

Maritime Economics

Grade 10-Term 1

Study Guide



STUDY GUIDE

Brian Ingpen, <http://maritimesa.org/grade-10/>, 2015



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PREFACE

The following icons are used in this study guide:



This is a note or an example.



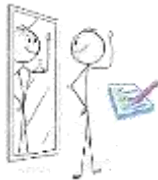
This is a warning: It tells you about potential pitfalls and how to avoid producing errors.



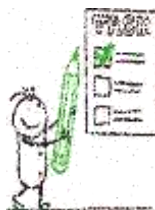
This is a reference: It provides you with additional information that will help you with the subject under discussion.



This is a Question: Anything appearing in a box of this type is a question based on an application on the subject under discussion.



This is self-assessment: you are required to answer the questions found at these icons, as it will assist you in mastering the content.



This is a task: you as the learner must complete the exercises/tasks/activity/assignments that appear in the learning units.



This is a hint or a tip: It will guide you through the learning opportunity.



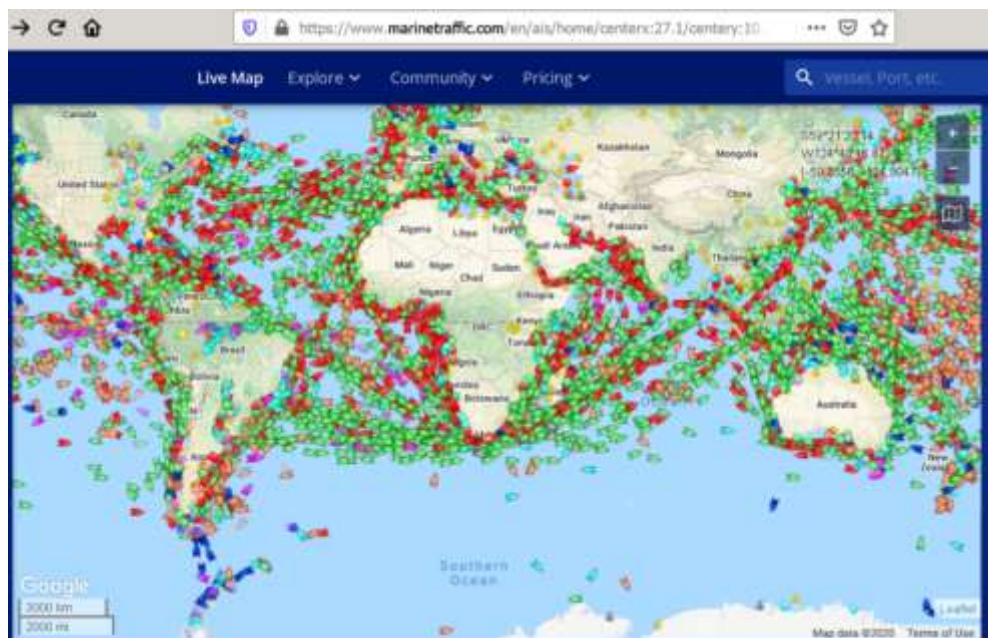
This is an experiment: It is an empirical procedure that may be used to test models or hypotheses.

Learning Outcome 1: Maritime World

1.1 What is the Maritime World ?



- 🌐 About 75 % of our world's surface is covered by the salty oceans.
- 🌐 If we connected all the **navigable** inland waterways of the world, the total length of the waterway will be 2,293,412 km.
- 🌐 Our continents are separated by the vast oceans.
- 🌐 We use ships to move large quantities of cargo between continents and between countries.
- 🌐 The picture below shows the position of vessels around the world at one instant in time, namely on 23 February 2020 at 13h23 local South African time. There are over 180,000 vessels at the instant in time.



Meaning of MARITIME WORLD

We consider the industry which involves any commerce or leisure relating to transport on water as the maritime world. The maritime industry is possible because of the demand for transport by water and the demand for resources in water.

**Task 1:**

- 1.1 What is the combined percentage of the world's surface which is covered by our continents, islands, and inland-waters?
- 1.2 Draw a pie chart to show the percentage of ocean surface compared to the remainder of the world's surface.
- 1.3 What is the meaning of the term “navigable water-way”?
- 1.4 Write 2,293,412 km out in words.
- 1.5 Write 180,000 out in words.

**Did you know:**

- 🌐 Ships are used for about 92 % of the world's trade.
- 🌐 Over 90 % of South Africa's import and export of goods is by sea.

**Self Assessment 1:**

List examples of goods which are imported and exported by South Africa?

Imported:

Exported:

1.2 Terminology used by the shipping industry



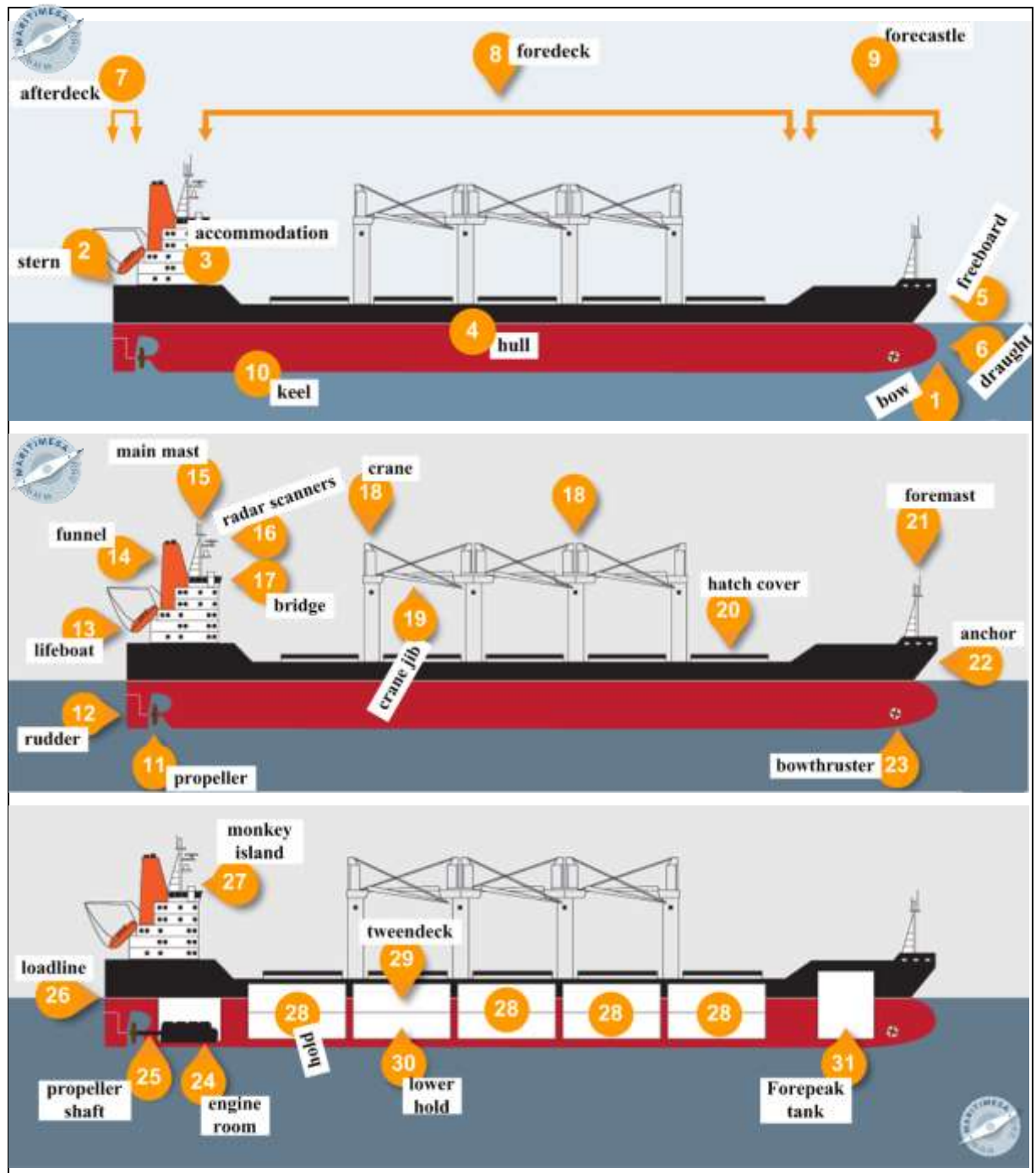
We will now look at words and terms that are common and characteristic of the shipping industry.

These words will appear strange at first, but remember that our mind is a sponge for new words. It will soak all the words in.



Be a sponge, soak up all the words

1.2.1 Parts of a ship



1 Bow - the front of the ship. 2 Stern - the back of the ship. 3 Accommodation (or superstructure) - this where the crew live and operate the ship. 4 Hull - the part of the ship that is partly in the water. The cargo is kept in holds (or in tanks) in the hull. 5 Freeboard - the part of the hull that is above the water. Freeboard is usually given in meters. For example, 6 metres of the hull is above the water. The more cargo the ship is carrying, the less will be her freeboard. 6 Draught - the part of the hull that is below the water. Draught is usually given in metres. The more cargo the ship is carrying, the greater will be the draught. (e.g. a ship with little cargo may have a draught of 6 m, but the same ship with a full cargo may have a draught of 12 m). 7 Afterdeck - the deck aft (on the stern side) of the accommodation. 8 Foredeck - the deck of a ship from the accommodation to the forecastle. 9 Forecastle (pronounced fowksil and often spelled fo'c'sle) - raised part of the foredeck near the bow. 10 Keel - the bottom of the ship. 11 Propeller - a rotating fan-like structure used to propel the ship with power generated and transmitted by the main engine of the ship. 12 Rudder - used for steering a ship. 13 Lifeboat - Used in an emergency when the crew have to abandon ship. 14 Funnel - The exhaust gasses pass from the engines and generators through pipes in the funnel. 15 Main mast - carries important lights for night-time navigation. Some electronic equipment (such as the radar scanner) is mounted on the mast. 16 Radar scanners - electronic navigation instruments with a rotating antenna. Used to detect objects such as other ships and land obstacles and provide bearing and distance for collision avoidance and navigation. 17 Bridge (or wheelhouse) - The ship is navigated from here, and it is the "nerve centre" of the ship. 18 Crane - Used to lift cargo. (Some older ships have derricks to lift cargo.)	19 Crane jib - the arm that extends horizontally from the crane. Used to support the load clear of the main support of the crane. 20 Hatch cover - The "lid" over the hold to ensure that water does not enter the hold. 21 Foremast - the mast which is located towards the bow of the ship. It usually has a special light that is shown at night, as well as the ship's foghorn which is blown during poor visibility to warn other ships of this ship's presence. 22 Anchor - is attached to the ship by a cable or chain and is lowered to the seabed to hold the ship in a particular place by means of a fluke or pointed projection that digs into the sea bottom. The primary force holding an anchored ship in place is the weight of the chain lying on the bottom and its friction with the bottom of the sea. 23 Bowthruster - a small propeller that can shoot water to the starboard side (right side) or to the port side (left side), to swing the bow in the opposite direction. 24 Engine room - The ship's engine/s, generators and other machinery are located here. The engine/s turn/s the propeller shaft to which the propeller is attached. The generators generate electricity that is used for lighting, air-conditioning, electronic systems, cranes, pumps, refrigeration, etc. In some ships, there is no main engine, but several powerful generators - the electricity generated is used to drive the propeller shaft and therefore the propeller. 25 Propeller shaft - A steel shaft to which the propeller is fixed. 26 Loadline - A special mark on the side of the ship indicating the level to which the ship may be loaded. 27 Monkey island - Deck atop (above) the wheelhouse 28 Hold - The place where cargo is kept on the ship. This ship has five holds in which cargo can be stowed (placed). In ships that carry liquid cargoes, the "holds" are tanks in which the liquid cargo is carried. Therefore we call ships that carry liquid cargoes tankers 29 Tweendeck - A deck inside the hold where cargo can be stowed. 30 Lower hold - The lower part of the hold where cargo can be stowed. 31 Forepeak tank - Used to stow liquid cargo or fresh water or ballast water. (Ballast water is sea water that is used level the ship).
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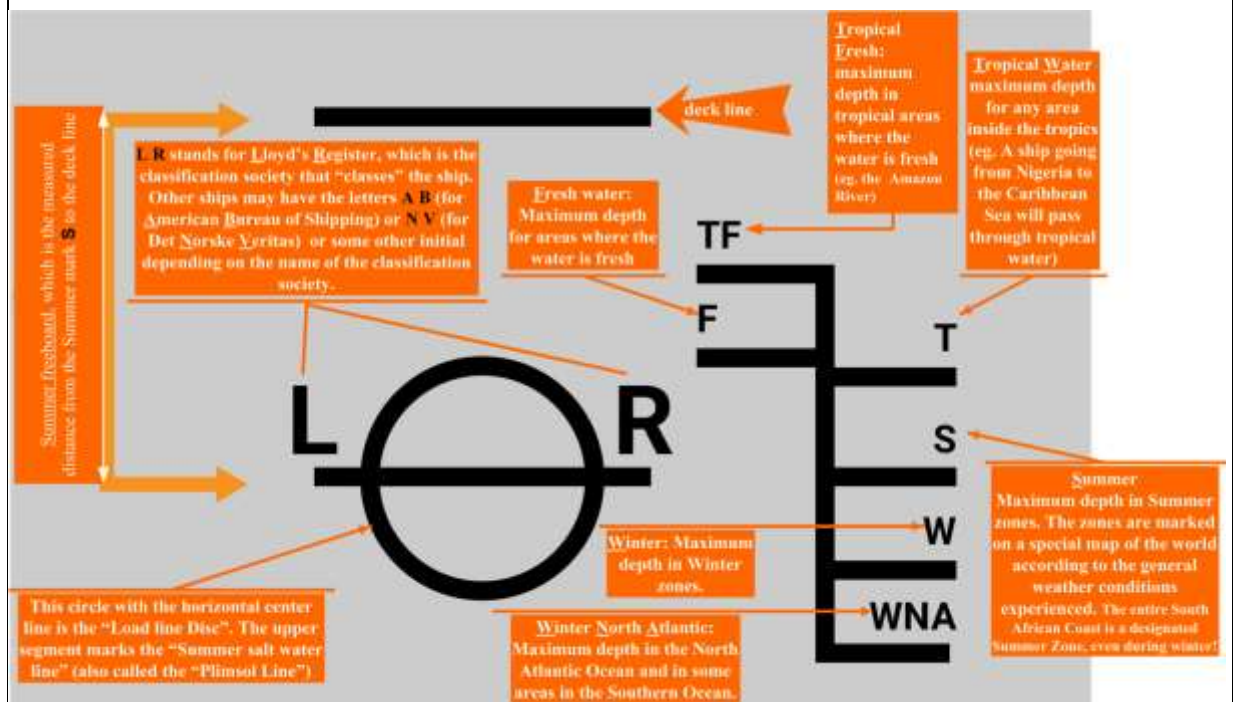
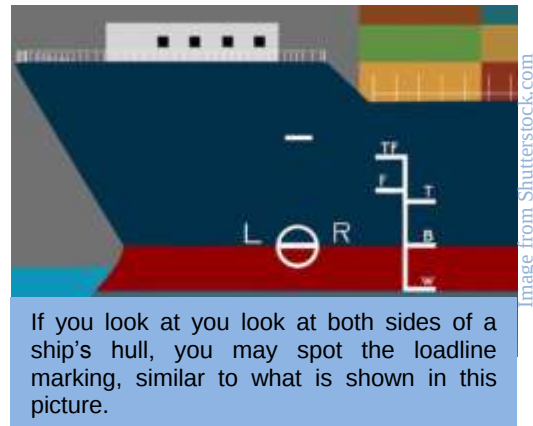


1.2.2 Ship's loadline 26

Before the international adoption of the **Loadline Convention**, ships could sail with massive loads that resulted in very little freeboard and which put the ships at risk of sinking.

