal-franka

The lowermost sub-layer or member of globigerina limestone formation, also called 'tal-franka' in Maltese, which is used for building stone.

luzzu

luzzu

A wide and sturdy fishing boat with pointed bow and stern.

M

magma

magma

Molten rock which is found under, or inside, the earth's crust.

magma chamber

ħawt vukaniku

A large store of magma in the earth's crust.

main volcanic vent

arterja vulkanika

A vertical passageway in a volcano which joins the magma chamber to the main crater, whence magma flows on its way out.

mammal

mammiferu

A hair or fur bearing creature. The female carries on a pregnancy, give birth and nurses the young. Examples include human beings, dolphins, bats, hedgehogs and weasels.

mantle of the earth

mantell tad-dinja

The layer in between the crust and the core of the earth. Parts of this layer are solid while others are molten.

manufacture

manufattura

The processes of production carried out in factories and workshops.

maquis

makkja

An ecosystem typical of valley floors and slopes in the Mediterranean region, consisting of low trees such as carob and laurels, as well as creepers like bramble.

mass tourism

turizmu tal-massa

Intense touristic activity in a relatively small place which cannot cope for the large numbers involved leading to environmental, infrastructural and social problems.

maximum temperature

temperatura massima

The highest temperature registered in a particular day, usually in the early afternoon.

mean sea level aquifer

ħazna tal-ilma tal-pjan

Rainwater stored in the pores and fissures of the globigerina limestone and lower coralline limestone.

Mediterranean/Maltese fever

deni rqiq

A serious illness that was quite common in Malta and other Mediterranean countries caused by drinking un-pasteurised milk.

Mediterranean steppe

steppa Mediterranja

A former garigue area that was impoverished by fire or excessive pasture, characterised by bulbous plants such as seaside squill.

melanoma

melanoma

Cancer of the skin caused by over-exposure to the sun's rays.

Mercalli scale

skala Mercalli

A system by which the intensity of an earthquake is calculated by observation of the damaging effects, on a scale of grades 1 to 12.

metal

metall

Hard mineral that can be molten and given another shape, like iron, silver, gold and aluminium.

metamorphic rock

blat metamorfiku

Rock which changes its structure through pressure or great heat. This happens for example when limestone turns to marble.

metereological station

uffiċċju meteoroloġiku

The weather is forecast here with the aid of appropriate instruments.

metereology

meteoroloġija

The study and forecasting of the weather and climate.

methane

metanu

Inflammable, odourless and colourless natural gas which is mainly formed during decomposition of waste in landfills or the cultivation of rice.

microscopic organism

orgainizmu mikroskopiku

A very small creature that is only visible through a microscope.

middle globigerina limestone

globigerina tal-qargħajja

The middle sub-layer or member of globigerina limestone formation. It is easily weathered and broken.

migration

migrazzjoni

The movement of people from one place to another for social, economic, political or environmental reasons.

mineral

mineral

Natural resource that is mined from underground, like bauxite (aluminium), iron, diamonds and gold.

minimum temperature

temperatura minima

The lowest temperature registered in a particular day, usually by night.

moist lower soil horizon

tira

The humid layer below the dry soil at the surface.

mollusc

mollusk

Boneless and soft-bodied creatures such as snails, shells, squids and octopus. They may develop a shell for protection.

monsoon

monsun

A south or south-westerly summer wind which brings torrential rain to south and south-east Asia.

mountain

muntanja

High land with steep slopes. A mountain may rise singly or in a series called mountain chain or range such as the Alps.

mudflow/lahar

valanga ta' tajn

A mass of mud which slides down the slopes of a mountain or volcano.

municipal waste

skart muniċipali

All things discarded from residential areas such as houses, shops, offices, schools and restaurants.

