

# 5 Water



0762CH05



## Glossary

**Terrarium:** It is an artificial enclosure for keeping small house plants.



## Activity

### Make your own Terrarium



A Terrarium

Fill one-fourth of a big jar with soil and press it well. Put a thin layer of humus on top of it. Plant the largest plants first and then arrange the smaller ones around them. Spray the arrangement with water and close the jar. The water that evaporates from the leaves and soil condenses and falls back in the form of drops of water.

When you think of water, what images come to your mind? You think of rivers, the waterfalls, the pitter patter of raindrops, water in your taps... Children love to float paper boats in rain puddles. By noon the puddles vanish. Where does the water go?

The sun's heat causes evaporation of water into vapour. When the water vapour cools down, it condenses and forms clouds. From there it may fall on the land or sea in the form of rain, snow or sleet.

The process by which water continually changes its form and circulates between oceans, atmosphere and land is known as the water cycle (Fig 5.1).

Our earth is like a terrarium. The same water that existed centuries ago still exists today. The water used to irrigate a field in Haryana may have flowed down the Amazon River a hundred years ago.

The major sources of fresh water are the rivers, ponds, springs and glaciers. The ocean bodies and the seas contain salty water. The water of the oceans is salty or saline as it contains large

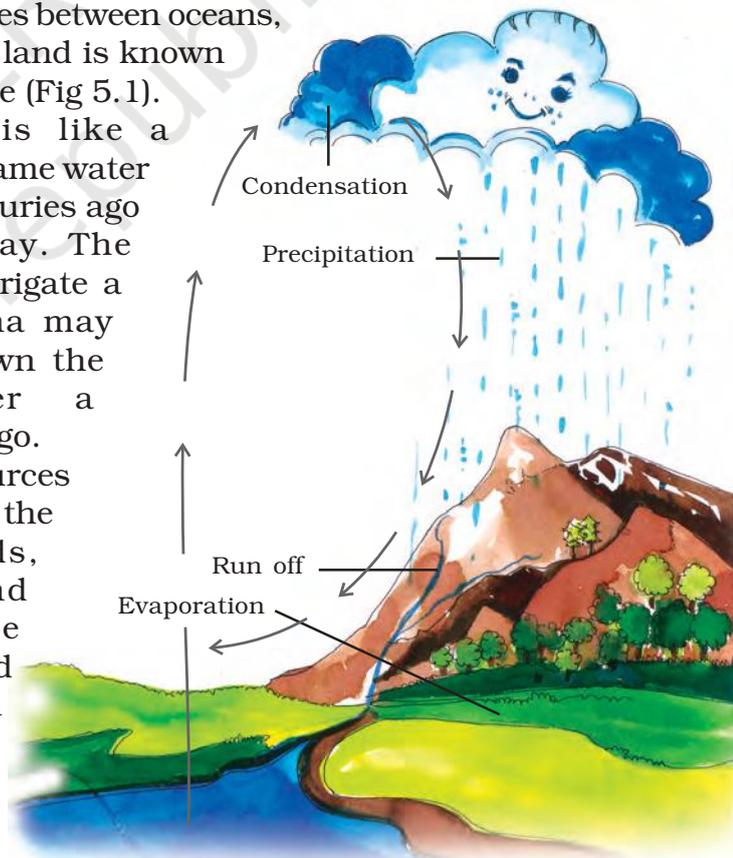


Fig. 5.1: Water Cycle

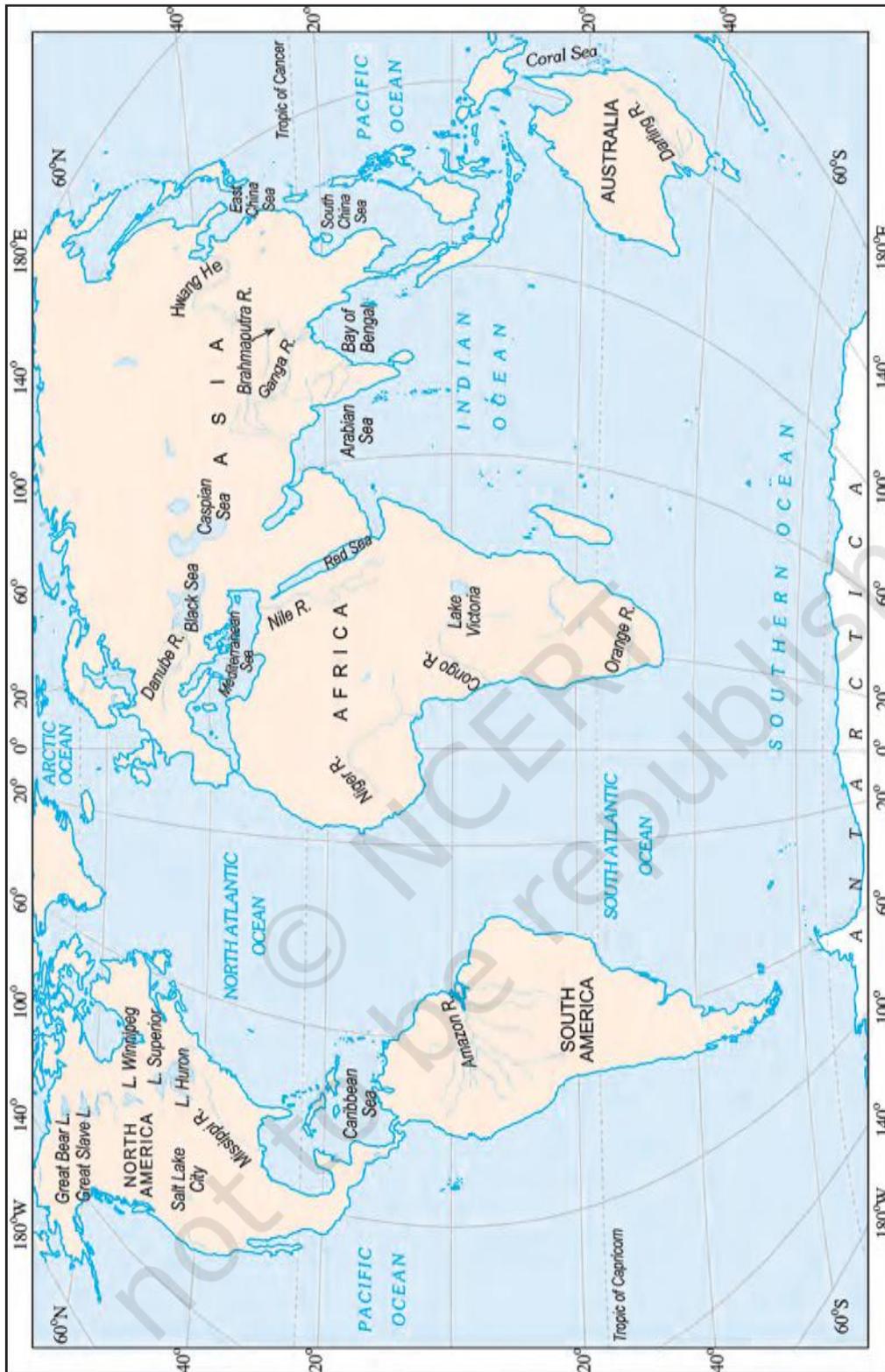


Fig. 5.2: World – Major Seas, Lakes and Rivers

amount of dissolved salts. Most of the salt is sodium chloride or the common table salt that you eat.



### Do you know?

Salinity is the amount of salt in grams present in 1000 grams of water. The average salinity of the oceans is 35 parts per thousand.



### Do you know?

Dead sea in Israel has salinity of 340 grams per litre of water. Swimmers can float in it because the increased salt content makes it dense.

## DISTRIBUTION OF WATER BODIES

We all know that three-fourth of the earth surface is covered by water. If there is more water than land on this earth, why do so many countries face water scarcity?

Is all the water on earth available to us? The following table gives the distribution of water in percentage.