The Load line identifies the maximum legal limit up to which a ship can be loaded in distinct types of waters. This reduces the risk of the ship having inadequate freeboard and buoyancy.

The level of water against the Load line makes the task of detecting whether the vessel is overloaded easy and effortless.



Did you know:

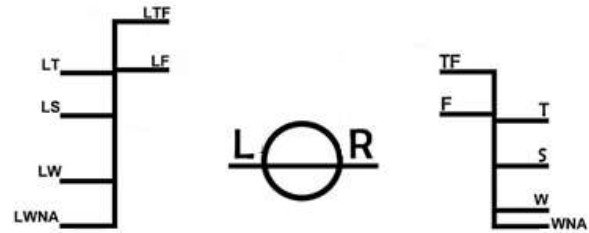
- 🌐 The first legal provision for the marking of the load line was in 1897.
- 🌐 “Load line” used to be called the “Plimsoll line” after Samuel Plimsoll, who was a merchant and shipping reformer.
- 🌐 An International Load Line was adopted by 54 nations in 1930.
- 🌐 In 1968 a new line, permitting a smaller freeboard for the new and larger ships, went into effect.



The Load lines shown previously are not the only load lines

For timber carrying vessels the load line marks include:

- ✚ LTF – timber tropical fresh water
- ✚ LFF – timber fresh water
- ✚ LTT – timber tropical seawater
- ✚ LST – timber summer seawater
- ✚ LW – timber winter seawater
- ✚ LWNA – timber winter North Atlantic



Below are some pictures of **over loaded vessels**

The *Sewol* was carrying more than three times the recommended maximum load on the day it capsized.



The *Hoegh Osaka* ran aground in January 2015. It was carrying high-end cars.

A "significant difference" between the actual and estimated cargo weight left it unstable and contributed to the accident.



Task 2:

2.1. What may be the impact of goods being transported on a ship which is overloaded?

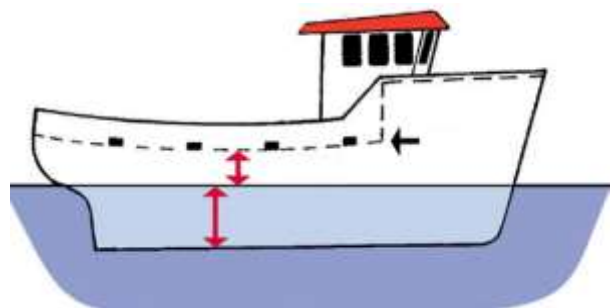
2.2. How can authorities identify if a ship is overloaded?

2.3. Where is cargo stored in a ship?



Self Assessment 2:

Use these pictures and others which you may find to practice labeling parts of a ship.





1.2.3 Port side, starboard side, stern and bow



- 🌐 The port side is the “left-hand” side of the ship when you are on the ship and looking towards the bow.
- 🌐 Starboard side is the “right-hand” side of the ship when you are on the ship and looking towards the bow.



Did you know:

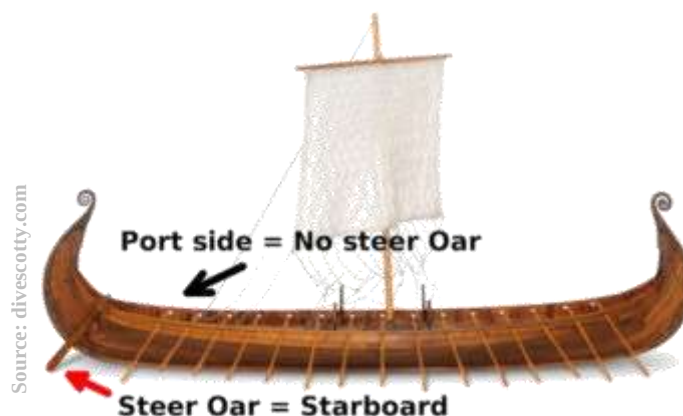
- 🌐 Port and starboard never change. They are unambiguous references that are independent of a **mariner's** orientation, and, thus, mariners use these **nautical** terms instead of left and right to avoid confusion.
- 🌐 Before the invention of the rudder (see part **12** on page 3), sailing ships were steered with a board.
- 🌐 Most of the sailors were right-handed, so the steering board, or steerboard, was on their stronger hand side. Sailors began to call this steering side “starboard”.
- 🌐 The opposite side of the historic oar side faced the port and allowed supplies to be ported aboard by the porters. Hence the name “portside”.

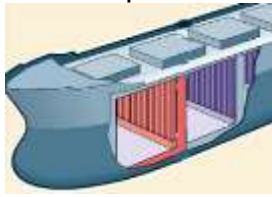
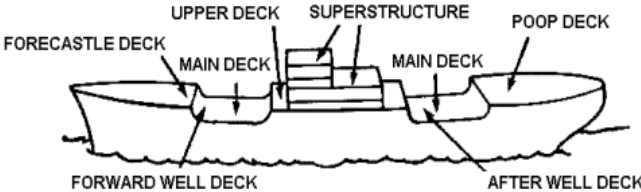
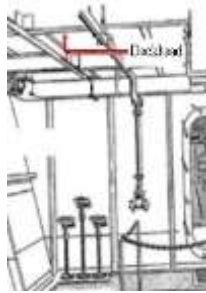


Source: wikiwand.com



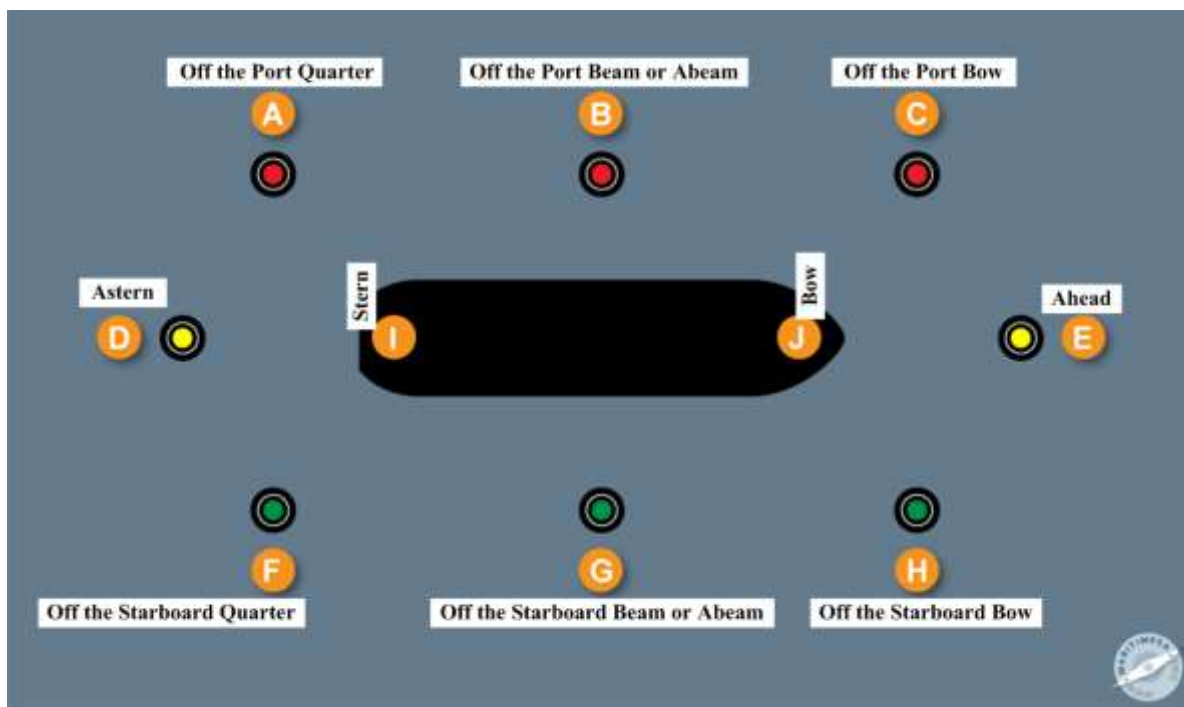
Source: divescotty.com



 1.2.4 Additional terminology		
Alley - Passage on a ship 	Bulkhead - Wall or vertical partition on a ship 	
Bunk - Bed on a ship; Cabin - Bedroom on a ship 	Deck - Floor on a ship 	
Deckhead - Ceiling on a ship 	Galley - Kitchen on a ship 	Gangway - set of steps used to board or disembark a ship 
Hatch - Opening in a deck 	Heads – Toilets   Images from seabits.com Showing Head and holding tank	
Main Deck - The longest deck on a ship  Image from insidelst.com	Mess - Crew's dining area on a merchant ship (on naval ships this can refer to the crew's sleeping quarters) 	
Porthole -Round window on a ship 	Saloon - Officers' dining room on a ship  Image from hmy.com	
Scupper - Window on a ship. (The term window is still used when referring to the windows on the bridge) 		



Knowing positions of objects outside the ship and relative to yourself when onboard the ship



Practice Examples:

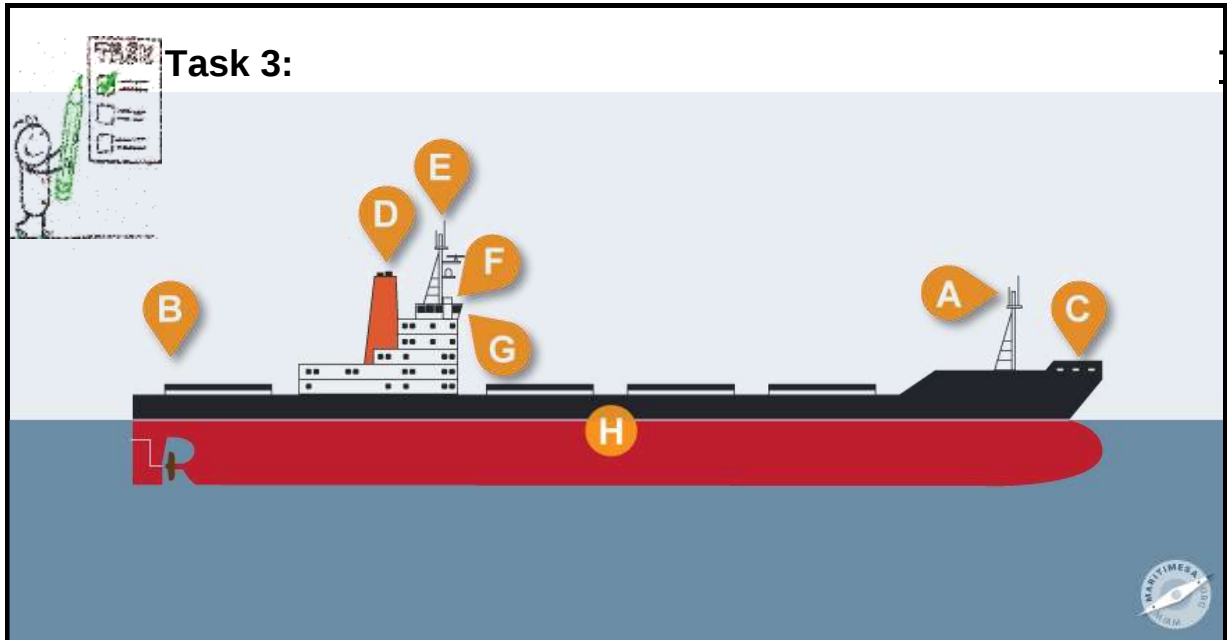
- 🌐 If you see a lighthouse at A: Lighthouse off the port quarter!
- 🌐 If you see a buoy at H: Buoy off the starboard bow!
- 🌐 If you see a person in the water at E: Person ahead!
- 🌐 If you see an iceberg at C: Iceberg off the port bow!
- 🌐 If you spot a whale at G: Whale off the starboard beam!



When on board a ship, you may need to describe the position of one object relative to another.

To do so we use terminology such as:

- 🌐 Aft (closer to the stern compared to another object)
- 🌐 Aft (to indicate something which is near or toward the stern)
- 🌐 Aloft (up the mast)
- 🌐 Atop (above something)
- 🌐 Below (level/s lower)
- 🌐 Down aft (close to the stern)
- 🌐 Forward (closer to the bow compared to another object)
- 🌐 Midships (the middle point of the ship)
- 🌐 Thwartships (something that lies across a ship)
- 🌐 Upforward (close to the bow)



In the above picture:

- 3.1. Is the funnel (D) abaft the main mast or is the main mast abaft the funnel?
- 3.2. Is the accommodation aft, midship or up forward?
- 3.3. Is the monkey island (F) atop the wheelhouse (G) or down below?
- 3.4. If the Captain is standing at B, describe his position relative to the ship?
- 3.5. Is the main mast (E) forward of the funnel or is the funnel forward of the main mast?
- 3.6. A person on deck at H would be in which position relative to the ship?
- 3.7. What is the meaning of “in the main deck thwartships passageway”?
- 3.8. If the Captain is standing at C, describe his position relative to the ship?
- 3.9. Is the foremast (A) forward of the main mast (E)?

1.3 Types of ships



Did you know:

- 🌐 If a vessel weighs at least 500 tons or above it is categorized as a ship.
- 🌐 Lighter vessels such as for towing, sailing, paddling, kayaking, canoeing and patrolling are all categorized as a boat.
- 🌐 Submersible vessels are categorically termed as “boats”.



Did you also know:

- 🌐 Merchant vessels are ships that primarily carry cargo or passengers.
- 🌐 There are over 50,000 merchant ships trading internationally.
- 🌐 Merchant vessels can be designed to carry cargo such as:
 - ✚ Liquefied natural gas, crude oil, chemicals
 - ✚ scrap metals, iron ore, coal, wood
 - ✚ sugar, cocoa, coffee grains, rice
 - ✚ food and drink
 - ✚ refrigerated goods such as fruits, vegetables, meat, flowers, dairy
 - ✚ electrical and electronics equipment
 - ✚ oversized goods such as turbines, drilling platforms etc.