N

natural hazard

dizastru naturali

A disaster that happens through natural processes such as floods, great storms and earthquakes.

natural population increase

zieda naturali tal-popolazzjoni

The difference between the number of babies born and the number of people who die in a country every year.

natural resource

rizersa naturali

Useful materials that are not man-made such as oil, water and coal; a variety of minerals like gold, iron and salt; as well as forests, animals, fish and plants.

nature reserve

riserva naturali

An area where plants and animals are protected since threatened with extinction.

neptune grass

alka

A marine plant which blossoms in spring and bears fruit in Autumn, scientifically known as *posidonia oceanica*. It has long leaves like ribbons and rhizomes which anchor it well to the sand. It forms large meadows on the seabed where fish and other creatures shelter and nest.

nitrate

nitрати

A chemical substance based on nitrogen which is found in natural manure and in artificial fertiliser.

non-irrigated lands

raba' bagħli

Fields that are only watered by rainfall and therefore are dry in summer.

non-renewable energy

energija li ma tiġġeddidx

Energy source, such as coal, oil and gas, which took many millions of years to form underground and which is now being depleted since used at a very fast rate.

nuclear cloud

shaba radjoattiva

A mass of radioactive air originating from a nuclear explosion.

nuclear energy
energija nukleari

Energy produced by fission, that is the breaking up of the atom of uranium in a nuclear reactor. In this process great heat is produced to turn water to steam. The latter will then turn the turbines and generate electricity.

nuclear radioactivity
radjoattività nukleari

Rays originating from nuclear power stations which may destroy all life forms. In order that radioactivity is avoided the nuclear reactor is covered by a concrete dome, since this is the only material which stalls these rays.

nuclear reactor
reatur nukleari

The core of a nuclear plant where the uranium atom is split by smaller particles to produce a chain reaction that emits great energy.



oasis
oasi

A cultivated and fertile place in the desert where water is available.

ocean
oċean

A very large expanse of seawater such as the Atlantic Ocean between America, Europe and Africa.

oil refinery
raffinerija taż-żejt

An industrial plant where crude oil is turned into other useful products for industry and transport such as petrol, diesel, kerosene, grease and asphalt.

onion-skin weathering/exfoliation
tmermir folja folja

The process by which rock is broken down in layers by continuous expansion during the day and contraction during the night.

orchid
orkidea

A rare plant which creeps and hangs over tropical rainforest tree branches. Its flowers are very beautiful and attractive.

organic farming
biedja organika

Farming by which products are raised, grown and processed without the use of artificial fertilisers and pesticides, thus not harming the environment.

organic waste
skart organiku

Products that can decompose, such as food, leaves and paper that are thrown away by people.

outer core
qalba ta' barra

The layer of molten rock situated between the mantle and the inner core of the earth.

overgrazing**ragħa zejjed**

When plants are exposed to intensive grazing for extended periods of time and as a result vegetation is damaged and the ground becomes liable to erosion.

ozone layer**saff tal-ozonu**

A layer of gas at about 25 kilometres altitude which protects us from the ultraviolet rays of the sun.

P**Pacific ring of fire****iċ-ċirku tan-nar tal-Paċifiku**

The most extensive seismic zone with many volcanoes and earthquake events all around the Pacific Ocean. It is made up of a series of 425 volcanoes some of which submerged. It starts at the southern tip of South America, runs through all the west coast of America, crosses over the Aleutian and Kuril Islands, and down to Japan, the Philippines and New Zealand, a distance of 40,000 km.

Pangaea**Pangaea**

The enormous landmass that existed about 300 million years ago which comprised all the present continents joined together.

pastoral farmer**raħħal**

A person who raises animals such as cows, pigs, sheep, goats, rabbits and fowl.

pasture land**mergħa**

A grassland area where animals graze.

peninsula**peniżola**

A country or land that is surrounded by the sea on many sides and is only connected to the mainland on one side, such as Valletta and Italy.

perched aquifer**ħazna tal-ilma ta' fuq it-tafal**

Rainwater which deposits in the pores of the greensand and upper coralline limestone layers above the blue clay.

perennial plant**pjanta perenni**

A plant which has a life-span of two or more years.

permeable**permeabbli**

Rock through which water can pass.

pesticide**bexx/pestiċida**

Chemical poison produced in liquid or powder form meant to kill insects, worms and other creatures which eat crops.

