GEOGRAPHY

Grade 10

Educational Publications Department

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Contents

1 The Composition of the Earth

The earth occupies a unique place among the planets in the solar system as it is the only planet which sustains life. The reasons for the existence of life are the availability of air, water and solar energy.

The objective of this lesson is to examine in detail the composition of the earth which is our habitat.

Composition of the Earth

The area of the surface of the Earth is about 510 million square km *(www.universetoday.com)* and it is considered a very large system.

The earth system is composed of four sub systems. (Figure 1.1) They are the,

- Atmosphere
- Lithosphere
- Hydrosphere
- Biosphere

Figure 1.1
The Earth System

There is an interaction among these four sub-systems, For example,

- The water in the hydrosphere is added to the atmosphere through evaporation.
- That water falls again to the earth as precipitation.
- The bio-environment in the biosphere is composed of soil, air and water.
- The components of the bio-environment, has impacts on the hydrosphere, atmosphere and lithosphere.

Lithosphere

Lithosphere is the layer that includes the Earth's crust and the upper mantle. Continents and oceans are located in the lithosphere.

The lithosphere consists of two parts according to its structure. (Figure 1.2)

1. Earth's Crust
   - Continental crust
   - Oceanic crust
2. Upper mantle

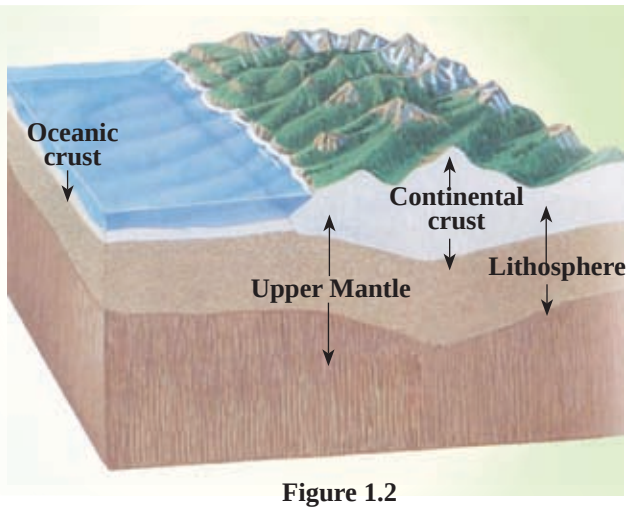


Figure 1.2
Structure of the lithosphere
Source- http://sci.gallaudet.edu/06/02/2014

The lithosphere is the home for living beings. Most of the human activities occur here. The living and non living resources which are found in the lithosphere are utilized to fulfil human needs.

When the resources found in the lithosphere are utilized by man, the lithosphere is affected in various ways. Examples of such effects are shown below.

- The occurence of land degradation due to excavation of land to obtain mineral resources.
- Intensification of soil erosion as a result of exposure of land due to clearing of forests .
- Changes seen in the surface landscape.
- Changes in the ground water level.
- Damage to certain layers of the lithosphere as a result of disposal of domestic and industrial waste.

Activities

1. Name the four main sub-systems that the earth is composed of.
2. Explain the inter-relationship that exists among the sub-systems with examples.
3. Illustrate the structure of the lithosphere using a diagram and name its parts.
4. Write three uses of the lithosphere.

Assignment

Prepare a leaflet including the followings.

- Unfavourable effects caused to the environment through human activities.
- The steps that could be taken to minimize them.

Atmosphere

The atmosphere is the thin blanket of air around the earth that consists of various gases. The atmosphere is held by the earth due to its gravitational pull. The most important layer of the atmosphere is the area that extends up to 120km from the surface of the earth. 50% of the total air content of the atmosphere is present in the region that extends up to 5-6km from the earth's surface. *(David Waugh-2000)*

The atmosphere is immensely important for the existence of living beings and plant life as it provides oxygen for respiration of living beings and the necessary carbon dioxide for the process of photosynthesis.

Table 1.1

Composition of the atmosphere

Name of gas	Volume %
Nitrogen (N_2)	78.09
Oxygen (O_2)	20.95
Argon (Ar)	0.93
Carbon dioxide (CO_2)	0.03
Ozone (O_3)	0.00006
Helium (He)	trace
Neon (Ne)	
Krypton (Kr)	

Source- *David Waugh (2000)*

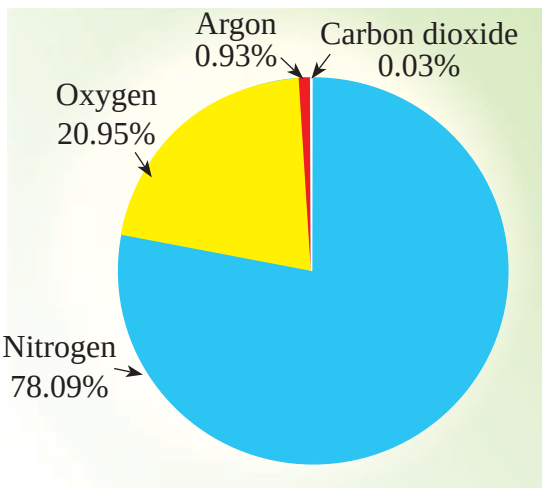


Figure 1.3
Composition of the atmosphere
(kinds of m aingas es)

The atmosphere mainly consists of various gases and it also contains water vapour, dust and salt particles. (See Table 1.1 and Figure 1.3).

As a result of different human activities and natural phenomena (Exhaustion of gases during volcano eruptions, release of methane from marshes etc.) natural gases like Carbon Dioxide, Methane, Carbon Monoxide, and Sulphur Dioxide are added to the atmosphere. This changes the composition of the atmosphere and may adversely affect the existence of life.

Structure of the atmosphere

The atmosphere is divided into four main layers on the basis of change of the temperature with the altitude.

1. Troposphere
2. Stratosphere
3. Mesosphere
4. Thermosphere (Figure 1.4)

Special characteristics of the layers of the atmosphere

Troposphere

- It extends up to 8-12 km from the surface of the earth.
- The temperature decreases with altitude. It is known as environmental lapse rate (normal lapse rate). The temperature decreases by 6.4^0C for every 1000m.
- All the atmospheric phenomena including precipitation, temperature, pressure, humidity, winds and formation of clouds occur within this layer.
- The processes that occur in the troposphere are very important for the existence of the biosphere.
- Normal aeroplanes fly in the area close to the upper boundary of the troposphere (Figure 1.4).
- The upper limit of the troposphere is called the **Tropopause**.

Stratosphere

- The upper boundary of the stratosphere extends up to 48-50 km from sea level.
- The increase of temperature with the increase in altitude is a special characteristic in this layer.

- The ozone layer which is very important for the existance of the biosphere is located between 20-30 km of this layer.
- The specific feature of the ozone layer is the absorption of the ultra-violet rays of the sun, that are harmful to living beings. The ozone layer prevents it from reaching the earth.
- The location of the ozone layer influences the increase of temperature in this part.
- Most of the meteorites that fall towards the earth from space burn up and get destroyed within the stratosphere. (Figure 1.4)
- Supersonic jets fly within the central region of this layer.
- The upper boundary of the stratosphere is called the **Stratopause**.

Figure 1.4
Layers of the atmosphere

Source-*http://ete.cet.edu/gcc/13/03/2014*

Mesosphere

- The upper boundary of this layer extends upto the altitude of 80 km from sea level.
- Within this region, the temperature decreases with altitude.
- There is no water vapour, clouds and dust particles in this region.
- The lowest temperature of the atmosphere prevails in this region. (-90^0 C).
- Electric phenomena occur in abundance in this layer.
- The upper boundary of the mesosphere is called the **Mesopause**.

Thermosphere

- The upper boundary of the thermosphere extends up to 120 km approximately.
- The temperature increases rapidly with the altitude.
- There is a high temperature in this layer. The temperature at noon is about 1100^0 C.
- The difference between the temperature of day and night is at a higher level.
- The volume of gases is very low.
- The upper boundary of the thermosphere is the upper boundary of the earth's atmosphere.

Activities

1. Define atmosphere.
2. Illustrate the four main layers of the atmosphere using a diagram. Write two features of each layer.
3. Write four uses of the atmosphere to man.

Assignments

1. Prepare a document including the human activities that cause pollution of the atmosphere and the impact of pollution on the physical and human environment.
2. Prepare a set of suggestions on actions to be taken to minimize air pollution.

Hydrosphere

The entire body of water on the surface of the earth in various forms is termed the hydrosphere. The total volume of water on earth is calculated as 1386 million cubic kilometers (Environmental Geography 1996).

Water is essential for the sustenance of all the bio systems. Water is utilized for drinking and domestic purposes as well as for agricultural, industrial and transportation activities.

Figure 1.5
Hydrosphere

Source- *www.earthssciencеeducation.com*

Distribution of water on the earth

Water can be seen in different forms on earth as follows (Figure 1.6).

- Ocean water (in oceans and seas).
- Surface water (on the surface of the land, rivers, streams, lakes and reservoirs).
- Ground water (water deposited under ground)
- Atmospheric water (Atmospheric humidity)
- Soil water (water in soil).

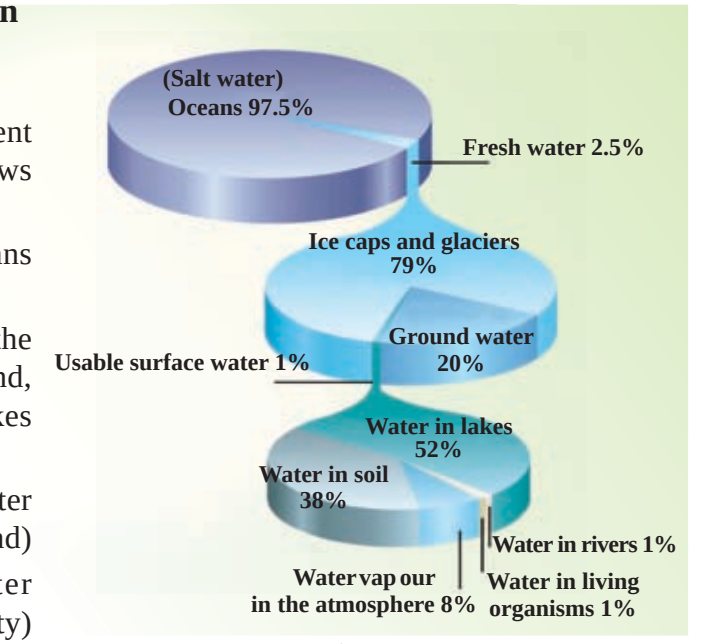


Figure 1.6
Distribution of Water
Source- *https//chandoo.org/wp/2014/03/13*

Out of the total volume of global water only 1% or a very limited amount of fresh water found on the surface of land, can be utilized by man. (Figure 1.6)

At present, the quality of water is deteriorating due to the impact of various human activities.

Some of the examples are,

- Addition and release of various chemicals and carbonic matter into the water used and released by industries.
- The mixing of fertilizers and chemicals added to soil in agricultural activities with the water.
- Addition of bacteria to ground water and surface water on the land as a result of the irregular disposal of waste matter and sewage.

Accordingly, the deteriorization of the quality of water causes harmful effects on the survival of living beings.

The Water Cycle

- The continuous process by which water is circulated throughout the earth and the atmosphere through evaporation, condensation, precipitation, and the transpiration of plants is known as the water cycle.(Figure 1.7)
- The atmosphere gets the water that is evaporated from the surface of the land and water bodies and also the water transpired from plants. This water which exists as water vapour in the atmosphere is subjected to condensation and returns to the earth as rainfall through the process of precipitetion.
- A part of the water received on the surface of the earth flows as surface runoff and another part of it is infiltrated into the land. The infiltrated water is stored in the earth as ground water and the springs and wells are fed by this infiltrated water.

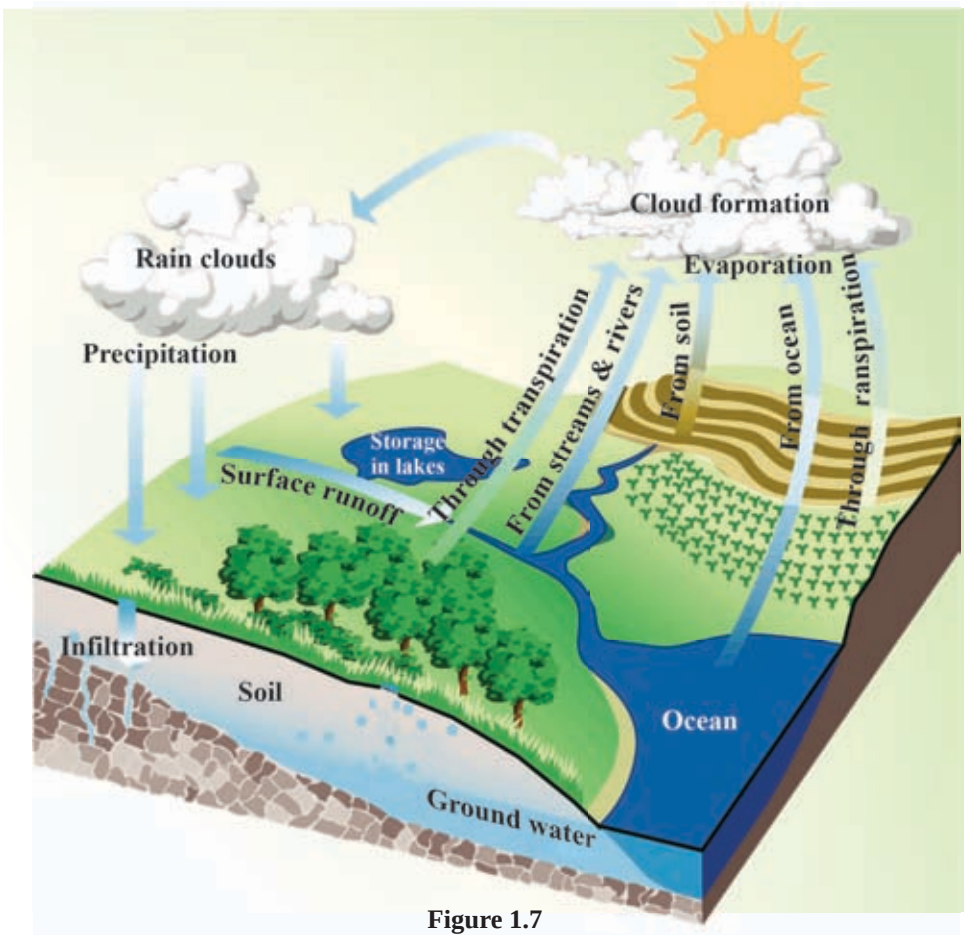


Figure 1.7

The Water Cycle

Source- *www.teamleaf.org 06/02/2014*

Activities

1. Name the various forms of water that exist in the Earth's hydrosphere.
2. Describe the distribution of water on the earth using a diagram.
3. "Out of the large volume of water found on the earth, only a small amount can be utilized by man". Explain this statement.

Assignments

1. Find information and prepare a list about the human activities that cause water pollution.
2. Design a poster under the theme "Let's contribute to sustainable conservation of water which is a precious resource".
3. "Due to wastage and the low quality of water, there may be a scarcity of drinking water in future". List the problems Sri Lankans will have to face in future regarding this issue and make a list of suggestions on how to minimize them.

Biosphere

The total ecological systems integrating plant and animal life which constantly interact with the Earth is termed the biosphere.The existence of the biosphere depends on the interaction of the atmosphere, lithosphere and hydrosphere with each other.

There are two factors that affect the processes in the biosphere.

1. Living components - (plants, animals and decomposers)
2. Non-living components - (solar energy, soil, water, climate)

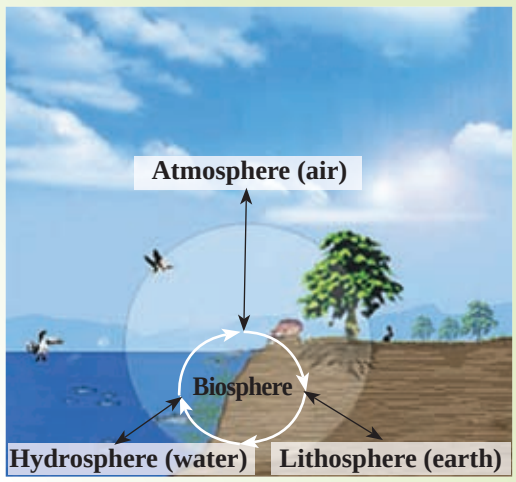


Figure 1.8

Biosphere

Source - *https//greenfoecast.com/06/02/2014*

The boundaries of the biosphere

- In the lithosphere - The layer in which the root system of plants spreads and where soil organisms live (2.5 m within the soil approximately).
- In the hydrosphere - The ocean bed in which sufficient amount of sunlight penetrates for the process of photosynthesis.
- In the atmosphere - The limits where birds fly (Approximately about 5000 m in the upper sky).

The process of photosynthesis which is necessary for the existence of man occurs in the biosphere . A process of interaction between plant and animal life is visible in the biosphere. Hence, plant life cannot exist without animals and animals cannot live without plants. At present, most of the human activities have become a strong threat to the biosphere. Accordingly, the equilibrium of the biosphere has been disturbed due to these human activities. For example, the loss of animal habitats due to the destruction of forests, destruction of the bio-systems, erosion of the surface soil and infertility of soil.

Activity

Briefly define the biosphere and state its boundaries.

Assignments

1. Design a poster on the theme "The wonders of the Biosphere".
2. Find information and write a report to show how human activities affect the existence of the biosphere.

The structure of the Earth

After the study of composition of the Earth, you would be able to understand the structure of the earth in this lesson.

The structure of the Earth is composed of three main layers.

1. Crust
   - Continental
   - Oceanic
2. Mantle
   - Upper mantle
   - Lower mantle
3. Core
   - Outer core
   - Inner core (Figure 1.9)

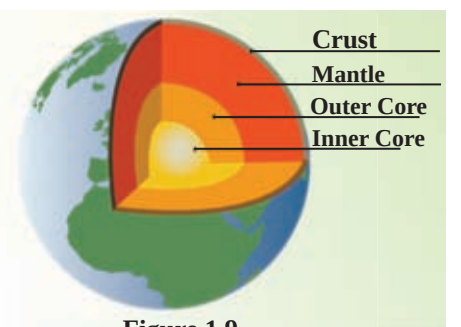


Figure 1.9
Structure of the earth
Source- *tec_001 www.bbc.co.uk06/02/2014*

The Special characteristics of the layers of the Earth's structure

The Crust

It belongs to the lithosphere and consists about 1% of the total land mass of the earth.

The thickness of the crust is not uniform. It extends with a thickness of 5km in depth in the oceans and 60 km in the continents.

It consists of rocks and contains a wide variety of useful minerals.

The uppermost thin layer of the crust consists of soil and it is continuously developed through the processes in the bio-environment. This thin soil layer is important for agricultural activities.

The crust is divided into two parts according to its location, composition and the density of rocks.

- Continental crust and
- Oceanic crust (Figure 1.10)

The continental crust consists of granitic rocks. This part is called the Sial layer as it is primarily composed of Silica (Si) and Aluminium (Al).

The oceanic crust consists of basaltic rocks. This layer is called the Simag layer as it consists primarily of Silica (Si) and Magnesium (Mg).

The Simag is the basic rock layer on which the Sial layer lies.

The boundary that separates the crust of the earth from the mantle is called the Mohorovicic discontinuity. (Figure 2.2)

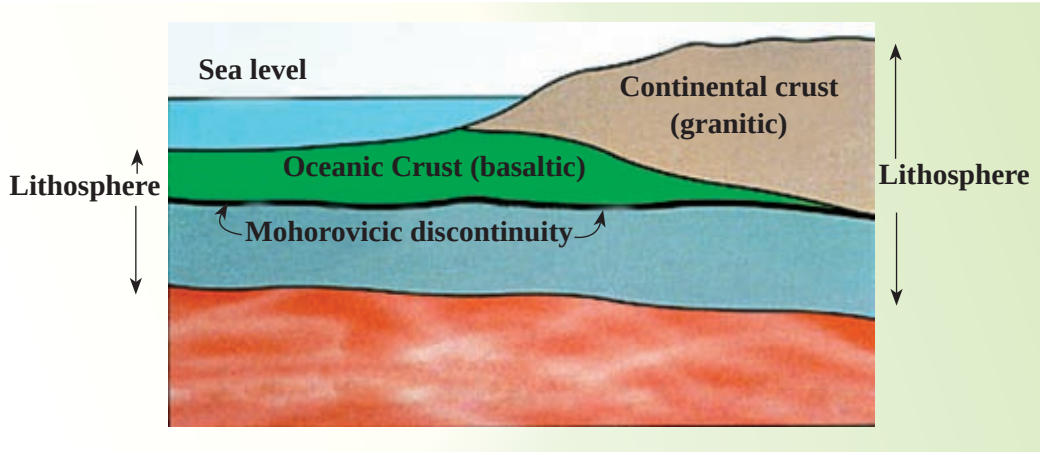


Figure 1.10

Continental Crust and the Oceanic Crust

Source- *Robert Gabler, James E Peteron, L. Michael Trapsso (2006)*

The Mantle

Mantle is the layer which is located between the crust and the core.

The mantle is a layer that extends to a depth of 2900 km from the surface of the Earth. This layer forms 2/3 of the land mass of the Earth.

The upper part of the mantle consists of Olivine and Silicate while the lower part is made up of Magnesium and Silicate.

According to the chemical composition and rocks, this layer is divided into two parts ; the upper mantle and the lower mantle.

The boundary that separates the mantle from the core is called the Gutenberg discontinuity.

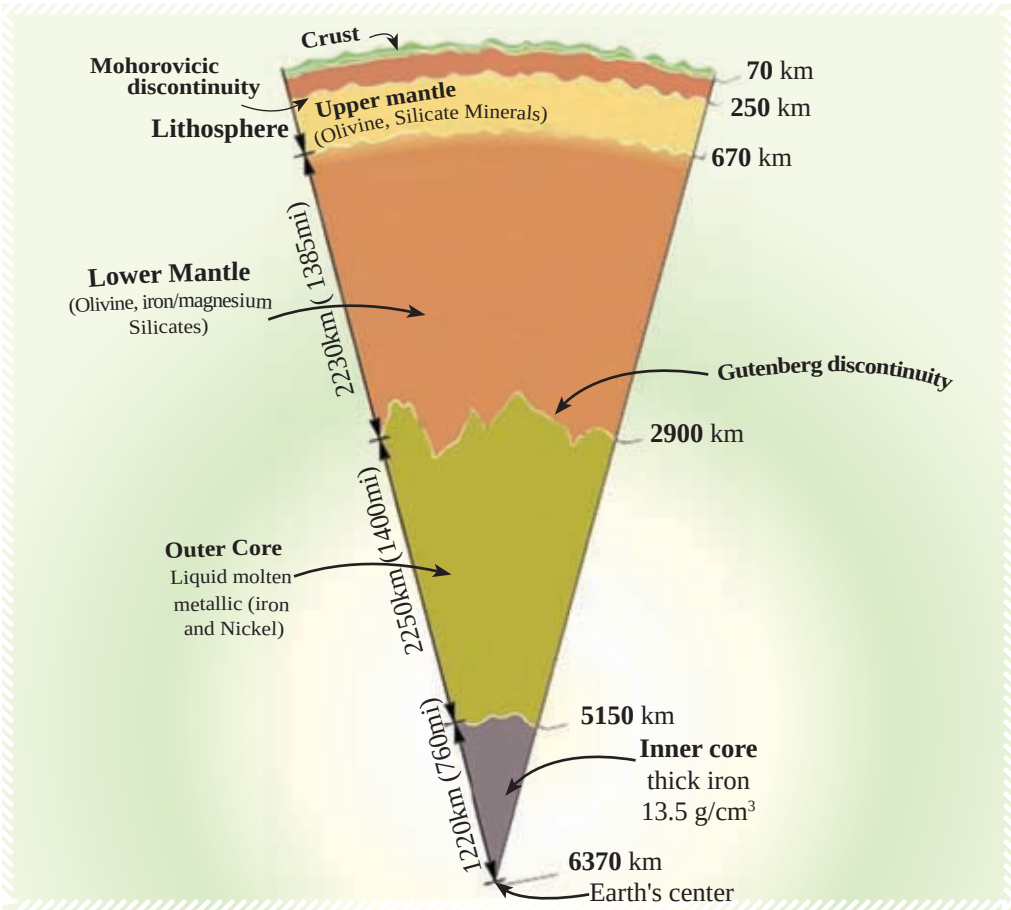


Figure 1.11

Cross section of the structure of the earth, depth and the composition of rocks

Source-*https/geoscience.wise.edu/06/02/2014*

The Core

The core is located below the mantle of the earth.

According to the composition, it is divided into two parts, namely the inner core and the outer core.

The outer core consists of liquid metal (Nickel and Iron) and it extends from the mantle to a depth of 2250 km.

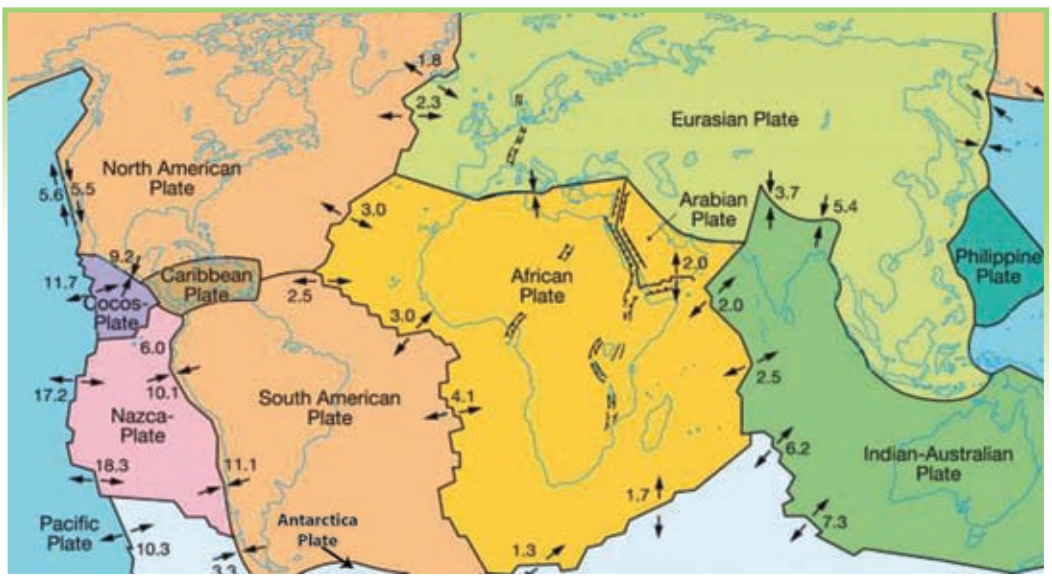
The inner core consists of a thick metal (Iron) layer and it extends to a depth of 1220 km from the outer core.

Tectonic plates

The lithosphere consists of a number of tectonic plates that move very slowly in relation to one another. The lithosphere consists of seven major tectonic plates and a few minor plates. (Map 1.1)

These tectonic plates move as a result of the convectional currents which are active in the mantle.

Tectonic plates in the lithosphere



Map 1.1

location of the tectonic plates of the earth

Source-*https/www.diercke.de/bilder/omeda/06/02/2014*

Activities

1. Draw a cross section of the structure of the earth and mark the three layers and their boundaries.
2. Write three main features of each of the layers in the structure of the earth.
3. Name five types of minerals contained in the crust, which are useful to man.
4. Mark and name the location of the major tectonic plates on a map of the world.
5. On which plates are the following countries located Sri Lanka, Japanese islands, Indonesia, Madagascar, British Islands, Greenland, Cuba and Brazil.

Assignment

Using an object like a rigifoam ball, create a model of the structure of the earth as indicated in figure 1.9.

Bibliography and Sources

Gabler E.Robert, James, F Peteron , Trapsso Michael L. (2006), Essentials of Physical Geography.3rd edition,USA.

Waugh David (2000), Geography An Integrated Approach, 3rd Edition Scot Print, London

ගුරු මාර්ගෝපදේශ සංග්‍රහය, භූගෝල විද්‍යාව, 10 ශ්‍රේණිය (2007), ජාතික අධ්‍යාපන ආයතනය, මහරගම.

පාරිසරික භූගෝල විද්‍යාව (1996), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.

භූගෝල විද්‍යාව, 10 ශ්‍රේණිය (2011), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.