Did you also know:

- 🌐 Some ships catch fish
- 🌐 Some ships search for oil below the seabed
- 🌐 Some ships search for precious metals and minerals
- 🌐 Some ships suck up sand from harbours to keep the harbor deep
- 🌐 Some ships help bigger ships in and out of harbours
- 🌐 Some ships are used by the military for defence



The economic factor is of prime importance in choosing and designing a merchant ship.

A ship owner will want maximum **return on investment from the ship**. So the type of ship and construction features of the ship will depend on the current economic and social necessities and future adaptability.



The major types of ships are:

Containerships, Bulk Carriers, Tankers, Gas Carriers, Multi-purpose Ships, Passenger Ships, Refrigerated Ships, Ro-ro ships, Heavylift Ships, Ferries, Fishing vessels, Tugs, Dredgers, Warships.



We will now learn about some of the major ship types.

1.3.1 Container ships

Container ships are designed to transport cargo-loaded containers from port to port.



Before **containerisation**, cargo used to be loaded using the so-called “**break-bulk**” method. The method required large teams of **stevedores** and they used equipment such as boards, slings, nets and pallets to load the cargo.

There are, and have been, many **disadvantages to break-bulk type of loading**:

- ✚ Individual items of cargo had to be handled, often one at a time, meaning that cargo work took a long time and required large teams of stevedores;
 - ✚ Because cargo was handled so many times, it was often damaged;
 - ✚ Cargo was sometimes stolen;
 - ✚ Because cargo loading took so long, ships often spent weeks in port, costing time and therefore money.
 - ✚ Weather-sensitive cargo (such as bags of cement, paper, bags of grain, and other cargoes that must not get wet) could not be handled during rain. Therefore rain delays to cargo work were frequent.
 - ✚ It is labour-intensive, costing money.
- Some present day ports with poor shoreside infrastructure are forced to still use a break bulk method to load cargo.



Stevedores (pronounced /'sti:vəðɔ:/) are workers who load and unload cargo.



Self Assessment 3:

3.1. Notice the disk on the mooring line in the above picture (marked with the yellow arrow). Can you find figure the reason for the disk on the mooring line?

tip The cargo being loaded is most likely flour and could attract rodents.

3.2. What are the possible problems that can arise with a container ship which has a rodent infestation?

3.3. The picture above show stevedores loading a massive part (marked with the green arrow). Would a container ship typically transport this kind of load? Explain your answer.



The economics of containerisation:

- 🌐 Containerisation is as a revolution in sea transport.
- 🌐 Containerisation is a system of freight transport using containers of an internationally standardised size that can be loaded onto specially-designed ships, trucks, trains.
- 🌐 Containerisation allows for the smooth transfer of cargo from one medium of transport to another, for example from a ship to a train or to a truck. That is, containerisation promotes intermodalism.
- 🌐 Some containers are owned by the liner company.
- 🌐 Some containers are leased (hired/rented) from their owners by shipping companies.
- 🌐 An inland container terminal, such as in Johannesburg, enables customs clearing to occur away from the coast, and helps to relieve congestion at container terminals at the harbours.
- 🌐 Containers can be gathered at an inland terminal for onward movement to the harbours.



1.3.2 Bulk carriers

Bulk carriers (or bulkers) are vessels that **carry non-liquid cargoes in large quantities**. The cargo is either **dry bulk** or **neo-bulk**.

Examples of dry bulk are minerals, grain, fertiliser, sugar.

Examples of neo-bulk are bagged cargo, steel, aluminium ingots, timber, rolls of newsprint, blocks of granite.

In either case, the bulk cargo is stored in the ship's **cargo holds**.



Bulker being loaded with coal (dry bulk) (image: shipsandports.co.ng)



Bulker being loaded with grain (dry bulk) (image: shutterstock)



Bulker being loaded with steel (neo-bulk) (image: DNV GL)



Bulker being loaded with granite block (neo-bulk) (image: flgranites.com)

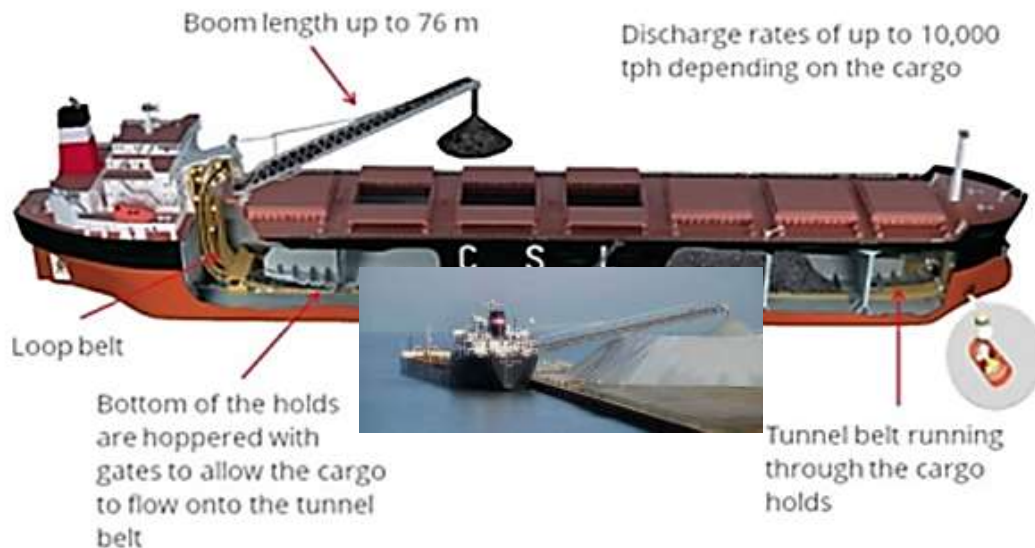


Slides 1 to 23 in <http://maritimesa.org/grade-10/what-is-a-bulk-carrier/> describe how some types of dry bulk is loaded into a bulk carrier's cargo hold.



Equipment used in loading and unloading of bulk carriers:

- 🌐 Some ships are **gearless** (they have no cranes) and some are **geared** (with cranes).
- 🌐 cargo can be handled by Conveyor systems, Chutes, Grabs, skips



Self unloader discharging using a tunnel belt and hoppered gates (images: bulkcarrierguide.com)



Did you know that a **Capesize Bulker**:

- 🌐 is over 150,000 deadweight;
- 🌐 between 300 m to 400 m long;
- 🌐 can have about 18 m draught;
- 🌐 cannot pass through the Suez Canal when fully laden;
- 🌐 cannot pass through the Panama Canal when fully laden; and
- 🌐 have to **round the Cape** at tip of South America or the Cape at tip of Africa on voyages to and from Europe – **hence the name, Capsize.**
- 🌐 By April 2019 there were 523 Capesize bulkers in the world.



Did you also know that:

- 🌐 South Africa has one out of the over 523 Capesize bulkers.
- 🌐 South Africa is rich in resources such as iron ore, which is commonly transported by Capesize bulkers.

1.3.3 Tankers and Gas Carriers

Tankers are ships that carry liquid cargoes in tanks.

The tankers are customised to carry crude oil, liquefied natural gas, liquefied petroleum gas, chemicals, prospecting vessels and products.

1.3.3.1 Crude oil

Crude oil is a mixture of hydrocarbons that exists as a liquid in underground geologic formations and remains a liquid when brought to the surface.



The principle fields from which crude oil is extracted are:

- 🌐 Middle East,
- 🌐 Caspian Sea,
- 🌐 Equatorial West Africa,
- 🌐 Caribbean and U.S. Gulf,
- 🌐 North and East of South America,
- 🌐 North Sea,
- 🌐 Siberia, and
- 🌐 Alaska.

Crude oil tankers may carry the crude oil directly from the site of extraction to a port so that the crude oil can be piped to a refinery to be changed into useful oil products (such a petrol, diesel, paraffin, aircraft fuel, lubricating oil, various grades of ships' fuel, and a variety of liquid chemicals).



Did you know that the types tankers, by size are:

- 🌐 ULCC – Ultra Large Crude Carriers: ~415 m, up to 500,000 dwt
- 🌐 VLCC – Very Large Crude Carriers: ~330 m, up to 350,000 dwt
- 🌐 Suezmax - ~285 m, up to 200,000 dwt
- 🌐 Aframax - ~245 m, up to 120,000 dwt
- 🌐 Panamax - ~294 m, up to 80,000 dwt (new Panamax is up to 366 m, ~120,000 dwt)
- 🌐 Handymax - ~190 m, up to 60,000 dwt
- 🌐 Coastal - ~205 m, 50,000 dwt



Main crude oil tanker/trading routes

1.3.3.2 Product tankers

Product tankers carry all kinds of liquids. Some of the liquid cargo examples are:

- ✚ Marine fuel,
- ✚ Petrol,
- ✚ Diesel,
- ✚ Aircraft fuel,
- ✚ Bitumen,
- ✚ Liquid chemicals,
- ✚ Vegetable oils, and
- ✚ Fish oil.



Bunkering:

- 🌐 Bunkering is the supplying of fuel to ships by bunker tankers (which are convenient floating refueling stations)
- 🌐 Bunkering operations are located at ports, and they include the storage of "bunker" fuels (on tankers) and the provision of the fuel to vessels.



Bunkering from a bunker tanker (Image from maritimesa.org)



Did you know that:

The term bunkering originated in the days of steamships, when the fuel (which was coal), was stored in bunkers.



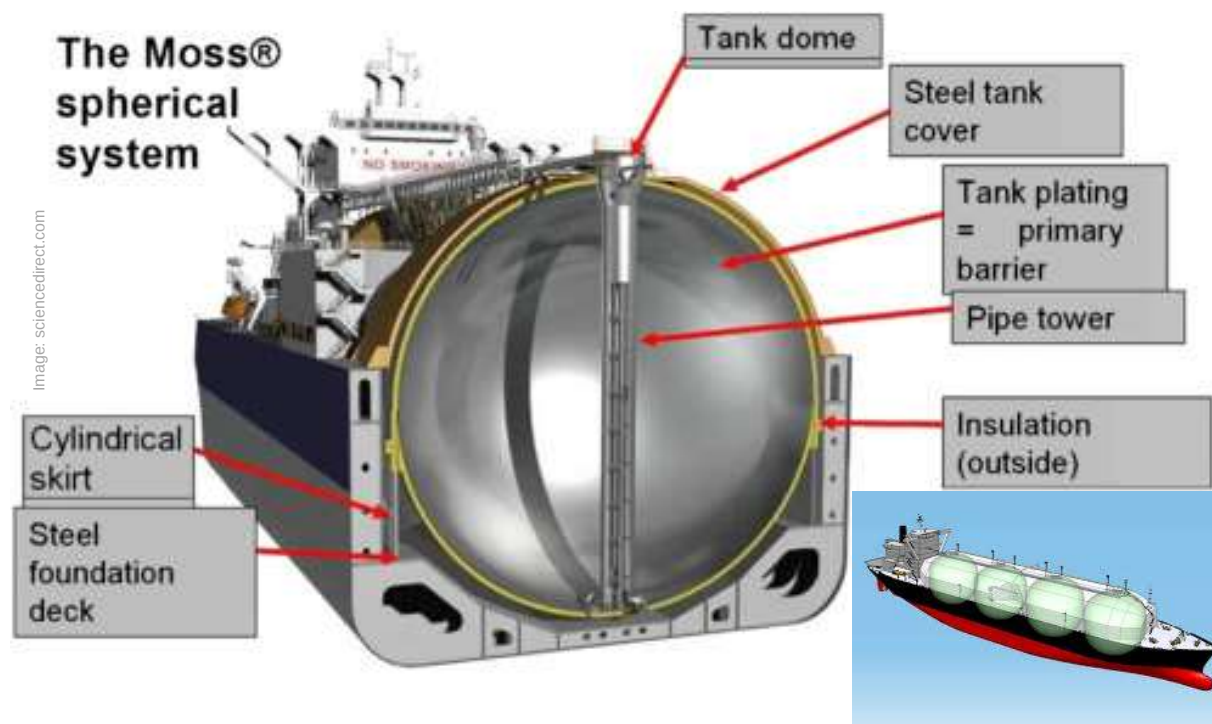
Did you also know that:

Japan's Asahi Tanker Company has announced (in March 2020) plans to build the world's first zero-emission electric bunker tankers.

These bunker tankers are being designed by e5 Laboratories, Inc. and will be powered by large-capacity lithium ion batteries.

Two of the zero-emission bunker tankers will be delivered between March 2022 to March 2023, with plans for the first to enter service in Tokyo Bay.

1.3.3.3 Gas Carriers



There are various types of gas carriers. Some examples are:

- ✚ **Fully pressurized** – most of these ships are fitted with two or three horizontal, cylindrical or spherical cargo tanks. These ships typically carry liquefied petroleum gas at ambient temperatures and required saturated gas pressure.
- ✚ **Semi-pressurized** – These ships can carry gases in a semi-pressurized/semi-refrigerated state. This type of ship is the most popular amongst operators of smaller-size gas carriers due to its cargo handling flexibility.
- ✚ **Fully refrigerated** – These ships can carry liquefied gases at low temperature and at atmospheric pressure. The storage tanks are fully refrigerated. These ships are suitable for carrying large volumes of cargo.
- ✚ **Liquefied natural gas (LNG)** – LNG is stored at low temperature and nearly ambient pressure. LNG is liquefied by cooling it to -165°C . This makes it easier to handle. Also, liquefied gas occupies less space compared to its gaseous form, so far greater volumes can be carried by the gas carriers.
- ✚ **Compressed natural gas (CNG)** - CNG is stored at ambient temperature and high pressure. CNG carriers are economical to transport gas over medium distances. These ships can be preferred over undersea pipelines as they have less complicated fast loading and unloading features.

Gases which are generally transported in liquefied form include methane, ethane, propane, ethylene, hydrogen, ammonia and chlorine.

Special shore side terminals are constructed to load and discharge gas cargoes.



Use the link <https://www.marineinsight.com/guidelines/20-hazards-on-oil-tanker-ship-every-seafarer-must-know/> for an easy to follow and illustrative video on tanker types.

1.3.4 Prospecting vessels

These ships are used in searching for oil and gas below the seabed. They can also be used in collecting the oil (or gas) and bringing it ashore for refining.

Some undersea prospecting vessels have a **Dynamic Positioning System** that via links to satellites and links to a special propulsion system, can keep the ship in a given position automatically.

Some types of prospecting vessels are:

- ✚ **Seismic survey ship** – used for seismic surveys of rock structures under the seabed.
- ✚ **Drill ship** – used for drilling into sub-sea rock structures to see whether oil or gas is present.
- ✚ **Oil rig** – used for undersea drilling.