petrochemical plant**impjant petrokimiku**

A large factory which produces chemical substances and products made out of oil.

photosynthesis**fotosinteżi**

The process by which green plants change carbon dioxide and water into carbohydrates by means of chlorophyll and energy from the sun.

photovoltaic/solar panel

pannella fotovoltajka/solari

A structure which turns the sun's rays into electricity.

pig sty

maqjel

The place where animals are raised on a farm.

pillar

plier

A column extending from the ceiling to the ground of a cave. It is composed of calcium that is left when water drips down the ceiling of a cave.

plague

pesta

An infectious disease which is caused by bacteria transmitted from mice to humans through the bite of fleas. The symptoms include very high fever, dehydration and wounds in the skin.

plankton

plankton

Microscopic sea-organisms which are eaten by fish.

plate margin/boundary

xifer ta' qoxra

The edge of tectonic plates that move towards, away from or past each other. This is a very seismically active area.

plough

moħriet

A wooden agricultural implement used for cutting, lifting, turning over and partly pulverising the soil in preparation for cultivation.

pod

ħaxix tal-miżwed

Crops producing edible seeds which grow inside a pod or husk such as beans and peas.

polar climate

klima polari

The normal weather in the cold regions around the North and South Poles.

pole

pol

The points at the North Pole, situated in the Arctic Ocean at latitude 90° North of the Equator, and the South Pole, situated in Antarctica at latitude 90° South of the Equator, through which the axis of the earth passes.

pollution

tniġġis

The damage caused to the natural environment such as the air, water, soil and living creatures, by human activities.

population density

densità tal-popolazzjoni

The amount of people in a given area, usually given as people per square kilometre.

population distribution

distribuzzjoni tal-popolazzjoni

The way people are spread around the world or a particular country.

population pyramid/structure

piramida tal-popolazzjoni

A graph composed of horizontal bars according to five-year age groups and divided into two, showing the percentage distribution of males on the left and females on the right in a particular place.

pottery

fuħħar

The produce of clay that is baked in an oven.

power station

power station

A large factory where electricity is generated. Many are fire-powered by fossil fuels to boil water into steam which turns the turbines that operate the electrical generators. The electricity is then distributed to consumers.

precious stone

ħaġra prezzjuza

A rare and dear mineral found underground, such as diamonds, emeralds, rubies and sapphires.

precipitation

preċipitazzjoni

Part of the hydrological cycle when water falls down back to earth in the form of rain, ice or snow.

predator

predatur

A creature which preys on other creatures.

primary consumer

konsumatur primarju

A herbivore which eats only plants.

primary sector

settur primarju

The extractive economic activities by which raw materials are taken from the sea and land, such as mining, quarrying, forestry, fishing and agriculture.

pumice stone

ħaffiefa

A whitish, light and buoyant volcanic rock with many pores.

pumping station

impjant għall-ippumpjar tal-ilma

The place whence groundwater is brought up to be distributed to consumers.

purse seine

tartarun

A large funnel-shaped fishing net whose sides and bottom may close, catching fish inside.

pyroclastic flow

daħna piroklastika

An avalanche of volcanic ash, pumice stones, cinder, rocks and gases which are emitted from the crater and roll downslope at more than 100 km per hour. This cloud with a temperature of more than 500°C, drags along and burns whatever comes its way.

Q

quarry

barriera

A place used for excavating rock for building stone and material.

quaternary deposit

depożitu kwaternarju

A thin layer of soil and silt that had been carried by water in the quaternary period and which generally deposits by the sides of valleys.

quay

moll

A strong seawall built to contrast waves. Ships berth by quays to load or unload cargo.