Oceans	:	97.3	Saline Water
Ice-caps	:	02.0	} Fresh Water
Ground water	:	0.68	
Fresh water lakes	:	0.009	
Inland seas and salt lakes	:	0.009	
Atmosphere	:	0.0019	
Rivers	:	0.0001	
		<u>100.00</u>	

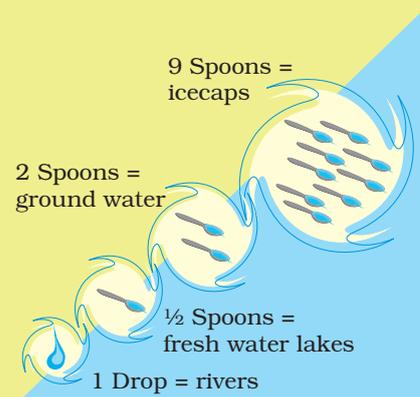
Water distribution can be demonstrated by a simple activity (see activity box).



### Activity

Take 2 litres of water. Let it represent the total water on the surface of the earth. Measure out 12 spoons of water from this vessel into another bowl. The water that is left behind in the vessel represents the salty water found in oceans and seas. This water is obviously not fit for consuming. It is saline (contains salts).

The 12 spoons of water that was taken in a bowl is the total amount of fresh water on earth. The figure shows us the distribution of this fresh water. See for yourself how much water can actually be used by you.



**Distribution of fresh water**

Water is absolutely essential for survival. Water alone can quench our thirst when we are thirsty. Now don't you think we are wasting a precious resource when we use water carelessly?

**MORE THAN JUST A PROBLEM...**  
Only collaborative efforts between public, private and voluntary sectors, particularly community participation, can help bring about concrete, substantive results in the efforts toward effective conservation of water resources.

**Coping with Water Scarcity**  
Coping with Water Scarcity is the theme for World Water Day 2007, which is celebrated each year on 22 March. The international observance of World Water Day was established that grew out of the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. The United Nations World Day for Water, Starting in 1993, is celebrated annually on 22 December 1992 by the United Nations Environment Programme (UNEP).

**Water scenario in urban India & Delhi**  
The urban water supply and sanitation sector in the country is suffering from inadequate levels of service, an increasing demand-supply gap, poor sanitary conditions and deteriorating financial and technical performance.

**The water you drink**  
...could be making you ill. The alarming amounts of industrial and human pollution in our water bodies expose us to myriad health risks, warns Nikhil Menon

**EVERY DROP COUNTS**  
Water is a resource so critical to our very survival. However, we might believe that water scarcity doesn't mean we should conserve. PALLAB DATTA

**a DROP OF LIFE**  
Dams Have Cut Rivers Off From Their Flood Plains: WWF  
**Many major rivers in danger of drying out**  
Geneva: Many major rivers in the world are at risk of drying out because of climate change and dam construction, which could affect fresh water supplies and marine life, the global nature protection body WWF said on Tuesday.  
In a report ahead of the March 22 "World Water Day", the Swiss-based group identified 10 rivers, including the Nile, the Rio Grande and the Danube, as some of the worst victims of poor planning and inadequate protection.  
"Rivers regularly no longer reach the sea, like the Indus in Pakistan, the Nile in Africa and the Rio Grande in the US," said Jamie Pittock, director of WWF's global freshwater programme.  
"Rivers are the world's main lifeblood. They provide water for drinking, irrigation, industry and recreation. They also support a wide range of wildlife and fish species. But dams and other infrastructure have cut rivers off from their flood plains, reducing their ability to recharge aquifers and maintain flow. This has led to a decline in water quality and a loss of biodiversity. Climate change has added to the problem by increasing evaporation and reducing precipitation in many areas."

**Ganga among 10 dying rivers**  
New Delhi: The Ganga, which is virtually synonymous with Indian civilisation, is dying. Pollution, over-extraction of water, encroached tributaries and climate change are the main culprits, according to a report by the World Wildlife Fund (WWF).  
The report, titled "Ganga: A River on the Edge", says that the Ganga is one of the most polluted rivers in the world. It is also one of the most over-exploited. The report says that the Ganga is losing its ability to recharge aquifers and maintain flow. This has led to a decline in water quality and a loss of biodiversity. Climate change has added to the problem by increasing evaporation and reducing precipitation in many areas.