There are various types of vessels which support offshore prospecting and extraction. These

- ✚ **Offshore supply vessel/tug/anchor handler** - such a ship can tow rigs or platforms. It may also be used to lay out or move the anchors for rigs.
- ✚ **Crane vessel** – used for offshore construction.
- ✚ **Pipe layer** – can serve to connect oil production platforms with refineries on shore.
- ✚ **Floating storage and off-take vessel (FSO)** – these are offshore units which are equipped for resource storage and offloading to a shuttle tanker.
- ✚ **Floating production storage and offloading (FPSO)** – this is used for the production and processing of hydrocarbons, as well as for the storage of the resource.



Did you know that:

Cape Town and Saldanha Bay provides repair and maintenance services to the offshore oil and gas industry.



Did you also know that:

- ✚ In the recent years there have been significant findings of gas off Southern Africa.
- ✚ With Mozambique's offshore gas reserves, there is an over US\$70 billion investment in LNG projects. The Mozambique government is under pressure to correct any exploitive relationships with foreign corporations and to focus the country's efforts into improving the lives of its people and making local communities climate-resilient.
- ✚ Amongst other companies, South Africa gave the French company, *Total*, exploration rights in part of a block in the Outeniqua Basin, which is in South Africa's exclusive economic zone (EEZ), just off the coast of Port Elizabeth.
- ✚ *Total* made the largest discovery in the Outeniqua Basin in 2019.
- ✚ There is hope that the reserve in the Outeniqua Basin will provide SA with a significant boost of over R1-trillion, for the economy, over the next 20 years.
- ✚ Some of the challenges for vessels in this zone will be the geology, strong sea current and adverse weather conditions.



1.3.5 Multi-purpose ships

Multi-purpose ships (also called General Cargoships or Freighters) are designed to carry a number of types of cargo:

- ✚ Bulk Cargoes (e.g. grain, or minerals).
- ✚ Neo-bulk Cargoes (e.g. blocks of granite; steel bars; rolls of paper).
- ✚ Containers (on deck or perhaps in a specially designed hold).
- ✚ Break-bulk Cargoes (e.g. bags of rice, boxes of vehicle parts, bales of wool, machinery etc.).
- ✚ Liquid Cargoes – small amounts of liquid cargoes are sometimes carried in the deep tanks or other tanks.

Multipurpose ships generally have cranes to handle the cargo that they carry. Some multi-purpose ships have heavy-lift cranes that can lift large machines, railway locomotives, power station parts, or mining equipment.

Some multipurpose ships may have tweendecks so cargo maybe be stowed in the hold space as well as atop.

The below picture from maritimesa.org is of a multi-purpose ship called *Purple Beach*. This ship has five holds, one of which is designed to carry containers (like the structure on container ships). The ship also carries heavylift cargo and other goods, such as machinery or large vehicles. The other holds have tweendecks and a lower hold to carry a variety of cargoes.



1.3.6 Passenger vessels

Passengers are carried as part of the following types of shipping operations:

- ✚ **Point-to-point passenger services** - these services involve passenger ships operating from designated ports to other designated ports. That is, the ship travels directly to a destination. Dedicated passenger ships with point to point service is practically non-existent. This is because it became economically unviable. Only specific destination pairs was offered so passengers would have been forced to find another means of travel to get to their final destination. Operating costs also increased which meant that companies would have had to increase passenger fares. Point-to-point passenger travel became expensive and air travel became the preferred option.

Nowadays, point-to-point passenger travel by sea can be taken by freighters.

✚ **Cruise Ships** – these ships are typically larger passenger ships which people take mainly for vacationing. A cruise ship's ports of call are usually places of great beauty and/or places of historical interest. Cruise ships generally make round-trip voyages, and passengers may go on shore excursions during ports-of call. The Caribbean is the principal cruise destination for passengers sourced from North America. Some cruise ships operate on long voyages, some even going on around-the-world cruises. While some people with a lot of time available (and with money to spend) can afford to travel in the ship for the entire voyage, others join the ship for one of the legs, such as from Singapore to Cape Town or from Cape Town to Rio de Janeiro.



Image: farandwide.com



Did you know that:

By 2017, An estimated 137 million onshore visits by passengers and crew helped generate US\$61 billion in direct cruise sector expenditures at destinations and source markets around the world. This US\$61 billion also includes the direct expenditures of the cruise lines for goods and services in support of their cruise operations.

Also, globally, the cruise sector made a total employment contribution of over 1 million.

1.3.7 Reefer

The term 'reefer' is used in shipping to refer to refrigerated ships and refrigerated shipping containers that transport perishable commodities, which require temperature control, by sea. Such perishables are fruit, meat, fish, vegetables, and dairy products. Reefer ships differ from conventional container ships in their size, design, power generation and electrical distribution equipment. The key difference is that they are smaller and require provisions made for powering each container's cooling system.



Did you know that:

- ✚ At the beginning of 2000 there were over 20 companies worldwide who were specialised in transport with reefers. By 2018 there are only eight.
- ✚ A key reason behind this change is that diversified carriers that have the capacity to hold **reefer containers** offer a faster return on investment as well as the fact that they give carriers greater security in an unstable market.
- ✚ The additional insulation and the power plant results in a 12 meter reefer container costing around six times more than a regular container.

1.3.8 Ro-ro ships

The cargo for a ro-ro ship is driven onto ("rolled on") and driven off ("rolled off") the ship. Hence the name ro-ro. The holds on these ships are without hatches. The hold looks like a large parking garage.

Ro-ro ships are thus designed to carry wheeled cars such as cars and trucks which are driven on and off the ship on their own wheels or by using a platform vehicle.

Ro-ro ships will have either built-in or shore-based ramps or ferry slips to allow the cargo to be efficiently rolled on and off the vessel when in port. The ramps and doors may be located in stern, bow or sides, or any combination thereof.

The examples shown below (from <https://en.wikipedia.org/wiki/Roll-on/roll-off>) are of a train ferry ro-ro (left) and Procyon Leader (right).



Procyon Leader is a vehicle carrier. Notice that the stern quarter ramp is down on the vehicle carrier. You can also see the port side ramp. This ro-ro is the length of two soccer fields. Inside, there are 3 decks. These decks, as well as the top, open deck, all designed to accommodate just one type of cargo, namely cars. It can hold 5,700 cars when fully loaded.



Because of the ro-ro ramp, ro-ro ships can be used to carry large or bulky items of cargo (e.g. large machinery, mining equipment, factory parts) that can be rolled on and off the ship. This type of cargo is often called **project cargo**.

1.3.9 Heavy-lift ships

A heavy-lift ship is a ship that is specially designed and capable of loading and unloading heavy and bulky items. These ships can be categorised into four main categories, namely:

- ✚ Project cargo ships – Also seen as a ro-ro ship, the project cargo ships are relatively small ships, often with a large box-shaped hold. The hold can be used for carrying machinery, port equipment, locomotives, knocked down cranes, small boats, yachts etc.
- ✚ Open deck cargo ships – these are also ro-ro type vessels with the superstructure positioned fore. Open deck cargo ships are designed for transport of large modules, fully-erected container cranes, etc, on a large open cargo deck, accessible with a full width stern ramp.
- ✚ Dock ships - are characterized by the full-length sidewalls protecting the cargo area. The cargo can be loaded by float-in/float-out by submersing the ship until the dock deck is under water. Other means of loading/unloading is by lift-on/lift-off, using cranes and by roll-on/roll-off over the ship stern ramp.
- ✚ Semi-submersible ships - capable of submerging its large open deck to below the water's surface to allow another vessel to be floated over it and landed on a dry-dock-build mounted on the heavy lift ship's deck. The heavy lift ship then rises out of the water by pumping out its ballast tanks in a process very similar to the operation of a floating dry-dock. The transported cargo, which must be barge-mounted or able to float itself, then rides on the deck of the heavy lift ship for the voyage to its destination. This type of ship is also known as a Float-On / Float-Off (FLO-FLO) ship or a Semi-Submersible Heavy Lift Vessel (SSHLV). If the ship is equipped with a crane it is also called a Semi-Submersible Crane Vessels (SSCV). Typical cargoes are drilling rigs, floating plants, dredging equipment, offshore structures, floating drydocks, other vessels.

Examples of heavy-lift ships are shown below.



1.3.10 Ferries

A ferry is a passenger-carrying vessel that link islands with the mainland or they link ports across a sea or gulf.

Some examples are:

- ✚ Ferries link Britain with France (across the English Channel or Straits of Dover).
- ✚ Ferries operate among the Greek islands, and other Mediterranean islands.
- ✚ New Zealand ferries link the North Island and South Island.
- ✚ Ferries on the Bass Straits between Melbourne (Australia) and Tasmania.
- ✚ Ferries operating between the islands off Philippines, Japan, and in the Pacific island groups.

Many passenger ferries also have a ro-ro capacity so that they can also carry vehicles. Via a ramp in the bow, the vehicles are driven onto the ferry's vehicle deck(s) and are secured for the voyage. At the destination, the vehicles are driven off the ferry via a ramp in the stern.

Some examples of ferries are shown below.



The Staten Island Ferry in the United States shuttles commuters between Manhattan and Staten Island in New York City (image from Wikipedia.org)



Car ferry in Stavanger, Norway

1.3.11 Fishing vessels

A fishing vessel is used to catch fish. There are commercial, artisanal and recreational fishing.

Many countries have measures to regulate the quantity of fish that is harvested. These measures are necessary to protect ecosystems and to address socio-economic concerns. The measures may include limits on: operating time, area closures, ship size, net dimensions, line lengths, and catch volume.

Types of commercial fishing vessels are:

- ✚ Trawlers – which use trawl net to catch large volumes of fish.
- ✚ Seiners – use surrounding and seine nets.
- ✚ Line vessels – use long, heavy fishing lines with a large series of baited hooks hanging from the main line. The number of hooks and lines handled depends on the size of vessel, the number of crew, and the level of mechanisation. There are four primary classifications for lines vessels, namely:
 - Longliners – use one or more fishing lines, each with a series of baited hooks hanging on smaller branched lines.
 - Jiggers - operate by deploying a number of lines, with multi-pronged lures (often called jigs) or baited hooks, from the sides of the boat. The lines are attached to jigger winches or jigger machines to cause to lures to move in a jerky motion to simulate the movement of prey.
 - Pole and line vessels - The fishers stand at the railing or on special platforms and fish with rods and reels.
 - Trollers – fast-swimming fish are caught by towing astern one or more trolling lines. That is, baited hooks or lures are dragged through the water.



Did you know that:

The total number of fishing vessels in the world in 2016 was about 4.6 million.

1.3.12 Tugs and offshore service vessels

When ships come into harbour, or leave a harbour, they require assistance to manoeuvre in the restricted harbour area. Therefore, harbour tugs have developed over the years to help ships turn, to push them carefully against a wharf when berthing, or to tow them away from that wharf when the ships are ready to leave the harbour.

A multi-directional harbour tug has a marine propulsion system that allows the tug to change direction immediately, when required by the **tugmaster**. A Voith Schneider propeller (VSP) is an example of a multi-directional system. The VSP helps to manoeuvre massive ships in strong wind and in small areas.



Apart from two tugs operating in Saldanha Bay, all the multi-directional tugs in South African harbours were built in Durban.

Tugs are also used to transport a marine pilot to embark incoming and out-going vessels.

Tugs are also used for salvage and ocean towage operations.

1.3.13 Dredgers

A dredger is equipped with a device (or devices) for scraping or sucking the seabed to excavate material such as sand and gravel from the sea or other body of water.

Some purposes for dredging include:

- ✚ Engineering greater depth of water for navigability. Some ports in South Africa do not have much sand accumulation and need very little dredging. Ports such as Durban, East London and Richards Bay require regular dredging.
- ✚ Reshaping of land and water features. A **grab dredger**, which is a vessel with a crane, is used to lower a grab to the seabed and to lift pieces of rock with the grab. In dredging for land reclamation, the dredger can be used to deposit the excavated material elsewhere to construct new land.
- ✚ Mining of marine deposits.



1.3.14 Warships

A warship (also known as a combatant ship) is a vessel that is designed to withstand damage and is usually faster and more manoeuvrable than merchant ships. Unlike a merchant ship, which carries cargo, a warship typically carries weapons, ammunition and supplies for its crew. Warships usually belong to a navy, though they have also been operated by individuals, cooperatives and corporations.

Types of warships include:

- ✚ Amphibious assault.
- ✚ Offshore/coastal patrol ships.
- ✚ Capital ship - the largest ship in a nation's fleet. These can be aircraft carriers, but the first two warship types are now no longer used.
- ✚ Corvette/Frigate – is a small, lightly armed ship. Typically used to protect merchant vessels and other warships. Frigates can have anti-submarine capacity and be equipped with missiles. The frigate can also have a hangar and helipad on the after deck for helicopter support.
- ✚ Minehunter – hunts for and destroys explosives devices which may be laid in the sea.
- ✚ Hydrographic survey – used to survey the seabed so that charts can be drawn for the surveyed area.
- ✚ Fleet replenishment vessel – serves to carry supplies of food, ammunition and fuel to other ships.
- ✚ Submarine – capable of remaining underwater for extended periods.



South African Navy submarine SAS Charlotte Maxeke and frigate HMS Portland
(image: Caroline Davies, Wikimedia Commons)

1.4 General terminology relating to ships

Ballast: is sea water that is pumped into the ship's tanks to trim the ship, i.e. to ensure that she is not too high in the bow, or too high in the stern, or listing (leaning to one side) when putting to sea. Ballast is also put into a ship's tanks to spread the weight (and therefore the stresses) along the length of the ship when loaded.

Bunker: is a ship's fuel. **To bunker** means to take on fuel.

Coaster: A ship that trades along the coast of a country (e.g. from Durban to Cape Town, or between Australian ports) or the coast of a region (e.g. southern Africa). These ships are usually relatively small. The role of coasters has been reduced recently because of the widespread use of trucks to move cargoes between ports, while larger ships often carry containers between local ports during their coastal voyages. (e.g. a ship trading between South Africa and Europe may call at Durban and while loading cargo for Europe, she also loads cargo for Cape Town which is her next port of call en route to Europe.)

Geared ship: A ship that has her own cranes.

Gearless ship: A ship that does not have her own cranes.

Knot: The unit of measurement of the speed of a ship. If a ship steams at 15 knots, she will cover 15 nautical miles in an hour or 27.78 kilometres in an hour. (1 knot = 1 nautical mile – see nautical mile below.)

Liner: A ship that operates on a regular service (e.g. between certain ports in Europe and certain ports in South Africa) and has a published schedule. Most container ships operate on liner services.