R

radioactive rain

xita radjoattiva

A very destructive toxic rain which falls after a nuclear explosion.

radioactive waste

skart radjoattiv

The remains of the uranium rods that are left in the nuclear reactor after energy generation. These are stored in underground concrete bunkers since they are harmful to health.

rain

xita

Part of the hydrological or water cycle, when condensed water droplets in the atmosphere become large and heavy enough to fall to the ground or sea.

rainbow

qawsalla

Seven differently coloured arch-shaped light features in the sky which are visible after rainfall caused by the rays of the sun being reflected by the water droplets in the air.

rain-gauge

pluvjometru

A cylindrically-shaped weather instrument which measures the amount of rain, taken daily in millimetres.

raw material

materja prima

Natural resource like oil, gold, copper and trees that can be processes into manufactured goods.

recycling

rićiklar/rićiklagg

The process by which an object which has been discarded is put to another use.

reeds wind breaker

qannic

A wall made of reeds put up by the sides of a field to provide shelter from high winds.

reef

skoll

A rock that is just above or below sea-level, often very dangerous for shipping.

refugee

refugjat

A person who has fled his country because of war, persecution or natural disaster and is given asylum in another country.

relief/orographic rainfall

xita orografika

When rain falls due to cooling and condensation of moist air while rising along the slopes of a mountain.

renewable energy

energija tiggedded/rinnovabbli

Energy produced from natural sources that will not run out, such as wind, sun and water. These are clean sources of energy and do not harm the environment.

reptile**rettli**

An egg-laying animal with scales that prefers to spend time in the sunshine.

reservoir**ġibjun**

A covered storage place for water which is much larger than a cistern.

restoration**restawr**

Cleaning a place or repairing its damage in order to bring it to its former better state.

reverse osmosis**reverse osmosis**

A desalination plant by which seawater is filtered and turned into potable water.

Richter scale**skala Richter**

An automatic system of determining the intensity of an earthquake with grades from 1 to 10.

river**xmara**

A considerable amount of surface running freshwater that flows from the hills or mountains down to sea or lake.

river basin**ħoġor ix-xmara**

The area through which the main river and all its tributaries pass and drain on their way to sea.

river bed**sodda tal-wied**

The bottom of the channel where the river flows.

river mouth/estuary**fomm ix-xmara**

The place where the a river joins or drains into the sea.

river tributary**xmara tributarja**

A small side river which joins and drains its waters into a the channel of a larger main river.

rubble wall**ħajt tas-sejjeħ**

A low wall that separates fields made up of undressed stones and constructed without the use of mortar.

running surface water**ilma ġieri**

Water which comes out of a natural spring.

rural area**żona rurali**

Any place found in the country.

S**saguaro****saguaro**

A very large cactus with a high and thick water-storing trunk, typical of the Mexican, Californian and Arizona deserts. It blossoms during the night and bears edible red fruit.

saline marshland**bur salmastru**

A partly salty coastal lake such as Ġhadira Nature Reserve at Mellieħa.

salinisation

salinazzjoni

When soil becomes more salty.

salinity

salinità

The amount of salt in the sea or in soils.

sand

ramel

Fine rock particles weathered by wind and water which deposits on the beaches, the seabed, valley sides and deserts.

sand dune

għarma tar-ramel

A mound of sand found at the back of a beach, such as at Ramla l-Ħamra Bay in Gozo. In the desert like the Sahara are found much larger mounds of sand that are carried and moved by the wind.

sandstorm

maltempata tar-ramel

High winds that carry considerable amounts of sand in the desert.

sea arch

ħnejja/tieqa

A sea-cave which erodes right through a promontory such as the Blue Grotto or Wied il-Mielah arch.

seafood

frotta tal-baħar

Sea-creatures like the urchins, oysters, crabs and prawns.

seaquake

maremot

An earthquake having the seabed for epicentre. If strong enough such seaquake may cause a tsunami.

secondary consumer

konsumatur sekondarju

A carnivore that eats smaller plant-eating animals.

secondary sector

settur sekondarju

Economic activities where products are manufactured or processed, most commonly in factories where many people are employed, such as manufacturing industries and food processing.

sediment

sediment/naqal

Silt, mud, sludge, spalls and rock particles that are carried by rainwater, wind and the waves, then deposited on water-beds or on land.

sedimentary rock

blat sedimentarju

Rock composed of mud, sand, silt and remains of creatures which are deposited in layers on the seabed and solidify by pressure.