**Troubled Waters**  
River: Danube, Congo, Nile, Rio Grande, Yangtze, Mekong, Salween, Ganga, Indus, Nile, Murray-Darling  
Continent: Europe, N. America, S. America, Asia, Asia, Asia, Asia, Africa, Australia

**The best way to tackle water scarcity is to catch rainwater where it falls...**  
Benefits of Rainwater Harvesting:  
• A concrete, tiled paved area of 100 sq. meters can save about four times the annual drinking requirements of a five member family.  
• Enhances equality and quantity of ground water.  
• Checks soil erosions by reducing surface run off.  
• Minimises water logging by minimising flow into storm drains.  
Climate change has added to the problem by increasing evaporation and reducing precipitation in many areas.

- Why is water important for us?
- Suggest some ways in which water can be conserved (a) in your home (b) in your school

## OCEAN CIRCULATION

There is something magical about walking bare feet on the seashore. The wet sand on the beach, the cool breeze, the seabirds, the smell of the salt in the air and music of the waves; everything is so fascinating. Unlike the calm waters of ponds and lakes, ocean water keeps moving continuously. It is never still. The movements that occur in oceans can be broadly categorised as: waves, tides and currents.



### Do you know?

March 22 is celebrated as World Water Day when the need to conserve water is reinforced in different ways.

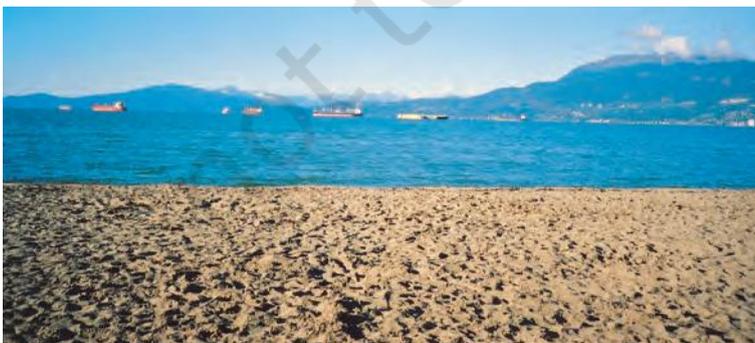


Fig. 5.3: Pacific Ocean



### Do you know?

Waves are formed when winds scrape across the ocean surface. The stronger the wind blows, the bigger the wave becomes.

## Waves

When you are playing throw ball on the beach and the ball falls into the water, what happens? It is fun to watch how the ball gets washed back to the shore by the waves. When the water on the surface of the ocean rises and falls alternately, they are called waves.

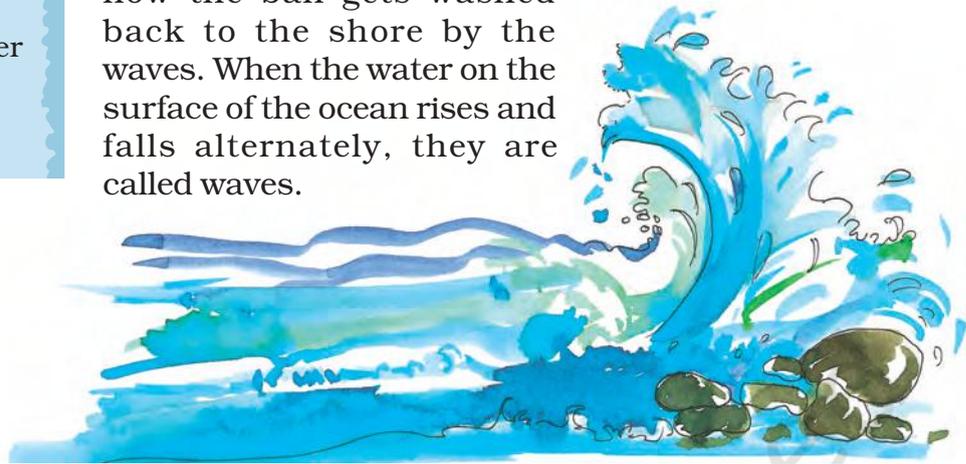


Fig. 5.4: Waves



### Do you know?

Tsunami is a Japanese word that means “Harbour waves” as the harbours get destroyed whenever there is tsunami.