Nautical Mile: The unit of distance at sea. Its abbreviation is a capital M, e.g. 150M or 2400M. (1 nautical mile = 1.852 kilometres approximately)

Near-sea trader A ship that trades between countries across a relatively narrow sea or gulf (e.g. from Europe to the UK; from Europe to North Africa.)

Panamax: A ship that can pass through the Panama Canal when she is fully loaded with cargo. The ship's length, beam and draught are such that she can fit in the Panama Canal.

Post-Panamax: A ship that is too large (too long, too wide and/or too deep) to pass through the Panama Canal fully loaded with cargo.

Stores: items that will be needed during a voyage – e.g. food, paint, engine-room requirements (other than fuel).

Trampship: A ship that has no regular schedule. She calls at a port to load cargo, then goes to another port to discharge that cargo. She may return to the loading port if required to load another cargo, or she may go to another port to load a totally different cargo. (e.g. She loads grain in Argentina and goes to Durban to discharge the grain; then she takes steel from Durban to India where she discharges the steel. In India, she loads rice for Australia where she discharges the rice and loads coal for China.) Most bulk carriers operate as trampships.

**Task 4:**

(these are the test yourself exercises given in section 10.1.1 in <http://maritimesa.org/grade-10/test-yourself-10-1-1-terminology/>)

4.1. With her own cranes, *Artemis* was loading 28 000 tons of steel in Durban, the 4320-TEU *Oscilla* was discharging containers, *Ulwandle* was working 13 000 tons of break-bulk cargo and 242 containers, and *Capetan Andros* was loading 25 000 tons of coal. *Heron* was clearing mud from the bed of Durban harbour. *Sea Eagle* was loading 13000 tons of petrol for East London.

4.1.1. What kind of vessel is *Capetan Andros*?

4.1.2. What kind of vessel is *Artemis*?

4.1.3. What kind of vessel is *Oscilla*?

4.1.4. What kind of vessel is *Ulwandle*?

4.1.5. What kind of vessel is *Heron*?

4.1.6. What kind of vessel is *Sea Eagle*?

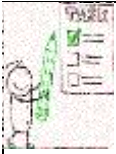
4.1.7. *Oscilla* operates on a regular service from Durban to Europe via Port Elizabeth and Cape Town. What term is given for a ship like *Oscilla*?

4.2. *Artemis* was loading at a rate of 400 tons per hour. She commenced loading at 09:00 on Friday 15 November. There are breaks totalling 10 hours and she will sail four hours after completing loading.

4.2.1. How many hours will it take to load the steel, including breaks?

4.2.2. When will she finish loading?

4.2.3. What is her ETD (Expected Time of Departure) from Durban?

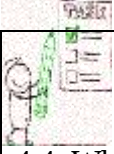


Task 4 continued...

4.3. *Artemis* is 170 metres long, has 5 holds (each is served by a crane), each hold – apart from number 1 hold – has a tweendecks, and when she is ready to sail from Durban, she will have a draught of 11 metres. She has her accommodation and engineroom aft.

4.3.1. Draw a labelled diagram of the ship (bow to stern), showing all the various parts.

4.3.2. Draw a labelled diagram of her (port to starboard) through number 3 hatch, showing all the various parts.



Task 4 continued...

4.4. What is the correct term for each of the following:

4.4.1. Ship's fuel?

4.4.2. A ship that trades daily from Calais (France) to Dover (England) and carries passengers and the passengers' vehicles?

4.4.3. A ship that has a ramp at the stern through which cargo can be loaded?

4.4.4. A passage on a ship?

4.4.5. A vertical partition (wall) on a ship?

4.4.6. The kitchen on a ship?

4.4.7. The place in a harbour where container ships load and discharge their cargoes?

4.4.8. The large cranes that load and discharge containers?

4.4.9. The mark on the side of ship to indicate the levels to which the ship may be loaded?

4.4.10. The unit of measurement for:

4.4.10.1. The speed of a ship?

4.4.10.2. Distance at sea?

1.5 Continents, water masses, canals, sea currents, major ports



Do you know where the kitchen is in your home?

Do you know where your cup is if you want to drink juice?

Do you know the closest shop from your home to buy groceries?

Do you know where to stand if you needed a taxi?

Surely your answer is “YES” to the above questions.



Self Assessment 4:

Now, consider that you are a ship and the open waters and ports are your many homes.

4.1. What will happen if your captain did not know the location of land or water masses?

4.2. Where will you go if there are no ports?

4.3. What could happen to you and your cargo if your crew do not know the ocean currents and weather conditions?



It is necessary to know where places are, as well as being able to identify the oceans, major seas and other water bodies because ships pass through these as they move from one port to another.



Some facts about the oceans:

- 🌐 About 72 percent of the earth's surface is water.
- 🌐 The largest water body by designated region is the Pacific Ocean.
- 🌐 The oceans, seas and inland waterways are sources of food, they are driving forces for our climate and they provide a medium for transport.
- 🌐 The deepest place in the ocean is Marianas Trench, which is 11022 m below sea level.



Image from thoughtco.com

According to National Geographic, if we could place Mount Everest at the bottom of the Mariana Trench, the mountain's peak would still be more than 2000 m BELOW the sea level !



1.5.1 Continents



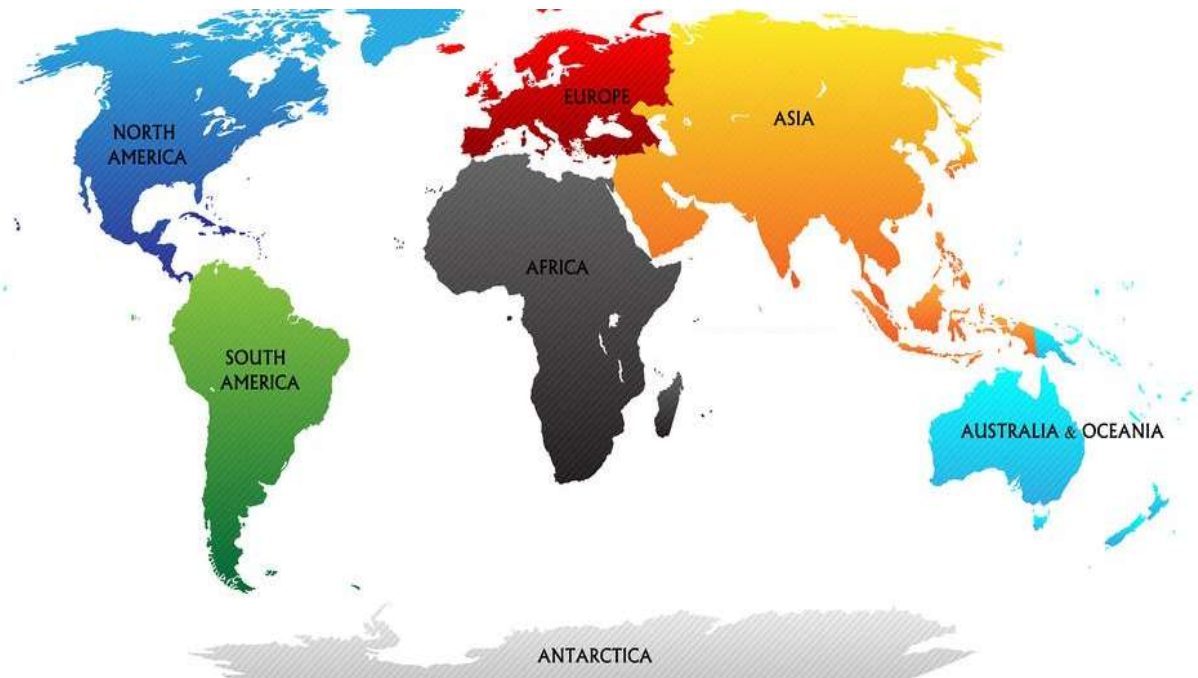
Continents of the World



Did you know: The number of continents in our world depends on the model which is being used. There are at least five models.

Model	Continents
Seven Continents	Africa, Antarctica, Asia, Australia/Oceania, Europe, North America, South America
Six Continents (Version One)	Africa, Asia, America, Antarctica, Australia/Oceania
Six Continents (Version Two)	Africa, Eurasia, North America, South America, Antarctica, Australia/Oceania
Five Continents	Africa, Eurasia, America, Antarctica, Australia
Four Continents	Afro-Eurasia, America, Antarctica, Australia

The below map shows the continents of the world using the seven continent model.



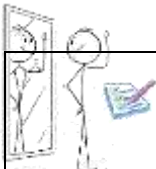
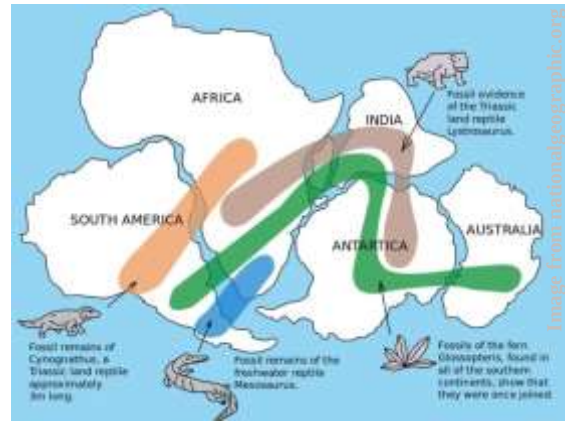
Notice how islands, given as the tiny dots or larger landmasses, are shown as part of a continent.



Australia/Oceania is also referred to as **Australasia**.

**Did you now:**

- 🌐 Our continents are moving!
- 🌐 The movement of continental plates is called “plate tectonics”.
- 🌐 Australia is moving the fastest.
- 🌐 Australia actually creeps 7 cm north each year because of tectonic plate movement.
- 🌐 By 2016, no adjustments had been made to maps for 22 years, so that in 2016 the difference between where Australia actually was and where **GPS satellites** thought it was, is 150 cm.

**Self Assessment 5:**

- 5.1. A _____ is a large piece of land?
- 5.2. What was Pangaea?
- 5.3. What was Laurasia and Gondwana?
- 5.4. When Pangaea and Laurasia split, the 2 land masses moved apart and formed today's continents. Are our continents still moving apart?
- 5.5. What is the effect of moving continents for a ship's navigation?



On the bridge of a ship. Notice the navigation system screens.

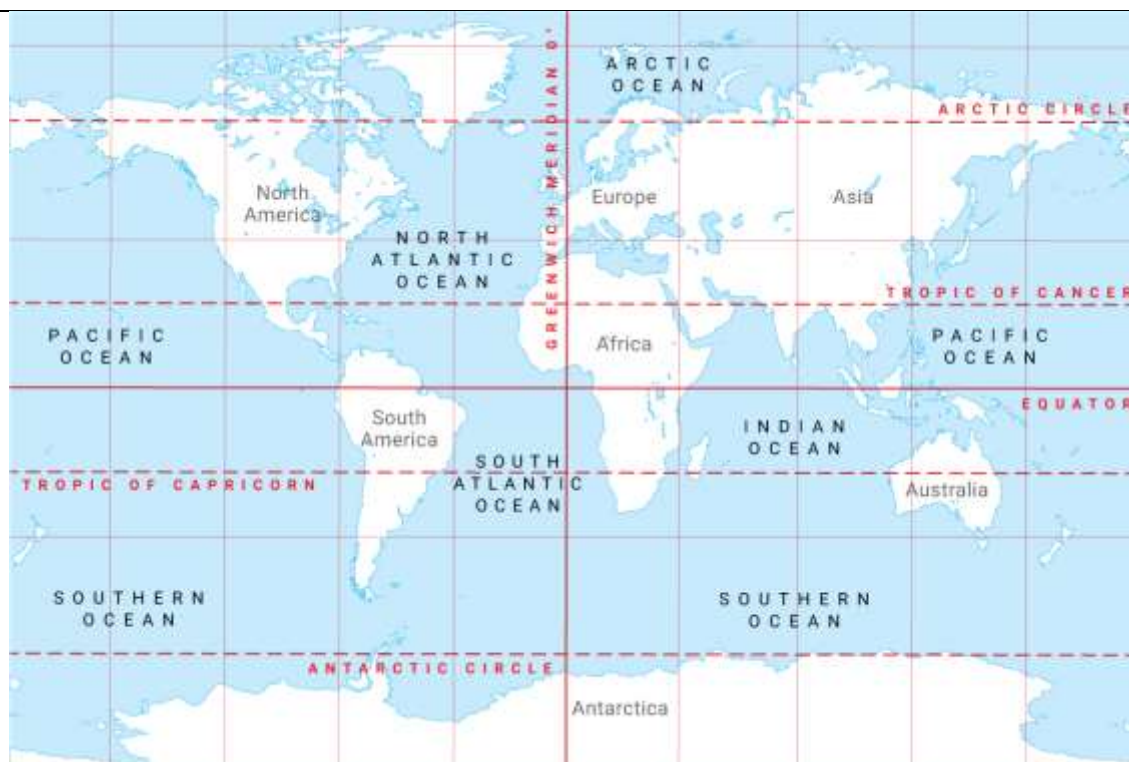
1.5.2 Oceans



THE OCEAN:

- 🌐 The ocean is a continuous body of salt water.
- 🌐 The total ocean area is 335,258,000 km².
- 🌐 While there is **ONLY ONE** ocean, this vast body of water is *geographically divided into distinctly named regions*.
- 🌐 We consider the six major oceanic bodies of water as shown in the below map. These oceans are the:

- ✚ Arctic Ocean;
- ✚ North Atlantic Ocean;
- ✚ South Atlantic Ocean;
- ✚ Indian Ocean;
- ✚ Pacific Ocean; and
- ✚ Southern Ocean.



- 🌐 The Pacific Ocean is sometimes seen as two major water bodies, namely:
 - ✚ the North Pacific Ocean; and
 - ✚ the South Pacific Ocean.
- 🌐 We may then consider that there are seven oceans.



The horizontal and vertical lines which are shown in red on the map as called lines of latitude and lines of longitude, respectively.



The Southern Ocean and the Arctic Ocean may appear as new to you but remember that ships travel in these waters. In fact, icebreakers are special ships that can cut through ice and often go to the Antarctic and Arctic.



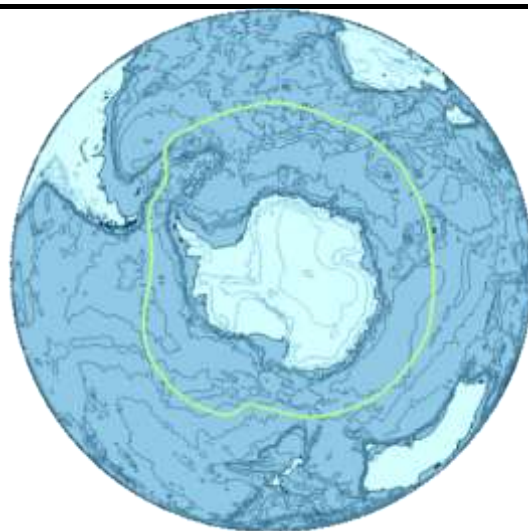
Did you now:

- 🌐 The Arctic Ocean is mostly a layer of polar pack ice edged by jagged chunks of floating ice covers;
- 🌐 The Arctic Ocean is the earth's northernmost cap;
- 🌐 The Arctic Ocean has an area of roughly 12,000,000 km²;
- 🌐 The Arctic Ocean is the smallest ocean - more than five times smaller than the Indian and Atlantic oceans;
- 🌐 The Arctic Ocean is the coldest ocean with average temperatures of about -2°C.