භෞතික භූගෝල විද්‍යාව 1 කොටස (2013), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.

http://www.universetoday.com/26653/size-of-the-earth/

www.encyclopedia.com

www.teamleaf.org

http://ete.cet.edu/gcc/?/volcanoes-layers/

https//chandoo.org/wp/2014/02/06/pie-of-pie-of-pie-chart/

https://sci.gallaudet.edu/Mary/lithosphere.jpg

https//www.windows2universe.org/earth/water/water cycle.html

https//greenforecast.com/the-spheres/

https//geoscience.wise.edu/chuck/classes/Mtn and plates/lecture1.html

https//www.diercke.de/bilder/omeda/800/11630E 1 Erde plattentektoni.jpg -Lithosphere

https://chandoo.org/wp/2012/11/09/pie-of-pie-of-pie-chart/

Glossary

Lithosphere	- ශිලාගෝලය	- கற்கோளம்
Atmosphere	- වායුගෝලය	- வளிமண்டலம்
Hydrosphere	- ජලගෝලය	- நீர்க்கோளம்
Biosphere	- ජෛවගෝලය	- உயிர்க்கோளம்
Land degradation	- භූමිහායනය	- நிலம் தரமிழத்தல்
Evaporation	- වාෂ්පීකරණය	- ஆவியாக்கம்
Precipitation	- වර්ෂණය	- படிவு வீழ்ச்சி
Crust	- කබොල	- ஓடு
Mantle	- ප්‍රාවරණය	- மூடி
Exosphere	- බාහිරගෝලය	- புற மண்டலம்
Photosynthesis	- ප්‍රභාසංශ්ලේෂණය	- ஒளித்தொகுப்பு
Water vapour	- ජලවාෂ්ප	- நீராவி
Elevation/Altitude	- උන්නතාංශය	- எழுச்சி/ ஃ தரையுயர்ச்சி
Troposphere	- පරිවර්තීගෝලය	- மாறன் மண்டலம்
Stratosphere	- අපරිවර්තීගෝලය	- படை மண்டலம்
Mesosphere	- මෙසෝගෝලය	- இடை மண்டலம்
Thermosphere	- තාපගෝලය	- வெப்ப மண்டலம்
Laps rate	- පතනශීඝ්‍රතාව	- நழுவு வீதம்
Humidity	- ආර්ද්‍රතාව	- ஈரப்பதன்
Run-Off	- අපධාවය	- கழிவு நீரோட்டம்
Ultra-violet rays	- පාරජම්බුල කිරණ	- புறஊதாக் கதிர்கள்
Meteors	- උල්කාශ්ම	- விண்கற்கள்
Tropopause	- පරිවර්තී මණ්ඩලය	- மாறற்றரிப்பு
Stratopause	- අපරිවර්තී මණ්ඩලය	- படைத்தரிப்பு
Menopause	- මෙසෝ මණ්ඩලය	- இடைத்தரிப்பு
Season	- ඍතුව	- பருவகாலம்
Condensation	- ඝනීභවනය	- ஒடுங்கல்
Infiltration	- කාන්දු වීම	- மண் உறிஞ்சுதல்
Ground Water	- භූගත ජලය	- தரைநீர்
Outer Core	- පිටත හරය	- வெளிமையம்
Inner Core	- ඇතුළත හරය	- அக மையம்
Mass	- ස්කන්ධය	- திணிவு
Discontinuity	- අසන්තතිය	- தொடர்ச்சியற்ற
Tectonic Plates	- භූ තැටි	- புவித்தட்டுக்கள்
Convectional currents	- සංවහන ධාරා	- மேற்காவுகை

2 The Major Physical Characteristics of the Earth

Climate and relief are the major physical characteristics of the Earth. Relief is the variety of the physical features found on the Earth. The Earth consists of various physical features and a large number of such features are seen on the Earth. Hills, mountains, mountain ranges, plateaus and plains are examples of such features. Similarly, there is a variety of climatic conditions on the Earth.

The objective of this lesson is to study the relief, the nature of the main types of climate and their distribution on the Earth.

The landforms or physical features of the Earth differ from each other in magnitude. The largest features according to magnitude are the continents and oceans. Within these large landform features, there are a number of smaller features.

Continents

Land covers 29% of the total area of the Earth. These lands are located as either continents or islands. The large land masses which have risen from oceans are called continents. There are seven such continents in the world. Table 2.1 below includes information about the magnitude of those continents.

Table 2.1

The Magnitude of the Continents

Continent	Area km^2	Percentage of total Land mass %
Continent of Asia	43,820,000	29.5%
Continent of Africa	30,370,000	20.4%
Continent of North America	24,490,000	16.4%
Continent of South America	17,840,000	12.0%
Continent of Antarctica	13,720,000	9.2%
Continent of Europe	10,180,000	6.7%
Continent of Australia	9,085,000	5.8%

source - *www.wikipedia.org*

Map 2.1

Continents and Islands of the World

The shallow sea strip that stretches towards the ocean from the continental boundary is known as the continental shelf. A continental shelf is not seen at the boundary of every continent. The edge of the continental shelf slopes abruptly towards the ocean and it is called the continental slope.

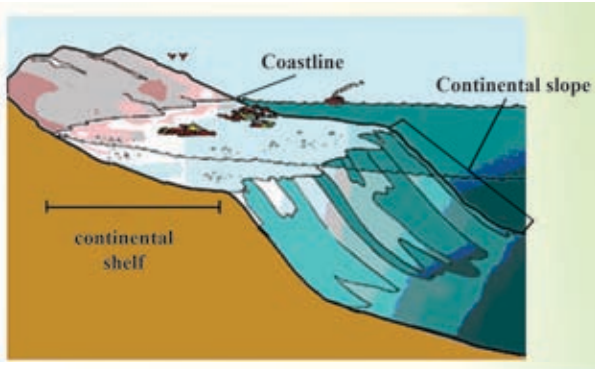


Figure 2.1

Continental shelf and the continental slope

Source - *http://www.studyblue.com/13/03/2014*

Islands

Islands are small land areas of various shapes surrounded by water. Many islands are located in the continental shelf close to continents.

For example :-

- Islands located in the continental shelf of Asia - Borneo, Java, Sumatra and Sri Lanka
- Islands located in the continental shelf of Australia - Papua New Guinea and Tasmania
- An Island located in the continental shelf of Africa - Madagascar

When observing a world map or a model globe you would be able to identify islands located in the central regions of the oceans too. The islands of Hawaii and Iceland which were created as a result of volcanic activities that occurred in the deep ocean are examples for that.

Activities

1. What is a continental shelf ? What is a continental slope? Explain with the help of a diagram.
2. Mark and name ten islands of different sizes in a world map and five islands that belong to Sri Lanka in a map of Sri Lanka.

Assignments

1. Identify the islands of the world with the help of an Atlas and prepare a list.
2. Tabulate the advantages and disadvantages of a country being an island.

Oceans

Oceans are large water bodies filled with brine (salt) water distributed on the Earth. 71% of the surface of the Earth is covered by oceans. There are five such oceans in the world (Map 2.2). Table 2.2 shows those oceans according to their magnitude. There are deep trenches located in certain oceans (Figure 2.2). Mariana trench (depth 11035 m) and Mindanao trench (10497 m) are examples. Most of the trenches are located in the Pacific Ocean.

Table 2.2

Oceans and theirm agnitude

Ocean	Area km^2
Pacific Ocean	155 557 000
Atlantic Ocean	76 762 000
Indian Ocean	68 556 000
Southern Ocean	20 337 000
Arctic Ocean	14 056 000

Source -*www.worldatlas.com*

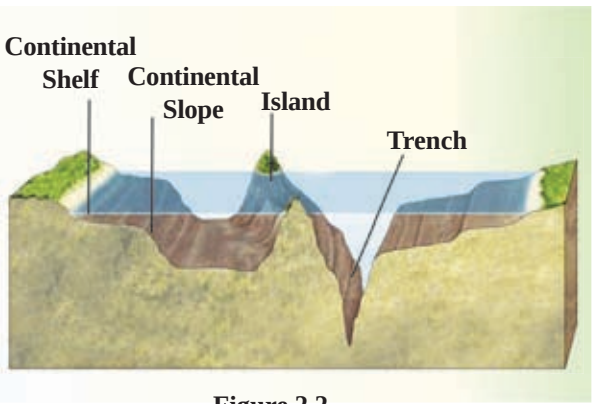


Figure 2.2
Several features in the Ocean bed

Source- *http:jwilson.wikidot.com/13/03/2014*

Seas

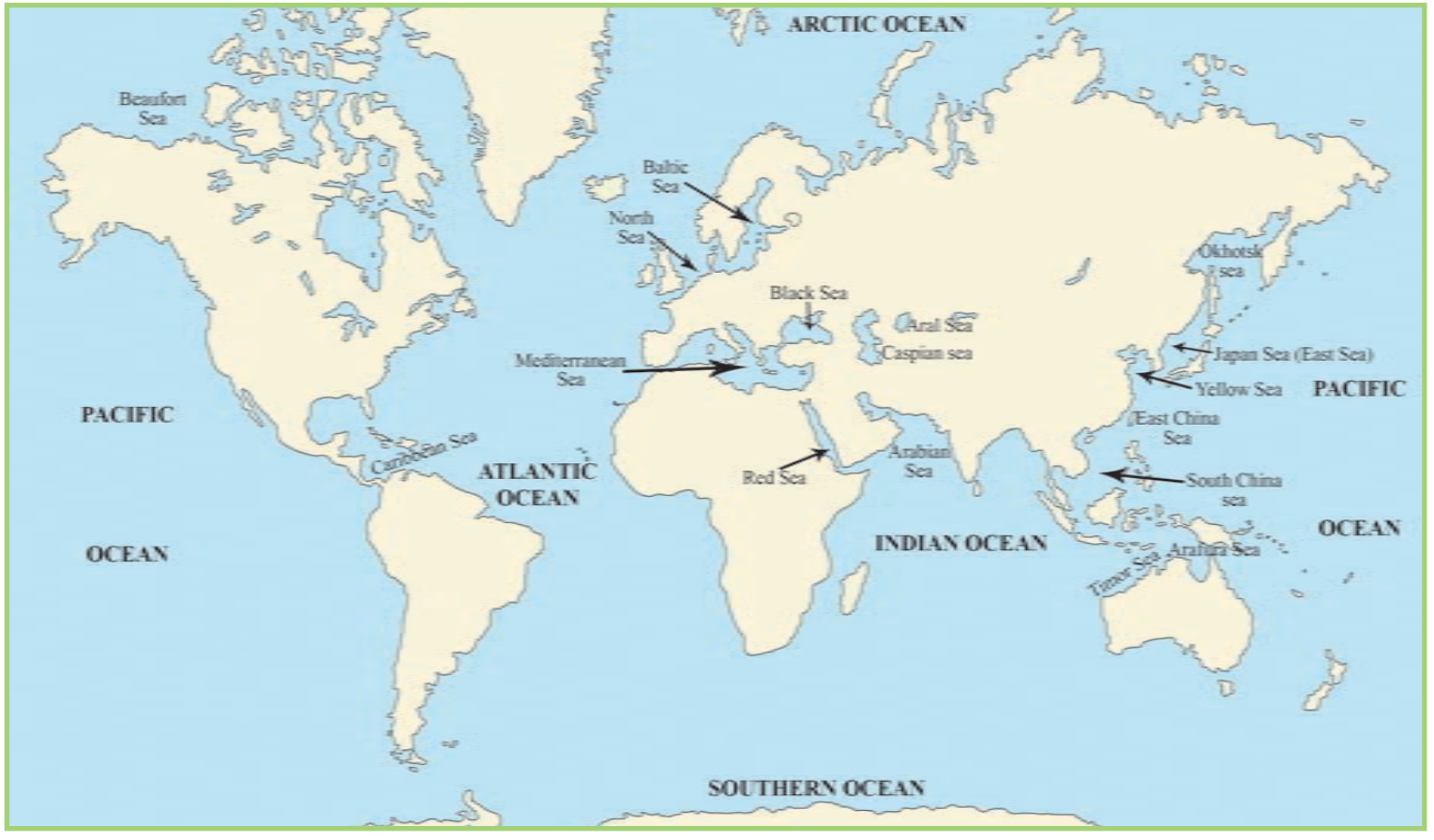
Seas are water bodies of brine (salt) water partly or completely surrounded by lands or connected to the oceans. For example:-

- Seas completely surrounded by lands - Caspian Sea, Aral Sea.
- Seas partly enclosed by lands - Mediterranean sea, Red sea, Black sea, Yellow sea, Sea of Japan and Baltic sea.
- Seas within the oceans - Arabian Sea, China Sea.

The map 2.2 indicates some of the seas located in the world. Observe the map and identify them.

Activities

1. Mark and name the five oceans, ten seas, three ocean and trenches in a world map.
2. Explain the instances when man uses the oceans and seas as a resource.



Map2.2

Oceans and seas

Assignment

Prepare a document relating to the human activities that cause pollution of oceans and suggest actions that could be taken to minimize them.

Mountain ranges

The mountain ranges are landform features that stretch with a higher elevation having a variety of slopes and several peaks. When several mountains are distributed in a large region it is called a mountain range system. Himalaya, Rockies and Andes are examples of large mountain systems. Map 2.3 indicates some of the largest mountain ranges of the world.

Figure 2.3
The Rockies
Source - *http://portfolios.chuckhaney.com*

Figure 2.4
Himalaya mountain range – An Aerial photograph
Source - *http://blogs.oregonstate.edu*

Plateaus

Plateaus are high flat lands located in a mountainous area. The Tibetan plateau is located in the mountain range of Himalayas at a very high elevation from sea level. Pamir, Mongolian, Deccan and Arabian plateaus are examples of other large plateaus located in the world. There are small plateaus located in Sri Lanka too. Welimada, Mahaweletenna, Koslanda and Hatton plateaus are examples for them. Map 2.3 indicates some of the plateaus located in the world.

Figure 2.5
Tibetan plateau
Source - *http://static.panoramio.com*

Map 2.3

Few mountains, plateaus and plains in the world

Plains

The flat lands extending in a very large area at a low elevation are called plains. The Great Siberian plain, North American plain and Nullabar plain in Australia are some examples for plains. (See map 2.3). Sometimes, these plains may show a slightly undulating nature. These plains have been used for various human activities more than higher mountainous areas. These plains are called by specific names according to their formation or location. Coastal plain, glacier plain, fluvial plain and alluvial plain are examples.

Figure 2.6
Great North American Plain

Source - *www.wikipedia.com*

Figure 2.7
Nullarbar Plain in Australia

Source - *www.crikey-adventure-tours.com*

Activities

1. Mark and name the three largest mountains, main plateaus and three plains in a world map.
2. What is the plateau located at the highest altitude above the sea level?
3. Write three human activities linked to each of the mountainous and low land regions of the world.

Assignment

Refer to an Atlas and identify continents (other than Antarctica). Fill in the table with three mountain ranges, three plains and three plateaus for each of the continents.

Continents	Mountain ranges	Plateaus	Plains
1	1..... 2..... 3.....	1..... 2..... 3.....	1..... 2..... 3.....
2	1..... 2..... 3.....	1..... 2..... 3.....	1..... 2..... 3.....
3	1..... 2..... 3.....	1..... 2..... 3.....	1..... 2..... 3.....
4	1..... 2..... 3.....	1..... 2..... 3.....	1..... 2..... 3.....
5	1..... 2..... 3.....	1..... 2..... 3.....	1..... 2..... 3.....
6	1..... 2..... 3.....	1..... 2..... 3.....	1..... 2..... 3.....

Rivers

A river is a natural water resource flowing throughout the year along a clear cut valley into an ocean, a sea, a lake, a basin or a marsh. A river originates from a high area and flows according to the gradient of the land. A few major rivers in the world are shown in map 2.4. The source of a river may vary. Some rivers originate from mountainous areas while some other rivers may originate from a spring or a lake.

Examples for such rivers

River Thames - From a spring

River Nile - From a lake

River Rhine - From melted glaciers

River Mahaweli - From a spring in a mountainous area

Figure 2.8
River Mahaweli
Source - *http://upload.wikimedia.org*

Lakes

A depression (a crater) located on land which is filled with fresh water is known as a lake. Lakes are located in almost all the continents in the world. Lake Baikal in Asia, The Five Great Lakes in North America, Lake Ayre in Australia, Lake Ladoga in Europe, Lake Titicaca in South America and Lake Victoria in Africa are examples. Certain lakes are large water bodies filled with salt water and they are considered as inland seas. Lake Superior is the largest lake in the world while Lake Titicaca is located at the highest elevation. Map 2.4 shows several lakes in the world.

Activities

1. Mark and name ten rivers and five lakes on a world map. (Select lakes and rivers from all the continents except Antarctica).
2. Explain with examples how rivers and lakes become important in human activities.

Assignment

Study map 2.4 and prepare a list of rivers and lakes according to their location in each continent.

Map 2.4
Main rivers and lakes of the world

Distribution of the climatic types and their basic features

Climate is the general condition of the atmosphere that prevails within a long period of time. Data on weather conditions for a period of at least 30-35 years should be studied to get a clear idea about this generalized condition.

Various types of climates in the world have been identified according to different climatic conditions that prevail in different geographical regions within a long period of time. A particular type of climate is determined by some important factors such as temperature, the rainfall, means of rainfall and the duration of rainfall.

The first idea about distribution of climates in the world was originally put forward by a Greek philosopher, Aristotle around 384 BC. He divided the world into three broad climatic zones. He used the distribution of temperature that changes according to the latitudinal location of the world as the basis for this division. Later, persons like Austin Miller, Thornthwaite and Keppen have presented wide climatic classifications at global level. Sub-climatic types have been identified according to the specific features within the main climatic zones.

The three main climatic zones which are based on the distribution of the latitudinal temperature in the world are emphasized here.

The main climatic zones

1. The Tropical zone
2. The Temperate zone
3. The Frigid or Polar zone (See Figure 2.9 and Map 2.5)

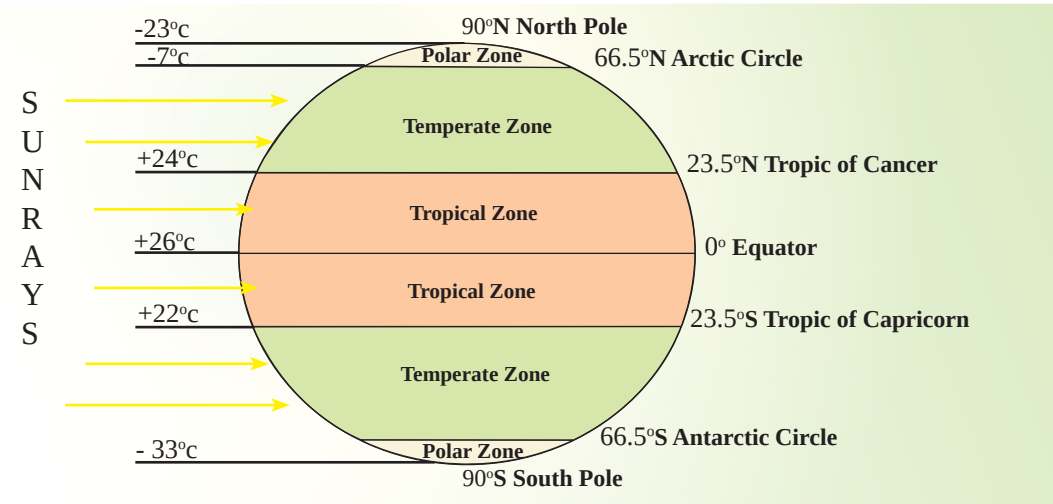
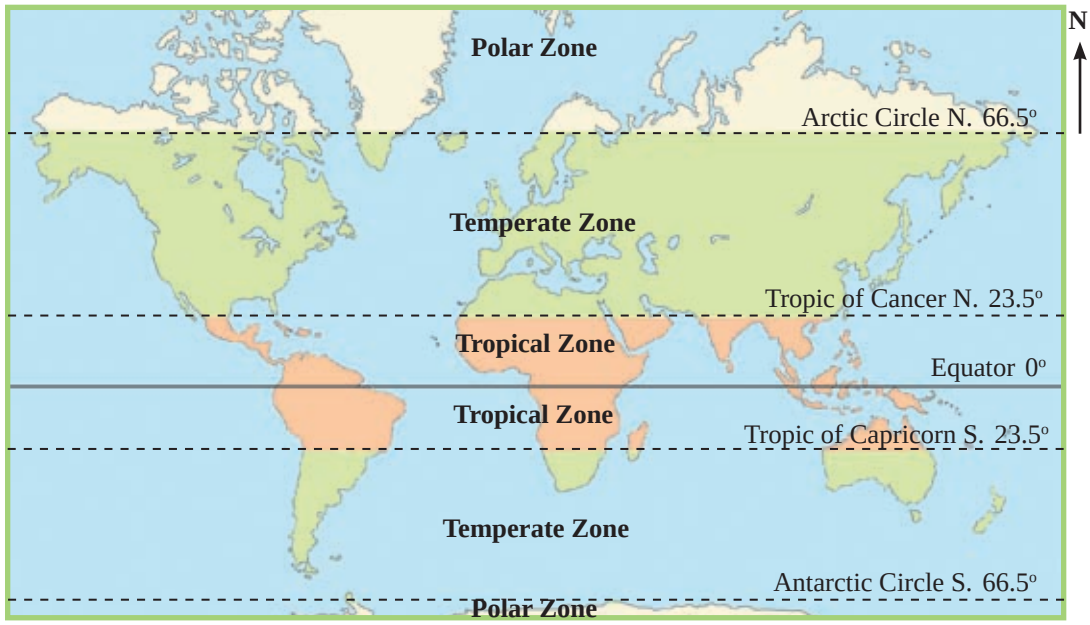


Figure 2.9
The major climatic zones in the world



Map 2.5
The main climatic zones in the world

Tropical climate

The zone located between the Tropic of Cancer ($23^1/_2{}^0$ North latitude) and Tropic of Capricorn ($23^1/_2{}^0$ South latitude) is known as the Tropical Zone. Generally, the highest temperature is reported in this zone and a very high temperature prevails throughout the year (over 18^0 C).There is no winter. Therefore, warm climatic conditions can be seen. Most of the areas located in this zone receive a very high rainfall throughout the year. Various types of climates in the world have been identified according to different climatic conditions that prevail in different geographical regions within a long period of time. A particular type of climate is determined by some important factors such as temperature the rainfall, means of rainfall and the duration of rainfall.

Figure 2.10
A Tropical Grassland

Source - *http://www.south-africa-tours-and-travel.com*

Figure 2.11
A Tropical Forest (Amazon)

Source - *http://static.panoramio.com*

Figure 2.12 - A Tropical Desert Region (Sahara)

Source- *http://toptravellists.net*

Temperate climate

The Temperate Zone stretches between the Tropic of Cancer ($23^{1}/_{2}^{0}$ North latitude) and the Arctic Circle ($66^{1}/_{2}^{0}$ North latitude) and also between the Tropic of Capricorn ($23^{1}/_{2}^{0}$ South latitude) and the Antarctic Circle ($66^{1}/_{2}^{0}$ South latitude). The normal temperature in the temperate zone is lower than in the tropical zone. The temperature in this zone changes according to seasonal differences. A hot season and a cold season with rainfall could be clearly seen in this zone. Prevalence of the Mediterranean climate is a specific feature of this zone.

Figure 2.13
Natural vegetation in the temperate zone

Source - *http://upload.wikimedia.org*

Polar climate

The Polar climate is distributed in the Polar regions extending from the Arctic Circle ($66^{1}/_{2}{}^{0}$ North latitude) to the North Pole, and between the Antarctic Circle ($66^{1}/_{2}{}^{0}$ South latitudes) to the South Pole. The annual rainfall is between 250-300 mm and it remains at a very low level. Snowfall and fog are the main features of this zone. Tundra climate is a specific climate that prevails here.

Figure 2.14
Polar climatic environment
Source - *http://hdw.backgroundswallpapers.info*

Figure 2.15
Natural vegetation in a
polar climatic environment
Source - *http://cityoftongues.files.wordpress.com*

Activities

1. Define "climate".
2. Name three persons who presented world climatic classifications.
3. State the three main climatic zones of the world based on the latitudes with a diagram and write two features of each zone.
4. Explain how climate affects human activities in your area giving examples.

Assignment

Prepare a report including pictures about human activities and the main features of the major climatic zones of the world.

Bibliography and Sources

- Gabler E Robert, James, F Petersen, Trapsso L Michael (2006), Essentials of Physical Geography, 3rd Edition, USA.
- The Oxford School Atlas (1984), Oxford University Press, London.
- Waugh, David (2000), Geography-An Integrated Approach 3rd edition Scotprint London.
- උපාලි වීරක්කොඩි (1993), භූගෝල විද්‍යා ශබ්දකෝෂය, කර්තෘ ප්‍රකාශන.
- ගුරු මාර්ගෝපදේශ සංග්‍රහය, භූගෝල විද්‍යාව, 10 ශ්‍රේණිය (2007), ජාතික අධ්‍යාපන ආයතනය, මහරගම.
- ගුරු මාර්ගෝපදේශ සංග්‍රහය, භූගෝල විද්‍යාව, 12 ශ්‍රේණිය (2009), ජාතික අධ්‍යාපන ආයතනය, මහරගම.
- තම්බයියාපිල්ලේ ජී.ජී.ආර්. සිල්වා එම්.සී.ද (2009), භෞතික භූගෝල විද්‍යාව, 6 වන මුද්‍රණය, අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව.
- පාරිසරික භූගෝල විද්‍යාව (1996), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.
- භූගෝල විද්‍යා තොරතුරු, 9 වන කලාපය (1996 ජනවාරි), ශ්‍රී ලංකා භූගෝල විද්‍යාඥයින්ගේ සංගමය, කොළඹ.
- භූගෝල විද්‍යාව, 10 ශ්‍රේණිය (2011), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.
- භෞතික භූගෝල විද්‍යාව 1 කොටස (2013), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.
- www.worldatlas.com
- http://www.studyblue.com/notes/note/n/ch-4-ocean-basins/deck/6167301
- http:jwilson.wikidot.com/weekly-lesson-for-april-16
- www.travelphotogallery.net
- www.crikey-adventure-tours.com
- http://portfolios.chuckhaney.com/data/photos/973_1rocky_mtn_front_aerial_002_copy.jpg
- http://blogs.oregonstate.edu/irisgodfrey/files/2013/04/press_2007_large.jpg
- http://upload.wikimedia.org/wikipedia/commons/c/c8/River-nile.JPG
- http://toptravellists.net/wp-content/uploads/2012/05/Oasis-Dakhla-Sahara-Desert-Nature-Egypt.jpg
- http://static.panoramio.com/photos/large/4978777.jpg
- http://www.south-africa-tours-and-travel.com/images/south-african-savannah-marakelenationalparkinsouthafrica.jpg
- http://upload.wikimedia.org/wikipedia/commons/2/2d/Aerial_View_of_Autumn_Forest_Colors.jpg

- http://hdw.backgroundswallpapers.info/0002/nature-landscapes_hdwallpaper_cabin-in-the-tundra_13431.jpg
- http://cityoftongues.files.wordpress.com/2012/12/polar-bear.jpg

Glossary

• Relief	- භූ විෂමතාව	- தரைத்தோற்றம்
• Climate	- දේශගුණය	- காலநிலை
• Continents	- මහාද්වීප	- கண்டங்கள்
• Oceans	- සාගර	- கண்ட மேடை
• Continental shelf	- මහාද්වීපික තටකය	- கண்ட சாய்வு
• Continental slope	- මහාද්වීපික බෑවුම	- அகழிகள்
• Trench	- සාගර අගාධ	- மலைத்தொடர்
• Mountain range	- කඳු පද්ධතිය	- பீடபூமி
• Plateau	- සානුව	- சமவெளி
• Plain	- තැනිතලාව	- அயன வலயம்
• Tropical zone	- නිවර්තන කලාපය	- இடைவெப்ப வலயம்
• Temperate zone	- සෞම්‍ය කලාපය	- முனைவு வலயம்
• Polar zone	- ධ්‍රැව/ශීත කලාපය	- கடகக்கோடு
• Tropic of Cancer	- කර්කටක නිවර්තනය	- மகரக்கோடு
• Tropic of Capricorn	- මකර නිවර්තනය	- கண்டங்கள்

3 Major Types of Agricultural Land Utilization in the World

People have been engaged in agriculture to produce food since the ancient times. Utilizing the land for cultivation is known as agricultural land utilization. Various characteristics are seen in agricultural land utilization. The main feature is the use of land for subsistence agriculture and commercial agriculture. Although various changes have taken place in agriculture over a long period of time, its value has not reduced. The factors for this are given below;

- Providing food for people i.e. producing crops, animal products and beverages to satisfy the needs of people.
- Supplying necessary raw material for the developing industrial sector.
- Majority of the world population being engaged in agricultural activities.
- The importance acquired by agro-products in world trade.

The objective of this chapter is to study the major types of agricultural land utilization in the world and their specific characteristics.

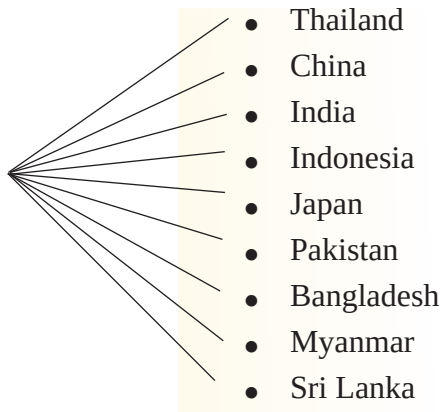
Figure 3.1 depicts some products related to agro-crops which are manufactured in various countries in the world.

Figure 3.1
Products related to various crops

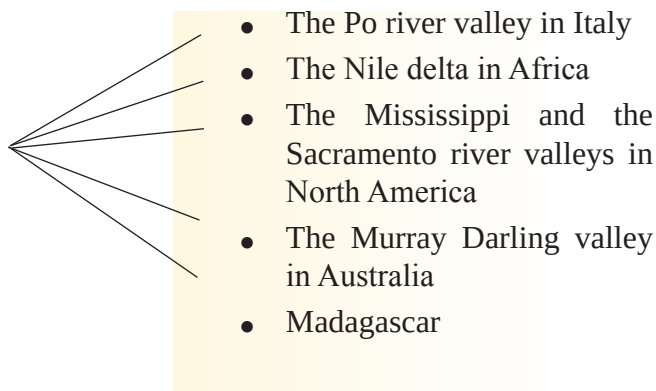
Paddy cultivation

Paddy is the crop that provides rice, the staple food of the majority of people living in Asian countries. A special characteristic of Asian paddy cultivating regions is that the production is consumed within the region itself. Two main paddy cultivating regions can be identified in the world, as paddy cultivating regions in Asia and paddy cultivating regions outside Asia.

01. The main paddy cultivating countries in Asia

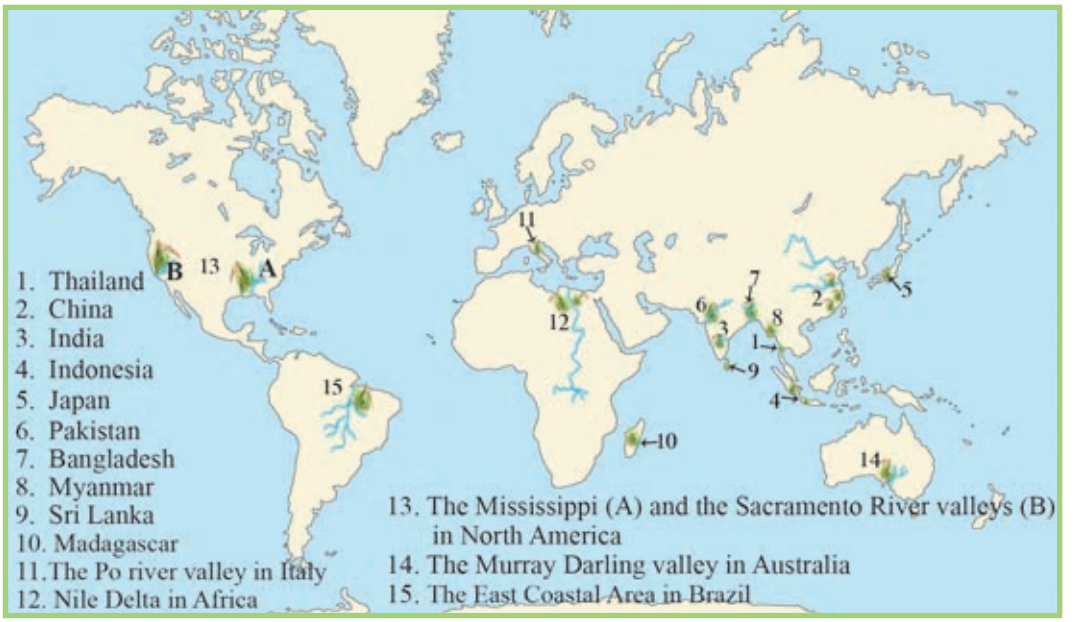


02. Paddy cultivating regions outside Asia



Study map 3.1 and identify the paddy cultivating regions in the world.