During a storm, the winds blowing at very high speed form huge waves. These may cause tremendous destruction. An earthquake, a volcanic eruption or underwater landslides can shift large amounts of ocean water. As a result a huge tidal wave called **tsunami**, that may be as high as 15m. is formed. The largest tsunami ever measured was 150m. high. These waves travel at a speed of more than 700 km. per hour. The tsunami of 2004 caused wide spread damage in the coastal areas of India. The Indira point in the Andaman and Nicobar islands got submerged after the tsunami.

## TSUNAMI – THE EARTH’S PANDEMONIUM

Tsunami or the harbour wave struck havoc in the Indian Ocean on the 26 December 2004. The wave was the result of the earthquake that had its epicenter close to the western boundary of Sumatra. The magnitude of the earthquake was 9.0 on the Richter scale. As the Indian plate went under the Burma plate, there was a sudden movement of the sea floor, causing the earthquake. The ocean floor was displaced by about 10 – 20m and tilted in a downwardly direction. A huge mass of ocean water flowed to fill in the gap that was being created by the displacement. This marked the withdrawal of the water mass from the coastlines of the landmasses in the south and southeast Asia. After thrusting of the Indian plate below the Burma plate, the water mass rushed back towards the coastline. Tsunami travelled at a speed of about 800km. per hour, comparable to speed of commercial aircraft and completely washed away

some of the islands in the Indian ocean. The Indira point in the Andaman and Nicobar islands that marked the southernmost point of India got completely submerged. As the wave moved from earthquake epicenter from Sumatra towards the Andaman islands and Sri Lanka the wave length decreased with decreasing depth of water. The travel speed also declined from 700-900km. per hour to less than 70km. per hour. Tsunami waves travelled upto a depth of 3 km. from the coast killing more than 10,000 people and affected more than lakh of houses. In India, the worst affected were the coastal areas of Andhra Pradesh, Tamil Nadu, Kerala, Puducherry and the Andaman and Nicobar Islands.

While the earthquake cannot be predicted in advance, it is possible to give a three-hour notice of a potential tsunami. Such early warning systems are in place across the Pacific ocean, but not in the Indian Ocean. Tsunamis are rare in the Indian Ocean as the seismic activity is less as compared to the Pacific.



*Destruction caused by tsunami on Tamil Nadu Coast*

The tsunami that ravaged the South and South east Asian coasts in December 2004, is the most devastating tsunami in the last several hundred years. The large damage caused to life and property was primarily a result of lack of monitoring, the early warning systems and knowledge among the coast dwellers of Indian ocean.

The first indication that tsunami is approaching is the rapid withdrawal of water from the coastal region, followed by destructive wave. When this happened on the coast, instead of people going to high ground, they started assembling at the coast to view the miracle. As a consequence there was a large casualty of curious onlookers when the gigantic wave (tsunami) struck.

## **Tides**

The rhythmic rise and fall of ocean water twice in a day is called a tide. It is high tide when water covers much of the shore by rising to its highest level. It is low tide when water falls to its lowest level and recedes from the shore.