Did you now:

- 🌐 The Southern Ocean is the newest named ocean;
- 🌐 The Southern Ocean boundaries were proposed to the **International Hydrographic Organization** in 2000;
- 🌐 The Southern Ocean is the body of water that lies between 60°S latitude and the Antarctica coastline (the region within the yellow line in the picture alongside). (Can you spot South Africa in this picture?);
- 🌐 South Africa can be a gateway to Antarctica for many countries that have a presence on the icy continent. This can be a boost for the South African economy;
- 🌐 The Southern Ocean has a maximum depth of 7,434 m;
- 🌐 The manned submersible *DSV Limiting Factor* successfully visited the bottom of the deepest level for the first time ever on 3 February 2019.





Self Assessment 6:

- 6.1. The below world map shows the major routes across the oceans which ships use to transport cargo between countries. What could happen with the South African economy if ships do not pass by South Africa?



- 6.2. One of the major consequences of climate change is the melting of sea ice. One of the implications is a through way in the Arctic Ocean, along what is called the "Northern Sea Route". The map below shows the Northern Sea route through the Arctic Ocean. How can a viable route through the Arctic help speed up ship transportation of goods between Asia and Europe? Will there be a global economic benefit?



1.5.3 Ocean currents



- 🌐 Ocean currents are masses of water that flow in a definite direction from one place to another around the world;
- 🌐 Ocean currents act like giant conveyor belts;
- 🌐 Ocean currents are caused by differences in temperature, differences in salinity, and by wind;
- 🌐 Ocean currents help control our climate and weather patterns around the world;
- 🌐 Ocean currents provide a transportation system for marine life;
- 🌐 Ocean currents can help a ship when the current **pushes the vessel from aft** in the direction the ship is going. Cost wise, the extra push speeds up the ship and helps the ship cover more distance. The average fuel consumed for covering the given distance gets reduced;
- 🌐 There is a challenge when vessels face oceans currents which oppose the ship's heading. The ocean current pushes the vessel astern. In this case the ship's engine has to put more **effort** with more fuel to cover a desired distance within a certain time.



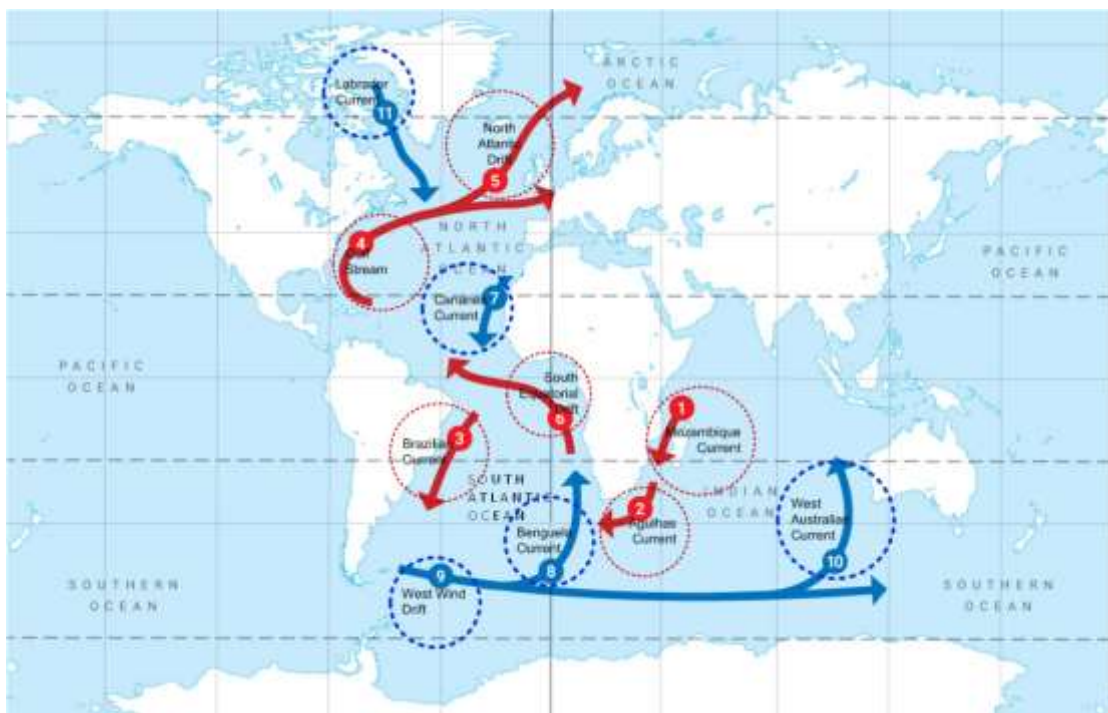
Some Ocean Currents:

The below map shows currents in the Atlantic, Indian and Southern oceans.

- 🌐 The warm currents which flow from the tropical regions are marked in red.
- 🌐 The cold currents which flow from the polar regions are shown in blue.



What will be a simple experiment to demonstrate Ocean Currents?



1.5.4 Seas, Gulfs, Bays, Straits and Capes



1.5.4.1 Seas

- Seas are smaller than oceans and are usually located where the land and ocean meet;

The below map shows some of the seas in the world.



Did you now:

- The middle of the Bering Sea is known as the 'Donut Hole' because it is **international waters**;
- Commercial fish species that can be found in the Bering Sea include the Pacific salmon;
- The United States alone catches roughly \$1 billion (~R16 billion) worth of seafood from the Bering Sea each year.



Did you now:

- The Tasman Sea is between Australia and New Zealand;
- The Tasman Sea's economic resources include fisheries and petroleum deposits;
- The maximum length of the Tasman Sea is 2,800 km;
- In 2018, New Zealander Scott Donaldson was the first person to kayak solo across the Tasman Sea. He paddled alone and his journey across 2,200 km took him 62 days!



**Did you now:**

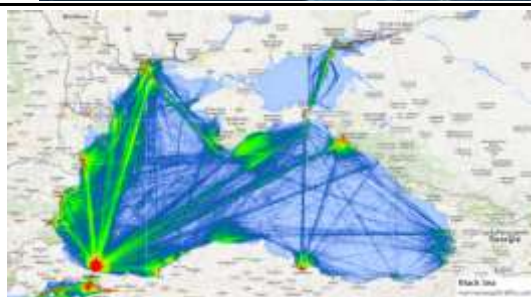
- 🌐 The Caribbean Sea is one of the largest seas in the world;
- 🌐 There are more than 7000 islands in the Caribbean, and they belong to over 28 distinct nations!
- 🌐 In picture 1 alongside you can see the deep blue waters of the Atlantic Ocean on one side of the road, and the calm turquoise-green waters of the Caribbean Sea on the other side;
- 🌐 The average temperature is 27°C and it varies no more than 3°C;
- 🌐 The Caribbean Sea is home to about 9% of the world's coral reefs;
- 🌐 The habitats supported by the reefs attract tourist activities such as fishing and diving, which provide an annual economic value to Caribbean nations of between \$3.1 and \$4.6 billion (between R49 billion and R72 billion);
- 🌐 However, marine pollution threatens the Caribbean Sea and the food security and economy of the nations;
- 🌐 What do you think about the island in picture 2? This stretch of 'island' is actually floating thrash in the Caribbean Sea!
- 🌐 By May 2019 only 14 of the over 28 Caribbean countries banned single-use plastic in an effort to clean up their sea.



Spot the Black Sea in this remotely sensed night image.

**Did you now:**

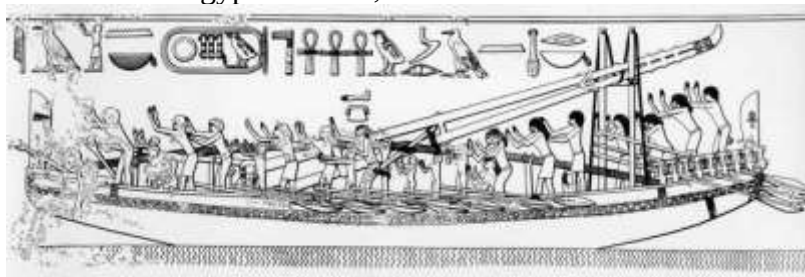
- 🌐 The Black Sea is an inland sea and a busy waterway (as can be seen by the vessel traffic density alongside).
- 🌐 Storms during the winter make the water in the Black sea appear black;
- 🌐 The lower portion of the Black Sea is the largest dead zone in the world. Marine life in this area is scarce because of the large deficiency in oxygen;
- 🌐 The Black sea contains oil and natural gas;
- 🌐 There are over 20 drilling wells in the Black Sea;
- 🌐 The estimated total Romanian State revenue from their oil and gas production off the Black Sea is 144 billion Leu (which is \$26 billion, R407 billion);
- 🌐 The Black Sea ecosystem is under threat by pollution!





Did you now:

- 🌐 The Red Sea got its name because of a type of algae called *Trichodesmium erythraeum*, which is found in the sea. When these blooms of algae die off they appear to turn the blue-green color of the ocean to a reddish-brown;
- 🌐 The Red Sea has been used for commerce since ancient Egyptian times;



- 🌐 The average temperature in the south of the Red Sea can be as high as 30°C;
- 🌐 Because of high evaporation rates the Red Sea is one of the world's saltiest seas;
- 🌐 *Safer* is a tanker which has been converted into a floating storage and offloading facility. The facility floats in the Red Sea, off the coast of Yemen. *Safer* is loaded with more than a billion barrels of crude oil.



- 🌐 The picture on the right is a view of the external piping system and the hose failure that led to a spill in 2019. (Image from maritime-executive.com)
- 🌐 It is believed that the *Safer* is releasing flammable gases and could explode and release huge volumes of oil into the sea.



- 🌐 What is the effect of the very salty water on *Safer*?
- 🌐 What can be done with *Safer* to prevent oil spills and an environmental and economic catastrophe in and around the Red Sea?



1.5.4.2 Gulfs, Bays and Capes

🌐 A **Gulf** is a part of an ocean or sea extending into the land;

🌐 A **Bay** is similar to a gulf, but with a smaller indentation;

🌐 Both gulfs and bays are:

✚ filled with seawater from nearby oceans; and

✚ are enclosed by land.



🌐 A **cape** is an elevated landmass that extends deep into the ocean, sea, river, or lake;

🌐 A cape is bordered by water on two sides.

The below map shows some of the gulfs, bays and capes in the world.





Did you now:

There are many capes, and of many sizes lined up on the coasts of all the continents!

South Africa's Cape Agulhas comes from the Portuguese word “Cabo das Agulhas” and means “Cape of Needles”.

- ✚ Cape Agulhas is the most southern point of the African continent;
- ✚ Cape Agulhas is the true geographical division between the Atlantic and Indian Oceans.



South Africa's Cape of Good Hope is part of the Sandstone Table Mountain and is believed to have been created by the erosion caused by the ocean currents.

- ✚ Cape of Good Hope is the southwestern most point of Africa;
- ✚ Cape of Good Hope is also known as the *Cape of Storms*. On a day with bad weather, heavy wind can toss a stone across a distance of 15 meters in one second. Waves can be over 11 m high. Such conditions can be treacherous for ships. The highest known wave is the 20.5 m wave in 1978.

Cape Horn is in southern Chile at 56°S latitude.

- ✚ Cape Horn marks where the Southern Ocean and South Atlantic Ocean meet;
- ✚ Cape Horn is less than 1,000 km from Antarctica (which is about one fifth the distance compared to Antarctica from Cape Agulhas);
- ✚ The area west of Cape Horn is notorious for rogue waves, which can attain heights of up to 30 m;
- ✚ “Doubling the Horn” means **sailing** from 50°S on one side of the Horn to 50°S on the other side. The minimum distance to “double the Horn” is ~1,500 km.
- ✚ Cape Horn is a stage for the world's most challenging yacht races, including the Vendee Globe and the Volvo Ocean Race.

The Volvo Ocean Race can cost a participating team over R300 million, including the cost of shore crews who move a pair of shipping containers full of supplies in leapfrog fashion in front of the boats. This can be income and jobs for countries such as South Africa and Chile because the race has a stage in both countries.



Picture from sail-world.com



1.5.4.3 Straits

A strait is a narrow body of water that connects two other bodies of water. The below map shows some of the straits in the world.



Did you now:

- The Straits of Malacca is the longest strait in the world. It is 800 km long.
- The widest strait in the world is the Denmark Strait (or Greenland Strait) which separates Greenland from Island.
- The world's “highest” known waterfall, called the **Denmark Strait cataract**, is actually in water and flows down the western side of the Denmark Strait.
- The Denmark Strait Cataract and other cataracts like it are part of a delicate ecosystem. Commercial fishing and deep sea creatures rely on the cataracts and smaller waterfalls (known as cascades).
- The **IHO** defines the Mozambique Channel as a part of the South African coast. The western limit of the channel is more correctly defined as the coast of Southern Africa.
- South Africa protects the Mozambique Channel from piracy threats.
- The opening of the Suez Canal in 1869 ended the Mozambique Channel's main shipping link between Asia and the West and this changed the Mozambique Channel's status in significance to global commerce.
- The significance of the Mozambique Channel is again shifting because of the largest gas find in the world.



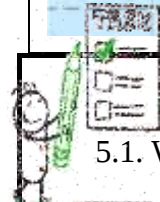
Image from cimsec.org

1.5.5 Canals, navigable rivers and ports



- 🌐 A canal is an artificial waterway that is constructed to allow the passage of boats or ships inland.
- 🌐 A navigable river is any river that is deep, wide and slow enough for a vessel to pass.
- 🌐 A port is a maritime facility and a multimodal distribution hub. It primarily comprises one or more wharves where ships may dock to load and discharge passengers and cargo.

The below map shows some of the canals, navigable rivers and ports in the world.



Task 5:

5.1. Which canal links the Red Sea to the Mediterranean Sea?

5.2. In which country is the Panama Canal?

5.3. Which canal links the entire Atlantic Ocean coastline to the Pacific Ocean and Asia?

5.4. Consider the Google Earth image alongside.

How do ships avoid going around the north of Denmark to save time (which means also saving cost) when they travel between the North Sea and the Baltic Sea?





Self Assessment 7:

Use the below map to write on the names for the canals, navigable rivers and ports which are shown.