The main conducive factors for the distribution of paddy cultivation in these regions are the prevalence of temperature of about 27^0C, rainfall around 2000 mm, alluvial soil and flat low lands. Paddy is cultivated in these areas with rain water and also with water from irrigation. Figure 3.2 represents a hilly region where paddy is cultivated in terraced method.



Map 3.1
The main paddy cultivating regions in the world

Figure 3.2
A terraced paddy field

Special characteristics of paddy cultivation

- Cultivation of paddy in small blocks of land for domestic consumption in countries like Sri Lanka and Bangladesh.
- Cultivation of paddy on a commercial basis in countries like India, Japan, United States of America, China, Pakistan, Thailand and Vietnam.
- Paddy is mostly a labour intensive crop in Asian countries, but machinery is largely used in countries outside Asia. Using machinery has become a recent trend in Asia as well.
- More attention is paid on using organic fertilizer at present.
  Example - Sri Lanka.
- Introduction of seeds that produces a short term yield with resistence to various types of diseases using gene technology.
- Production of rice that contains specific qualities. Example - Golden rice.
- Using new techniques for manufacturing and packing rice related products. Examples - rice flour, bread and biscuits.
- The rice-trade is often done in the same area where it is produced.

Figure 3.3
Tilling the land

Figure 3.4
Scattering fertilizer

Figure 3.5
Harvesting

Using modern machinery in paddy cultivation

Activities

1. Mark and name the paddy cultivating countries and regions in Asia and regions outside Asia on a world map.
2. Explain the reasons that have contributed for the distribution of paddy cultivation in those countries.
3. Prepare a list of various products related to rice.

Assignment

Design a poster on the theme "Modern technology used in paddy cultivation"

Wheat cultivation

Wheat has acquired a unique place among all the other grains, produced and consumed in the world in a large scale. Wheat is consumed as the staple food by the majority of world population. As a result, wheat is cultivated in large scale farm lands on a commercial basis.

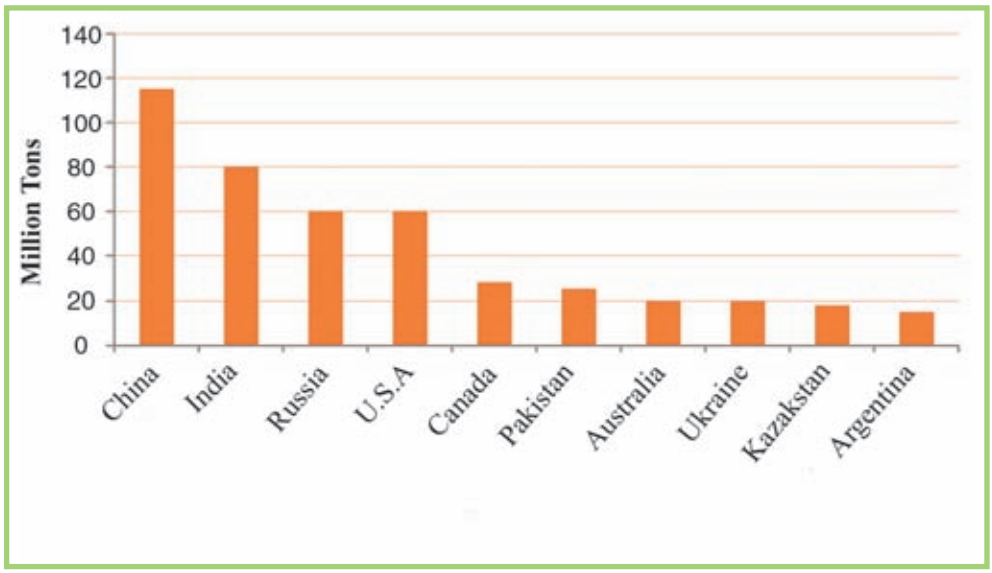
Wheat is processed in various methods for human consumption and its by-products are used as animal fodder.

Figure 3.6
Wheat products

Study map 3.2 and identify the major wheat growing countries of the world.

Map 3.2
The main wheat growing countries in the world

The Graph 3.1 gives information about wheat production in a few major wheat producing countries of the world.



Graph 3.1
Wheat production in a few major countries 2009-2010
Source – *http//spotonlists.com*

According to Graph 3.1 the major wheat producing countries in the world are China, India, Russia, and the U.S.A. Rainfall between 300-500 mm, cool wet climate during the period of plant growth, flat lands with proper drainage and chernozem soil are the conducive factors for the distribution of wheat cultivation in these areas.

In addition, the use of pesticides, agro-chemicals, new types of seed, machinery, modern technology and the ability of capital investment have contributed for the development of wheat cultivation.

Special characteristics of wheat cultivation

- Although a lesser yield is obtained per land unit, the per capita yield is increased due to low population in wheat growing regions.
- Wheat cultivation is done as monoculture and they were grown in extensive lands.
- Use of advanced technological methods to increase production. Examples- gene technology and soil conservation methods.
- Prevalence of an extensive market throughout the world for wheat.
- Mechanization of wheat cultivation on a large scale when compared to paddy cultivation.
- Use of different types of wheat with a high yield. Example - Norin10 (a type of wheat).
- Consumption of wheat as food processed using different methods.

Activities

1. Mark and name ten main wheat growing countries in the world on a world map.
2. Write three differences and three similarities related to paddy and wheat cultivation.
3. Explain the reasons for the significance of wheat as a major crop in the world market.
4. Explain the reasons why wheat has become a popular kind of food among people in the world.

Assignment

Prepare a list of food items produced using wheat throughout the world.

Plantation agriculture

Well-organized, export-oriented crop cultivation with a good management using skilled labour on large estates is called plantation agriculture. Tea, rubber, sugarcane, cotton, coffee, cocoa and coconut are the most significant crops grown under plantation agriculture.

Special characteristics of plantation agriculture

- Expansion of plantation on very large estates and its operation on a commercial basis.
- Use of both local and foreign labour.
- Use of skilled labour with proper management.
- Presence of industrial features although it is a system of agriculture.
- Being export crops which earn foreign exchange.

  Examples - Tea, rubber and coconut in Sri Lanka.
- In many countries plantation agriculture was initiated by foreigners.

Out of the above mentioned crops, only tea and rubber cultivation are focused in this lesson.

Tea cultivation

Tea, discovered by Chinese can be introduced as a commonly consumed beverage in almost all the countries in the world at present. During the colonial period, the Western nations introduced tea cultivation to some countries in the world. At present, it has become a main crop in plantation agriculture. The Asian region occupies a prominent place in the cultivation of tea than other regions in the world.

Figure 3.7
A tea estate

Map 3.3 shows a few countries where tea cultivation is distributed.

Map 3.3
Major tea growing countries in the world

Tea cultivation has expanded in these countries due to the prevalence of favourable factors such as temperature between 15^0 C-27^0 C, annual rainfall around 1900 mm-5460 mm, loam and laterite soil, areas with gentle slopes and skilled labour.

Special characteristics of tea cultivation

- A crop that gives an extending harvest over a long period of time.
- Expansion of tea plantation as small and large estates.
- Prevalence of proper management and a regular labour organization.
- Use of various techniques to increase the yield.
- Popularity of the vegetatively propagated tea than the tea that is planted from seeds.
- Presentation of tea to the market with various flavours and attractive packaging.

  Examples-Yellow tea, Black tea, Green tea, Lemon tea and White tea.

Figure 3.8 shows several tea related products.

Figure 3.8
Different tea related products

Activities

1. Mark and name five main tea producing countries on a world map.
2. Mention the strategies followed by tea producing countries to increase their markets.

Assignment

1. Find information from media such as magazines and newspapers on " How consumption of tea affects human health" and prepare an article for a newspaper.

Rubber cultivation

Rubber which had been a jungle crop in Brazil, later expanded gradually into countries of South and South-east Asia and Africa as a plantation crop. The demand for rubber increased gradually with the development of the automobile industry in Europe around 1890s. By the 20th century, rubber was only second to tea among the crops grown under plantation agriculture. At present, 95% of the world's total natural rubber is produced in the South and South East Asian countries.

Map 3.4 shows some countries in the world where rubber is cultivated.

Map 3.4
Rubber growing countries in the world

Source- *www.webcrawler.com*

Rubber cultivation is widely distributed in these countries in the world due to favourable physical factors such as a temperature of about 27^0 C, rainfall about 2000 mm and laterite or kabok mixed red soil. At present, rubber has become important as a main cultivation crop that provides necessary raw material for various industrial products. Figure 3.9 shows some rubber based products.

Figure 3.9
A few rubber based products

Special features of rubber cultivation

- Distribution of rubber cultivation in large estates.
- A labour intensive cultivation.
- Use of modern technology at present for tapping rubber and collecting latex instead of manual labour.
- Increase in demand for rubber as a raw material due to the availability of manufacturing industries where rubber is used as a raw material.
- Focus on the production of finished products locally by rubber exporting countries while exporting rubber as a raw material.
- Makes a large contribution to the economy of developing countries where rubber is grown.
- Natural rubber has faced issues in the market due to the competion from synthetic rubber

Activities

1. Mark and name the rubber producing countries on a world map.
2. Explain the factors that have influenced the expansion of rubber cultivation in the rubber producing countries.

Assignment

Prepare a booklet on "The importance of rubber cultivation in the world" including the distribution, production and trade related to rubber plantations.

Livestock farming

Livestock farming is regarded as the most ancient form of land use which is important to obtain the requirements of food and which beverages as well as to obtain raw materials for industries. It has become a well organized and systematic farming method in many countries.

Livestock farming includes mainly the rearing of cattle, sheep, goats, pigs and poultry. Figure 3.10 shows the benefits gained by rearing those animals under livestock farming.

Figure 3.10
Various animals and the benefits gained from them

Among livestock farming activities, attention is paid only on commercial dairy farming in this lesson.

Commercial dairy farming

Milk is one main food item that provides the protein requirements of the people in the world. Countries engaged in commercial dairy farming in the world produce pasteurized liquid milk and various other processed products related to milk. (Figure 3.11)

Figure 3.11
A few milk products

Dairy farming is mostly distributed in the areas located in the temperate zone of the world. The marginal lands with cool climate, which cannot be used for other types of cultivation, are often used for dairy farming. Factors such as the availability of grasslands and water, skilled labour, large market and the presence of modern technology have contributed to the development of dairy farming.

The map 3.5 shows several countries engaged in commercial dairy farming in the world.

Map 3.5
Dairy farming countries in the world

New technological strategies are used by almost all the countries engaged in commercial dairy farming world wide. Figure 3.12 shows an instance of obtaining milk using such modern machinery.

Figure 3.12
Milking using a modern machine

Special characteristics of dairy farming

- The developed countries have acquired prominence in every aspect of commercial dairy farming.
- Developed countries have control over the milk related market.
- Using improved techniques to obtain milk, for transportation and storage of milk as well as to obtain an increased quantity of milk. For examples : vaccinating lactating cows with hormones and using gene technology to obtain an increased yield by breeding improved cows.
- Expansion of the market for liquid milk and milk related products.
- Increase in the consumption of milk products such as cheese, butter and yoghurt.

Activities

1. Mark and name the dairy farming countries on a model world map.
2. Explain the factors that have contributed to the development of dairy farming in those countries.

Assignments

1. Prepare a portfolio including information about various milk products.
2. Complete the following table using the information you have obtained from this lesson.

Crop	Temperature required	Rainfall required	Three countries engaged in	New trends related to the cultivation
Paddy cultivation	.....	.....		
Wheat cultivation	.....	.....		
Tea cultivation	.....	.....		
Rubber cultivation	.....	.....		

Bibliography and Sources

- ගුණසේන ෆිලිප්ස් ලෝක සිතියම් පොත (2003), ඇම්.ඩී. ගුණසේන සහ සමාගම, කොළඹ.
- ගුරු මාර්ගෝපදේශ සංග්‍රහය, භූගෝල විද්‍යාව, 10 ශ්‍රේණිය (2007), ජාතික අධ්‍යාපන ආයතනය, මහරගම.
- ගුරු මාර්ගෝපදේශ සංග්‍රහය, භූගෝල විද්‍යාව, 12 ශ්‍රේණිය (2009), ජාතික අධ්‍යාපන ආයතනය, මහරගම.
- භූගෝල විද්‍යාව, 10 ශ්‍රේණිය (2011), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.
- www.en.wikipedia.org
- www.worldatlas.com
- http://cdn3.chartsbin.com/chartimages/1-6409-67576fd1142f
- http://www.mapsofworld.com/world-top-ten/tea-exporting-countries./rice-producing-countries/ wheat-production html.
- http://www.statista.com/statistics/157865/of-cow-milk-production-world-wide/
- http://www.statisticbrain.com/beef-cattle-production-statistics/
- http://www.sagevfoods.com/mainpages/Rice101/production.html
- http://www.top5ofanything.com/index.php?h=7738agg2
- http://www.factfish.com/statistic/natural +rubber,production+quantity

Glossary

• Land use	- භූමි පරිභෝගය	- நிலப் பயன்பாடு
• Labour Intensive Cultivation	- ශ්‍රම සූක්ෂම වගාව	- ஊழியச் செறிவான
• River valley	- ගංගා නිම්නය	- ஆற்றுப் பள்ளத்தாக்கு
• Organic fertilizer	- ඓන්ද්‍රීය පොහොර	- சேதன பசளை
• Technology	- තාක්ෂණය	- தொழில்நுட்பம்
• Technology	- ජාන තාක්ෂණය	- மரபணு தொழில்நுட்பம்
• Consumption	- පරිභෝජනය	- நுகர்வு
• Monoculture	- ඒක භෝග වගාව	- ஒரினப்பயிர்
• Soil Conservation Methods	- පාංශු සංරක්ෂණ ක්‍රම	- மட்பாதுகாப்பு முறைகள்
• Natural Rubber	- ස්වාභාවික රබර්	- இயற்கை இறப்பர்
• Marginal lands	- ආන්තික බිම්	- எல்லை நிலங்கள்
• Synthetic rubber	- කෘත්‍රිම රබර්	- செயற்கை இறப்பர்

4 Agriculture in Sri Lanka

Sri Lanka, being endowed with favourable environmental conditions for agriculture could be identified as a country which had an agricultural economy since ancient times. Early settlements were also established near river valleys suitable for agricultural activities and the Sri Lankan economy and culture are entwined with agriculture since then.

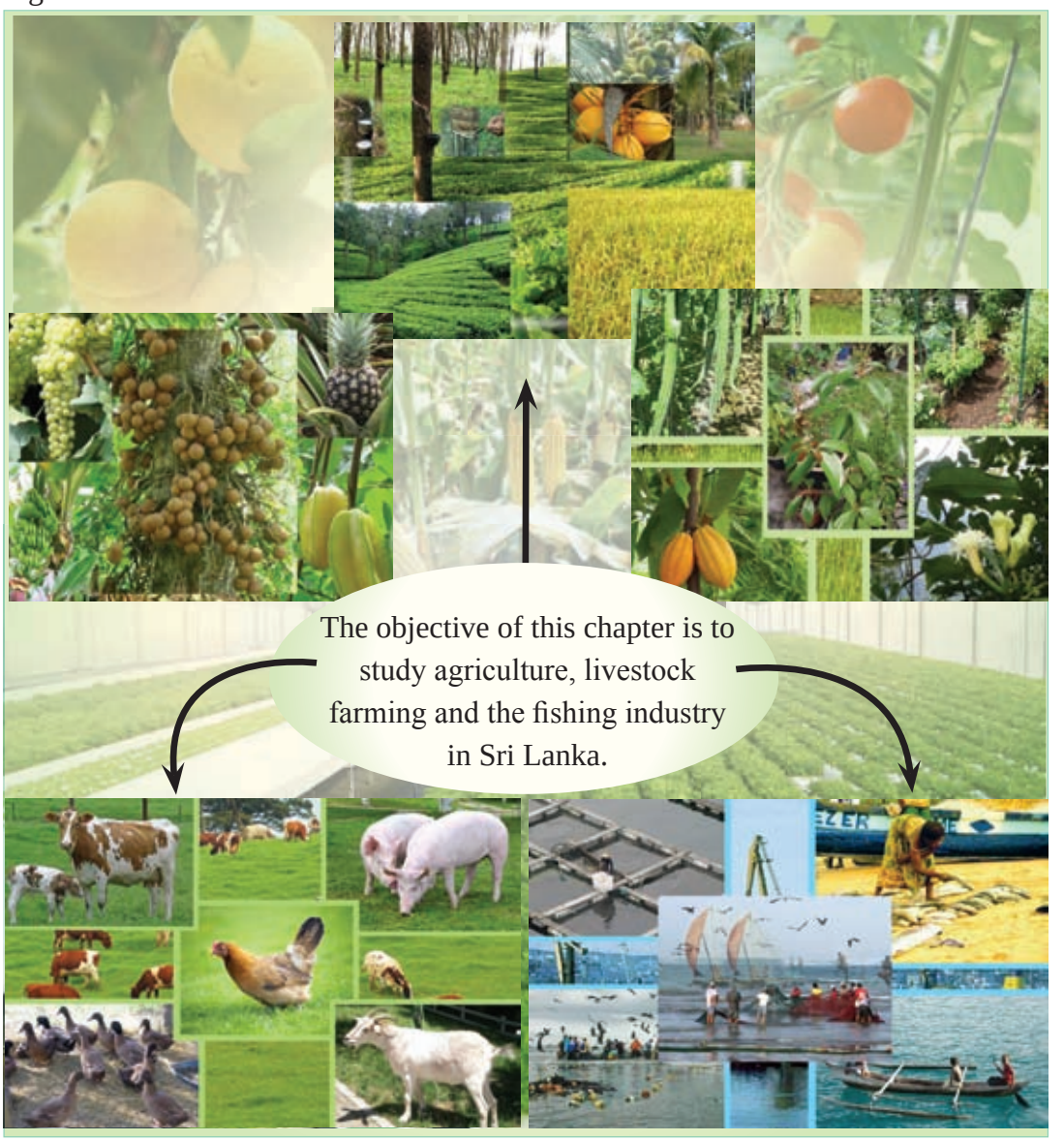


Figure 4.1
Agricultural activities in Sri Lanka

Paddy Cultivation

Paddy is an important staple food crop cultivated in Sri Lanka from the past. Prince Vijaya and his followers also, who came from North India established settlements in the plains around river valleys which were suitable for the cultivation of paddy. There was a decline in paddy cultivation during the colonial era, but many steps were taken to uplift it after independence. Setting up farming colonies in the dry zone and the reconstruction of tanks were some examples for such measures. Towards the end of 1960, paddy cultivation expanded rapidly due to the Green Revolution. At present, it has expanded even as a commercial crop.

Significance of Paddy Cultivation

- The staple food of Sri Lankans
- Important as a local commercial crop
- Introducing many subsidiary products related to rice such as diverse food products and various type of animal food to the market
- Provision of raw materials for many industries
- Production of organic fertilizers
- Emergence of different kinds of jobs related to paddy cultivation

Due to the reasons stated above, greater attention has been paid on paddy cultivation. Much research is being done in Research Institutes at places such as Bombuwela, Mahailluppallama, Batalegoda, Hingurakgoda and Ambalantota. In addition, seed paddy and necessary instructions for cultivation are also provided by those institutions.

As shown in map 4.1, paddy is cultivated in all the areas of Sri Lanka. Among them, paddy is the prominent crop in a few areas. These areas can be categorized into diverse environmental zones as follows;

1. Dry zone
2. Intermediate zone
3. Wet zone
4. Hilly areas (Refer Map 4.2)

Paddy Cultivating Areas of Sri Lanka

Map 4.1 : Distribution of paddy cultivation and different steps of paddy cultivation

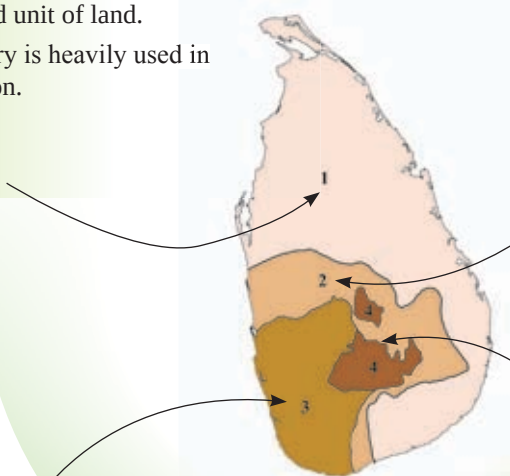
Source : Adapted from Gunasena Philips Map Book (2009)

1. Dry Zone

- Districts like Anuradhapura, Batticaloa, Hambantota, Polonnaruwa, Vauniya, Ampara, and Jaffna belong to this zone.
- The main seasons of paddy cultivation in these areas are 'Yala' and 'Maha'. Other than that, some areas have an intermediate season.
- Rain water and other water supply methods are used for cultivation. Irrigation is also used for cultivation of 'Goda Vee' or highland farming.
- There is a surplus of rice production because there is a big harvest per cultivated unit of land.
- Machinery is heavily used in cultivation.

2. Intermediate Zone

- Kurunegala district and some parts of Badulla, Matale, Moneragala and Matara districts belong to this zone.
- Kurunegala is the district which has the largest amount of land under paddy cultivation.
- Cultivation is done using rain water and other sources of water supply.
- Yields are high per unit of land.
- Machinery is heavily used in cultivation.



Map 4.2

Main Zones of Paddy cultivation in Sri Lanka
Source : Adapted from Biodiversity Conservation in Sri Lanka (1998)

3. Wet Zone

- Galle, Kalutara, Ratnapura, Colombo, Gampaha and Kegalle districts belong to this zone.
- Paddy cultivation is done in low land areas and river valleys.
- Cultivation is mainly done with rain water.
- The harvest is lower, compared to the dry zone harvest.
- Cultivation is done in small plots of land.
- Very often, floods cause destruction to cultivation.

4. Hilly Lands

- Kandy, Matale and Nuwara Eliya are some important areas in this zone.
- Paddy cultivation is done in terraced fields.
- The least amount of land used for paddy cultivation is in Nuwara Eliya district.
- A low harvest is reaped per unit of land in this area.

Factors that have influenced paddy cultivation in these zones.

- Annual rainfall of more than 1900 mm.
- Average temperature of 21^0 C - 35^0 C.
- Alluvial soil, which retains moisture.
- Availability of labour.
- Dry weather when harvest is reaped.
- Facilities available for supply of water.

As shown in Table 4.1 below, there has been an increase in production of paddy as well as in the land used for paddy cultivation at present in Sri Lanka.

Table 4.1
The extent of land used for paddy cultivation and paddy production

Year	The extent of land used for paddy cultivation Hectares in Thousands	Quantity produced Metric Tons in Thousands
2008	1053	3875
2009	978	3652
2010	1065	4301
2011	1223	3894
2012	1067	3846

Activities

1. Mark and name the following in a map of Sri Lanka.
   i. The two districts where the largest and the least amount of land under paddy cultivation are located.
   ii. The Agricultural Research Institutes at Mahailluppallama, Amabalantota and Bombuwela.
   iii. Agro - Technological park at Gannoruwa.
2. Prepare a bar graph using the data in Table 4.1 to show the extent of land used for paddy cultivation and the quantity produced. Write two changes in the production of paddy based on the data in the graph.

Assignments

1. Make a list of traditional and modern varieties of paddy.
2. Pay a visit to a farmer and discuss the problems faced by farmers who cultivate paddy and present a report.
3. Write a letter to a newspaper on the topic "Use of organic fertilizer in paddy cultivation".

Cultivation of Tea

Tea cultivation was introduced to Sri Lanka by an Englishman named James Taylor. He introduced it to the hill country in 1839. Tea was expanded as a plantation crop in 1867 in the Lul Kandura Group of Estates at Hewaheta, Kandy. At present, tea is cultivated in large estates as well as in small lands. The progress of tea cultivation from the inception to date can be explained as follows;

- In 1873, Sri Lanka, cultivated 7.5 hectares of land and produced 10.5 kilograms of tea for the first time. The revenue incurred was Rs.58/=
- In 2012, tea was cultivated in 222 000 hectares of land and the production of tea was 326.3 million kilograms. The income had risen to 74,065 million rupees.

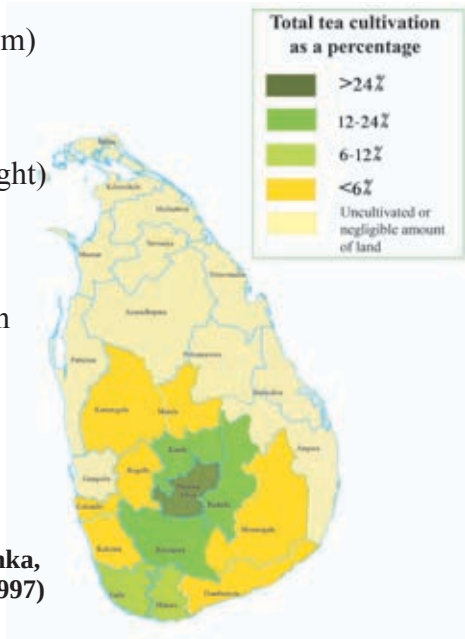
Source : The Central Bank Report 2012

Distribution of Tea Cultivation in Sri Lanka

The areas under cultivation of tea in Sri Lanka are categorized into three divisions. They are, Up country tea, Mid country tea and Low country tea.

- Up country tea - (Highlands over 1220 m) Nuwara Eliya
- Mid country tea - (Lands between 610 m - 1220 m in height) Examples - Kandy, Matale, Badulla.
- Low country tea - (Lands below 610 m in height) Examples - Kalutara, Matara, Galle, Hambantota, Ratnapura, Kegalle.

Source : The Tea Industry in Sri Lanka, Supplementary Teachers' Manual (1997)



Map 4.3
Districts under tea cultivation in Sri Lanka

Source : Adapted from Gunasena - Philips World Atlas (2009)

Map 4.4

The distribution of tea cultivation in Sri Lanka and tea productions

Source : Adapted from Gunasena Philips World Atlas (2009)

The factors which have contributed for the cultivation of tea,

- An annual rainfall of 1900 mm - 5400 mm
- An average temperature between 15^0 C - 27^0 C
- Loam and laterite soil
- Land with gentle slopes with a good drainage
- Skilled labour
- A developed transport service
- Availability of local and foreign market

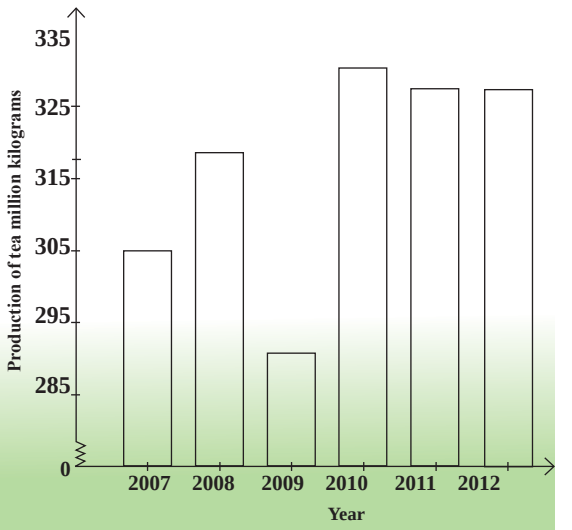
Production of tea from 2007 to 2012 in Sri Lanka is shown in Table 4.2 and Graph 4.1

Table 4.2
Production of tea in Sri Lanka

2007-2012

Year	Production of tea in million kilograms
2007	305
2008	319
2009	291
2010	331
2011	328
2012	328

Source - Central Bank Report 2013



Graph 4.1
Quantity of tea production in Sri Lanka (2007-2012)

Activities

1. Study the table and graph shown above. Write the relevant year in which the highest and the lowest amount of tea was produced.
2. Write two changes that have taken place in tea production from 2007-2012 according to the above graph.

The Tea Research Institute of Thalawakele, Small Tea Estate Development Authority and Ceylon Tea Board are some institutions that provide an important service to promote tea cultivation in Sri Lanka.

A greater quantity of tea is produced for export in Sri Lanka, and it is presented in diverse forms for the export market. See Figure 4.3

Figure 4.3
Various tea products

Sri Lanka is one of the countries that produces high quality tea in the world. Sri Lanka as the producer of the best tea has introduced "Ceylon Tea" under the "Lion Logo" and has succeeded in winning accolades of consumers all over the world. The main buyers of Sri Lankan tea in the Middle East are countries such as Iran, Iraq, The United Arab Emirates, Syria and Jordan. Apart from these, Russia, United Kingdom, Japan and Australia are some of the other countries buying tea from Sri Lanka.

Activities

1. Discuss how tea cultivation was introduced to Sri Lanka in brief.
2. Mark and name five districts where tea is grown on a large scale in a map of Sri Lanka.
3. Mark and name five main countries to which Sri Lanka exports tea in a map of the world.
4. Write three advantages of promoting tea cultivation to the economy of Sri Lanka.

Assignments

1. Write a letter to the Small Tea Estate Development Authority including your suggestions on how to promote the tea industry in Sri Lanka.
2. Design a poster to promote 'Ceylon Tea' in the world.