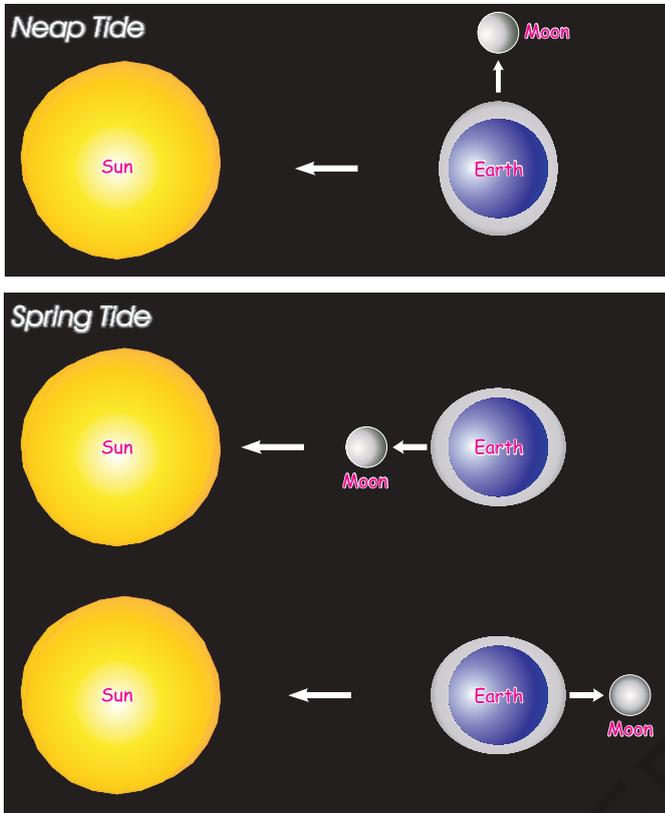


Fig. 5.5: Spring Tides and Neap Tide

The strong gravitational pull exerted by the sun and the moon on the earth's surface causes the tides. The water of the earth closer to the moon gets pulled under the influence of the moon's gravitational force and causes high tide. During the full moon and new moon days, the sun, the moon and the earth are in the same line and the tides are highest. These tides are called spring tides. But when the moon is in its first and last quarter, the ocean waters get drawn in diagonally opposite directions by the gravitational pull of sun and moon resulting in low tides. These tides are called neap tides (Fig. 5.5).

High tides help in navigation. They raise the water level close to the shores. This helps the ships to arrive at the harbour more easily. The high tides also help in fishing. Many more fish come closer to the

shore during the high tide. This enables fishermen to get a plentiful catch. The rise and fall of water due to tides is being used to generate electricity in some places.