1.5.6 Some notes on ports



The term port comes from the Latin word portus, meaning gate or gateway.



- 🌐 Many cities in the world sprung up because of the location of ports.
- 🌐 Ports have an important economic role, both within its surrounds and globally.
- 🌐 Ports provide:
 - ✚ Maritime access;
 - ✚ Maritime interface;
 - ✚ Infrastructures and equipment; and
 - ✚ Land access.

1.5.7 Water bodies and ports in Europe



- 🌐 Europe has a dense network of busy inland waterways and ports;
- 🌐 Port of Rotterdam, which is in the Netherlands, is the busiest container port in Europe;
- 🌐 The navigable river Rhine, which flows into the North Sea, flows through 6 European countries, including the Netherlands;
- 🌐 The Nieuwe Maas River in Rotterdam is a **tributary** of the Rhine. The river is seen as the life-blood flowing through Rotterdam;
- 🌐 The depth of the Nieuwe Maas River enables the largest of container ships to access the harbour in Rotterdam;
- 🌐 With the link to the North Sea and inland countries, by way of the navigable river Rhine and other **intermodal transportation**, the Port of Rotterdam handles about 465 million tonnes of goods and receives around 30,000 sea-going ships in a year.
- 🌐 The main activities in Algeciras are connected with the Port of Algeciras. Algeciras is the main embarkation point between Spain and Tangier and other ports in Morocco.

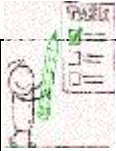
The map below shows some water bodies and ports in Europe.



**Task 6:**

(these are the test yourself exercises given in section 10.1.2 in <http://maritimesa.org/grade-10/category/10-1-learning-outcome-1-maritime-world/10-1-2-continent-water-masses-canal-sea-currents-and-major-ports/10-1-2-t-test-yourself-continent-water-masses-sea-currents-and-major-ports/>)

- 7.1. A ship steams from St Petersburg to San Francisco on the west coast of North America via the Panama Canal, and from there, via the shortest route to Singapore.
 - 7.1.1. Name all the seas, oceans, etc, through which she will pass during the entire voyage.
 - 7.1.2. On this voyage, how many times does the ship cross the Greenwich Meridian?
 - 7.1.3. How many times does the ship cross the Equator?
 - 7.1.4. How many times does the ship cross the Tropic of Cancer?
 - 7.1.5. Does she pass Cape Town during her voyage from St Petersburg to Singapore via San Francisco?
- 7.2. Name the following:
 - 7.2.1. The Straits to the north west of Singapore
 - 7.2.2. The ocean or sea a ship would cross on a passage from:
 - 7.2.2.1. the east coast of South America to Australia.
 - 7.2.2.2. the west coast of South America to Australia
 - 7.2.3. The ocean or sea a ship would cross on a passage from Durban to India
 - 7.2.4. The canal through which a ship would pass on a passage from New York to San Francisco
 - 7.2.5. The strait a ship would cross on a passage from France to England



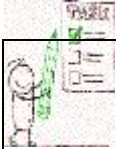
Task 7 continued...

7.2.6. The line on the Loadline to which a ship can be loaded when steaming from Lagos (LA) to Rio de Janeiro (R)

7.3. A ship leaves Odessa (OD – Ukraine) for Vancouver (VA – Canada). Give the names of all water masses through which she will pass on that voyage.

7.4. Study the map of Europe.





Task 7 continued...

7.4.1. For the numbers 1 to 14 on the map, provide the name of the correct water body:

1	2	3
4	5	6
7	8	9
10	11	12
13	14	15

7.4.2. For the points A to I on the map, provide the name of the port:

A	B	C
D	E	F
G	H	I

7.4.3. Provide the names of the seas, bays, straits and any other water bodies through which a ship will pass when steaming from St Petersburg (SP) to Port I.

7.4.4. Provide the names of the seas, bays, straits, and any other water bodies through which a ship will pass when steaming from Suez Canal to Port C.

1.6 Time zones



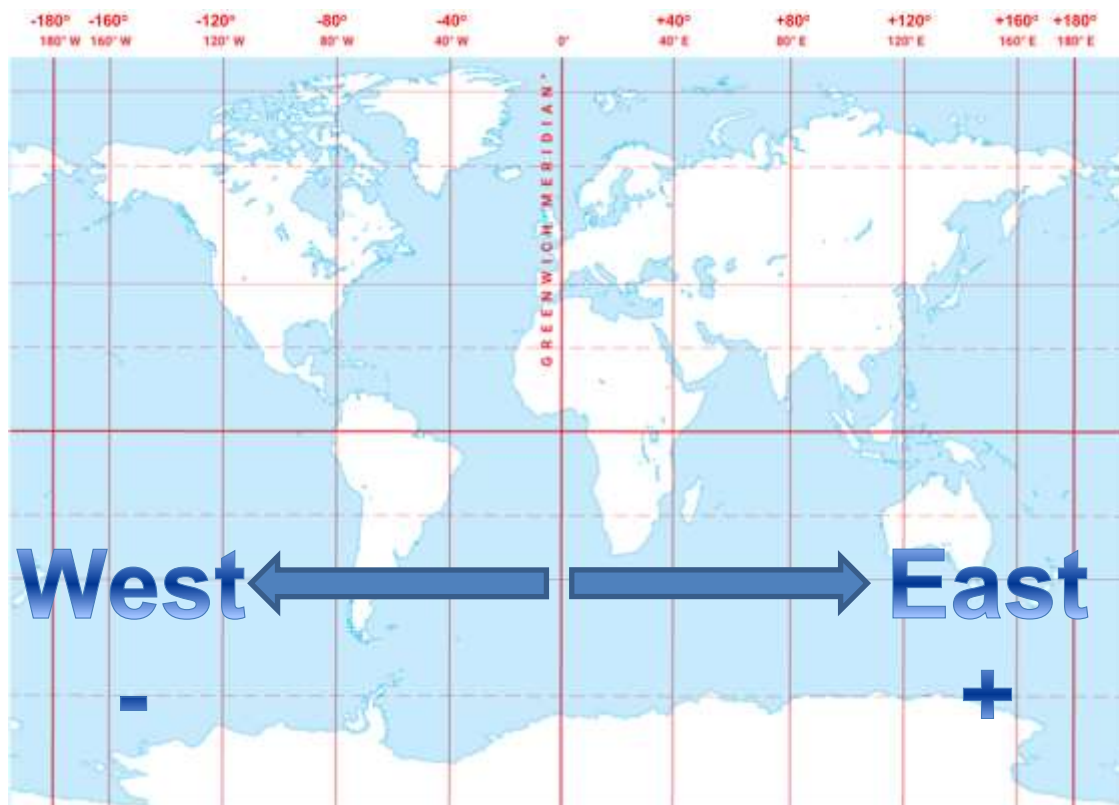
A time zone is an area on Earth that has a specific time that all citizens can set their clocks to.



If you're early, you're on time. If you're on time, you're late.

~Lik Hock Yap Ivan
From: RaiseYourMind.com

1.6.1 Lines of longitude and time



Take a look at the above map with the vertical red lines and text which is also in red. The vertical red lines are called lines of longitude and run from the North Pole to the South Pole. They are “labelled” from the Greenwich Meridian which has the value of **0°**.

Lines of longitude on the eastern side (to the right) of the Greenwich Meridian increase in value until 180° E (or -180°, where - indicates to the east).

Lines of Longitude on the western side (to the left) of the Greenwich Meridian increase in value until 180° W (or +180°, where + indicates to the west).

If we also consider the exclusive economic zone (EEZ), South Africa stretches from 13.348°E to 36.531°E.

You can notice that the lines of Longitude, **180° E and 180° W, are the same line of longitude, and is known as the International Date Line**. It does not cut through any country and therefore has several parts that are not straight. This is to avoid confusion over the date within a country.

1.6.2 Difference in time



When you start school at 8am in South Africa, another child could be having supper at exactly that moment!

For every 15 degrees difference in longitude, sun time changes by one hour.

Consider the below examples:

Place A 15° E ↔ **Place B 30° E**

$$\begin{aligned}\text{Difference in Longitude} &= 30^\circ - 15^\circ \\ &= 15^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in Time} &= \frac{15^\circ}{15^\circ \text{ per hour}} \\ &= 1 \text{ hour difference in time}\end{aligned}$$



Place C 45° E ↔ **Place D 90° E**

$$\begin{aligned}\text{Difference in Longitude} &= 90^\circ - 45^\circ \\ &= 45^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in Time} &= \frac{45^\circ}{15^\circ \text{ per hour}} \\ &= 3 \text{ hours difference in time}\end{aligned}$$



Place X 15° E ↔ **Place Y 165° E**

$$\begin{aligned}\text{Difference in Longitude} &= 165^\circ - 15^\circ \\ &= 150^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in Time} &= \frac{150^\circ}{15^\circ \text{ per hour}} \\ &= 10 \text{ hours difference in time}\end{aligned}$$



Place M 105° W ↔ Place Q 15° W

$$\begin{aligned}\text{Difference in Longitude} &= -15^\circ - (-105^\circ) = -15^\circ + 105^\circ \\ &= 90^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in Time} &= \frac{90^\circ}{15^\circ \text{ per hour}} \\ &= 6 \text{ hours difference in time}\end{aligned}$$



Place P 105° W ↔ Place Q 15° E

$$\begin{aligned}\text{Difference in Longitude} &= +15^\circ - (-105^\circ) = +15^\circ + 105^\circ \\ &= 120^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in Time} &= \frac{120^\circ}{15^\circ \text{ per hour}} \\ &= 8 \text{ hours difference in time}\end{aligned}$$



Additional examples:

- i. What is the difference in time between place A at 30°E and place B at 90°E?

$$\begin{aligned}\text{Difference in longitude} &= +90^\circ - (+30^\circ) \\ &= +90^\circ - 30^\circ \\ &= 60^\circ \\ \text{Difference in time} &= 60^\circ / 15^\circ \text{ per hour} \\ &= 4 \text{ hours difference in time}\end{aligned}$$

- ii. What is the difference in time between place C at 30°E and place D at 150°E?

$$\begin{aligned}\text{Difference in longitude} &= +150^\circ - (+30^\circ) \\ &= +150^\circ - 30^\circ \\ &= 120^\circ \\ \text{Difference in time} &= 120^\circ / 15^\circ \text{ per hour} \\ &= 8 \text{ hours difference in time}\end{aligned}$$

- iii. What is the difference in time between place E at 30°W and place F at 165°W?

$$\begin{aligned}\text{Difference in longitude} &= -165^\circ - (-30^\circ) \\ &= -165^\circ + 30^\circ \\ &= -135^\circ \\ \text{Difference in time} &= -135^\circ / 15^\circ \text{ per hour} \\ &= -9 \text{ hours difference in time}\end{aligned}$$

- iv. What is the difference in time between place G at 30°W and place H at 90°E?

$$\begin{aligned}\text{Difference in longitude} &= +90^\circ - (-30^\circ) \\ &= 90^\circ + 30^\circ \\ &= 120^\circ \\ \text{Difference in time} &= 120^\circ / 15^\circ \text{ per hour} \\ &= 8 \text{ hours difference in time}\end{aligned}$$

- v. What is the difference in time between place I at 120°E and place J at 45°E?

$$\begin{aligned}\text{Difference in longitude} &= +45^\circ - (+120^\circ) \\ &= +45^\circ - 120^\circ \\ &= -75^\circ \\ \text{Difference in time} &= 120^\circ / 15^\circ \text{ per hour} \\ &= -5 \text{ hours difference in time}\end{aligned}$$

1.6.3 Calculating sun time

Because of differences in time between places, shipping is regarded as a 24-hour business, and all involved in shipping need to be aware of the time differences.

If we are **E**ast of a place, then we are ahead in sun time compared to the place. For example, Vereeniging is to the East of Cape Town. Vereeniging is therefore **ahead** in sun time. This means that day starts in Vereeniging before the day will begin in Cape Town.

If we are to the **W**est of a place, then we are **behind** in sun time. In the above, we know that Cape Town is to the West of Vereeniging, so Cape Town is behind in sun time.

Once we have calculated the difference in time in hours, we can calculate the sun time at a given place.

Examples:

- i. What is the sun time at place B?

Place A 30° E ↔ **Place B 90° E**

Time: 10:00
Date: 23 June

$$\begin{aligned}\text{Difference in longitude between B and A} &= +90^{\circ} - (+30^{\circ}) \\ &= +90^{\circ} - 30^{\circ} \\ &= +60^{\circ}\end{aligned}$$

$$\begin{aligned}\text{Difference in time} &= +60^{\circ}/15^{\circ} \text{ per hour} \\ &= +4 \text{ hours difference in time}\end{aligned}$$

Because B is to the **east** of A, so B is **ahead** of A in sun time.

The sun time at place B is
10:00 on 23 June + 4 hours = 14:00 on 23 June

- ii. What is the sun time at place C?

Place C 60° E ↔ **Place D 150° E**

Time: 14:00
Date: 19 June

$$\begin{aligned}\text{Difference in longitude between C and D} &= +60^{\circ} - (+150^{\circ}) \\ &= +60^{\circ} - 150^{\circ} \\ &= -90^{\circ}\end{aligned}$$

$$\begin{aligned}\text{Difference in time} &= -90^{\circ}/15^{\circ} \text{ per hour} \\ &= -6 \text{ hours difference in time}\end{aligned}$$

Because C is to the **west** of D, so D is **behind** C in sun time.

The sun time at place D is
14:00 on 19 June - 6 hours = 08:00 on 19 June

- iii. What is the sun time at place N?

Place M 135° W  **Place N 90° E**

Time: 06:00
Date: 12 June

$$\begin{aligned}\text{Difference in longitude between N and M} &= +90^\circ - (-135^\circ) \\ &= 90^\circ + 135^\circ \\ &= +225^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in time} &= +225^\circ/15^\circ \text{ per hour} \\ &= +15 \text{ hours difference in time}\end{aligned}$$

Because N is to the **east** of M, so N is **ahead** of M in sun time.

The sun time at place D is
06:00 on 12 June + 15 hours = 21:00 on 12 June

- iv. What is the sun time at place P?

Place P 60° W  **Place Q 105° E**

Time: 07:00
Date: 15 June

$$\begin{aligned}\text{Difference in longitude between P and Q} &= -60^\circ - (105^\circ) \\ &= -60^\circ - 105^\circ \\ &= -165^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in time} &= -165^\circ/15^\circ \text{ per hour} \\ &= -11 \text{ hours difference in time}\end{aligned}$$

Because P is to the **west** of Q, so P is **behind** Q in sun time.

The sun time at place P is
07:00 on 15 June - 11 hours = 20:00 on 14 June (i.e. at 8pm the day before)!