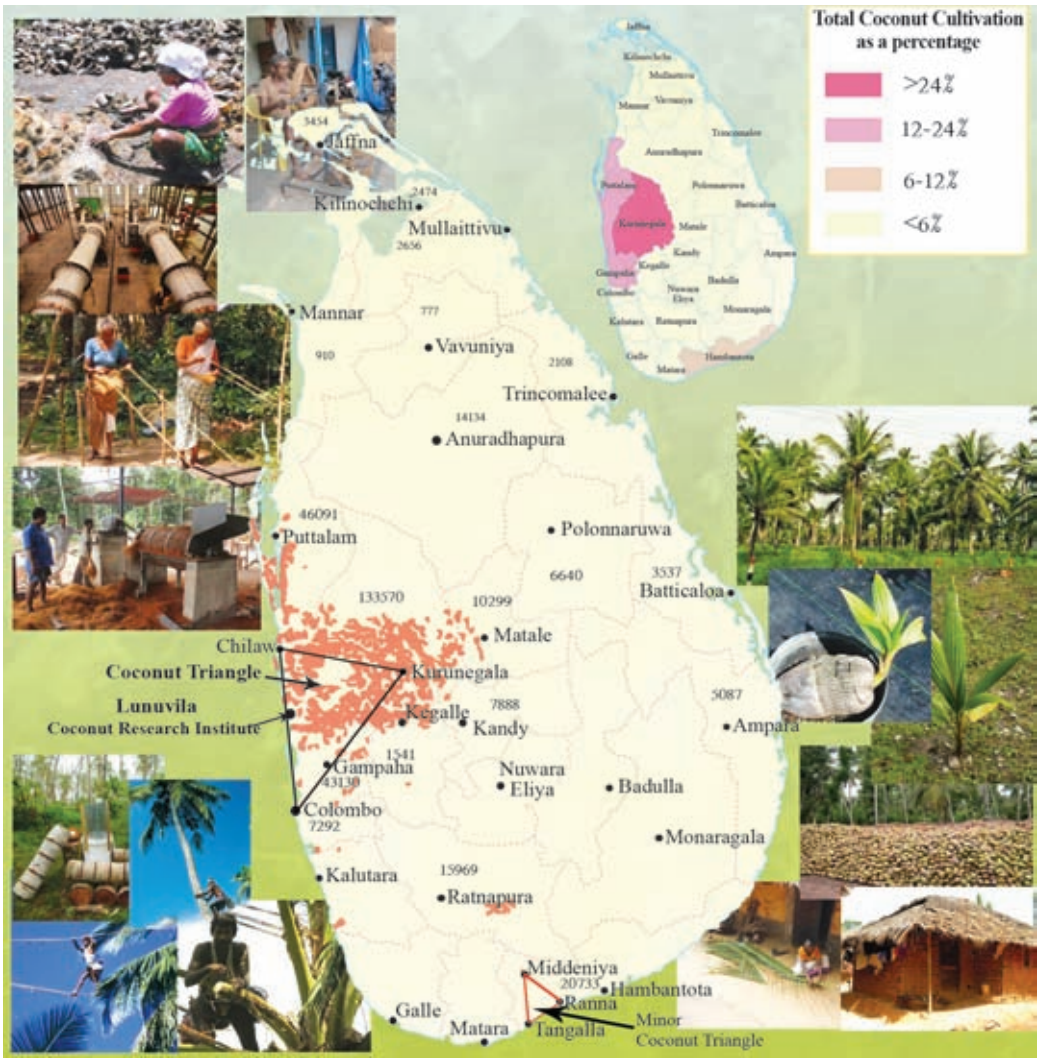
Coconut Cultivation

The coconut tree is considered a special tree entwined with Sri Lankan folk life. Coconut tree is called the 'Kap Ruka' (Tree of Bounty) because every part of the tree is used in preparation of food, beverages, decorations, furniture, curios/ ornaments and animal food. Things taken from coconut tree are used during festive occasions too. For example, coconut flowers and "Gok Kola' (tender leaves). Study Figure 4.4 and indentify coconut based products.

Figure 4.4
Coconut based products

Distribution of coconut cultivation

Coconut cultivation is mainly centralized in a few major zones (Map 4.5). Examples are the areas formed as a triangle, joining Colombo, Chilaw and Kurunegala called the "Coconut Triangle", and the area joining Ranna, Middeniya and Tangalle known as the "Minor Coconut Triangle". Except in those areas, coconut cultivation is distributed on the coastal belt from Colombo to Tangalle and also in the areas like Batticaloa and Jaffna. Coconut is grown in home gardens in almost every part of Sri Lanka.



Map 4.5

Distribution of coconut cultivation and coconut products

Source : Adapted from Gunasena Philips World Atlas (2009)

About 28% of the cultivated lands in Sri Lanka is under coconut cultivation, and this land area is placed second only to paddy cultivation. The Coconut Research Institutes at Lunuwila and Embilipitiya have taken steps to expand coconut cultivation.

The physical factors that influence coconut cultivation are as follows;

- Annual rainfall between 2000 mm - 2500 mm.
- Average temperature between 20^0 C - 27^0 C.
- Saline, sandy soil and undulating land
- Availability of labour
- Availability of local and foreign markets

Table 4.3 shows the quantity of coconuts produced in Sri Lanka.

In 2012, out of the lands under cultivation, about 395 000 hectares of land were utilized for coconut cultivation. In 2012, according to the lands cultivated and the nuts produced, Sri Lanka is ranked the fourth among the countries that grow coconut in the world. The income received from coconut cultivation was 65551 million rupees during that year.

Source: Central Bank Report 2012

Table 4.3
The coconut production in Sri Lanka
2008 - 2012

Year	Quantity of nuts (in Millions)
2008	2909
2009	2853
2010	2584
2011	2808
2012	2940

Source: Central Bank Report (Social Economic Data, 2013)

A large quantity of coconut produced in Sri Lanka is used for local consumption. Therefore, with the growth of population in Sri Lanka there has been an increase in the domestic consumption of coconut.

Activities

1. Mark and name five districts that grow coconut on a large scale in a map of Sri Lanka.
2. Give reasons to explain why the coconut tree is considered the 'Kap Ruka' or the "Tree of Bounty" from ancient times.
3. Draw a bar graph using the data in table 4.3. Express your views about it.
4. List five suggestions you could make to promote coconut cultivation.

Assignments

1. Fill in the table with coconut based products related to various parts of the coconut tree.

Coconut kernel	Coconut shell	Coconut flower	Coconut fronds	Coconut trunk	Coconut husks

2. Prepare a field book on the theme The coconut tree is a Tree of Bounty ('Polgasa Kaprukak') by using pictures, tables, and graphs to illustrate it.
3. Make a few ornaments for your classroom by using raw materials from the coconut tree.

Rubber Cultivation

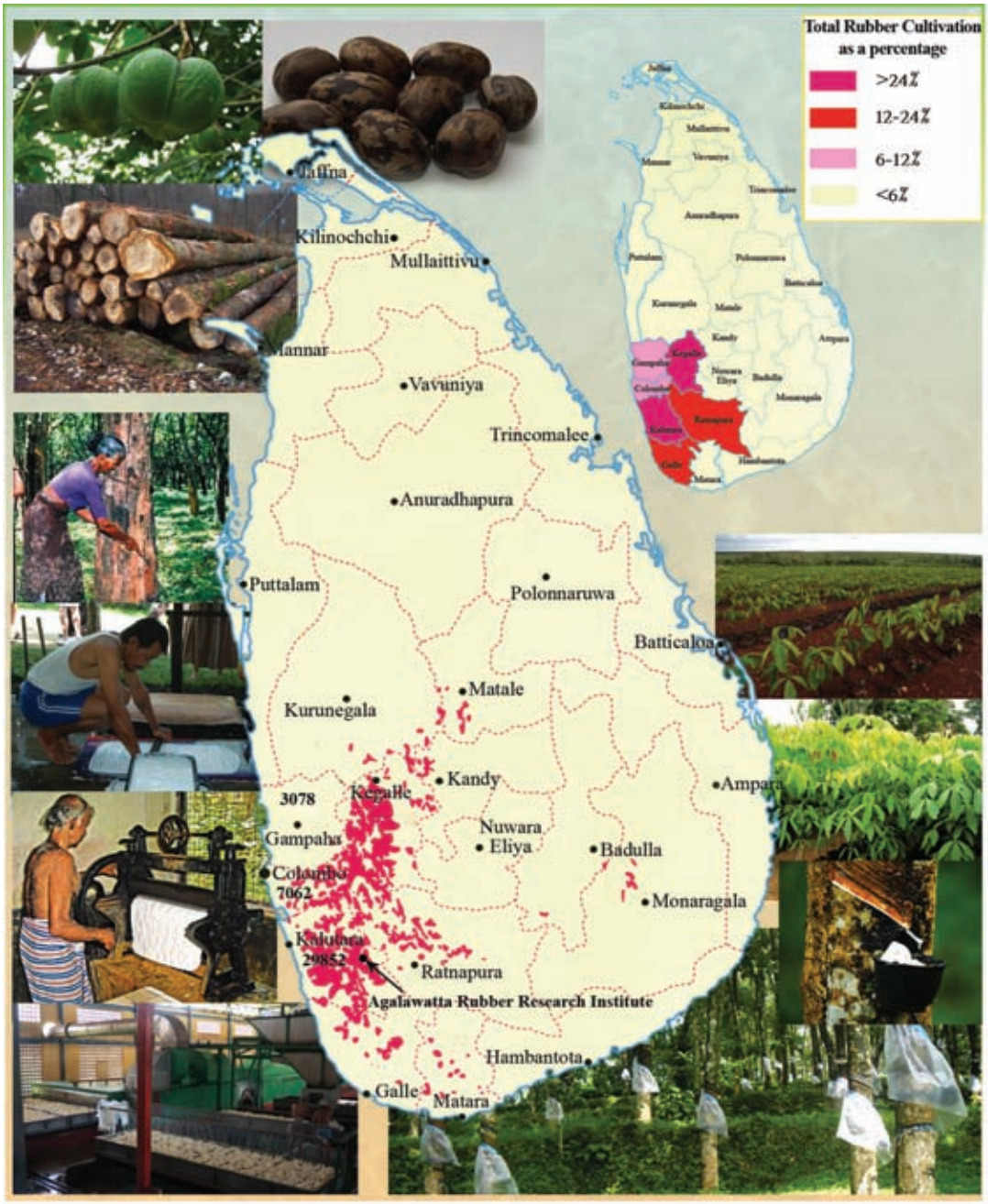
Rubber cultivation which was started as a minor plantation crop in Sri Lanka had expanded to many areas within a short period of time. In 1890, a British national, Sir Henry Wickham planted the first rubber plant in Henerathgoda Gardens in Gampaha. At present, rubber has become one of the main cultivated crops under plantation agriculture in Sri Lanka. Rubber occupies an important place in land utilization in Sri Lanka. It is also important as a source of employment opportunities linked to rubber production and, as a source of good export income. This becomes very clear when you study the following information.

In 2012, the extent of land cultivated with rubber was 131 000 hectares. The production was 152.0 million kilograms. The income earned was 50 255 million rupees.

Source - Central Bank Report - 2012

There was a high demand for rubber during World Wars I and II and that was a reason for the expansion of rubber cultivation and development in production of rubber.

According to Map 4.6, rubber cultivation is mostly distributed in the Wet Zone. It is mostly done in the districts of Kegalle, Rantnapura, Kalutara, Colombo, Gampaha and Galle. It is done on a small scale in the districts of Matale, Kandy, Matara, Badulla, Hambantota and Monaragala. Action has been taken to expand rubber cultivation in the districts of Mullaitivu and Vavuniya.



Map 4.6
Distribution of rubber cultivation in Sri Lanka, rubber products and related human activities

Source : Adapted from Gunasena Philips World Atlas (2009)

Factors affected for the distribution of rubber cultivation in the Wet Zone.

- An annual rainfall of over 2000 mm
- A mean temperature of approximately 27^0 C
- Laterite soil
- Gentle slopes which are less than 300 m in height
- Skilled labour, transport facilities, international market and local market

Rubber was exported as a raw material to foreign market during the early stages of plantations. However at present, the local industrialists use rubber as a raw material and introduce different products to the market.

Figure 4.5 shows various rubber products.

Figure 4.5
Items manufactured using rubber

The Rubber Research Institute of Sri Lanka is situated at Agalawatta. Research is carried out to improve and expand rubber cultivation. Relevant instructions and expansion services are also provided by this institution. Sri Lankan rubber products are exported to countries in the European Union, (like Austria, Belgium, France, Germany, Greece, Italy) India, China, Japan, Hong Kong, Pakistan and the United States of America.

Activities

1. Where was the first rubber seed planted in Sri Lanka?
2. Explain the economic benefits of developing rubber cultivation.
3. Mark and name five main districts where rubber is cultivated in a map of Sri Lanka. Mark the place where the Rubber Research Institute is located and name it.

Assignments

1. Fill in the table with the products that can be manufactured from the following raw materials of rubber.

Raw material	Products
Concentrated Latex Rubber Wood Rubber Seed	

2. Design a poster to be exhibited in the classroom showing the uses of a rubber plant.

Minor Export Crops

Minor export crops are the small-scale products for exportation in addition to the main traditional commercial crops.

After 1960s the Government of Sri Lanka has paid special attention to promote the cultivation of minor crops. It is because,

- Traditional exports are subjected to price fluctuation
- It was impossible to depend entirely on traditional exports like tea, coconut and rubber
- Problems arising with regard to foreign exchange earnings

- Increase in demand for minor export crops in the world market
- Cultivation of minor export crops increase the income of local people
- Minor export crops can be grown, in lands not used for tea, rubber and coconut
- Intercropping in lands can be done with minor export crops.
- Create employment opportunities

Figure 4.6

Minor Export Crops

After the establishment of the Department of Minor Export Crops in 1972, export crop diversification programme was introduced in Sri Lanka. Under this programme new export crops like flowers, vegetables, chillies, betel, peanuts, ornamental plants and vegetables were added. This was in addition to the export of traditional crops. A great contribution towards this programme was made by the Agro Export Board which was established in 2010. The necessary instructions are given by the Minor Export Crop Research Institute located at Matale.

Table 4.4

The distribution of minor export crops

Minor export crop	Districts/ Areas under cultivation
Cinnamon	Scattered in areas along the coastal belt between Negombo and Matara and in the districts of Ratnapura and Hambantota
Coffee	Kalutara, Ratnapura, Kegalle, Gampaha, Matale, Kandy.
Pepper	Kandy, Matale, Kegalle
Cardamoms	Kandy, Kegalle, Ratnapura, Matale, Matara
Cloves	Matale, Kandy, Kegalle.
Nutmeg	Matale, Kandy, Ratnapura
Cashew	Mannar, Hambantota, Puttalam
Citronella	Matara, Hambantota
Flowers	Nuwara Eliya, Badulla, Bandarawela.

Apart from these gherkins, water melon, banana, maize, dragon fruit, ornamental plants and flowers are grown in home gardens and in Mahaweli Development Zones.

Activities

1. Mark and name the districts in which each minor export crop is cultivated in a map of Sri Lanka.
2. Explain two benefits of cultivating minor export crops.

Assignments

1. Fill in the table with the names of the traditional minor export crops and the non traditional minor export crops of Sri Lanka.

Traditional Minor export crops	Non-traditional minor export crops

2. Prepare a minor export crop garden in your school premises or in your home garden and maintain it.

Vegetables and fruits

The vegetables and fruits that we eat can be cultivated in any part of Sri Lanka. They can be grown in a small plot of land as an intercrop or as a commercial crop or as garden corps.

In the past there were specific areas of Sri Lanka identified for cultivation of vegetables.

Drumsticks (*Murunga*), long beans (*Mekaral*) tomato, brinjals, kekiri, bitter gourd (*karawila*), and pumpkins. → **Dry zone**

Ladies fingers (*Bandakka*), Snake gourd (*Pathola*), lufa (*vatakolu*), long beans → **Wet zone**

Leeks, cabbage, beans, carrot, potatoes, beetroot and knolkhol → **Hill country**

Figure 4.7
Vegetables cultivated in Sri Lanka

However, upcountry vegetables are grown in many parts of Sri Lanka with the advancement of technology at present.
Vegetables are grown on a commercial level in areas like Welimada, Bandarawela, Badulla and Nuwara Eliya under proper management by using both rain water and irrigation systems. A large number of Labourers are employed in this venture and organic manare from the animal farms is used in vegetable cultivation.

Other than that, vegetables are grown on a large scale for local and foreign markets in districts such as Badulla, Matale, Kandy, Hambantota, Anuradhapura, Moneragala, Ampara and Jaffna.

Fruits

Fruits which are essential for a healthy life are grown in many areas in an organised manner since recent times. There is a local as well as a foreign market for Sri Lankan fruits. Bananas, pineapples, mangoes, passion fruit, oranges, grapes, papaw, and

avocados are some of the fruits which are grown on a commercial basis. Bananas are grown in Hambantota, Moneragala and Ratnapura districts. Pears, grapes and strawberries are grown in Nuwara Eliya, Badulla and Jaffna districts. Other than that fruits are grown in almost all other areas in the country for consumption. These fruits are exported as fresh fruits, canned sliced fruits, pieces, and dehydrated fruits.

Figure 4.8
Fruits cultivated in Sri Lanka

Activities

1. Name the fruits and vegetables grown in abundance in Nuwara Eliya, Hambantota, Anuradhapura, Badulla and Moneragala districts.
2. Give your suggestions to promote the cultivation of local vegetables and fruits and to improve the industries linked to them.

Assignments

1. Make some plots of vegetables and fruits in your home garden or school premises to make the land more beautiful and useful and maintain them.
2. Prepare a list of by-products which can be produced with fruits.
3. Collect information about the methods of preserving fruits and present them.

Livestock Farming

Livestock farming is a process related to agriculture. Special attention has been paid on livestock farming in Sri Lanka from recent times, for the following purposes.

- For the upliftment of nutrition of the people.
- Providing employment opportunities for people in rural areas.
- To get maximum use of marginal lands that cannot be cultivated.
- To provide an additional income for farming communities.
- To provide organic manure for agriculture.
- To earn and save foreign currency.

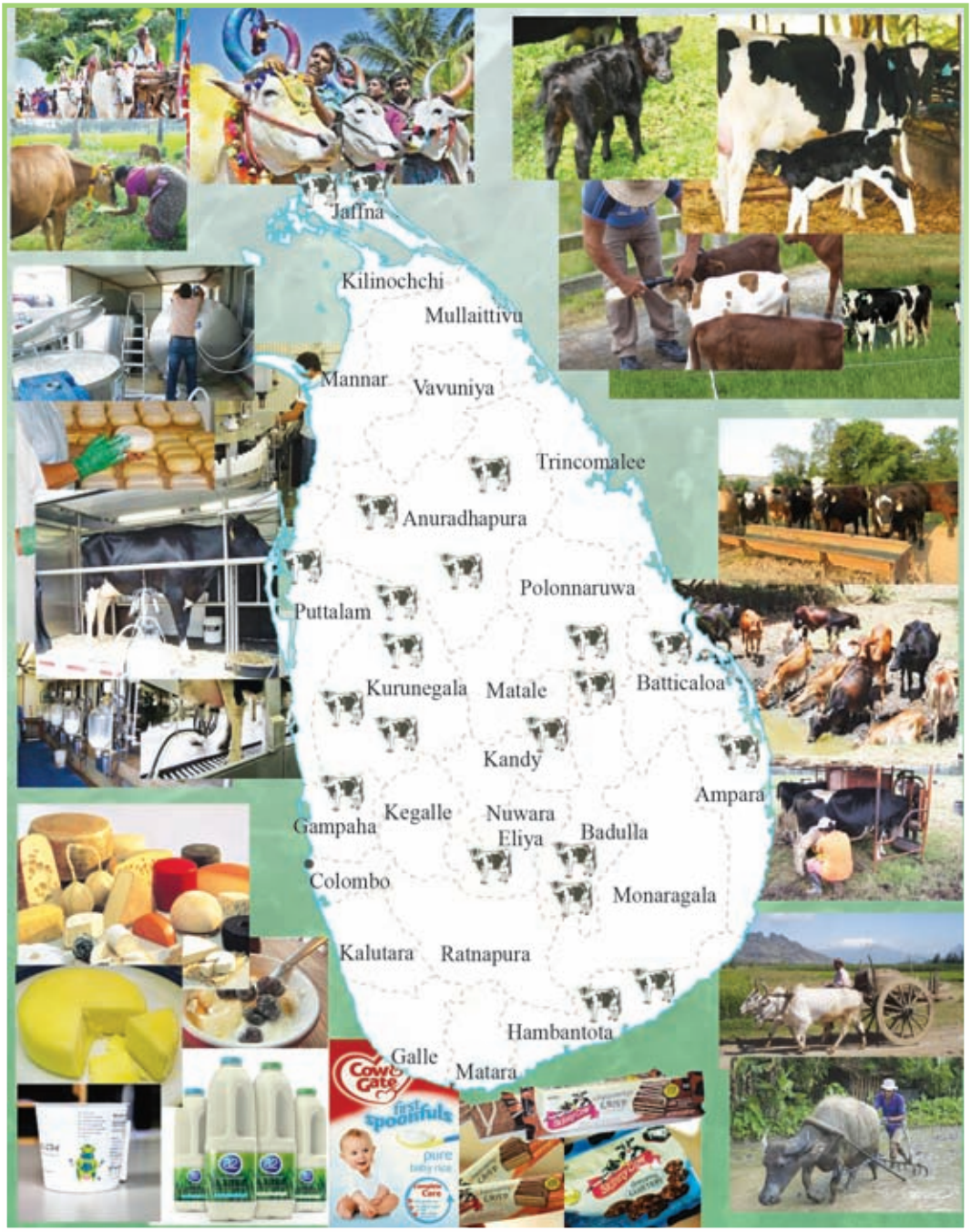
Under livestock farming, attention is focussed only on dairy farming in this lesson.

Dairy Farming

The need for improving the local production of milk has arisen in order to save the foreign exchange spent on the import of milk powder and to develop adequate nutrition levels of Sri Lankans. Therefore, the Sri Lankan Government and the people have focused their attention on dairy farming.

Cattle rearing is mainly done in areas such as Nuwara Eliya, Badulla, Polonnaruwa, Hambantota, Ampara, Anuradhapura, Kurunegala and Batticaloa. About 2/3 of the buffaloes are reared in the areas of Dry Zone in Sri Lanka.

Research institutions at Ambewela, Kananwila, and Walpita have introduced new breeds of cattle and new varieties of grass as well as provided instructions when necessary. 'Meevanapalana' Dairy Cattle centre has been set up to exchange lactating cows.



Map 4.7

Areas of Sri Lanka where milk production is carried out, dairy products and related human activities

Source: Susara Map Book (2011)

Milk Products

Production of liquid milk has become popular recently in Sri Lanka and Figure 4.9 shows some of the milk products.

Figure 4.9
Some milk products

Activities

1. Mark and name three districts where dairy farming is carried out on an outline map of Sri Lanka.
2. Explain the steps taken by the Government to promote milk products in Sri Lanka.
3. Explain with examples, the advantages of promoting dairy farming in Sri Lanka.

Assignment

Prepare a list of milk products of Sri Lanka.

Fisheries Industry

Fisheries industry can be considered as an important sector of the economy of Sri Lanka. Many factors favourable for fisheries industry are found in Sri Lanka. They are as follows.

- Sri Lanka being an island surrounded by the ocean.
- A long coastline around the island.
- A wide continental shelf
- Location of bays, lagoons and harbours
- The presence of rivers, canals, streams, tanks and reservoirs
- Plenty of plankton during the monsoons due to the activation of ocean currents.

Map 4.8
The Exclusive Economic Zone of Sri Lanka
Source : Gunasena Philips World Atlas (2003)

Map 4.9

The distribution of the fisheries industry of Sri Lanka and the relevant human activities

Source : Adapted from Gunasena Philips Atlas (2003)

Importance of Fishing industry

- To provide required amount of protein for people.
- Existence of a wide local and foreign market for fisheries products
- Provision of employment opportunities
- Ability to earn foreign currency by selling fisheries products.
- Availability of resources to improve the fisheries industry.

Hence the fisheries industry can be considered as an important part of the ecomony of Sri Lanka.

The fisheries industry can be categorized into three parts according to the regions where it is distributed.

1.Marine water fisheries

2.Fresh water fisheries

3.Brackish water fisheries

Marine fisheries industry (Ocean fishing)

Fishing in the Exclusive Economic Zone is called "Marine Fishing". It has two main sectors.

- Fishing in coastal sea or in the continental shelf
- Deep sea fishing

Fishing in the coastal sea

The largest quantity of fish is obtained from the coastal sea. Fishing industry is distributed widely from Mannar to Hambantota and Batticoloa to Jaffna in the shallow sea. The reasons for the abundance of fish in the shallow sea are given below.

- Availability of plankton for fish in abundance.
- Organic particles brought by the rivers, streams and canals have deposited in the coastal areas.
- Fish food at the bottom of the sea is brought to the surface water by the action of ocean currents.

As a result plenty of small fish such as *Salaya*, Sprat, *Herring*, *Etawalla*, *Sudaya*, Mullet and *Alagoduwa* are bred in this coastal area,

Deep sea fishing industry

Large fish such as *Thalapath (Sword fish)*, *Thora* (seer), *Mora* (Shark), *Koppara, Kelawalla, Balaya* (tuna) are caught in the deep sea. Deep sea fishing is done under state patronage as well as under private enterprise. Various kinds of fishing gear (tackle) is used to harvest such kinds of fish. Figure 4.10 shows such tackle.

Figure 4.10
Tackle used in the fishing industry

Fresh water fishing industry

Fresh water fishing comprises fishing in inland water bodies such as rivers, streams, canals, tanks and ponds in Sri Lanka. Fish such as Lula, *Kanaya, Magura, Koraliya, Godaya, Hunga, Maspetiya, Kavaiya, Thadalaya* are important varieties of fresh water fish.

Fish such as Grass Carp, Big head Carp, Silver Carp, Catla, Rohu, Thilapia and Gurami are being bred at present in tanks and ponds. Breeding of ornamental fish and aquaculture for fish food are done under fresh water fishing industry.

Figure 4.11
Fresh water fish of Sri Lanka

Brackish water fishing industry

Brackish water fishing is carried out in many places along the coast which is about 1760km in length. The main areas where brackish water fishing is carried out are Jaffna, Puttalam, Mundala, Chilaw, Negombo, Polwatta river, Malala lagoon and Arugam Bay. Estuaries and lagoons are the most suitable places for brackish water fishing as there is both sea water and fresh water in those areas. Existence of mangroves and organic matter brought by rivers, streams and canals have contributed for the abundant breeding of fish that can withstand changes in salinity. In places like Chilaw, Negombo and Puttalam, prawns and crabs are bred on a commercial scale. Multi National Companies provide aid to breed prawns at present.

Brackish water fish

Figure 4.12
Brackish water fish of Sri Lanka

Activities

1. List three advantages and disadvantages of brackish water fishing.
2. Describe three steps taken by the Government to uplift the fisheries industry.

Assignment

Prepare a leaflet to create awareness among people about the importance of developing the fisheries industry for the economy of Sri Lanka.

New Trends and issues pertaining to Agriculture in Sri Lanka.

There are many issues related to agriculture in Sri Lanka. They can be categorized as problems related to land use, production, trade and environmental issues.

Issues related to land utilization

- Scarcity of lands and fragmentation (Eg :- vin relation to paddy, tea, coconut and rubber land).
- Reclamation of paddy land.
- Using agricultural land for other purposes
  (Eg :- coconut and rubber lands being blocked out in small plots).
- Lands being used for construction of houses and for other development purposes due to the rapid increase of population.
- Lower harvest due to cultivation of crops in the same land for a long period of time (Eg :- paddy, tea, coconut and rubber land).

Issues in production

- Low yields due to use of land over a long period
  (Eg :- tea, rubber, coconut).
- Inability to use machinery due to land fragmentation.
- Lower yield per unit of land
  (Eg :- paddy, tea, minor export crops).
- Scarcity of water in the dry zone, excess water in the wet zone.
- Increase in the prices of fertilizer (Eg :- paddy).
- Scarcity of skilled labour and the unwillingness of the younger generation to get involved in jobs related to agriculture.
- Using harmful equipment and using harmful methods (Eg :- to catch fish in the fisheries industry).
- Production cost is higher and the farmers become indebted.
- Factories not being modernized
  (Eg :- tea and rubber factories).

- Excessive cost of new breeds of cows and high cost of maintenance and food (Eg :- in dairy farming).
- Increase in the cost of fishing boats, fishing tackle, cold storage and fuel prices (Eg :- fisheries industry).
- Insufficient storage facilities and cold storage facilities.

  (Eg :- paddy, vegetables,fish, fruits, milk)
- Provision of subsidies being irregular.
- Difficulty in obtaining credit facilities as there are problems in the ownership of land (Eg :- minor export crops).
- Insufficient transport facilities (Eg :- fish, milk, vegetables and fruit)
- Labour problems regarding Trade Unions (Eg :- regarding tea, coconut and rubber).
- Lack of technological knowledge and labour skills.
- Increased cost of machinery .
- Due to the use of seeds of low standard , production falls short of market demands (Eg :- vegetables and fruits).

Issues related to trade

- Insufficient purchasing centers

  (Eg :- paddy, vegetables, fruits, milk).
- Exisitence of non stable price in local and foreign markets.
- Increase in local consumption has resulted in a limitating exports.

  (Eg :- paddy, coconut)
- The income of farmers has decreased because of intermediaries

  (Eg :- paddy, vegetables, fruit, milk)
- Price fluctuations in the international market.
- Challenge from substitutes.

  Eg :- Rubber - Synthetic rubber

  Tea - Other beverages
- Challenge from other countries

  Eg :- Tea - Kenya

  Rubber - Malaysia
- Low quality goods being exported to the international market.
  (Eg :- blending other varieties of tea with Sri Lankan tea)

Environmental Issues

- Facing epidemics and diseases caused by insects.

  Eg :- Coconut - diseases by beetles, mita attacks.

  Vegetables and Fruits - by mealy bugs

  Dairy farming - hoof and mouth disease

- Destruction of crops due to floods, land slides, droughts, heavy rain
- Problems created in the fishing industry through cyclones, ocean currents and Tsunami conditions.
- Health problems occur because of the pollution of water, land and air due to use of fertilizers, insecticides and weedicides.
- Extinction of animals and plants essential for the existence of the eco system.
- Releasing parts of plants and animals harmful to the environment

Trends in Agriculture

Trends in production

- Provision of subsidies to increase production.
- Diversification of agricultural products.