seismic trace

traċċa sismika

The line which the seismograph pen marks on the chart during the tremors of an earthquake.

seismogram

sismogramma

A seismic chart marked with the lines of the seismograph as registered by a seismograph during an earthquake.

seismograph**sismografu**

An instrument that measures and records the intensity and duration of earth movement during an earthquake.

seismologist**sismologu/sismoloġist**

A scientist who studies the origin, geographic locations, effects and probability of earthquakes.

sewage**drenagġ**

The underground system by which the effluent liquid and soil waste find their way from residences and other inhabited areas to sea or to treatment plants.

sewage treatment plant**impjnat għat-tisfija tad-dranagġ**

The place where sewage is cleaned and filtered before being either thrown to sea or recycled.

sheer cliff**rdum**

A perpendicular rock feature rising from the sea as found at Dingli or Ta' Ċenċ Cliffs.

shoal of fish**gliba**

A large number of fish moving in water together.

shore**xatt**

The land adjacent to the sea.

shrub**arbuxxell**

A rounded plant or small tree such as thyme and spurge.

slaughterhouse/abattoir**biċċerija**

A place where animals are killed for meat production.

snow**borra**

Solid precipitation similar to soft cotton flakes.

soil**ħamrija**

Stone particles and organic remains like worms and leaves that is necessary for cultivation of plants and crops.

soil erosion**erożjoni/telf/tgħawwir tal-ħamrija**

The process by which soil is lost due to natural elements such as strong wind or heavy rain as well as through bad agricultural practices such as overgrazing and deforestation.

soil profile**profil tal-ħamrija**

The different layers of the soil from the surface to the bedrock.

soil sediment**ħamla**

The material carried by a river or deposited by floods.

solar furnace**forn solari**

A large structure that uses the sun's heat to produce high temperatures. The rays of the sun are attracted by large parabolic mirrors that reflect them on to a focal point. This heat amounting to 3,500°C will then be used for electricity production.

species

speċi

Group of organisms having similar characteristics.

sponge

sponża

An animal that lives attached to the seabed. Its skin is hollowed and full of pores.

spores

spora

Black spots found at the back of leaves of plants such as ferns. They are necessary for reproduction.

spring/watercourse

nixxieġha/miġra

A course of running water.

sprinkler

ferfiera

A modern watering system by which water comes out of erected pipes under pressure and is spread around equally in the field.

stack

taqtigħa

A pillar of rock lying just off the coast. It is the remnant of an arch whose ceiling has collapsed.

stalactite

stalaktita

A cone shaped feature which hangs from the ceiling of caves that is made of calcium carbonate left over from water droplets.

stalagmite

stalagmita

A column rising from the ground of a cave, that is made out of calcium carbonate which is deposited by the droplets of water.

steam

fwar

Water vapour that has condensed into tiny buoyant droplets.

Stevenson screen

lquġħ ta' Stevenson

A wooden white-painted louvered box, standing about one metre high, which is placed in the open to house weather instruments so that they can take accurate measurement in an aerated but shaded environment.

stone fruit trees

frotta rqiqqa

Seed or bone-bearing fruit like pears, apples, almonds, peaches and plums.

storm

maltempata

Atmospheric condition with high winds, heavy rain, thunder and lightning.

stratosphere

startosfera

An atmospheric layer situated between 10 and 50 kilometres high, where no cloud or storms are present.

subsidy

sussidju

A financial grant to anyone who wishes to expand or modernise his business.

succulent

sukkulent

A plant like cactus that stores water in the trunk and leaves, in order to use it during the dry season.

sunshine recorder

kejjiel dawl ix-xemx

A weather instrument which measures and records the hours of bright sunshine during the day on a thin piece of paper attached to a glass globe that acts like a lens.

sushi

sushi

Japanese food made up of rice and raw fish.

sustainability

sostenibbiltà

The careful use of resources, so that they may not harm the environment and would still be available in the distant future.

sustainable development

żvilupp sostenibbli

The careful use of resources in a harmless way for the environment and to preserve the resource for use by future generations.