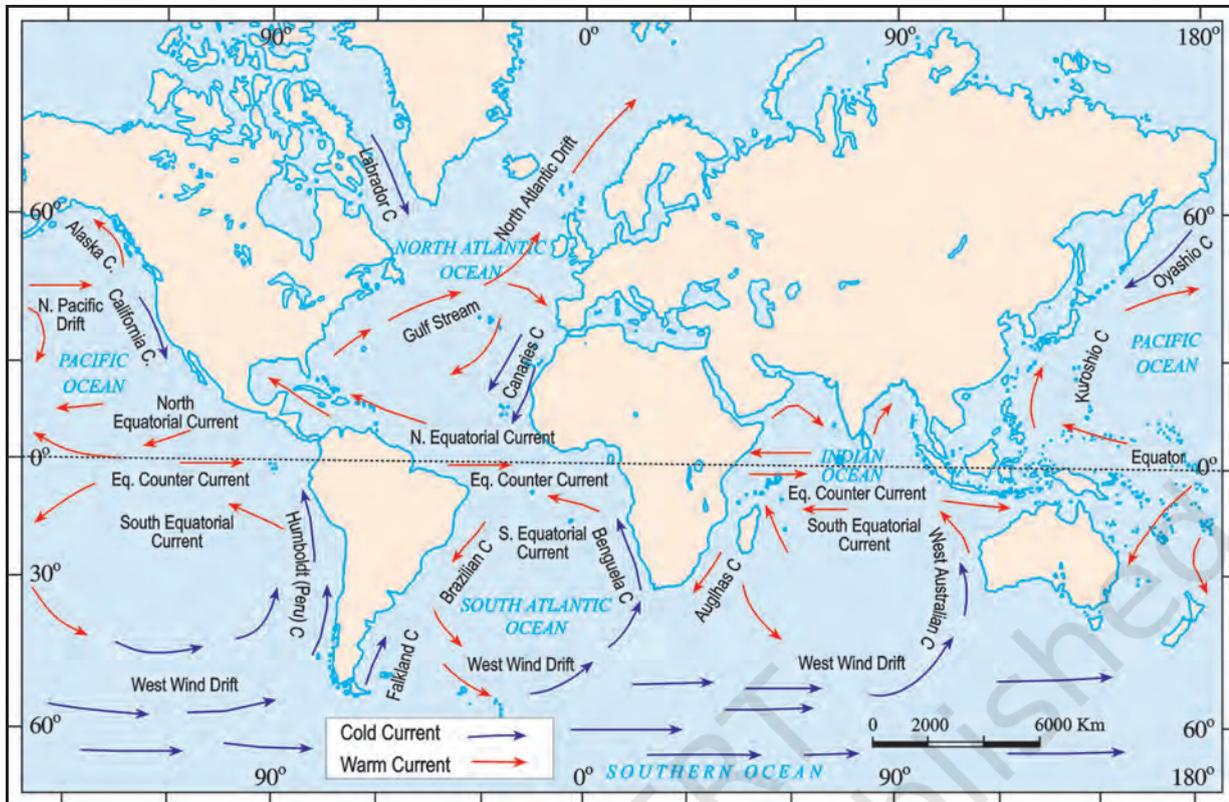


### Activity

Fill three-fourths of a bucket with tap water. Heat the water by putting an immersion rod on one side of the bucket. On the other side introduce an ice tray just removed from the freezer. Add a drop of red ink to observe the path of current by the process of convection.

### OCEAN CURRENTS

Ocean currents are streams of water flowing constantly on the ocean surface in definite directions. The ocean currents may be warm or cold (Fig. 5.6). Generally, the warm ocean currents originate near the equator and move towards the poles. The cold currents carry water from polar or higher latitudes to tropical or lower latitudes. The Labrador Ocean current is cold current while the Gulf Stream is a warm current. The ocean current influence the temperature conditions of the area. Warm currents bring about warm temperature over land surface. The areas where the warm and cold currents meet provide the best fishing grounds of the



**Fig. 5.6: Ocean Currents**

world. Seas around Japan and the eastern coast of North America are such examples. The areas where a warm and cold current meet also experience foggy weather making it difficult for navigation.



**1. Answer the following questions.**

- (i) What is precipitation?
- (ii) What is water cycle?
- (iii) What are the factors affecting the height of the waves?
- (iv) Which factors affect the movement of ocean water?
- (v) What are tides and how are they caused?
- (vi) What are ocean currents?

**2. Give reasons.**

- (i) Ocean water is salty.
- (ii) The quality of water is deteriorating.

### 3. Tick the correct answer.

- (i) The process by which water continually changes its form and circulates between oceans, atmosphere and land  
(a) Water cycle      (b) Tides      (c) Ocean currents
- (ii) Generally the warm ocean currents originate near  
(a) Poles      (b) Equator      (c) None of these
- (iii) The rhythmic rise and fall of ocean water twice in a day is called  
(a) Tide      (b) Ocean current      (c) Wave

### 4. Match the following.

- (i) Caspian Sea      (a) Largest lake  
(ii) Tide      (b) Periodic rise and fall of water  
(iii) Tsunami      (c) Strong seismic waves  
(iv) Ocean currents      (d) Streams of water moving along definite paths  
(e) Water cycle

### 5. For fun.

#### Be a Detective

- (i) The name of one river is hidden in each of the sentences below. Spot it.

**Example:** Mandira, Vijayalakshmi and Surinder are my best friends

**Answer:** Ravi

- (a) The snake charmer's bustee, stables where horses are housed, and the piles of wood, all caught fire accidentally. (Hint: Another name for River Brahmaputra)
- (b) The conference manager put pad, material for reading and a pencil for each participant. (Hint: A distributary on the Ganga-Brahmaputra delta)
- (c) Either jealousy or anger cause a person's fall (Hint: Name of a juicy fruit!)
- (d) Bhavani germinated the seeds in a pot (Hint: Look for her in West Africa)
- (e) "I am a zonal champion now" declared the excited athlete. (Hint: The river that has the biggest basin in the world)
- (f) The tiffin box rolled down and all the food fell in dusty potholes. (Hint: Rises in India and journeys through Pakistan)
- (g) Malini leaned against the pole when she felt that she was going to faint. (Hint: Her delta in Egypt is famous)
- (h) Samantha mesmerised everybody with her magic tricks. (Hint: London is situated on her estuary)
- (i) "In this neighbourhood, please don't yell! Owners of these houses like to have peace". Warned my father when we moved into our new flat". (Hint: colour!)
- (j) 'Write the following words, Marc!' "On", "go", "in"..... said the teacher to the little boy in KG Class. (Hint: Rhymes with 'bongo')

Now make some more on your own and ask your classmates to spot the hidden name. You can do this with any name: that of a lake, mountains, trees, fruits, school items etc.

#### Carry on Detective

- (ii) With the help of an atlas, draw each river which you discovered in For fun (i), on an outline map of the world.