  Eg :- Tea - instant tea, green tea, cordial
  Coconut - diverse ornamental products.
  Rice - flour, noodles, sweetmeats

- Increase in local consumption

  (Eg :- coconut, vegetables, fruits, milk, fish)

- Introduction of intercropping related to agricultural crops.

  Eg :- cultivation of pineapple, betel, passion fruit and pepper in coconut land, cultivation of coffee, cinnamon and pepper in rubber land.

- Research institutes have introduced new seeds that would resist droughts and floods. They also have introduced seeds which produce a higher yield by using gene technology and cloning.

  Eg :- in paddy cultivation,

  BG 407, BG 450, AT 307 Ma Vee (a variety of paddy)

  In coconut cultivation,

  Kap Setha (CRISL 2013), Kap Suvaya (CRISL 2012)
  (Coconut Research Institute of Sri Lanka)

- Using new land for cultivation

  (Eg :- rubber cultivation in Vavuniya, Mullaitivu

  Coconut cultivation - Dry zone areas

- Promoting the use of organic fertilizers

  (Eg :- The establishment of Organic Fertilizer Centre at Gonawala,

  Makandura in Kurunegala district

Trends in technology

- Using machinery with modern technology

  (Eg :- in paddy cultivation - machines are used for planting seeds, fanning and threshing (Combine havester)

  Fishing industry - using techniques such as echo sounder, sonar system, satellites and GPS technology

- Increase of mechanization in livestock farming.
- Introducing new methods in tapping rubber.

Trends in trade

- Processing agricultural products to attract consumers.
- Using new packaging methods.

  (Eg :- as packets, canning and making attractive bags

- Emergence of private companies in commercial production

  (Eg :- Milco, Nestle, Kothmale

Government patronage for agriculture

- Provision of export tax concessions.
- Expansion of market services.
- Provision of subsidies for fertilizer.

  (Eg :- paddy, tea, rubber, minor export crops)

- Provision of subsidies to replant crops

  (Eg :- tea, coconut, rubber, cinnamon)

- Establishment of training centers

  (Eg :- Matale - for minor export crops

  Gannoruwa, Bata Atha - Agro - Technological Park

  Agunakolapelassa - For legumes (Mansha Boga)

- Introduction of pension schemes and insurance systems.
- Expansion of distribution services.
- Establishing export villages

  Eg :- Paddy - Pollonnaruwa and Kurunegala

  Cashew - Damabadeniya

  Betel - Katugampola

  Chillies - Rajangana

- Introducing programmes on landscaping based on agricultural crops to beautify home gardens and other lands.
- Introducing programmes such as, 'Divi Naguma' and 'Gami Diriya' to uplift agriculture.

Activities

1. a). Write four problems that can come up when using technology for paddy cultivation.

   b). Present your suggestions to get those problems solved.

2. Fill in the following table with three pertaining and trends related to agriculture for each of the following crops cultivated.

Cultivation	Problems	Trends
Paddy Tea Coconut Rubber Minor export crops		

3. Write four suggestions to minimize the issues pertaining to dairy farming.

Assignment

Use magazines, news papers and other sources and prepare a report stating the steps taken by the government to solve problems related to agriculture.

Importance of agriculture in the Sri Lankan economy

Agriculture has an important place in the Sri Lankan economy. There are few reasons for this

- Agricultural sector contributes 11.1% to the Gross National Product.

- The Agricultural sector contributes 24% for the export income.
- 31% of the labour force is involved in employment in the agricultural sector
- A major portion of land utilization is used for agricultural crops in Sri Lanka.
- Provision of raw materials for industries and production of food.

The growth of agricultural sector is 5.8% in 2012

Source : (Central Bank Report - 2012)

Contribution to Gross National Product (GNP)

Contribution to Gross National Product by the agricultural sector is 11.1% in year 2012 .The composition is shown in Table 4.5

Table 4.5

Contribution to Gross National Product from the agricultural sector - 2012

Sector	Contribution to Gross National product (%)
Agricultural sector	11.1
1. Agriculture, Livestock resources and forest products like timber	9.8
• Tea	0.9
• Rubber	0.2
• Coconut	1.0
• Minor export crops	0.4
• Paddy	1.5
• Livestock	0.8
• Other food crops	3.7
• Estate development	0.3
• Timber and forest resources	0.6
• Other agricultural products	0.4
Fisheries industry	1.3

Source : Central Bank Report - 2012

Activities

1. Which sectors of Sri Lankan agriculture give the highest and the lowest contribution to the Gross National Product in Sri Lanka.
2. Write the steps taken by the Government at present to increase the income of agricultural sector.
3. Discuss two steps that can be taken further to develop the fisheries industry in Sri Lanka.

Contribution to the labour force

Sri Lanka is an agricultural country. By 2012, the labour force involved in agricultural activities was 31%. It is clear that 1/3 of the total labour force of Sri Lanka are engaged in employment under the agricultural scetor. It is shown in Figure 4.6

Figure 4.6

Employment of Sri Lanka in 2012 (%)

Section	2012
Agriculture	31.0%
Industries	26.1%
Services	42.9%

Source - Central Bank Report 2012

Employment opportunities in the agricultural sector can be catergorized as follows; those related to tea, coconut and rubber estates and paddy cultivation, in the production of rice flour, noodles and sweetmeats, in the processing industries related to minor export crops, in processing coconut products and in the fisheries industry. As new employment opportunities are created in the agricultural sector, much attention is paid on it by the Government too.

When considering contribution of the Sri Lankan agricultural sector to the export income, the importance of this sector becomes prominent. Table 4.7 shows the composition of agricultural export in year 2012. According to this table, 1/4 or 24% of the export income of Sri Lanka is earned by the agricultural sector. Tea, spices and coconut are among the major export crops.

Table 4.7

Composition of Agricultural exports of Sri Lanka - 2012

Category	Value in Dollar Million	Contribution (%)
Tea	1411.9	14.4
Rubber	125.1	1.3
Coconut	208.9	2.1
Spices	256.1	2.6
Vegetables	13.3	0.1
Tobacco - unprocessed	42.2	0.4
Sea food	198.0	2.0
Agricultural exports	76.0	0.8
Total	2331.5	23.9

Source - Central Bank Report 2012

Activities

1. Complete the table including new employment opportunities related to agriculture.

Field	New Employment Opportunities
Paddy Cultivation Tea Coconut Fisheries	

2. What are the reasons for the reduction of the labour force related to agricultural sector in Sri Lanka?
3. Write two suggestions to overcome those reasons.
4. Explain with examples, the importance of the agricultural sector for the economy in Sri Lanka.

Bibliography and Sources

Biodiversity Conservation in Sri Lanka, Framework For Action

උපාලි වීරක්කොඩි (1998), මානුෂ භූගෝල විද්‍යාව I, II

ගුණසේන ලෝක සිතියම් පොත (2009), සීමාසහිත ඇම්. ඩී. ගුණසේන සමාගම, කොළඹ.

ගෙවත්තේ වගාව (2011), ශ්‍රී ලංකා මහා බැංකු ප්‍රකාශන.

ගොවිකම් සඟරාව (2012 - අප්‍රේල් - ජුනි කලාපය), පේරාදෙනිය කෘෂිකර්ම දෙපාර්තමේන්තුව.

ජ්‍යෙෂ්ඨ කථිකාචාර්ය ඊ. දයාරත්න (2009), ආර්ථික වර්ධනය සංවර්ධනය හා ආර්ථික ප්‍රතිපත්ති

මානුෂ භූගෝල විද්‍යාව I, II (අ.පො.ස උ.පෙළ), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.

මිනිසා හා පරිසරය (1998), මධ්‍යම පරිසර අධිකාරිය

විදුරාව සඟරාව 28, 26 වෙළුම (2011- නොවැම්බර්), ජාතික විද්‍යා පදනම

ශ්‍රී ලංකාවේ තේ කර්මාන්තය ගුරු අත් පොත (1997), ජාතික අධ්‍යාපන ආයතනය, මහරගම.

ශ්‍රී ලංකාවේ ධිවර කර්මාන්තයේ ගුරු අත් පොත (1997), ජාතික අධ්‍යාපන ආයතනය, මහරගම.

ශ්‍රී ලංකාවේ පොල් කර්මාන්ත ගුරු අත් පොත (1991), පොල් කර්මාන්ත ආයතනය, ලුණුවිල.

සටහන 30 වෙළුම, (3 - 4 කලාපය) 2011- 11 - අප්‍රේල් මහ බැංකු ප්‍රකාශනය)

සමාජ ආර්ථික දත්ත (2010-2012, 2013), මහ බැංකු වාර්තාව

සුසර සිතියම් පොත (2011), සුසර ප්‍රකාශකයෝ, කොළඹ.

Glossary

Cash crops	- වෙළෙඳ භෝග	- பணப்பயிர்கள்
By products	- අතුරු නිෂ්පාදන	- உப உற்பத்திகள்
Organic fertilizer	- කාබනික පොහොර	- சேதன உரங்கள்
Terraced Cultivation	- හෙල්මළු වගාව	- படிக்கட்டுப் பயிர்ச்செய்கை
Agro Ecological Zones	- කෘෂි පාරිසරික කලාප	- விவசாய உயிர்ச்சூழலியல் வலயங்கள்
Agro Research Institute	- කෘෂි පර්යේෂණ ආයතනය	- விவசாய ஆராய்ச்சி நிறுவகம்
Tea Board	- තේ මණ්ඩලය	- தேயிலைச்சபை
Concentration	- සංකේන්ද්‍රණය	- செறிவு

Small Tea Estate Development Authority	- කුඩා තේ වතු සංවර්ධන අධිකාරිය	- சிற்றுடமை பெருந்தோட்ட அபிவிருத்தி அதிகாரசபை
Quality	- ගුණාත්මකභාවය	- தரம்
Coconut Triangle	- පොල් ත්‍රිකෝණය	- தெங்கு முக்கோணம்
Minor Coconut Triangle	- සුළු පොල් ත්‍රිකෝණය	- சிறிய தெங்கு முக்கோணம்
Domestic consumption	- ගෘහස්ථ පරිභෝජනය	- உள்நாட்டு நுகர்வு
Research	- පර්යේෂණ	- ஆராய்ச்சி (பரிசோதனை)
Minor export	- සාම්ප්‍රදායික අපනයනය	- மரபுரீதியான ஏற்றுமதி
Minor export crops	- සුළු අපනයන භෝග	- சிறிய ஏற்றுமதிப் பயிர்கள்
Export Crops Diversification	- අපනයන භෝග විවිධාංගීකරණය	- ஏற்றுமதிப் பயிர்களின் பன்முகப்படுத்தல்
Agro Export Board	- කෘෂි අපනයන මණ්ඩලය	- விவசாய ஏற்றுமதிச் சபை
Dairy Farming	- කිරිපට්ටි පාලනය	- பாற்பண்ணை
Sterilized	- ජීවානුහරණය	- தொற்று நீக்கப்பட்ட
Dehydration	- විජලනය	- நீரகற்றல்
Currents	- දියවැල්	-நீரோட்டங்கள்/துடிப்புக்கள்
Exclusive Economic Zone	- අනන්‍ය ආර්ථික කලාපය	- தனித்துவமான பொருள்
Plankton	- ප්ලවාංග	- பிளாங்ரன் தாவர வலயம்
Aquaculture	- ජලජීවී වගාව	- மீன்வளர்ப்பு
Potential sources	- විභව සම්පත්	- உள்ளார்ந்த மூலங்கள்
Sea Water Fisheries	- කරදිය ධීවර කර්මාන්තය	- கடல்நீர் மீன்பிடிக் கைத்தொழில்
Fresh Water Fisheries	- මිරිදිය ධීවර කර්මාන්තය	- நன்னீர் மீன்பிடிக் கைத்தொழில்
Brackish Water Fisheries	- කිවුල් දිය ධීවර කර්මාන්තය	- உவர் நீர் மீன்பிடிக் கைத்தொழில்
Land utilization	- භූමි පරිභෝජනය	- நிலப் பயன்பாடு
Fixed price	- ස්ථාවර මිල	- நிலையான விலை
Price fluctuation	- මිල උච්චාවචනය	- விலைத்தளம்பல்
Labour force	- ශ්‍රම බලකාය	- தொழிலாளர் படை
Organic matter	- ඓන්ද්‍රීය ද්‍රව්‍ය	- சேதனத் துணிக்கைகள்

5 Manufacturing Industries

Manufacturing industries occupy a very important place among economic activities of man. Industries which produce both finished and semi-finished products with the knowledge of technology and skills of man, utilizing the raw materials and other factors of production are called manufacturing industries. "During this process goods are produced by using essential raw materials in such a way that a value is attributed to them, so that they would provide maximum utility".

With the dawn of the Industrial Revolution during the 18th century there was a revival in the field of industries in many countries of the world. During this period, certain industries which existed as cottage industries were transformed into factories producing high quality industrial goods using machinery and new technological methods.

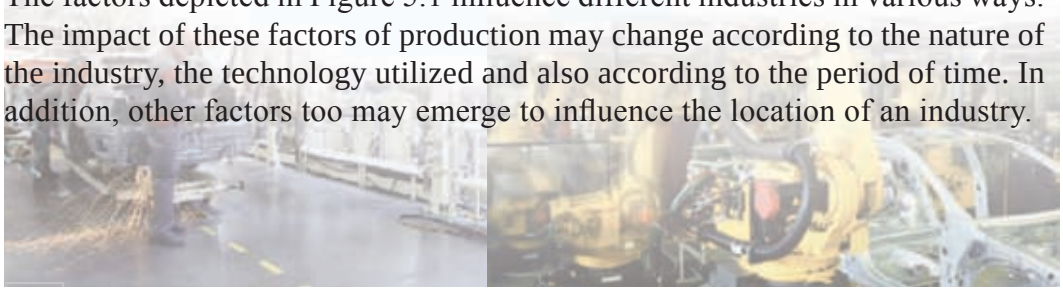
The objective of this chapter is to study the main manufacturing industries of the world, their distribution, production, trade and the modern trends.

Attention is paid on the following manufacturing industries for the purpose of this study.

- Iron and steel industry
- Automobile industry
- Ship building industry
- Electronic industry
- Cotton textile industry

The location of an industry is influenced by a few factors. Those factors are shown in Figure 5.1.

The factors depicted in Figure 5.1 influence different industries in various ways. The impact of these factors of production may change according to the nature of the industry, the technology utilized and also according to the period of time. In addition, other factors too may emerge to influence the location of an industry.



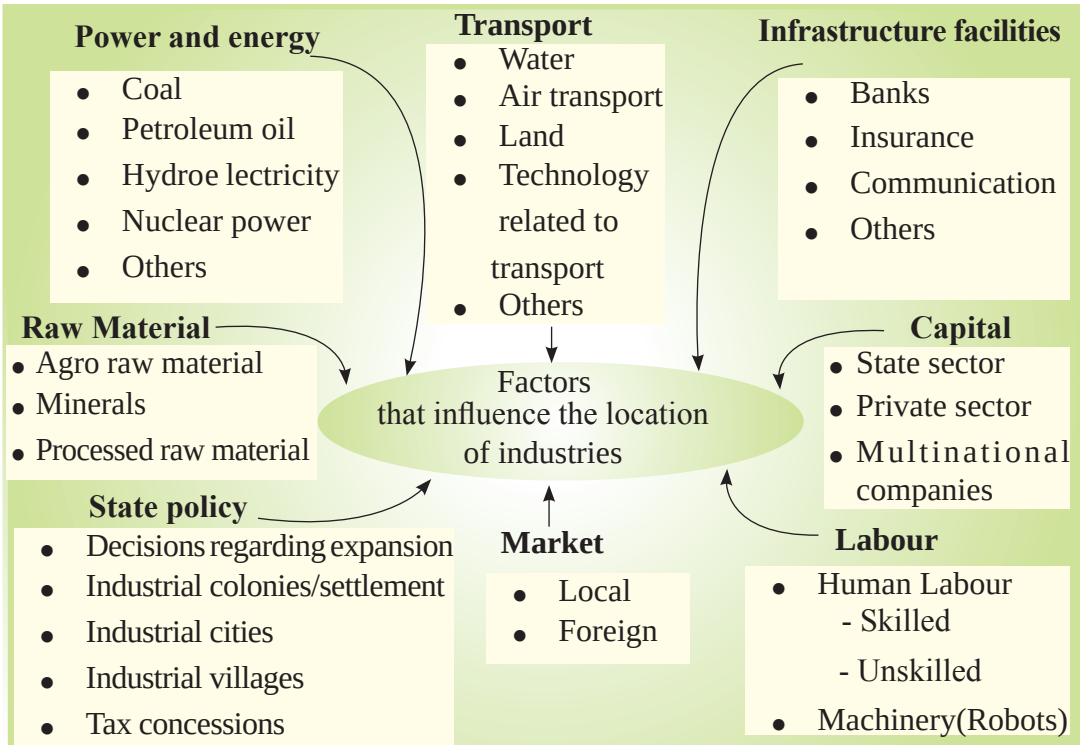


Figure 5.1
Factors that influence the location of industries

Iron and Steel Industry

The iron and steel industry is a very ancient industry. Due to the Industrial Revolution which began during the latter half of the 18th century, there was an accelerated development in the iron and steel industry. During the early stages, though this industry was located in countries where iron ore, coal and limestone deposits were in abundance, there are also countries where the iron and steel industry is maintained at a highly developed level using imported raw materials. As this industry is decisive in determining the technical strength of a country and in addition as iron and steel are used as a raw material for production of equipment, this industry has an important position. In this industry, basically iron ore is used to produce iron. Pig iron is mixed with other metals and seasoned further to produce steel. During the early stage of the Industrial Revolution, 90% of the raw material used, for production activities in the fields of machinery, electrical products and transport, was iron and steel . Later, when aluminium was discovered, the demand for iron and steel dropped to 65%. Iron and steel industry which is linked to different economic activities in the world is also important as a base industry for many other industries.

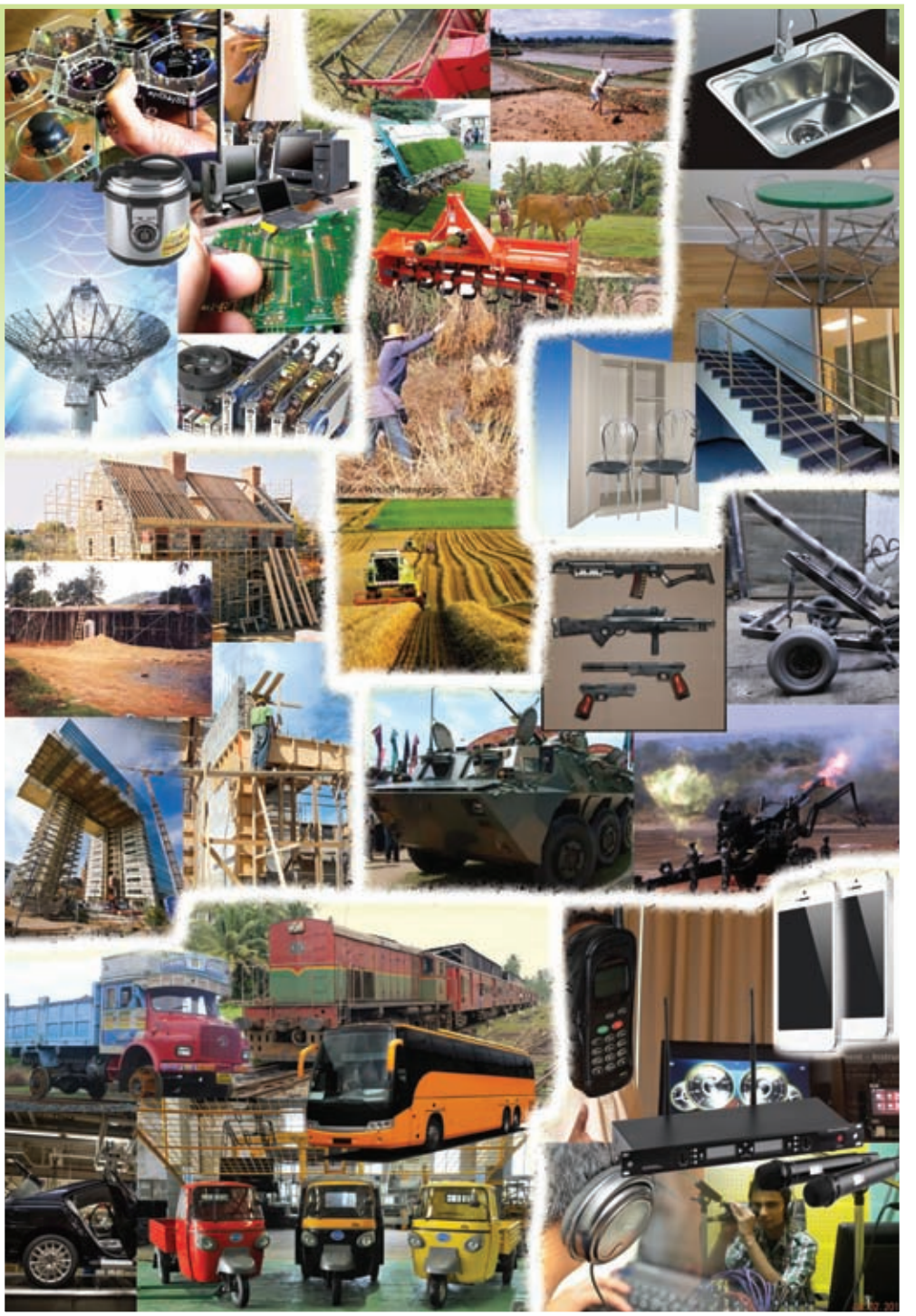
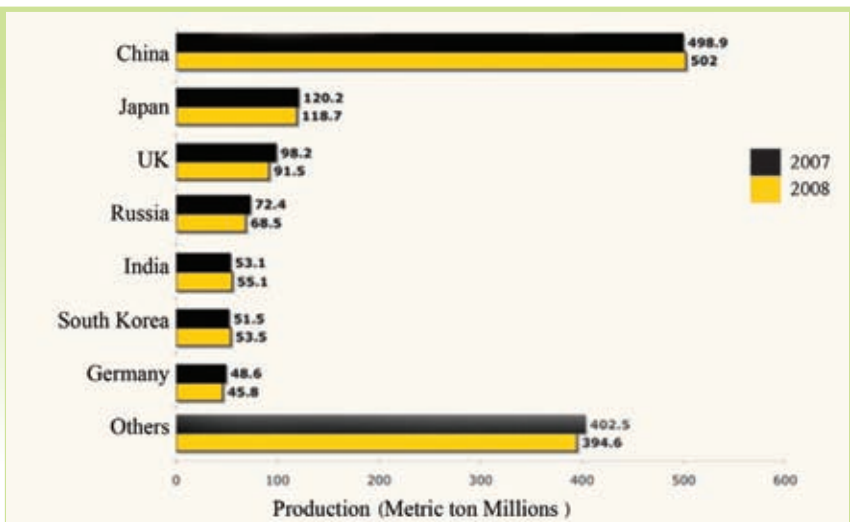


Figure 5.2
Other economic activities linked to iron and steel products

There is a continuous development in the iron and steel industry in the world.The iron and steel production which was around 70 million metric tons in 2000, has risen to 130 million metric tons by 2012 as shown in Graph 5.1.

Graph 5.1
The present progress of world steel production
Source: *HTTP;//WWW.wikipedia.org (2014.02.10)*

The uneven distribution of mineral resources has also affected iron and steel production as shown in Graph 5.2. According to Graph 5.2, different countries have contributed to the production capacity of iron and steel in various amounts. China has made the greatest contribution.



Graph 5.2
Steel producing countries in the world
Source: *http://www.worldsteel.org/?action=newsdetaild=257 (2014.02.10)*

Activity

Study Graph 5.2 and list the steel producing countries according to the continents in which they are located.

Although, the iron and steel industry was located in the regions where raw material was found in the past, there is a trend at present to locate the industry outside the places where raw material is available depending on other diverse facilities. Refer to Table 5.1.

Table 5.1

The factors that have contributed to locate the centres of iron and steel production in various countries

Country	Production centre	Important factors influencing location
China	Southern region of Manchuria, Beijing region, Shangshewan region.	Availability of iron ore on the surface of the earth.
Japan	Osaka, Kobe and Kyoto zones. Tokyo, Yokohama zone, North Kiyushu region, Nagoya industrial zone.	Availability of port facilities and market for import and export.
United Kingdom (UK)	Birmingham District, South Wales region, Lancashire region, North Eastern coastal region	Easy access to iron ore and coal and also port facilities to import iron ore.
Russia	Kuznetz zone, Moscow basin zone, Ural zone	Availability of iron ore which has a high content of iron.
India	Western industrial zone, Eastern industrial zone, Southern industrial zone.	Availability of coal and iron ore in the States of Orissa and Bihar and easy access to use river water.
United States of America (The USA)	Michigan Lake region, Pittsburgh region, Detroit industrial zone, New England region, South Appalachian region.	Lakes could be utilized for transport and the availability of raw material from areas around the lakes.

Source- *Adapted from Human Geography Advanced level text book- part II (2009)*

The steel producing regions in the world and the countries to which they belong are shown in Map 5.1.

Map 5.1
Iron and steel producing regions of the world
Source- *Adapted from Geography Text Book- Grade-10(2006)*

When you study the map you can get a general understanding of the regions which produce iron and steel. Information about leading countries in steel trade is shown in Table 5.2.

Table 5.2

The countries that were foremost in the steel trade in world (2012)

Export (Million Metric tons)			Import (Million Metric tons)		
Country	**2011**	**2012**	**Country**	**2011**	**2012**
China	**44.4**	**51.2**	USA	**25.3**	**29.7**
Japan	**40.3**	**41.1**	European countries	**34.0**	**25.2**
European countries	**36.2**	**37.8**	South Korea	**22.3**	**19.9**
South Korea	**28.0**	**29.4**	Thailand	**12.3**	**14.9**
Russia	**24.6**	**26.5**	China	**15.9**	**13.8**

Source *- http://www.issb.co.uk/global.html (2014.02.10)*

Activities

1. Study Table 5.2 and write down the countries that imported more steel in 2012 than in 2011.
2. Write down two reasons why more steel was imported by several countries in 2012 than in 2011 according to Table 5.2.

Features and trends of the Iron and Steel industry

- Diverse qualitative features of Iron and Steel (durability, capacity to bear weight, flexibility, ability to withstand shocks, profitable production)
- Ability to improve quality by mixing with other metals (Aluminum, copper)
- Ability to recycle after discarding (old iron, scrap iron)
- All the countries use iron and steel as a base metal for various products.
- Production activities have become modernized after moving away from traditional technology.
- Ability to smelt iron using alternative source of energy. For example; an electric furnace could be used as an alternative for smelting iron ore.
- Some countries which were prominent in production of iron and steel in the past have gradually receded from the market.
- As there is an increase in demand for steel from East Asian countries, a new market has been created (China, South Korea).
- With the development of electronic technology, various utilities are created.
- Certain countries export steel as well as import steel in the international trade. (For example China and South Korea).
- There is a tendency to locate industries based on factors such as capital and availability of a market rather than focusing on factors such as availability of iron-ore, raw materials and coal.

Figure 5.3
A furnace that smelts iron-ore

Activities

1. Mark and name three foremost iron and steel producing countries , three iron and steel exporting countries and three iron and steel importing countries on an outline map of the world.
2. Describe with examples the instances iron and steel are used by the people in the world.
3. Name three substitute products which can be used instead of iron and steel.
4. There is a daily increase in the demand for iron and steel. Explain this, citing two examples.

The Automobile Industry

The automobile industry in the world is changing fast. Automobiles which are required for goods and passenger transport are produced by the automobile industry. Further, at present, the automobile industry is showing a tendency to develop as an assembling industry as well. Various parts which are essential for a certain product are manufactured under specialization in different places or countries, are brought to one place and the final product is manufactured in an assembling industry. The basis for this system is the division of labour, specialization and technological advancement.

Automobiles manufactured for various requirements are shown in Figure 5.4 The internal structure, the strength to resist weight, size and the shape of the vehicle, will differ from one another depending on the type of goods expected to be transported.

Figure 5.4
Automobiles of different models

Table 5.3 - The number of automobiles in the major automobile producing countries for a selected number of years from, 1950-2012

1950	1960	1970	1980	1990	2000	2010	2012
U.S.A 8 005 858	U.S.A 7 905 119	U.S.A 8 283 949	Japan 11 042 884	Japan 13 488 798	European Union 17 142 142	China 18 284 887	China 19 271 808
U.K 783 672	Germany 2 058 149	Japan 5 289 157	U.S.A 8 009 841	U.S.A 9 782 997	U.S.A 12 799 857	European Union 17 107 350	European Union 18 240 476
Canada 387 728	U.K 1 810 700	Germany 3 842 247	Germany 3 878 553	Germany 4 976 552	Japan 10 140 798	Japan 9 625 940	U.S.A 10 328 884
France 357 512	France 1 389 210	France 2 750 088	France 3 378 433	France 3 468 993	Germany 5 528 615	U.S.A 7 761 443	Japan 9 942 711
Russia 342 200	Italy 644 833	U.K 2 098 498	Russia 1 884 000	Italy 2 120 850	France 3 348 381	Germany 5 905 985	Germany 5 849 269
Germany 308 084	Russia 490 200	Italy 1 854 252	Italy 1 610 287	Spain 2 053 350	South Korea 3 114 998	South Korea 4 271 941	South Korea 4 557 738
Italy 127 847	Japan 481 551	Canada 1 159 504	U.K 1 312 914	Canada 1 947 108	Spain 3 032 874	India 3 538 783	India 4 145 194
Japan 31 597	Canada 397 739	Russia 737 300	Spain 1 181 859	U.K 1 585 957	Canada 2 981 638	Brazil 3 381 728	Brazil 3 342 817
Chek 31 000	Australia 204 000	Spain 539 132	Brazil 1 165 174	South Korea 1 321 630	China 2 089 089	Spain 2 387 900	Mexico 3 001 974
India 14 888	Brazil 133 041	Australia 475 000	Belgium 923 426	Belgium 1 248 290	Mexico 1 935 527	Mexico 2 345 124	Thailand 2 483 043

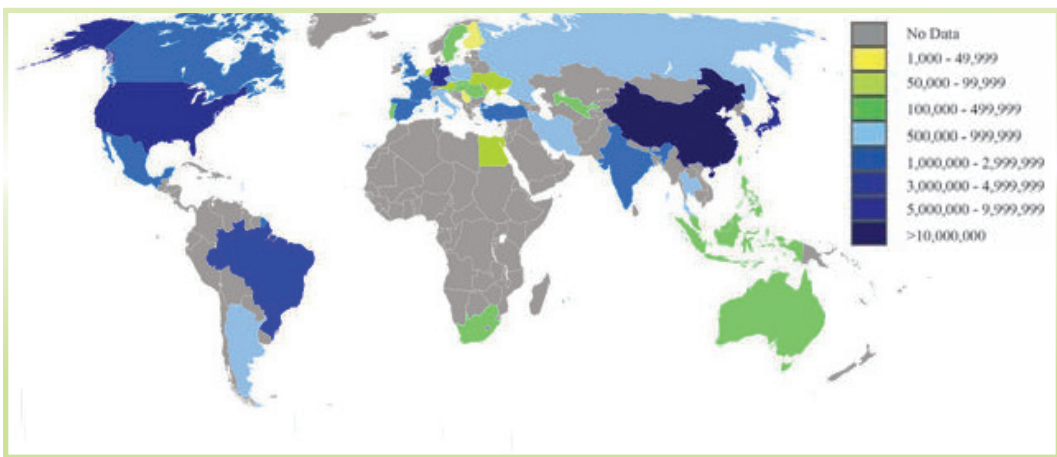
U.S.A -United States of America
U.K - United Kingdom

Source- *http://en.wikipedia.org/wiki*

In the past, the countries pioneered in automobile production were the developed countries. The main reason for this was the necessity to invest a large amount of capital for production. At present, a large number of countries manufacture automobiles. The models of motor vehicles change from time to time according to its utility and customer preferences. The number of automobiles produced in the selected years between 1950-2012 is shown in Table 5.3.