T

tectonic plate

qoxra tettonika

A large piece or block of the earth's crust which slowly moves over the mantle due to tectonic movement.

temperate anticyclone

antiċiklun temperat

An area of high atmospheric pressure, characterised by fine weather since the air is subsiding and warming, therefore there will be no condensation and rain.

temperate climate

klima temperata

Weather prevalent in mid-latitudes which are neither too hot nor too warm, such as in the Mediterranean region.

temperature

temperatura

The measure of how hot any object is, usually in degrees Celsius.

temporary immigrant

immigrant temporanju

A person who settles in foreign country with the intention of going back to his native country.

terra rossa

ħamrija tal-ħamri

Reddish soil found mostly where coralline limestones lie at the surface. The colour is derived from iron oxides in these types of rock.

terraced fields

għelieqi mtarrġa/sined

Rubble walled fields shaped on the slopes of hills, each one at a higher level than the other. The walls keep the soil in place while allowing the water to flow down the slope.

tertiary sector

settur terzjarju

Economic activities which provide a service to the other two sectors (primary and secondary) as well as to the rest of the community. These may include administration, education, medical professions, liberal professions, trades, transport and communication, banking and insurance, entertainment and others.

Tethys Sea

Baħar Tethys

A large sea which existed about 300 million years ago and which extended from today's entrance into the Mediterranean to the Indian and Pacific Oceans. The sea bent, narrowed and shrank, its remnants being the Mediterranean Sea, the Persian Gulf and Arabian Sea.

thermal mud

tajn termali

Lakes and pools of warm mud as can be found in volcanic regions like Iceland and New Zealand. This has therapeutic medicinal qualities.

thermal power station

power station termali

A plant where electricity is generated by the burning of fossil fuels.

thermal spring/hot spring

fawwara termali

A natural flow of warm water.

thermometer

termometru

The weather instrument that measures the heat in the atmosphere usually in degrees Celsius.

thunder

ragħda

The loud noise that accompanies lightning during storms.

tides

frugħ il-baħar

The onrush or ebbing of seawaters under the effect of the moon and the sun.

topography

topografija

The description of the physical characteristics of the landscape, such as hills, mountains, plains, valleys and rivers.

tourism

turizmu

Economic activity which caters for those who travel for leisure, sightseeing and business.

tourist resort

ċentru turistiku

A place having facilities to cater for holidaying tourists.

toxic chemical

kimika tossika

A poisonous substance that can harm the environment.

toxic gas

gass tossiku

Poisonous gas, produced by industrial activity, like the smoke which comes out of power station chimney stacks when fossil fuels or petrochemicals are burnt. These gases pollute the air, create acid rain and change climate.

trammel net**parit**

A three-layered fishing net, the middle layer of which is small-meshed, the others wide-meshed, so that fish attempting to pass through the net will become entangled in one of the meshes.

transhipment**trazbord**

Moving goods from one ship to another.

transpiration**traspirazzjoni**

The process by which water evaporates from plants and leaves.

transport**trasport**

Travel and carriage of people and goods by means such as cars, truck, trains, aeroplanes and ships.

trawler**bastiment tat-tkarkir**

A fishing vessel geared with modern apparatus for weeks-long voyages. It has cold stores for keeping fish frozen and may also have machinery which processes the fish. It uses large funnel-shaped nets which are dragged along the seabed to catch octopus, rock-fish, prawns and other fish.

trawling**tkarkir**

A fishing method by which a large funnel-shaped net is dragged on the seabed from the stern of the vessel.

troglo-dyte**troglodita**

Cave-dwellers, for example pre-historic peoples.

tropic of Cancer**Tropiku tal-Kankru**

Latitude 23 ½° North of the Equator.

tropic of Capricorn**Tropiku tal-Kaprikornu**

Latitude 23 ½° South of the Equator.

tropical climate**klima tropikali**

The hot and rainy weather commonly found between the tropics such as in the Amazon Rainforest.

tropical rainforest**foresta tropikali milwiema**

The richest ecosystem which is found in the hot and humid regions just north and south of the Equator. In it live two-thirds of all the world's living species.

tsunami**tsunami**

High waves originating from a tremor on the seabed.

tundra**tundra**

A large region of the Arctic where trees cannot live since the soil is always frozen.

tunny net/tunny fishing ground

tunnara

A way of catching tuna fish by being led into a labyrinth-like net. While migrating the tuna would go into the net and thus be trapped. The fishermen would then lift up the tuna one by one with the aid of large hooks.