By studying the data given in Table 5.3, the following information related to automobile production is revealed.

- Although the contribution of China towards the production of automobiles during the early period was low, by 2012 China has become the foremost automobile producer in the world.
- Although, The United States of America was the most prominent automobile producer in 1950, by 2012 the position has changed.
- Though France was a major producer of automobiles during the period from 1950 to 2000, its position within the first ten producers was lost after 2010.
- Asian countries like China, Japan, South Korea, India and Thailand have shown a fast development in the automobile industry by 2012.



Map 5.2
Distribution of automobile production in the world 2009
Source *– Adapted from http://en.wikipedia .org/2014.02.10*

According to Map 5.2 countries like China, Japan, The USA and India are the pioneers in producing automobiles.

Mechanical labour like robots and automated machinery are used in abundance in automobile production at present. In addition, the popularity of being an assembling industry has also led to the rapid development of the modern automobile industry; Figure 5.5 shows the work inside a factory using mechanical technology.

Figure 5.5
Few scenes inside an automobile factory

Features and trends of automobile production

- It is becoming a fast changing industry.
- Maximum use of modern technological skills and mechanical labour (robot technology).
- Expansion as an assembling industry (like in Taiwan, South Korea, Singapore, Indonesia).
- Investment of a large amount of capital.
- Production Multi-national Corporations very often own the production rights.
- Launching products by incorporated bodies (example - General Motors of USA incorporated with Shanghai Company, China).
- Production of ultra-luxury vehicles.

- Designing special automobiles to suit the goods being transported (eg :- fuel, milk and gas transport bowsers are vehicles that differ from one another).
- Producing vehicles that could ply both on land and water (hovercraft).
- Producing vehicles that could dive in water and vehicles which could change while travelling on land and be air-borne in the form of a light airplane.
- Factors like cheap labour, availability of raw materials, and the presence of foreign markets have led to the fast development of the automobile industry in countries such as Japan, India, South Korea , Singapore and Indonesia.
- Countries that did not produce automobiles in the past are now contributing towards this industry (Sri Lanka).
- Installing special electronic components and equipment (sensor) within the vehicle to maximize safety and ensure diverse facilities (for example GPS Technology, radio, television, air-conditioning, refrigerators flexible seats, automated doors and locks, side mirrors, manoeuvering facilities for the disabled, automated main lights , automatic starting and safety systems).
- Producing eco-friendly vehicles minimizing environmental pollution.
- Countries that have developed the automobile industry have started production factories in other countries.
- Japan has planned to manufacture mostly light and hybrid vehicles (using liquid fuel and electricity) after 2020.
- For the economic use of fuel, there is a tendency to produce smaller vehicles.

Activities

1. List five leading countries in the automobile production in 1950 and in 2012.Mark and name them on a world map.
2. Describe the changes that have been made in the modern vehicles according to the speciality in the goods that are being transported.
3. It is a prominent feature that almost all countries of the world have shown a tendency to contribute towards the production of light vehicles. Describe two reasons for this trend.
4. Name two strategies the automobile producing country that produce automobile use to be successful in the market.

Assignment

Study Table 5.3 with the help of your teachers and make a document including the trends in the automobile industry.

The Ship building Industry

The ship building industry which has a long history, progressed simultaneously with the development of the iron and steel industry and also with the exploration by the European nations in the latter half of the 18th century. There were a few factors that contributed to the development of the ship building industry in Europe.

- The high demand for ships due to explorations by European nations after the Renaissance in Europe and for trade, fishing and warfare activities.
- Availability of timber and steel required for ship building.
- Availability of indented coasts required to make shipping docks.
- State patronage

In the early stages, ships were built for transporting both passenger and goods. But, with the development of air transport the number of passengers using ships reduced and therefore more attention was directed towards building ships suitable for transporting goods (Cargo ships). However, even at present ultra luxury ships specified for transporting passengers are being built. Ship building industry has undergone several changes and it has gained a huge progress at present.

When we consider the ship building industry in the present world, it is clear that ships are being built, considering the types of goods that are transported. Eg: - Bulk carriers, Tankers, Container ships.

During the early period, only the developed countries paid attention on the ship building industry. The reasons being given are follows.

- The ability to invest a large sum of money as capital.
- The availability of iron and steel as raw materials.
- Having a great reputation and experience.

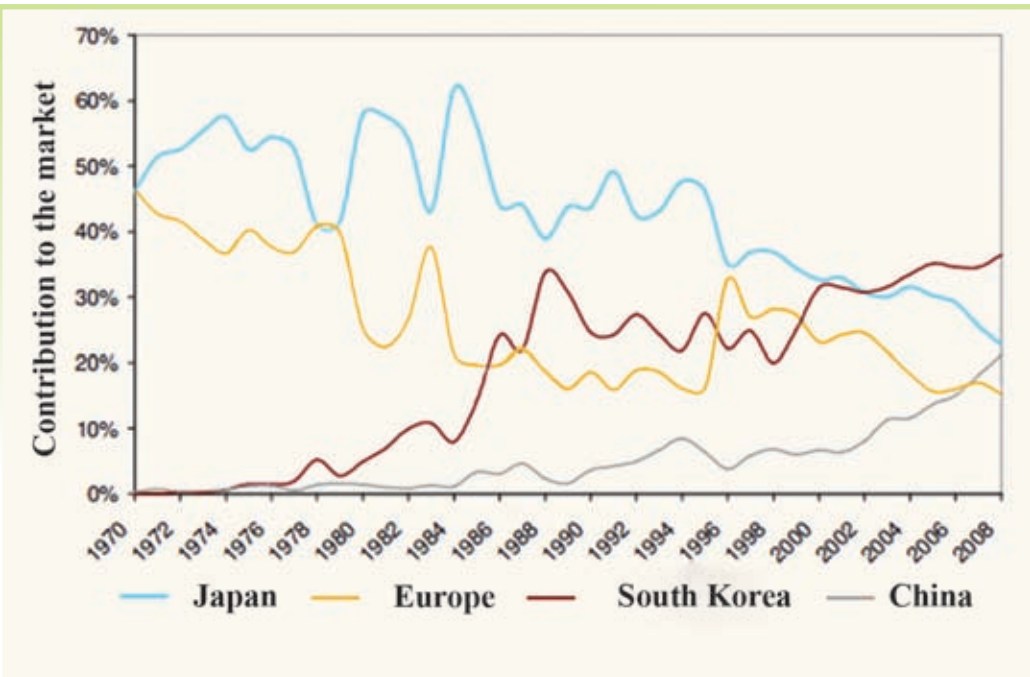
However, this situation has changed and Graph 5.3 makes it clear that today, countries like China, South Korea and Japan have come to the forefront in the ship building industry.

- Availability of cheap and skilled labour required for the shipbuilding industry.
- The presence of new technology.

- Presence of ice-free deep sea fronts to facilitate the dockyards, have contributed to that situation.

Recently, Sri Lanka too has begun boat and yacht building as an assembling industry.

When the ship building industry developed as an assembling industry, the countries that built ships in the past, lost the position they held as shown in Graph 5.3.



Graph 5.3
The contribution of the main ship building nations towards the market (CGT) between 1970-2008

Source : *http://ec.europa (2009)*
(CGT - Compensated Gross Tons. A unit to measure ships capacity.

Activity

Observe Graph 5.3 and explain the current changes in the ship building countries

Utilizing the developed technology as a base, ship building industry at present has produced ships to suit varied requirements and has made a great progress.This fact can be well established by studying the pictures given in page 100.

Figure 5.6
A container ship

Figure 5.7
The world's first ship powered by natural gas (L N G Powered)

Figure 5.8
I Ultra – Luxury Private Tourist liner

Figure 5.9
The Queen Elizabeth Air craft
carrier ship belonging to the British Royal Navy

Trends and features in the ship building industry

- Building special ships to carry passengers or varied commodities.
- Building large ultra- luxury passenger liners.
- Building small ultra- luxury yachts according to orders placed.
- Building ships for various purposes (like warfare, exploration of oceans, fisheries production factories and libraries).
- Though iron and steel were used as raw materials in the past, today light metals and different types of fibre and other substitutes are used to build lighter sailing vessels.
- Development as an assembling industry.
- Utilizing more mechanized labour (robots and machine technology) than human labour.

- Changes in the energy sources used in ship building (such as coal, mineral oil and nuclear power).
- Newly industrialized countries like China and South Korea have competed with the traditional ship building countries and come to the forefront.
- Developed technological systems like the GPS system have been added to the shipping sector.
- Though ships were used more for passenger transport in the past, they are used mostly for transporting goods at present.
- There is a rising demand for oil tankers, bulk carriers and container transport liners.

Activities

1. Explain how the modern technological development has contributed to the progress of the shipping industry.
2. Mention two reasons for considering naval transport as a profitable medium of transport.
3. Mark and name five main shipbuilding countries and five main ports in the Asian zone in a world map.

Assignment

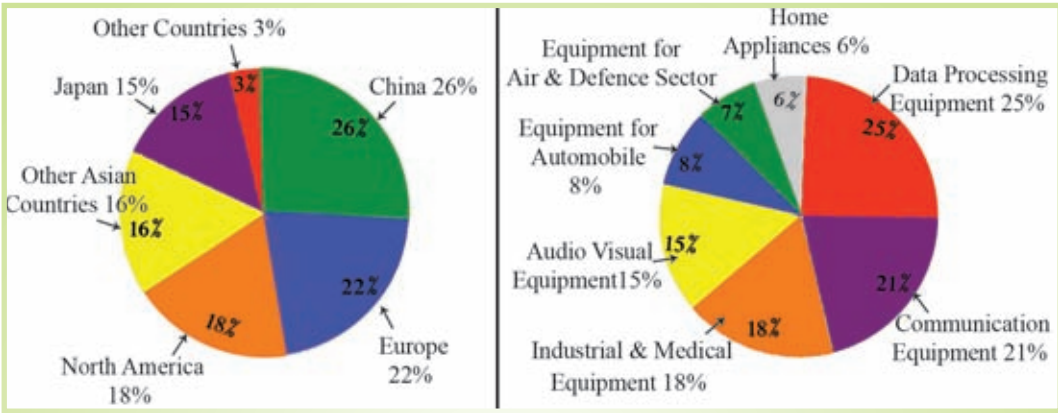
Collect pictures of ships used for various purposes and write a brief description of them to show how they have changed according to current requirements.

The Electronic Industry

Manufacture of commodities like radio, television sets, computers, transistors, communication equipment and electronic equipment come under the production of electronic goods.

According to Figure 5.10,You can understand that , most of the things produced in the electronic industry are found in the kitchen and the drawing room, our houses; In an office or in a vehicle. In addition, we may keep them in the pockets of our garments or even in our wallets.

Figure 5.10
Electronic goods used for daily human needs



Graph 5.4
World production of electronic equipment- According to zones and fields in which they are used (2008)

Source - www. decision.eu (2014.02.10)

According to Graph 5.4, we can identify the leading countries in the region that are in the forefront of the electronic industry and the fields for which the equipment are supplied. China, Japan and European Countries are in the forefront in this industry and the contribution of China in this field was 26% in year 2008. According to this graph it is clear that the production of data processing equipment and electronic communication appliances are the most important.

When considering the market for electronic equipment, it is a prominent feature that the countries that export such equipment are also importers.

When studying the information given in Table 5.4 regarding the world production and trade in electronic equipment between the years 2008-2013, it is possible to identify the progress that this industry had made during recent times.

- It is clear that North America and Europe are prominent in both the production, as well as in the contribution to trade in electronic appliances. In spite of that, it is seen that in both regions, the production in 2013 has decreased when compared to the year 2008.
- The same table clearly shows how the value of production as well as the contribution to the market by China, Japan and other Asian countries have increased.

Table 5.4

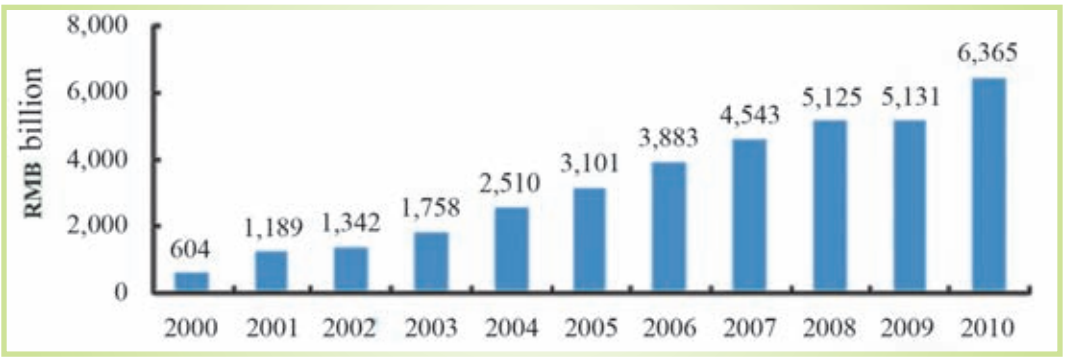
Production and trade in electronic equipment (In Euro-millions) 2008-2013

Zone	Production		Trade	
	2008	2013	2008	2013
Europe	251 124	246 724	241 229	260 489
North America	204 317	184 900	210 349	217 986
Japan	162 760	163 970	90 419	105 399
China	296 607	416 070	78 821	110 244
Other Asian Pacific Countries	184 383	244 075	81 192	114 248
Other countries	36 356	42 487	73 347	90 207

Source -prepared with reference to:- *www.decision.eu (2014.02.10)*

China has emerged as a powerful country in the Asian region in the field of electronic industry, within the period of 2000 – 2010. The income of china has risen from RMB billions 604 to RMB billions 6362 with the continuous development of the electronic industry during this period.

In addition to the information given above, a further study on Chinese electronic industry would show the direction of the world electronic industry. Table 5.5 shows the value in production of the various electronic appliances that China has earned in the year 2009.



Graph 5.5

The growth in the income of China in the production of electronic products 2000-2010

Source *- (http://www.hktdc.com (2014.02.10)*

(RMB = Renminbi) (RMB is the official currency used in official activities in China)

Table 5.5

Contribution of China to the production of electronic sub parts inthe world (2009)

Electronic Products	Contribution of China in World production
Laser disk player	85.0%
Digital Cameras	80.0%
Computer component sets	60.9%
Mobile Phones	49.9%
Colour TV component sets	48.3%

Source *- Adapted from http://www.hktdc.com (2014.02.10)*

According to table 5.5, it is clear that China, as a supplier small as well as large electronic appliances like laser disk players, digital cameras, computers and mobile phones makes a high contribution to the market. Sri Lanka gives an important place to Chinese electronic products. At present, there is a tendency in Sri Lanka and in many other countries in the world to use such electronic tools.

Features and trends of the electronic industry

- A large amount of capital has been invested.
- Research continues till the final product is brought out and twice the amount of money is spent on production research linked to the industry rather than on the production itself.
- Most of the workers include scientists, engineers, skilled technicians, and research personnel.

- Half the personnel in the service industry are engaged in the fields of research and development.
- Contribution to the production and ownership mostly belong to Multi-national Corporations.
- Day by day, new products are launched to meet the competitive market.
  (For example- mobile phones, television sets and cameras)
- Very complex subtle equipment and appliances are produced (Video equipment, chips and cameras)
- The same countries that export electronic appliances also import the same products from other countries.
- Maintained as an assembling industry.
- In addition to the production and trade of electronic equipment, a market for by- products too has been created . (For example- creation of virus for computers, virus guard systems and the necessity to update those systems, magnetic disks, magnetic discs like CDs and DVDs)

Activities

1. Describe how the electronic appliances in your house contribute in facilitating your day to day activities.
2. "Electronic tools have contributed a great deal to the advancement in the field of communication," elucidate this statement with examples.
3. Mark and name five prominent countries of the world that produce electronic products on a world map.

Assignment

Examine the electronic items in your home and complete the table given below

Name of electronic item	Country of manufacturing	Qualities
Example- Television	Japan	Receives information 2 and 3 dimensional images, black and white and colour pictures, Can watch CDs and DVDs, Use of remote control for manoeuvering

The Cotton Textile Industry

With the 'Industrial Revolution' which occurred in Europe during the 18th century, production of cotton textiles, expanded as a formal and organized industry. At that time, Britain gained a monopoly over this industry. However later, the cotton textile industry expanded in countries like China, India, Japan and Egypt due to the following factors,

- Possibility of growing cotton easily.
- Possibility of importing cotton from other countries.
- Availability of cheap labour.
- Presence of modern technology.
- Availability of the market.

Figure 5.11
Some pictures related to the cotton production process

The Figure 5.11 above shows a few pictures related to the industrial process of manufacturing cotion textile.

The cotton growing regions in the world and the cotton textile producing countries are shown in the Map 5.3.

Map 5.3
Cotton growing countries and cotton textile producing countries in the world
Source **-** *Prepared with reference to map in Gr . X Text Book (2006)*

The features and trends of the cotton textile industry

- The cotton textile industry has a long history.
- Maintained on agro-based material.
- Though in the past, the cotton textile industry was carried out by importing raw material from cotton growing countries, at present cotton growing countries too have entered the industry.
- Though European countries were the pioneers of cotton textile producers in the past, by the second half of the 21st century, East Asian countries too have emerged as foremost producers.
- As the cotton textile industry has become fully mechanized, high quality textiles are being produced.
- Diverse textiles of high quality are produced by mixing cotton with other fibres (synthetic-fiber, wool and flax).
- Being an eco-friendly production.
- The emergence of a by-product industry which includes dyeing of textiles and production of garments.

Activities

1. Mark and name three cotton growing countries and three countries famous for cotton textiles on a world map.
2. Name two types of fibre that are mixed with cotton.
3. Textiles mixed with other fibres have been given different names in the market. Write down three such examples.
4. Explain two reasons for the high demand for cotton textiles in the tropical countries.

Problems related to world manufacturing industries

The manufacturing industries in the world have contributed a great deal to fulfil human needs. In the same manner, many problems that affect the entire earth and man in various ways are emerging. Those problems which have arisen in relation to manufacturing industries can be identified as related to the following fields.

Problems linked to raw material

- Exhaustion of raw material due to long term usage.
- Use of synthetic raw material in place of natural raw material (for example- synthetic rubber and synthetic fibre).

Problems related to labour

- Unemployment has resulted because there is a tendency for factories to be mechanized (for example- use of robotics).
- Shortage of skilled labourers.
- Rising cost of labour.
- Emergence of labour problems.

Environmental problems

- Pollution of land, air and ocean beds (due to mixing of dyes, various kinds of oils and toxic substances).
- The extinction of certain species of flora and fauna, and the birth of new species due to the use of chemical fertilizers, weedicides, insecticides and various hormones.

Figure 5.12
How chemical wastes mix with water and air

- The emission of industrial wastes.
- The emission of heavy metal particles like mercury and lead into biological systems and creation of abnormalities in animal genes.
- Global warming, climatic changes, formation of acid rain and the pollution of ground water.
- The addition of electronic waste and equipment waste along with industrial development.
- Along with the development of bio-technology, the spread of disease carriers such as virus, fungus, bacteria which were non existing in the world before.

Figure 5.13
Collection and use of chemicals for diverse needs
Source *- http://www.waterencylopeia.com (2014-02-10)*

Social, Economic and Cultural problems

- Arising conflict situations due to attempts made to expand the market for industrial raw material and the finished product.
- The addition of duplicates to the market under famous brand names.
- Become subject to the influence of Multinational Corporations.
- Profit making becomes the main objective rather than fulfilling consumer necessities.
- The sensors of electronic systems cannot be replicated, due to high cost of repairs.
- Threat to world peace because of the production of fire-arms.
- The appearance of slums and shanties which are unsuitable for living due to urbanization resulting from industrialization.
- Some social groups are persuaded to involve in burglary, crime and fraud.

Problems related to the market

- The market which had been a heritage of the West European countries in the past, shifting to the East Asian zone, has created economic crises in these countries.
- The rise in the cost of commodities with the addition of the cost of advertisements to the price of such goods due to competitive markets.
- Presenting substitutes to the market for various commodities.

Problems related to power and energy

- The fluctuations in the price of mineral oil.
- The exhaustion of power and energy resources.
- Countries possessing energy resources are eternally facing political conflicts (The political problems in the Middle East oil zones).
- Environmental problems caused by nuclear power (For example, the leaking of radioactive material from the nuclear power stations in Japan).
- Though nuclear power is important as a power resource, problems arise as it can be utilized for other purposes unlawfully.

Figure 5.14
A Nuclear experiment
Source *- http://atlanticsentinel.com (2014-02-10)*

Figure 5.15
A Nuclear bomb
Source *- www. nuclear weapon archive.org (2014-02-10)*

Problems related to capital

- Shortage of capital.
- Multi-national corporations becoming powerful since they have invested capital resulting in the inability of states to control such enterprises.

Activities

1. Explain how industrialization can influence the economic development of a country.
2. Describe how industrialization can give rise to environmental pollution.

Assignment

Prepare a document including the steps to be taken to minimize the environmental problems that have emerged in relation to manufacturing industries.

Bibliography and Sources

http://comons.wikipedia.org/wiki/category:
Diagrams-of-iron-and-steel-industry

http://www.worldsteel.org/?action=newsdetaild=257

http://www.issb.co.uk/global.html

http://en.wikipedia.org/wiki/List-of-countries-by-motor-vehicle-production

http://en.wikipedia.org/wiki/file:World-map-of-motor-vehicle-production,-2009.svg

http://ec.europa.eu/enterprise/sectors/maritime/files/fn97616 ecorys final-report-on-shipbuilding.competitiveness en.pdf

http://ener-marine.com/shipbuilding

http://lngworldnews.com

http://www.charterworld.com

http://www.dailymail.co.uk

www.decision.eu

http://hktdc.com/info/mi/a/ef/%20en/1x07FRRO/1

Glossary

Manufacturing Industry	- නිෂ්පාදන කර්මාන්ත	- உற்பத்தி கைத்தொழில்
Technical knowledge	- තාක්ෂණික ඥනය	- தொழிநுட்ப அறிவு
Materials	- අමුද්‍රව්‍ය	- மூலப்பொருள்
Utility	- උපයෝගීතාව	- பயன்பாடு
Revolution	- විප්ලවය	- புரட்சி

Renaissance	- පුනරුදය	- மறுமலர்ச்சி
Cottage Industries	- ගෘහ කර්මාන්ත	- குடிசைக்கைத்தொழில்
Iron and steel	- යකඩ හා වානේ	- இரும்புருக்கு
Electricity	- විදුලිබලය	- மின்சக்தி
Automobile	- මෝටර්රථ	- மோட்டார் வாகனம்
Cotton textile	- කපු පිළි	- பருத்தி நெசவு
Energy	- බලශක්තිය	- சக்தி
Infrastructure facilities	- යටිතල පහසුකම්	- உட்கட்மைப்பு வசதிகள
Capital	- ප්‍රාග්ධනය	- மூலதனம்
Transport	- ප්‍රවාහනය	- போக்குவரத்து
Coal	- ගල් අඟුරු	- நிலக்கரி
Limestone	- හුණුගල්	- சுண்ணாம்புக்கல
Iron Ore	- යපස්	- இரும்புதாது
Aluminium	- ඇලුමිනියම්	- அலுமினியம்
Scrap Iron	- සුන්බුන් යකඩ	- பன்றி இரும்பு
Electrical equipment	- විද්‍යුත් උපාංග	- மின்சார உபகரணம்

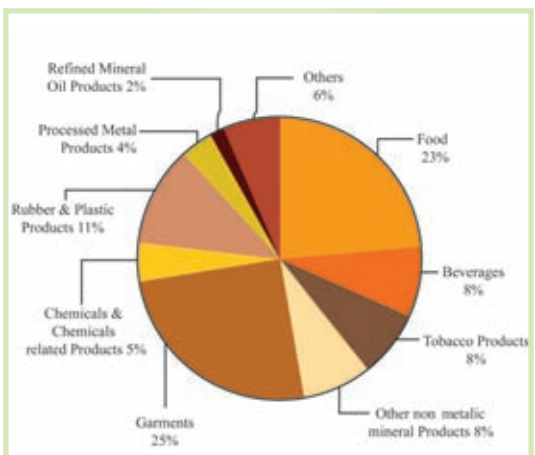
6 The Distribution of a few Industries in Sri Lanka - Problems and Trends

The history of industries in Sri Lanka

Although Sri Lanka was known as an agricultural country from the past, different historical evidences reveal that there was a certain development in the field of industries too. The fact that some industries, especially. The textile, construction, irrigation, sculpture, painting and metallurgy were at a higher level of development also implies that there were fine tools and instruments and a technological methodology connected to them. There is historical evidence to suggest that iron ore was smelted to make metals in the area around Samanalaweva and that there was a ship building industry near Mantai (Mannar). Accordingly, we can identify a technological development which was indigenous to Sri Lanka. However, that traditional industrial knowledge did not last continuously due to several invasions this country had to face and also because of the effects of West European Colonization.

Under the British rule, there was a progress in some industries such as processing of raw material and extractive industries like the mining industry. After independence, many industries were established under state enterprise. A number of industries such as the production of metal goods, paper, tyres, tubes and plywood can be shown as examples. Even then, there was no continuous progress in these industries.

After 1977, with the implementation of the open economic policy, private enterprise came to the forefront in the field of industries. Accordingly, many manufacturing industries have been expanded under different sectors at present.



Graph 6.1
The Composition of the Industries in Sri Lanka
Source: Central Bank Report 2012

The objective of this chapter is to study the distribution, problems and trends of certain selected industries in both state and private sectors.

A few Selected Industries

- Graphite Industry
- Kaolin related Industry
- Electronic Industry
- Petro-chemical Industry
- Automobile assembling and yacht building industries
- Food and Beverages Industry
- Cottage Industries
- Tourism

Figure 6.1
A few commodities produced by Sri Lankan Industries

The Graphite Industry

The graphite industry in Sri Lanka has a history of about 160 years. The finest quality graphite in the world with a carbon percentage between 97% and 99% is found in Sri Lanka. It is found in different areas in diverse amounts mainly in the Central, North Western, Sabaragamuwa, Southern and North Central provinces. About 97% of graphite is exported as an industrial raw material, while only a tiny proportion, around 3% is used for local use.

Mining minerals, processing, exporting and production of small commodities for the internal markets are the main sectors of the graphite industry.

Graphite found in Sri Lanka can be categorized as vein Graphite and mica.

Figure 6.2
Vein Graphite

Figure 6.3
Mica (plumbago flakes)

Table 6.1

Area distribution of graphite

Mineral	Areas distributed	Uses and products
Vein Graphite	Kahatagaha mines	Lead sticks Polish Paints Lubricants Dry battery raw material Moulds
	Kolongaha mines	
	Bogala	
	Rangala	
	Siyambalapitiya	
	Botale	
	Ragedera	
Mica	Thalagoda, Madhumana,	Electronic conductors Electronic equipment, paint. Plastic products Boiler covers for rubber based products
	Pallekelle, Thalathuoya	
	Mailapitiya, Pinnawela	
	Badulla, Dutuweva	
	Godakawela	

Graphite produced between 2008-2011 in Sri Lanka is shown in Table 6.2. This table shows that the production of vein graphite has gradually declined by 2011.

Table 6.2

Production of vein graphite and Mica (in Metric tons)

Year	2008	2009	2010	2011
Vein graphite	6615	3 171	3 437	3 357
Mica	2364	2 347	2 095	2 927

Source - Sri Lanka Minerals Yearbook, 2012

Tables 6.3 and 6.4 show the main countries to which Sri Lanka exported graphite, the amount exported and the income earned between 2009-2011. Accordingly, we can notice that the income earned from exports and the amount exported has undergone changes within that period. Japan, U.S.A and China are the countries which have bought the largest amount of graphite from Sri Lanka.

Table 6.3

Vein Graphite Exports in Sri Lanka

Country	2009		2010		2011	
	Amount (Metric tons)	Income (U.S Dollars)	Amount (Metric tons)	Income (U.S Dollars)	Amount (Metric tons)	Income (U.S Dollars)
Japan	700	456 526	920	616 565	1538	1 457 889
U.S.A	164	213 174	642	1 102 636	658	1 122 265
Pakistan	1560	710 214	310	177 442	400	376 802
Germany	20	26 394	803	1 299 307	527	550 187
U.K	434	615 275	149	226 216	115	200 939
India	142	135 836	135	190 579	61	111 893

Source - Sri Lanka Minerals Year book, 2012

The countries to which Sri Lanka exports mica is shown in table 6.4

Table 6.4

Mica Exports in Sri Lanka

Country	2009		2010		2011	
	Amount (Metric tons)	Income (U.S Dollars)	Amount (Metric tons)	Income (U.S Dollars)	Amount (Metric tons)	Income (U.S Dollars)
China	991	378 082	1456	556 354	1002	371 609
Germany	-	-	100	46 887	80	28 816
India	168	30 926	57	22 424	563	192 994
S Korea	-	-	-	-	20	8500

Source - Sri Lanka Minerals Year book, 2012

Problems related to the Graphite Industry

- High costs of mining graphite.
- Labour problems (wages / health / technology / risks)
- Damage to environment during mining
- Though graphite resources are fairly well distributed within the country, there are only two mines at work at present.
- A decrease in production at a regular rate for example-Although 6615 of metric tons vein graphite were produced in 2008 the production has decreased up to 3357 metric tons in 2011.
- Only a minimal amount of these valuable resources is utilized as a raw material for local industrial purposes.

Trends

- Graphite mining which was under state control is now being maintained under private sector.
- Use of modern techniques and methods in mining.
- By using such technology, steps have been taken to minimize risks to labourers.
- Asian countries too have become new buyers in addition to European buyers.

Activities

1. Prepare two tables to show vein graphite and mica distribution in Sri Lanka and show the districts in which these resources are located.
2. Mark and name the location of three graphite mines and three areas where graphite is found, on a map of Sri Lanka.
3. With reference to Tables 6.3 and 6.4, list a few features about the production and export of graphite and mica separately.
4. List the countries to which Sri Lanka exported the largest amount of graphite in 2011 in a sequential order. Mark and name them on a world map.

The Industry related to China clay

There are two main raw materials used in China clay related industry in Sri Lanka. One is Kaolin (*Kiri meti*) and the other is feldspar (*Bola meti*). Kaolin is needed to make high quality porcelain and feldspar is used to make floor tiles and ceramicware.

In producing goods related to china clay, minerals other than clay like feldspar, silica, quartz and calcite are also used as raw materials. The availability of all these raw materials in the country is also a reason for the development of this industry. Very often , distribution of China clay deposits are found in the wet zone lowland areas. There are also Kaolin deposits in Rattota and Matale. The easy accesibility of clay has caused the industry to be located in the same areas where it is found.

Table 6.5

Areas where china Clay is found, the location of industry and the ceramic ware production

Location of china clay deposits	location of industries	Products linked to china clay
Kaolin Boralesgamuwa Meetiyagoda Raththota **Feldspar** Dediyawela	Dankotuwa Negombo Piliyandala Meepe Horana Raththota	• Ceramicware • Tiles • Ornaments • Sanitaryware In addition, China clay is used a raw material for the production of paints/ rubber products/ tooth paste and paper.

Figure 6.4
Ceramicware

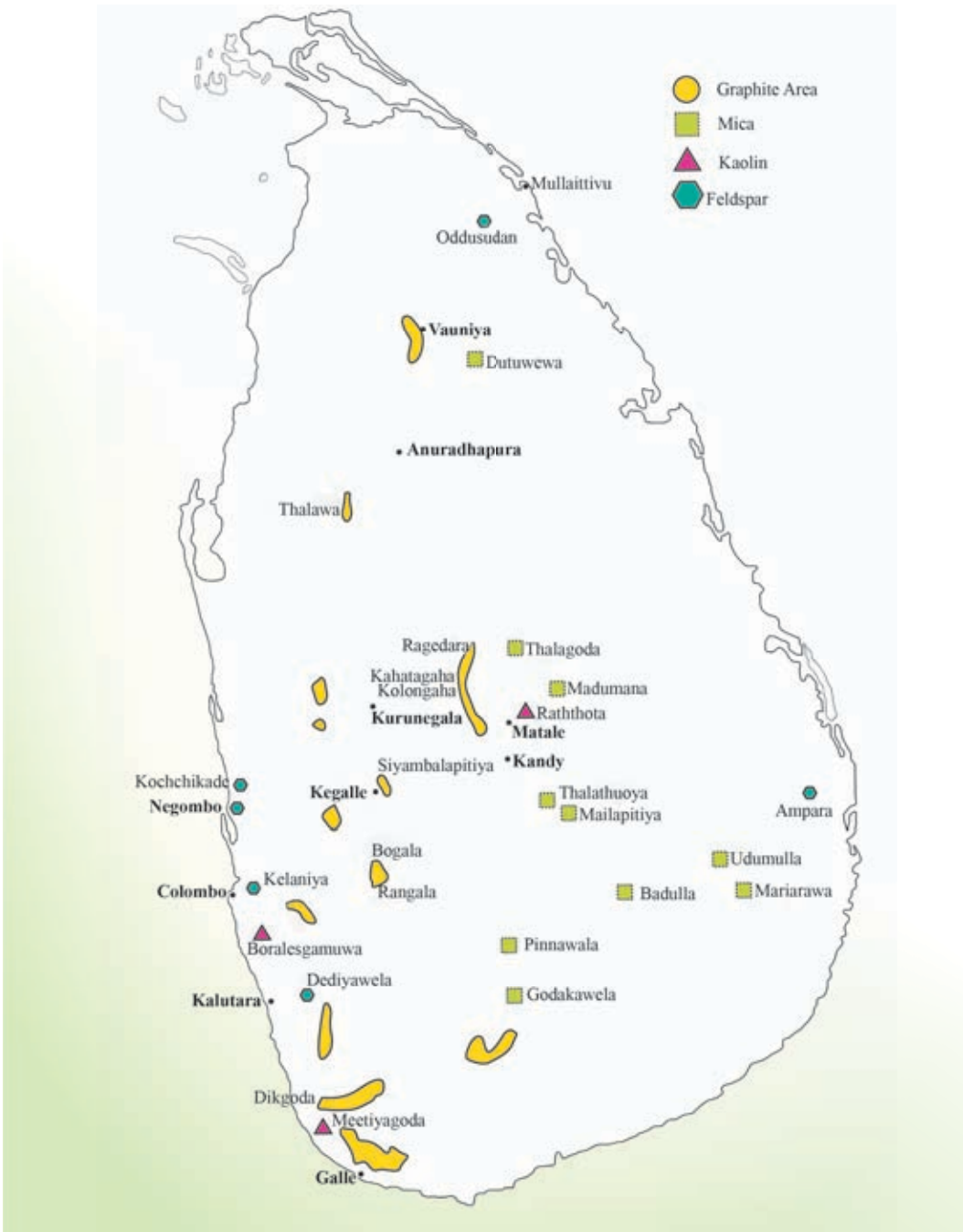
Table 6.6
Production of Ceramicware, quantity produced and income earned

	2009	2010	2011
Production of ornamental goods (Metric tons)	91	180	3819
Income earned (Rupees in Millions)			
Local sales	-	6.45	485.7
Export	78.57	237.23	1837.7
Ceremicware (Metric tons)			
Income earned	7050	6700	2674
(Rupees in Millions)			
Local sales	615.11	721.11	465.5
Export	2976.69	2689.05	834.8
Production of floor tiles (sq meters)	9 059 618	8 075 739	9 822 603
Income earned			
(Rupees in Millions)	8576.0	8863.5	
Local	944.7	637.3	11421.0
Export			632.8
Production of sanitaryware (Metric tons)	1650	1966	3600
Income received (Rupees in Millions)			
Local sales	140	321	873
Export	-	0.32	8.0

Source - Sri Lanka Minerals Year Book, 2012

Table 6.6 shows the production of ceramicware, amount produced and the income earned. A higher income has been earned by the export of ornamental products. It is clear that in the local market a higher income was earned by the sale of tiles and sanitary ware.

The distribution of some minerals in Sri Lanka



Map 6.1
The distribution of some minerals in Sri Lanka
Source- *Geological and Mining Bureau Annual Report 2012*

Problems

- Exhaustion of clay deposits.
- Large expense has to be borne to refine and process clay
- Environmental pollution due to clay mining.
- Increase of expenditure in ceramicware production (expenses for wages/ power and energy).
- High price of commodities.
- Competition with imported goods.
- State Policy.

Trends

- This industry is entirely run by private enterprise.
- High quality commodities are produced utilizing advanced technology and skilled workmen.
- High recognition for the products both in the local and export market.
- A greater demand from developed countries (U.S.A., Japan, Canada, Australia and European market).
- Growth of a high foreign demand for ceramic ornaments.
- A gradual increase in local demand for tiles and sanitaryware.
- An expansion of production of large tiles of high quality.

Activities

1. Mark and name areas where china clay is found and also where factories are located in a district map of Sri Lanka.
2. Study Table 6.6 and explain the current changes in the amount produced in ceramicware and the income earned at present.

Assignment

Identify the following locally produced goods in your household. Match them with the brand names and prepare a list.

- Ceramic ornaments
- Tiles
- Crockery
- Sanitaryware sets

Electronic industry

Although the electronic industry was recently started in the world, it has become one of the high income earning industries at present. Even in Sri Lanka, this industry has initiated only recently. This industry which comes under high tech industries, processes products which are rapidly developing and fast changing.

Electronic equipment

- Radio sets
- Television
- Computers
- Electronic circuits
- Remote control equipment
- Signal equipment
- Electronic sensors

Figure 6.5
Products related to the electronic industry

Electronic goods differ from electrical equipment because they are high-tech components and are cordless, (wireless) and need electricity to operate them. Often it is seen that some electrical equipment too includes electronic components.

As the local demand for electronic goods is growing, the industry too is developing. The electronic industry exists especially as an assembling industry and some electronic goods are exported to the foreign market. In 2009 the export of electronic goods brought a revenue of 187.51 million USD while in 2011 the revenue has gone upto 312.61 million USD.

Distribution

Very often, the electronic equipment industry is considered as a medium scale industry. Hence, it is distributed in Colombo and the suburbs and also in the Investment Promotion Zones.

Problems

- These electronic products depend mostly on imported sub components.
- Due to the fast changes in technology, a large number of electronic equipment become outdated within a short time.

- Due to the disposal of outdated electronic equipment (e-waste) there can be adverse effects on the environment.
- The constant use of electronic appliances like mobile phones may create health hazards.
- Emergence of cultural problems.

Trends

- Many direct and indirect employment opportunities arise in the electronic industry.
- Establishment of higher educational institutions and setting up of school curricula to train the required high skilled expert workers.
- The establishment of numerous equipment repair and service centres.
- Addition of the superior quality and technology of the imported equipment to the local products.
- High quality assembling industries are often established in urban areas.

Activities

1. Identify a few electronic equipment made in Sri Lanka and name them with their brand names.
2. Discuss the advantages and disadvantages of electronic equipment and prepare a report.

The Petro Chemical industry

The petro chemical industry is defined as an industry where the residue left over after obtaining petrol, diesel, kerosene and liquid fuel at the refinery is used to make other by-products.

Since Sri Lanka obtains a major part of the necessities of mineral oil from imported crude oil, the raw materials for the petro-chemical industry depends on the capacity of the crude oil refinery. Hence the size of this industry too is decided on the quantity of raw material available. This industry can be especially considered as a capital intensive industry, where new technological systems and machinery are used in abundance.

Among the export composition in the year 2012, mineral oil related products were in the range of 5 % and the revenue brought in was 463 million U.S dollars (Central Bank Report of Sri Lanka 2012) Refer Graph 6.2. Accordingly, a number

of such industrial products are also issued to the local market. Accordingly, it is clear that petroleum industry occupies an important place in the field of industry.

Distribution

The mineral oil refinery in Sri Lanka is located at Sapugaskanda close to Kelaniya. Hence, due to the availability of raw material, petro-chemical product factories are often found around Colombo and suburbs and in the Industrial Promotion Zones too.

Industries related to Petro-Chemicals

- Plastics
- Insecticide
- Chemical fertilizer
- Drugs
- Lubricants
- Perfumes
- Paraffin wax
- Beauty products
- Paints
- Synthetic rubber
- Other liquid products

Figure 6.6
Petro-chemical products

Problems

- The amount of raw material depends on the quantity of the imported oil to be refined.
- The fluctuating price of petroleum will have an adverse effect on the production industry.
- Due to the rise in production costs, the price of commodities increase.
- Since the industry is capital intensive, a shortage of capital affects industry.
- Market competition with imported goods.
- Environmental pollution due to the emission of chemical wastes from the refinery and from discarded goods.

Trends

- The rise in demand for petro-chemical products along with economic development.

- The number of products as well as revenue from the products increase.
- The industries are located in urban areas.
- The rise in quantity produced and the increase in revenue.
- The expansion of the local market for the products and the increase in market competition.
- A diversification of products is seen, for example, different types of lubricants, a variety of plastic products.

Activities

1. Mark and name the mineral oil refinery in a district map of Sri Lanka.
2. Name some liquid with a petroleum content that we use.
3. Explain the advantages and disadvantages of developing the petro-chemical industry.

Assignment

Prepare a list of petro-chemical products of Sri Lanka

Automobile Assembling and Boat Building Industries

Automobiles

The automobile assembling industry, though started recently, is an industry that shows signs of progress in Sri Lanka.The high demand for automobiles in Sri Lanka, and the exorbitant price of imported vehicles, resulted in the establishment of the automobile assembling industry. Although Upali Fiat and Mazda automobile assembling industry started about four decades back, this industry failed to make a continuous progress.

The Micro automobile industry which began in 2001 too, started as an assembling industry. The main, Micro automobile assembling factory is located at Polgahawela.

Figure 6.7
Assembled automobiles

Problems

- The absence of large factories using advanced technical skills
- Competition with imported motor vehicles.
- Problems linked to technology
- Shortage of capital
- Is not distributed as a main industry

Trends

- Assembling automobiles of different models
- This industry receives state patronage
- New technological skills and various accessories are systematically added to the automobiles in a technically suitable way.
- The gradual progress of quality in automobiles
- The assembling industry strengthened within the local industry.

Boat building

Due to the expansion of fisheries activities and the development of the tourist sector in Sri Lanka, the local demand for medium and small sized boats increased. The traditional experience in boat building using timber in the country too helped in building boats of high quality. The foreign demand for boats built in Sri Lanka is also rising. A large number of private entrepreneurs make boats both for the local and foreign markets.

In 2006, Sri Lanka earned 7.64 million U.S. Dollars by exporting boats to countries like India, Maldives, Singapore, Norway, South Korea and Seychelles. By 2010 the earnings increased to 97 million U.S Dollars. (Source: *www.Sri lankaexpo.com*)

The type of boats produced

- Fisheries boats
- Fast craft
- Tourist boats
- Passenger boats
- Boats for sports and leisure
- Defence craft

Distribution

It is seen that many boat building establishments are distributed in the urban coastal areas,

Boat building areas are

Beruwela	Kalutara	Negombo	Koralawella
Jaffna	Mutwal	Payagala	
Tricomalee	Panadura	Mirissa	

Figure 6.8
Boats of different models

Problems

- The rising cost of raw material, power, energy and other inputs.
- A large expenditure also has to be incurred to import parts of machines and technological tools for building of boats

Trends

- The demand for boats built in Sri Lanka is gradually increasing.
- Attention is paid on building high quality boats which include technological equipment
- Boats of different models are built for a variety of requirements.

Activities

1. Mark and name the places where boat building establishments are located in a map of Sri Lanka.
2. Explain how the trends in boat building industry in Sri Lanka influence the economic development of the country.

Assignment

Collect pictures of different models of boats built in Sri Lanka and also pictures showing their uses and prepare a portfolio.

Food and Beverages producing Industry

The food and beverages that are processed and produced in Sri Lanka come under this industry. There is a large number of investors engaged in this industry. They are distributed throughout the country, as medium and small scale industries as well as industries at cottage level. The number of such industries seems to be rapidly growing. Similarly, when the market is observed, it is clear that there is a large number of food and beverage items available.

As people are extremely busy within the changing socio-economic set up in Sri Lanka, there is a gradually growing demand for packeted food and beverages. The demand for such goods has also grown with the rise in the purchasing power of the consumers. The importance of this industry is clearly shown by the contribution of 31% in the composition of the industrial products in 2012 (Refer Graph 6.1) A considerable amount of foreign exchange had been earned by the export of processed food. In 2011 the earnings from such exports were 94.88 millions U.S.Dollars. (source: Ministry of Commerce and Trade Task performance survey 2012)

The Commodities produced

- Cool drinks
- Fruit cordial
- Biscuits
- Bakery products
- Spices
- Processed grain flour
- Sweetmeat
- Instant food
- Processed meat and fish
- Tea brands
- Coconut based products
- Milk products
- Bottled water
- Herbal products

Distribution

A large proportion of medium scale industries are found in the Greater Colombo Economic Zone and in the areas around the main cities of the island. Small and cottage level industries are found in all densely populated regions in the island.

Problems

- Due to the rising costs of raw material and power, the production costs too goes up resulting in the rising price of commodities.
- Since the products have to be sold within a short period of time, problems arise regarding storage and sales.
- Small scale products are affected because of various publicity measures taken by multinational corporations.
- Competition from imports.
- Problems arise regarding sales, because the same product is produced under different models by different institutions.
- Health problems may occur due to the use of unauthorized chemicals used for flavouring and preserving food.
- Problems connected to standards in food and beverages.

Trends

- Rise in the daily demand for processed food and beverages.
- Increase in the production of small scale and cottage industries.
- Use of various types of packaging and publicity to attract consumers.
- Export of many kinds of food and beverages.

Assignment

Collect labels of a few food and beverage products made in Sri Lanka. Collect information about the companies they are produced (location of the factory, date of manufacture and date of expiry etc) and make a file of the collected information. Assess the contribution made by these products to the Sri Lankan economy.

Cottage industries

Cottage industry is a specific small industry based on family labour and carried out either within a household of the investor or in his vicinity with a small amount of capital invested. Sometimes, small hand-operated machines and also light electrical machinery are used, but mostly the use of traditional skill techniques is a prominent feature. Preservation of local art, traditions and cultural heritage in association with this industry is a special feature.

A few cottage industries

- Handloom textile weaving
- Ornamental bobbin and trelis work
- Manufacture of cane products
- Production of household furniture
- Production of processed food (sweetmeats and desserts)
- Production of curios and ornaments
- Coir based products and preparation of batik textiles
- Production of bags, boxes, and mats
- Clay products
- Production of Brassware

Figure 6.9
Some products of cottage industries

Cottage industries are distributed in a number of regions in Sri Lanka, but some are only found in specific places. Pilimathalawe is famous for brass carvings, Moratuwa for carpentry, Radawadduna for cane products, Ambalangoda for mask making, and Galle and Koggala for bobbin lace and trelis work. Such industries can be shown as examples for cottage industries.

The steps taken by the Government in recent times to develop cottage industries

- Implementation of the Divinaguma development programme.
- Establishment of craft villages.
- Handicraft development programme.
- Training labour for cottage industries.
- Encouraging producers by holding exhibitions.

Problems

- Problem of obtaining industrial raw material.
- Shortage of labour to maintain traditional cottage industries.
- Effects of imported substitutes and similar product on these crafts.
- Rising costs of production.
- Problems of marketing the products.

Trends

- Immense patronage is given by the Central government, as well as at local and divisional levels to uplift these industries.
- Rising demand for these goods by the development of tourist industry.
- Setting up markets under state patronage.
- Increasing use of new machinery along with human labour.

Activities

1. Name a few cottage industries found in your area.
2. Explain with examples the service done by those industries for the development of the area.

Assignments

1. Find out whether there are cottage industries in your area.
2. Select one such industry and make a booklet including the raw material used, labour and market, problems connected with the industry and the trends.

The Tourist Industry

There is a long history about the arrival of travellers in Sri Lanka. The travelogues written by various travellers confirm that even in the past, Sri Lanka has been identified as an attractive country.

Sri Lanka is famous as a country that has acquired a historical heritage, an environmental heritage, a heritage of tangible innovations as well as an intangible heritage of hospitality and compassion. The tourist industry has an important place in the economy of Sri Lanka.

Table 6.7 depicts the number of tourists arrived in Sri Lanka in the recent past, the revenue accrued from tourists and the number of people employed. It shows the fast development that has taken place in all three sectors.

Table 6.7

The importance of the tourist industry in the economy of Sri Lanka (2009-2012)

Heads	2009	2010	2011	2012
Number of tourists entering	447 890	654 476	855 975	1 005 605
Approximate earnings from tourism (In Rs Millions)	40 133	65 018	91 926	132 427
Total employed	124 970	132 055	138 685	162 869

Source: Tourist Development Authority of Sri Lanka Central Bank of Sri Lanka -2012

Distribution

Although there are tourist attractions in almost all parts of Sri Lanka, the Sri Lanka Tourist Authority has identified seven tourist zones in the country.

Main tourist zones

1.The Colombo city.

2.The Greater Colombo zone.

3.The Southern Coastal region.

4.The Eastern Coastal region.

5.The Central Hill country.

6.The Zone that includes ancient cities.

7.The Northern region.

Map 6.2
The tourist zones

Source - *The National Atlas of Sri Lanka 2007*

Problems

- An arrival of wealthy tourists is limited.
- Most of the tourists come only during a certain season of the year.
- The difficulties of providing the same quality service to tourists, in all the tourist zones equally.
- The infra-structure facilities have not developed sufficiently in keeping with the tourist industry.
- The effects that the tourist industry has on the socio- cultural environment.
- Adverse effects on the natural environment.

Trends

- An accelerated development is seen in the tourist industry.
- The rapid development of facilities for tourists.
- The increase in direct and indirect job opportunities related to this industry.
- Patronage given by the State and private investors.
- Attention given by the universities and other institutions to provide skilled labour required for tourism and hospitality trade.
- Changes are taking place in traditional tourism and tourism is developing with multiple objectives (cultural and eco-tourism).

Activities

1. Draw a bar graph showing the entry of tourists to the country after observing Table 6.7.
2. Use the data in the Table and write a brief description about the progress of the tourist industry.
3. Mention some economic benefits that could be obtained from the tourist industry.
4. Explain some social and cultural problems that can be created with the tourist industry.

Assignment

Prepare a brochure with a brief description showing places of tourist attraction that you have identified. Include pictures of such attractive places.

The importance of industries in the Sri Lankan economy

- The support that the Sri Lankan economy gains from the industrial sector can be identified under the three sectors mentioned below.
  - Gross National Product
  - Employment
  - Foreign exchange earnings
- The Table 6.8 shows the contribution to the Gross National Product made by the agricultural, industrial and service sector and the number employed under each of the sectors. The contribution of the industrial sector to the GNP was 31.4% in 2012 and the employment in the sector was 2.1 million. Accordingly, the industrial sector is accorded the second place.

Table 6.8

The contribution towards GNP and employment (2012)

	As a percentage	Labour in millions
Agricultural sector	11.1%	2.5
Industrial sector	31.4%	2.1
Service sector	57.5%	3.5

Source: Central bank report 2012

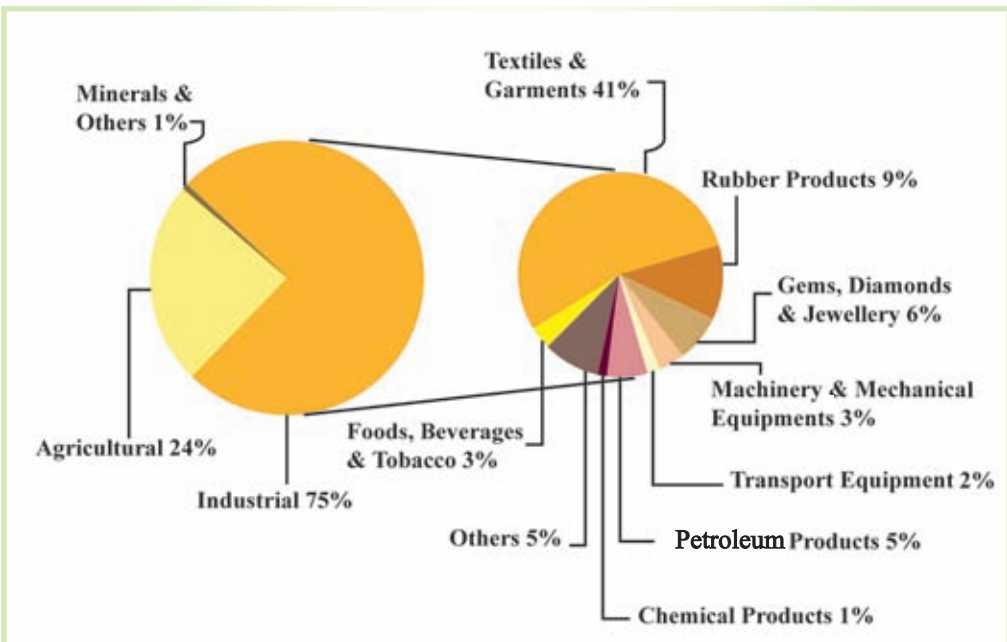
- The contribution of the industrial sector too is prominent in foreign exchange earnings as well. According to information in Table 6.9 it is revealed that, out of the whole export earnings.

Table 6.9

Foreign exchange earnings

	In USD Millions	As a percentage (%)
Agricultural sector	2231.5	23.9%
Industrial sector	7371.2	75.4%
Minerals and other exports	70.9	0.7%

Source: Central bank report 2012



6.2 graph

Exports according to commodities 2012

Source - *Central Bank, Annual report 2012*

The contribution of the agricultural sector, the industrial sector, mineral and other exports, as well as the contribution of each industrial product towards foreign exchange earnings, is shown in the Graph 6.2. According to the data, the industrial sector has shown a greater contribution and of that the export of textiles and garments have brought in 41.0% of the earnings.

Activity

Explain by giving examples, the importance of the industrial sector to the Economic Development in Sri Lanka.

Bibliography and Sources

- Geological Survey and Mines Bureau, Sri Lanka Minerals Year Book (2012).
- The National Atlas of Sri Lanka (2007).
- උපාලි වීරක්කොඩි (2009), මානුෂ භූගෝල විද්‍යාව දෙවන කොටස.
- කාර්ය සමාලෝචනය (2012), කර්මාන්ත හා වාණිජ කටයුතු ආමාත්‍යාංශය.
- මානුෂ භූගෝල විද්‍යාව, දෙවන කොටස (2009), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.
- ශ්‍රී ලංකා මහ බැංකු වාර්තාව (2012), ශ්‍රී ලංකා මහ බැංකුව.
- හේරත් ජේ. ඩබ්. (1979), ශ්‍රී ලංකාවේ ඛනිජ සම්පත්, භූ විද්‍යා සමීක්ෂණ දෙපාර්තමේන්තුව.
- En - Wikipedia. org

Glossary

Graphite	- මිනිරන්	- காரியம்
Industrial raw materials	- කාර්මික අමුද්‍රව්‍ය	- கைத்தொழில் மூலப்பொருள்
China clay /kaolin	- පිඟන් මැටි	- சீனக்களி
Brand names	- වෙළෙඳ නාම	- வணிக உரிமைப்பெயர்கள்
Ornaments	- විසිතුරු භාණ්ඩ	- அலங்காரப் பொருட்கள்
Electronic Industry	- විද්‍යුත් කර්මාන්තය	- இலத்திரனியல் கைத்தொழில்
High-tech Industry	- අධි තාක්ෂණික කර්මාන්තය	- உயர் தொழில்நுட்பக் கைத்தொழில்
Electronic equipment	- විද්‍යුත් උපකරණ	- இலத்திரனியல் உபகரணம்
Electronic circuits	- විද්‍යුත් පරිපථ	- மின்சாரச் சுற்றுக்கள்
Remote controls	- දුරස්ථ පාලක	- தொலைக்கட்டுப்பாடு

- Signal equipment - සංඥා උපකරණ - சமிக்ஞை உபகரணம்
- Electronic sensors - විද්‍යුත් සංවේදන - இலத்திரனியல் கடத்திகள்
- Investment Promotion Zones - ආයෝජන ප්‍රවර්ධන කලාප - முதலீட்டு ஊக்குவிப்பு வலயங்கள்
- Petrochemical Industry - පෙට්‍රෝ රසායන කර්මාන්තය - பெற்றொலிய இரசாயனக் கைத்தொழில்
- Crude oil - බොරතෙල් - மசகு எண்ணெய்
- Petroleum - පෙට්‍රෝලියම් - கனிய எண்ணெய்
- Refinery - පිරිපහදුව - சுத்திகரிப்பு
- Purchasing power - ක්‍රය ශක්තිය - கொள்வனவுச் சக்தி
- Foreign exchange - විදේශ විනිමය - அந்நியச் செலாவணி
- Instant food - ක්ෂණික ආහාර - உடனடி உணவு
- Multi National Corporations - බහු ජාතික සමාගම් - பல்தேசியக் கம்பனிகள்
- Tourism Industry - සංචාරක කර්මාන්තය - சுற்றுலாக் கைத்தொழில்
- Gross Domestic Product - දළ දේශීය නිෂ්පාදිතය - மொத்த உள்நாட்டு உற்பத்திகள்
- Employment - සේවා නියුක්තිය - தொழில் வாய்ப்பு

7 Introduction to Maps

The universal media of expression in which, the geographical information of the earth is represented to a scale on a flat surface is known as a map. Maps occupy a prominent place among the methods and techniques used to present geographical data and information. Hence, it is important to be aware of map reading, construction of maps and uses of maps.

The main objective of this chapter is to create an understanding about,

- Introduction to a map.
- Types of maps and their uses
- Basic features of the 1: 50 000 Topographic maps used in Sri Lanka.

Using maps for various purposes has taken place since ancient times. A map drawn on a clay tablet by a Mesopotamian to show the location of the region where he lived over 5000 years ago is considered as the oldest map discovered so far. Even in such eras, man was enthusiastic to map some features found in his surroundings. Cartography which began in that manner, has evolved up to the present, to become a developed science.

Figure 7.1
The oldest map drawn on a clay tablet

Map 7.1
A world map prepared using computers

At present, the following techniques are used for the purpose of mapping various types of geographical information accurately.

- Global Positioning System (GPS)
- Geographic Information System (GIS)
- Remote Sensing (RS)

The physical and cultural information on the earth's surface, information about the interior of the earth, the information about the planets and stars, as well as man made features on the earth's surface like administrative boundaries, latitudes and longitudes etc. are represented on maps.