U

ultraviolet ray

raġġ ultravjola

Invisible ray from the sun that damage the cells of all living creatures. The ozone layer intercepts these rays and so protects us.

upper coralline limestone

qawwi ta' fuq

The most recent calcareous rock layer to develop, made up of hard rock which is quarried for spalls and building sand. It forms sheer cliffs and vast garigue areas.

upper globigerina limestone

globigerina tal-kwiener

The uppermost sub-layer or member of globigerina limestone formation. It is resistant to fire and heat.

urban area

żona urbana

A city where many people live.

V

valley

wied

A low country between hills whence rainwater passes on to sea.

valley side

wilġa

The gentle slope of a basin or valley that is usually occupied by rubble walls of terraced fields.

vegetation

veġetazzjoni

Wild plants and trees that grow in the countryside, as well as the crops grown by the farmer.

vertebrate

vertebrat

Animal which has a spinal cord, like mammals, birds, reptiles, fish and amphibians.

veterinarian

veterinarju

Animals' doctor.

viscous lava

lava viskuża

A somewhat thick magma that flows out of a volcano. This type of lava forms steep-sided and high volcanoes.

volcanic ash**rmied vulkaniku**

Rock particles of less than 2 mm that are emitted during a volcanic eruption. When airborne, this fine ash is blown by the wind for very long distances.

volcanic gas**gass vulkaniku**

Gas that is emitted during a volcanic eruption, like carbon dioxide, sulphur dioxide and steam.

volcanic island**gzira vulkanika**

An island which is composed of volcanic rock, such as Pantelleria and Stromboli.

volcano**vulkan/mungbell**

A mountain from which occasionally lava, cinder, ash and gas may be emitted. These can be harmful to people and the whole environment.

volvanic eruption**žbroff ta' vulkan**

The sudden emission of lava, ash, cinder and gases from the crater of a volcano.

W**warm front****front sħun**

This is where a mass of warm air is moving and pushing a mass of cold air, generally at the front of a depression. It is characterised with cloudy and rainy weather.

waste**skart/żibel**

Discarded material that is no longer needed.

water/hydrological cycle**ċiklu tal-ilma idroloġiku**

The continuous process by which water is evaporated by the sun, cools in the air, condenses and falls as rainfall back to sea or land.

water channel**sieqa**

A channel dug out of stones through which irrigation water flowed. Any large system of such channels is called saqqajja.

water mill**sienja**

An irrigation system where water was brought up from underground by means of a blind folded donkey or mule.

waterfall**ċarċara**

The waters of a river as they fall from the height of a scarp on to a lower level.

wave-cut platform**blataforma**

A rocky plain emerging just a few centimetres from sea level.

weather**temp**

The conditions of the atmosphere in a particular day and place. It changes often.

weathering

tmermir

The way rock is worn down and broken into smaller pieces by physical, chemical and biological processes.

whirlwind/waterspout/tornado

tromba tal-arja

A gale force wind that turns in the shape of a cone, which can cause a lot of damage.

wind

riħ

Air in motion. It can be strong with a speed of 60 km per hour in which case it is called a gale.

wind turbine

turbina tar-riħ

A large rotor on top of a high mast that produces electricity while rotating.

wind-vane

pinnur

A weather instrument that shows the direction of wind. Usually it is made up of an arrow which points to the direction where the wind is coming from. If it points to East, the wind is coming from that direction.

wood

masġar

An area covered with trees such as Mizieb or Buskett.

Il-Gżejjer Maltin

Il-Baħar Mediterran