The main features of a Topographic map

- Contracting the landscape to a scale.
- Indicating location and direction accurately.
- Presenting much spatial information.
- Presentation of accurate relationship among the various kinds of spatial information. for example - Distance between two places, pattern of distribution, extent. etc.
- Use of colours and symbols to represent information.
- Generalization of the earth's surface.

A map presents physical and cultural features on the land on a flat surface to a scale.

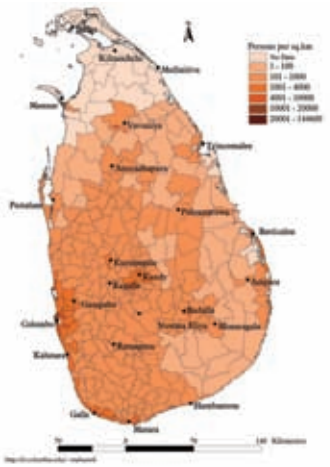
Types of Maps and their uses

There are two types of maps.

1. Thematic Maps
2. Topographic Maps

Thematic Maps

A thematic map is constructed to present the information under one specific field only. The heading of the map is given according to the information represented on the map. Several such thematic maps are given under Maps 7.2.



Distribution of population in Sri Lanka

Relief map of Africa

Rubber cultivation in Sri Lanka

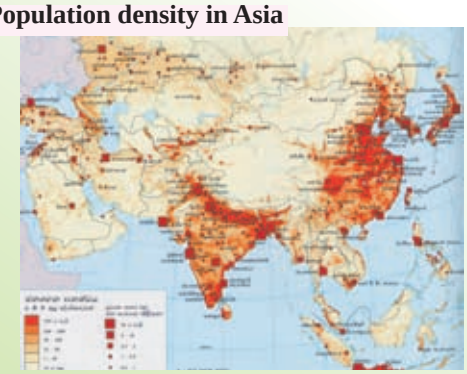
Road map of Sri Lanka

Thematic Maps

Tourist regions in Sri Lanka

Map of Political Divisions in Australia

Population density in Asia



Maps 7.2
Several Thematic Maps

Uses of Thematic Maps

- Since the information represented on the map is not complex, it can be easily understood.
- Ability to compare various thematic maps with each other.

  Examples - Climatic maps with natural vegetation maps
- The importance of each thematic map related to education, tourism, and development activities.
- Use of thematic maps in planning.
- Ability to have a good understanding of regional, spatial or field pattern.

Topographic Maps

Map 7.3
An extract from 1:50 000 Topographic map

A Topographic map is constructed including physical and cultural features.

Accordingly, on a topographic map, diverse features such as relief, drainage, natural vegetation, settlements, agricultural crop cultivations, cities, roads, railway lines, administrative boundaries, latitudes and longitudes etc are included.

Characteristics of Topographic Maps	Uses of Topographic Maps
• Representation of various topographical features of a certain area. • Showing relief features using contour lines. (mountains, valleys, spurs, plateaus etc). • Use of conventional symbols and colours to represent cultural features and physical features.	• Ability to understand the physical features and their inter-relationships. • Ability to understand the relationship between drainage patterns and relief . • Clarification of the relationship between physical features and human activities. • Ability to form an idea about land use patterns. • Ability to identify the administrative boundaries separately. • Ability to have an overall understanding about the region. • Ability to utilize in development activities.

Activities

1. Define what a map is.
2. With reference to an atlas, name five thematic maps of Sri Lanka and five thematic maps of the world separately.
3. List out separately physical and cultural features found in Topographic map 7.3.

Identifying the Peripheral Information with reference to 1: 50 000 Topographic maps of Sri Lanka

Among the maps of different scales, the 1:50000 Topographical map occupies a prominent place. It is accepted as a medium scale map. At the beginning of the 1980 decade, the Survey Department of Sri Lanka began to construct a map of Sri Lanka using metric measurements. The scale of this map is 1:50 000 and contour interval is set 20 metres. The distance of 1km on land is represented on this map by 2cm. The longest distance of Sri Lanka

from Point Pedro to Dondra Head is 432km. The maximum breadth from Colombo to Sangamankanda Point is 224km. (Refer Map 7.4) According to 1:50 000 scale, the length of this map is (432km ×2) 864cm (8.64m) and width of this map is (224km× 2) 448cm (4.48m). Since it is difficult to handle such a large map, it has been printed in 92 map sheets for the convenience of use (Refer Map 7.6).

Map 7.4
Extent of Sri Lanka

The land area covered by such a map sheet is

Length - 40km

Width - 25km

Area of the region -40×25=1000km^2

According to 1;50 000 scale the extent of the mapped area

Length - 40km×2 =80cm

Width - 25km ×2= 50cm

Area,

80cm× 50cm=4000cm^2

The Model of a 1:50000 Topographic Map

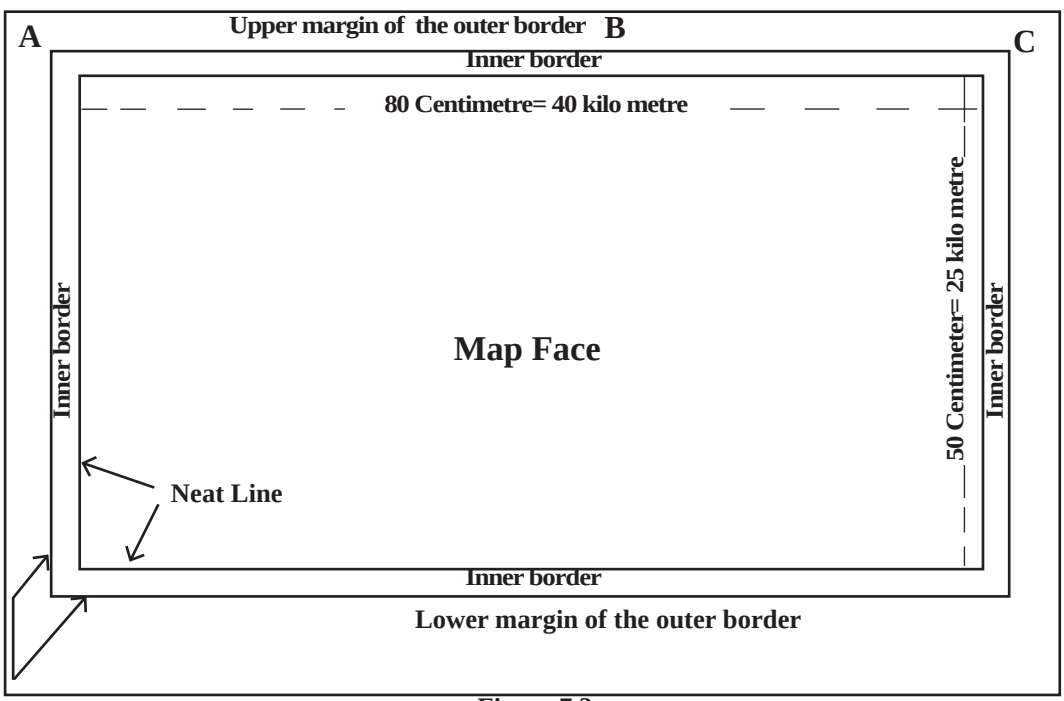


Figure 7.2
The model of a 1:50 000 Topographic map

Physical and cultural features of the relevant area have been mapped on the map face. Peripheral information help to read and understand the contents of the map face. In the inner border of Topographic maps, values of latitudes and longitudes as international coordinates, values of coordinates of the national grid, terminus of roads and the distances to them from the border are mentioned.

The contents of a 1:50 000 Topographical map can be divided as follows.

1: 50 000 Topographic map

Information on the map face

Physical Features

Land forms
Rivers
Forests
Grasslands
Scrubf or est
Roc kout crope tc.

Cultural Features

Administrative boundaries
Roads
Settlements
Cultivated Lands
Government building
etc.

Peripheral Information

Upper margin of theou terb order

A. Type of map
B. Name of the map
C. Number of the map

Lower margin of the outer border

Scale
Direction
Figure showing the adjecent maps
Figure showing the administrative boundaries
Key

Activity

Studying a 1:50 000 Topographic map, list out the information included in the upper margin and lower margin of the map.

Location - Location of any place on the 1:50 000 Topographic map of Sri Lanka can be identified in two ways.

1. According to latitudinal and longitudinal values.
2. According to national (metric) coordinates.

The absolute location of Sri Lanka (according to the latitudes and longitudes)

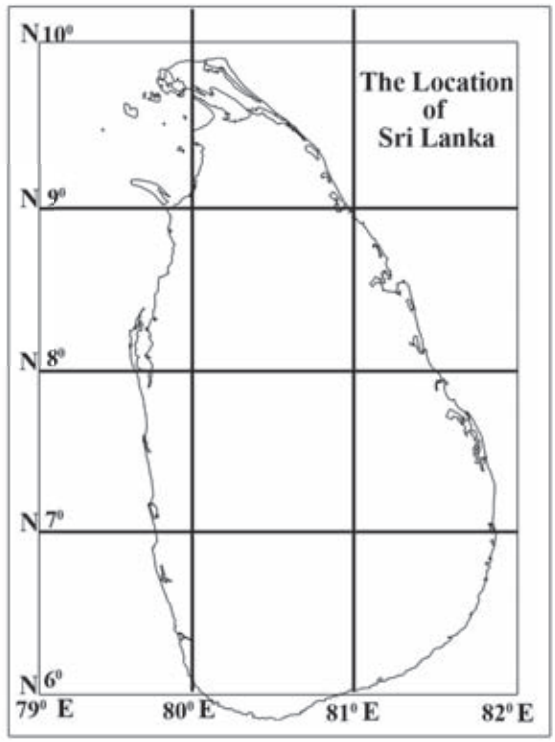
From North Latitudes 5^0. 55' to 9°51'

From East Longitudes 79^0.42' to 81^0.52'

(Refer Map 7.5)

On the East and West borders of the neat line of a 1:50 000 Topographic map, the latitudinal values and on the north and south borders, the longitudinal values are marked.

1degree (1^0) = 60 minutes (60')
1 minute (1') = 60 seconds (60")



Map 7.5
Absolute location of Sri Lanka

On the 1:50 000 Topographic maps values of latitudes and longitudes have been marked at 5 minute interval.

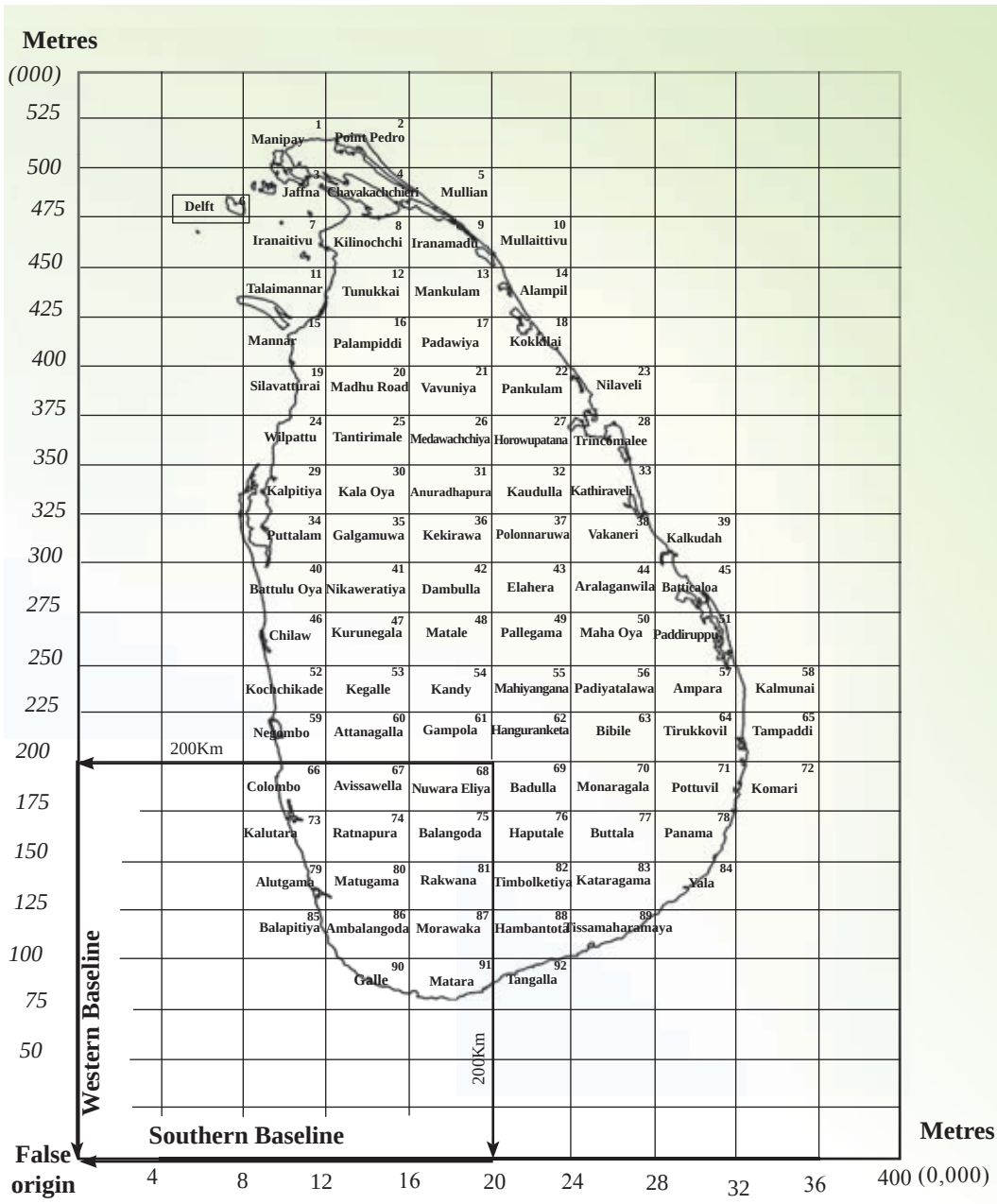
Example

In Vavuniya metric map, latitudes are marked as 8^0. 35', 8^0.40', 8^0.45' and longitudes are 80^0.25', 80^0.30', 80^0.35', 80^0.40',and 80^0.45'.

While values of latitudes and longitudes are marked along the border line, places where the latitudes and the longitudes intersect are marked by the symbol of ┼ on the map face. This information is useful to find the absolute location of any place in Sri Lanka. When the absolute location of a certain place in Sri Lanka is shown, it should be expressed in north latitudes and east longitudes.

Activities

1. Take 1:50 000 Topographic map and write down the values of the latitudes and longitudes found there.
2. Select two points where the latitudes and the longitudes intersect and write the absolute location of those points.



Map 7.6
The grid on which metric maps of Sri Lanka have been constructed

National (Metric) Coordinates

In constructing a map, a projection should be used. 1:50 000 Topographical map of Sri Lanka has been constructed based on Transverse Mercator projection. The Peak of Pidurutalagala mountain, the highest point located in the Central Hills of Sri Lanka has been selected as the base point to prepare this metric grid system. The point of origin of this grid system is located at a place where the vertical line that is drawn towards the south from a point, 200km west of the peak of Pidurutalagala intersects the horizontal line that is drawn towards the west from a point located 200km south of the peak of Pidurutalagala. This point is located in the Indian Ocean. This limit of 200km is at present increased to the limit of 500km. A map reader can read the values in metres too.

From the point of origin, a grid network that spreads 25km to 25km towards north and 40km to 40km towards east has been constructed covering the whole land area of Sri Lanka. Out of it, choosing 92 grids (rectangles) that cover the whole land area of Sri Lanka, ninety two 1:50 000 map sheets have been constructed. On these map sheets national (metric) coordinates have been marked at 5km intervals. (on map 10cm intervals). The land area represented in one topographical map sheet is 1000km^2.

On 1:50 000 maps of Sri Lanka,

- A square grid has been created using national (metric) coordinates.
- Vertical and horizontal lines of this grid system are drawn in blue.
- Starting points of National metric coordinates that run towards the north and the east have been marked respectively as mN (metres to North) to north and to the east as mE (metres to East) from the points of origin.

For example, on the Vavuniya National (metric) coordinates grid, X is located 385 000m to the north and 185 000m to the east.

When National (metric) coordinates values are mentioned, on every map sheet the initial value is indicated as a whole number in metres at the south west corner and other values are marked omitting the last three digits.

Examples-

375 000 mN (metres to North)

160 000 mE (metres to East)

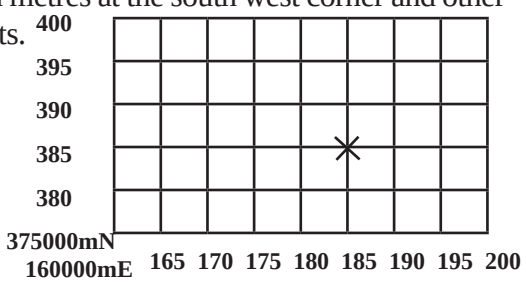


Figure 7.3
Model of national (metric) coordinate grid of Topographic map of Vavuniya

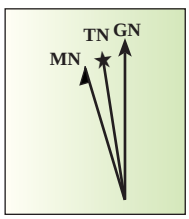
Activity

Refer to an 1:50 000 Topographic map available in your school and select two places where the coordinates intersect. Show the location of (national) coordinates of those places.

Indicating Directions

The direction is helpful to understand the information included in the map correctly. Generally, the north of a map is indicated by an arrow (Figure 7.4). Accordingly, other main directions and sub directions can be identified. On the 1: 50 000 Topographic maps a special figure is included to indicate the directions at the lower margin where the peripheral information of a map is included.

Figure 7.4
The figure showing the direction of a map



True North (TN)

Magnetic North (MN)

Grid North (GN)

Figure 7.5
The figure showing the direction in 1: 50000 Topographical map

True North

The true north is shown by a line that ends in a star. It is known as geographical north too. The direction where the North Pole in the globe is located is indicated by this.

Magnetic North

The north that is based on the magnetic field of the earth is called the magnetic north. It is shown by a line that ends with one half of an arrow point.

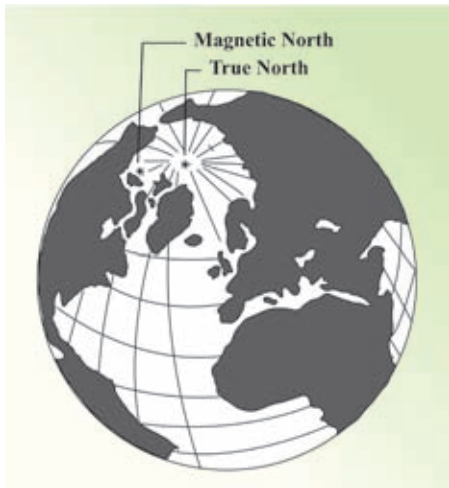


Figure 7.6
Location of true north and magnetic north

Grid North

The grid north that is indicated by a vertical line with a full arrow head is the north of the grid of the map. There is a small angular difference (3˚) between the true north and the grid north. This angular difference between true north and grid north can be observed declined towards left on the map located east of Pidurutalagala mountain range and declined towards right to the grid north on the map showing west of Pidurutalagala mountain range.(Figure 7.7)

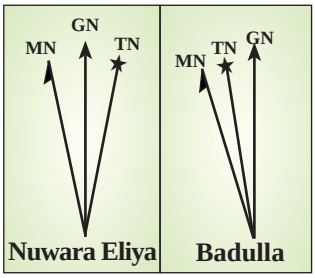


Figure 7.7
The variation of the figure indicating direction in maps with national coordinates based on Pidurutalagala

Activity

Observing several 1:50 000 maps available in your school, name five maps where the variation of the figure indicating direction is found.

Orienting

Orienting is very essential to read and understand a map accurately. Orienting a map means setting the direction of the map to the corresponding direction of the area shown on the map. A compass is required to do this accurately. When there is no compass, orienting the map can be done roughly identifying the direction according to the sun rise.

Scale

The ratio of the distance between two places on the map and the true distance between the corresponding places on the land is called the scale. In map reading the scale is very essential.

In 1: 50 000 Topographic maps, the scale is depicted in two ways

1. Linear scale
2. Representative fraction

Linear Scale

Construction of a scale on a horizontal line is linear scale. By the scale of 1: 50 000 Topographic maps, 1cm on the map represents 50 000cm (0.5km) on the land. Accordingly, 1km on land is represented by 2cm on map.

Figure 7.8
The figure showing the linear scale on a 1:50000 Topographic map

When constructing the linear scale

- Draw a horizontal line of 10cm in length and divide it into sections of 2cm (1km)
- Omit the first 2cm and number the others as 0, 1, 2, 3, 4
- To the left from the zero, mark 1. Divide that section into 10 sub divisions of 2mm to indicate the distance of 1/10 of a kilo metre. 100m on land is represented by one such part. (to show very short distance)
- Write km at the two ends of the line.

Representative Fraction

- To state scale as a ratio is the representative fraction.
- On topographic maps representative fraction is shown as 1:50 000.
- The special feature of showing this scale as a ratio is the ability for any person who uses any type of measuring unit in the world to measure the real distance between two places accordingly.
- According to the scale, the distance and area of the land can be calculated.
- In 1: 50 000 Topographic maps, the scale is shown in the lower margin of the outer border.

Calculation of Distance

- 1 km on the land is represented by 2cm on the map. Accordingly, the actual distance of a road that runs over 10cm on the map is (10cm ÷ 2) 5km.
- According to 1: 50 000 scale when a 7 km long road is mapped the length of it on the map is 14cm (7km× 2).

Activities

1. Select a segment from a Topographical map. Measure the length of a selected road or part of it and calculate the true distance in kilometres.
2. State the following in centimetres according to the scale of 1: 50 000.

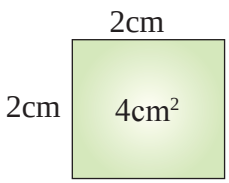
   A grade road of 3km long.

   An irrigation canal 4km long.

Area (Extent)

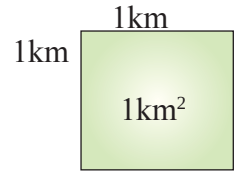
According to the 1:50 000 scale, the area of 2 cm×2cm square is 4cm^2. True area represented by 4cm^2 on the map is 1km length and 1km in width. The area of this land is 1km^2.

on map



(2cm × 2cm)
4cm²

Area of corresponding land



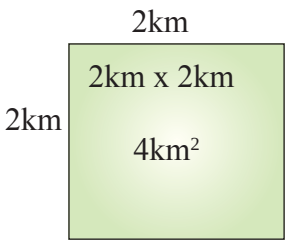
(1km x 1km)
1km²

2cm on map= 1km on land

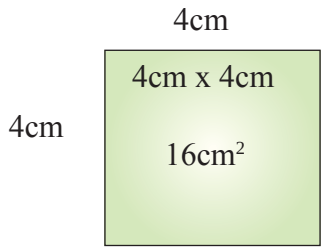
4cm² on map= 1km² on land

Accordingly, a simple method can be followed to convert the area of a part of a map into the area of the corresponding land. According to the above example, the area of 2cm × 2cm part in a map that is constructed to the scale of 1:50 000 is 4cm². When it is divided by 4 the answer is 1. Hence, this value should be considered as 1km² and not as 1cm². In the same manner, when the area on the land is multiplied by 4, the area on the map of the corresponding land can be obtained. It must be considered as cm² , but not as km² .

On land, length of a side of square shape paddy field is 2km. The area of paddy field is 2km×2km= 4 km².



When this paddy field is represented on the map the length of one side is 4cm. The area of it on the map 4cm ×4 cm= 16cm².



Activities

1. Show the following areas in cm² according to 1:50 000 scale.
   1km², 3km².
2. Show the following areas in km² according to 1:50 000 scale.
   8cm², 16cm²

The Key

The physical and cultural features of the relevant area are included on a map. A key is needed to read and understand the information on the map. The symbols which are used to represent such information are included in the key. On 1:50 000 topographic maps, the key is organized under eight main headings. (Figure 7.9)

1. Boundaries.
2. Tourist Information.
3. Roads and associated features.
4. Railways and associated features.
5. Drainage.
6. Relief.
7. Vegetation.
8. Other features.

The symbols and colours relevant to the above information is depicted in the lower margin of the outer border of 1: 50 000 Topographical maps. Different colours are used for different symbols. Several examples are shown below.

Blue	- Rivers, tanks, canals, seas, and features linked to water.
Yellow	- To all home gardens.
Green on yellow	- the symbols relevant to different crop cultivations
Dark Yellow	- Minor roads.
Green	- Paddy cultivation.
Red	- Main roads, Administrative boundaries, Railway stations, schools, courts and some cultural features.
Black	- Railway lines, rock outcrops, boundaries of forest Reserves, Settlements.
Brown	- Tank bunds, contour lines.

Figure 7.9
Figure showing the conventional signs in the 1:50 000 topographical map

Activity

Draw and name the conventional symbols shown under the eight headings on 1: 50 000 Topographic maps using relevant colours.

Other Peripheral Information

Sheet Number, Heading, Year of Print, adjoining maps

Sheet Number

The Topographic maps constructed for Sri Lanka are serially numbered from 1 to 92. The relevant number of the map is printed at the top right corner and at bottom left corner respectively.

Name of the Map (Heading)

Each 1:50 000 Topographical map has a name. It is printed in the centre of upper border. The name of a town or region in the mapped area has been used as the name of the map.

Example - Sheet no 21 –Vavuniya

Year of Print

The year of print and the years the map was revised are printed in lower margin of a Topographic map.

Adjoining Maps

On the topographic maps you study, a figure showing the location of adjacent maps is included in the lower margin under peripheral information.

Example- Showing adjoining maps of Vauvniya metric map

Palampiddi 16	Padaviya 17	Kokilai 18
Madu Road 20	Vavuniya 21	Pankulam 22
Tantrimalai 25	Medawachchiya 25	Horowpatana 27

Activity

Take a topographical map and show the location of adjacent map with sheet numbers in a grid diagram.

According to above information, the peripheral information of 1:50 000 Topographical maps is shown in the upper margin and the lower margin. When you study a Topographic map representing any part of Sri Lanka, you will get a correct understanding of that region through the peripheral information. Hence, the map has become an essential tool for diverse activities.

Activities

1. State the two methods of showing the scale of a map.
2. Present the scale of 1:50000 Topographic maps by these two methods.
3. Explain why the first part of a linear scale is divided into sub parts.
4. State the scale of the map as a ratio.
5. What is the area in km^2 represented by each sheet according to the scale of 1:50 000.
6. Draw the followings using conventional colours and symbols to 1:50 000 scale.
    1. Main road (A) of 4km in length.
    2. An irrigation canal of 3km in length.
    3. A large paddy field of $2km^2$.
    4. Built up area over $1km^2$.

Assignment

Group the Students and select one metric map for each group, construct a plan including all peripheral information you have studied.

Bibliography and Sources

- නවීන ගුණසේන - ෆිලිප්ස් ලෝක සිතියම් පොත (2003), සීමාසහිත ඇම්. ඩී. ගුණසේන සහ සමාගම, කොළඹ.
- ප්‍රායෝගික භූගෝල විද්‍යාව, අ.පො.ස උසස් පෙළ (2009), අධ්‍යාපන ප්‍රකාශන දෙපාර්තමේන්තුව, කොළඹ.

Glossary

Geographical data	- භූගෝල විද්‍යාත්මක දත්ත	- புவியியல் தரவுகள்
Cartography	- සිතියම් විද්‍යාව	- படவரைகலையியல்
Spatial information	- අවකාශීය තොරතුරු	- இடஞ்சார் தகவல்கள்
Global Positioning System	- ගෝලීය ස්ථානගත කිරීමේ පද්ධති	- பூகோள நிலைப்படுத்தல் முறைமை
Geographical Information Systems	- භූගෝල විද්‍යාත්මක තොරතුරු පද්ධතිය	- புவியியல் தகவல் ஒழுங்கு
Remote Sensing	- දූරස්ථ සංවේදය	- தொலையுணர்வு
Latitudes	- අක්ෂාංශ	- அகலக்கோடுகள்
Longitudes	- දේශාංශ	- நெடுங்கோடுகள்
Thematic maps	- තේමා සිතියම්	- கருப்பொருட் படங்கள்
Peripheral Information	- පර්යන්ත තොරතුරු	- எல்லைத் தகவல்கள்
Information on the map face	- මුහුණත තොරතුරු	- படமுகப்பின் தகவல்கள்
Metric Coordinates	- මෙට්‍රික් ඛණ්ඩාංක	- மெற்றிக் ஆட்கூறு
Topographical maps	- භූ ලක්ෂණ සිතියම්	-இடவிளக்கவியல் படங்கள்
Climatic zones	- දේශගුණික කලාප	- காலநிலை வலயங்கள்
Population Density	- ජන ඝනත්වය	- சனத்தொகை அடர்த்தி
Physical features	- භෞතික ලක්ෂණ	- பௌதிக அம்சங்கள்
Cultural features	- සංස්කෘතික ලක්ෂණ	- பண்பாட்டு அம்சங்கள்
Drainage pattern	- ජලවහන රටා	- வடிநிலப்பாங்குகள்
Contour lines	- සමෝච්ච රේඛා	- சமவுயரக்கோடுகள்

- Mountain ranges - කඳුවැටි - மலைத்தொடர்கள்
- Valley - නිම්නය - பள்ளத்தாக்கு
- Spur - නෙරුව - சுவடு
- Key - සූචකය - குறியீட்டு விளக்கம்
- Scale - පරිමාණය - அளவுத்திட்டம்
- Administrative borders - පරිපාලන මායිම් - நிர்வாக எல்லைகள்
- Absolute location - නිරපේක්ෂ පිහිටීම - முழுமை அமைவிடம்
- Relative location - සාපේක්ෂ පිහිටීම - சார்பு அமைவிடம்
- Projection - ප්‍රක්ෂේපණය - எறியம்
- False origin - ව්‍යාජ මූලය - போலியான தோற்றம்
- True North - සැබෑ උතුර - உண்மை வடக்கு
- Magnetic North - චුම්භක උතුර - காந்த வடக்கு
- Grid North - ජාල උතුර - பொய்யரி வடக்கு
- Linear scale - රේඛීය පරිමාණය -நேர்கோட்டு அளவுத்திட்டம்
- Representative fraction - නියෝජ්‍ය පරිමාණය - வகைக்குறிப் பின்னம்