- v. A fire breaks out on board a ship in Port X (165°E) at 08:30 on 14 May. The ship's owner has his office at Port Y (75°W) and has the following office hours : 08:00 to 18:30. He takes about an hour to travel to his office each morning and home again each evening. The ship's captain tries to telephone the owner on his (the owner's) mobile telephone number, but it is on voice mail. Should the captain telephone the owner on his office number or on his home number?

$$\begin{aligned}\text{Difference in longitude between Y and X} &= -75^\circ - (165^\circ) \\ &= -60^\circ - 105^\circ \\ &= -180^\circ\end{aligned}$$

$$\begin{aligned}\text{Difference in time} &= -180^\circ/15^\circ \text{ per hour} \\ &= -12 \text{ hours difference in time}\end{aligned}$$

Because Y is to the **w**est of X, so Y is **b**ehind X in sun time.

The sun time at place Y is
08:30 on 14 May - 12 hours = 20:30 on 13 May.

The ship owner is home by 19:30 so the ship's captain should call to the owner's home number.

1.6.4 International time zones and standard times

(some information from Wikipedia and maritimesa.org)

A time zone is a region of the globe that observes a uniform standard time for legal, commercial, and social purposes.

Time zones tend to follow the boundaries of countries and their subdivisions instead of strictly following longitude, because it is convenient for areas in close commercial or other communication to keep the same time. Although Cape Town and Vereeniging have different sun times, the two places are in South Africa and therefore follow South African Standard Time (SAST).

Universal Standard Time (UST) is the sun time on the Greenwich Meridian. Countries work out their Standard Time relative to the position of their longitude west or east of the Greenwich Meridian.

As South Africa takes its time from 30° East of Greenwich and therefore two hours ahead of UST, South African Standard Time (SAST) is UST +2 hours.

Because of the sun time differences between the eastern and western sides of wide countries (e.g. Russia, Canada, United States, Australia), some countries choose to have different time zones.

United States has four time zones – Eastern Standard Time (UST -5 hours), Central Standard Time (UST -6 hours), Mountain Standard Time (UST -7 hours), and Pacific Standard Time (UST -8 hours).

Alaska has its own time zone (one hour behind Pacific Standard Time, i.e. UST -9 hours) while Hawaii (USA's 50th state which is an island group far to the west of North America in the Pacific Ocean) is two hours behind Pacific Standard Time, i.e. UST -11 hours. Thus, when it is 12:00 in New York (Eastern Standard Time) it will be 09:00 in Los Angeles (Pacific Standard Time) and 07:00 in Hawaii.

Russia has eleven time zones! Vladivostok which is a port in the east of Russia is 8 hours ahead of St Petersburg, a port in the west of Russia.

Australia has three time zones. Sydney on the east coast is three hours ahead of Fremantle, a port on the west coast.

Africa also has time zones : East African Time; Central African Time; West African Time. South Africa falls into Central African Time, and takes its time from 30°E (UST +2 hours).

The below map shows the time zones for countries and regions. Notice the red line to the right on the map.



image source: www.mapsofworld.com

1.6.5 International Date Line

The red line on the above map is the International Date Line. Although it follows the general course along the 180° line of longitude, it does not run through any country, but runs only through the ocean in that area. As it avoids passing through any land to avoid confusion, it is not a straight line.

Consider these scenarios from maritimesa.org:

- ✚ The officer on watch when a ship crosses the Date Line on a voyage from Japan to San Francisco at 10:30 on Tuesday 4 March will have to change the ship's time to read 10:30 on Monday 3 March!
- ✚ The officer on a ship steaming in the other direction and crossing the Date Line at 06:45 on Thursday 6 March will have to change the ship's time to read 06:45 on Friday 7 March.
- ✚ If you are on a ship sailing from New Zealand to San Francisco and it is 21:00 (9 pm) on your birthday when the ship crosses the Date Line, you will repeat most of your birthday! (As the ship crosses the Date Line, the time will change to 21:00 on the previous day. You can have another birthday!)
- ✚ If your ship is steaming the other way from San Francisco to New Zealand, and it is 06:00 (6 am) on your birthday when the ship crosses the Date Line, you will miss most of your birthday! (As the ship crosses the Date Line, the time will change to 06:00 on the next day, and you will lose part of your birthday from 06:00 to midnight!)

In summary:

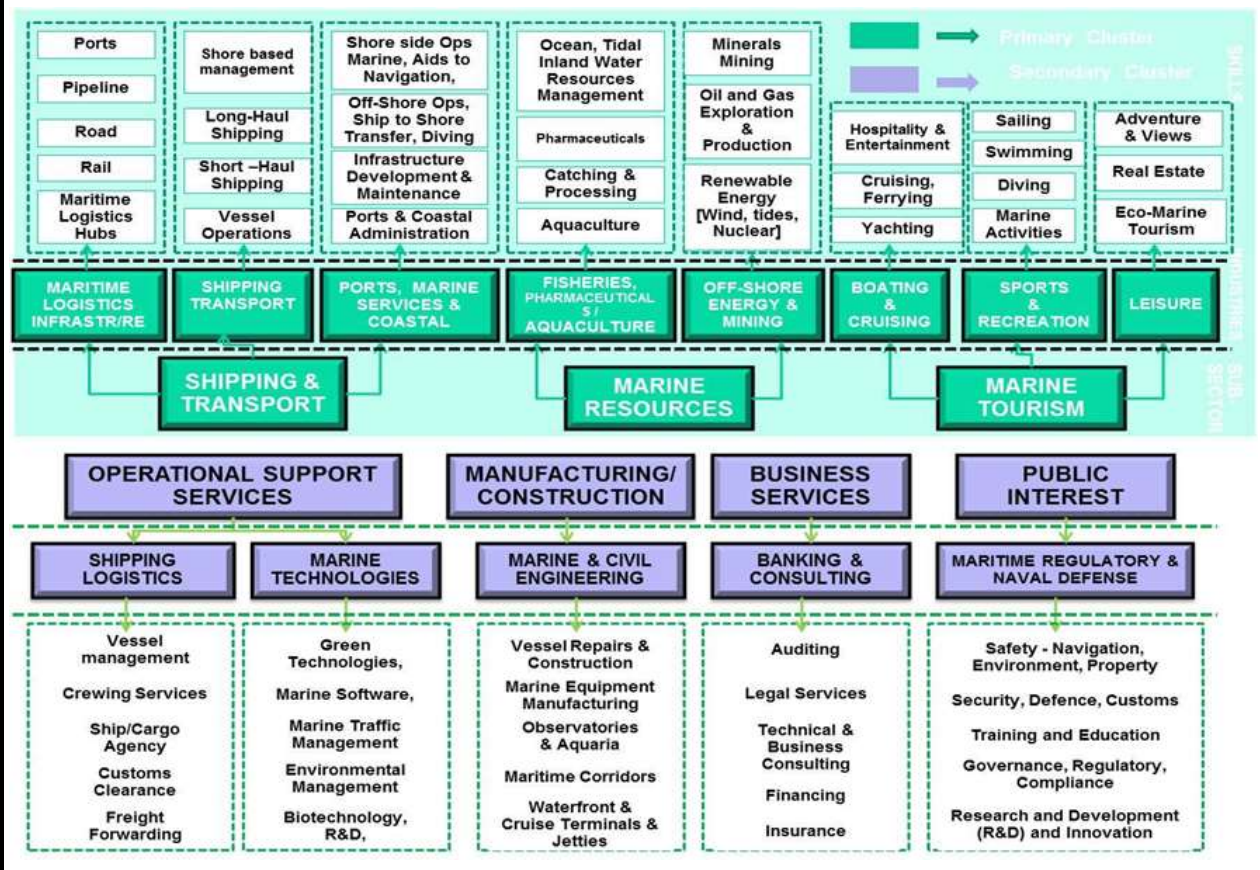
- 🌐 A ship going from west to east (e.g. from New Zealand to Chile) will repeat 24 hours.
- 🌐 A ship going from east to west (e.g. from the west coast of Canada to China) will lose 24 hours.

1.7 Maritime careers



You will have noticed that there are many job requirements in maritime

- 🌐 We have looked at water bodies, an introduction to ports and 13 types of ships which make use of the water bodies and ports;
- 🌐 Besides shipping and ports, there are careers in logistics, offshore resources, marine tourism and leisure, marine manufacturing and ship repair, fishing and aquaculture, naval and security, and support services;
- 🌐 There are over 340 careers across all sectors in the maritime industry;
- 🌐 Careers include seafarers, engineers, artisans, technicians, freight forwarders, shipping agents, ship surveyors, IT professionals, lawyers, insurance brokers, chefs, marine scientists, naval architectures, stevedores, etc.
- 🌐 Jobs can be sea-based or land-based;
- 🌐 The below schematic is an overview of the maritime sector, its support services and professional requirements.

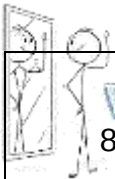
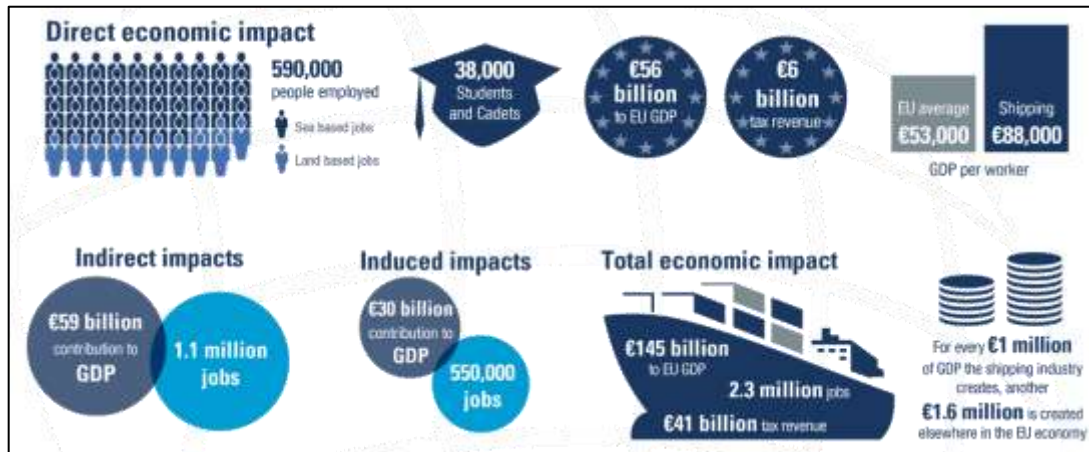


Did you now:

There are over 1 million jobs in the maritime sector in South Africa if we consider the direct, indirect and induced impacts.



- 🌐 If we continue to develop our maritime sector, it can contribute massively to the South African economy. There can be over 1 million jobs! 🧐
- 🌐 Imagine the economic value of a mature South African maritime sector. The below results is from a 2016 Oxford Economics study. It shows the *Economic value of the European Union's Shipping Industry*.



Self Assessment 8:

- 8.1. What is meant by direct economic impact?
- 8.2. What is meant by indirect economic impact?
- 8.3. What is meant by induced economic impact?
- 8.4. What is the estimated contribution to the EU GDP by the shipping industry?
 - Direct:
 - Indirect:
 - Induced:
- 8.2. What is the estimated number of jobs by the shipping industry in the EU?
- 8.3. What is the estimated tax revenue from the shipping industry in the EU?

1.7.1 Types of Careers



Many of the careers mentioned in this study guide will be explained in more detail in Grades 11 and 12.

Types of careers include:

- 🌐 Harbour Services
- 🌐 Every port has a:
 - ✚ Harbour Master
 - ✚ Pilots
 - ✚ Marine Manager
 - ✚ Vessel Traffic Controllers
 - ✚ Port Manager
 - ✚ Harbour Engineers
 - ✚ Civil, Electrical & Mechanical Engineers
 - ✚ Terminal Managers
 - ✚ Financial Manager
 - ✚ Human Resources Manager
 - ✚ Port Planner (Usually These People Are Economists)
 - ✚ Marketing Manager
- 🌐 Ship Chandlers and Repair services
- 🌐 Ship Chartering (Hiring of ships)
- 🌐 Ship management
- 🌐 Ship brokering
- 🌐 Crewing of ships
- 🌐 Cargo Forwarding & Clearing
- 🌐 Cargo logistics
- 🌐 Liner Services
- 🌐 Salvage Operations
- 🌐 Maritime Law
- 🌐 Policing Shipping



Meet some of the professionals in the maritime sector:

- 🌐 South African born Volvo Ocean Race Team electrical engineer, Mr Ashton Sampson;
- 🌐 Navigation Officer Luthando Skoti, from King Williamstown in the Eastern Cape.
- 🌐 Cape Town's marine pilot Sanette Robinson first served in the SA Navy as a combat officer.
- 🌐 Precious Dube and Pinky Zungu are both marine pilots.



1.7.2 Institutions offering study programs

The following are some of the institutions which offer study opportunities in maritime:



Higher Education Institution	Courses offered
Cape Peninsula University of Technology	- National Diplomas: Maritime Studies, Fisheries Resource Management and Oceanography - National Diploma: Engineering: Marine Engineering - National Diploma: Maritime Studies - BTech: Oceanography - Various Maritime Short Courses
Durban University of Technology	- National Diploma: Maritime Studies - National Diploma: Mechanical Engineering (with elective marine engineering subjects) - Non-Diploma Marine Engineering
Nelson Mandela Metropolitan University	- Postgraduate Diploma in Maritime Studies - Elective subjects as part of Programmes - Marine Science, Law & Tourism subjects
University of Cape Town	- Marine and Environmental Law - Oceanographic Studies
University of Stellenbosch	- BPhil: Maritime Transportation and Logistics - BSc Military Science: Technology and Defence Management - Postgraduate Degrees in Maritime Studies: MPhil and PhD
University of KwaZulu Natal	- Postgraduate Diplomas: Maritime Law, Maritime Transport, Maritime Studies - Master of Commerce in Maritime Studies - Master of Laws: Marine and Ship Surveying, Maritime Studies - Elective subjects in Maritime Law and Commerce - BSc Honours: Marine Ecology - MBA: Maritime Transport Economics and Management
Rhodes University	- Ichthyology Undergraduate studies - Ichthyology Postgraduate - BSc Zoology Hons in Marine Science
University of Johannesburg	- Postgraduate Diploma: Transport Management - BTech: Transportation Management - BSc Hons: Aquatic Health - BCom Hons: Transport Economics - MCom: Transport Economics, Logistics Management
University of South Africa	National Diploma: Transport Economics
University of Venda	Certificate: Geographical Information System
University of Zululand	Diplomas in Logistics Management and Transport Management

There are also more than 30 non-university training institutions for various maritime fields. These include:



Anchor Powerboat Academy
Aqua Academy
Cape Town Sailing Academy
Cape Technikon Survival Centre
Concord Maritime Training
Damelin
False Bay FET
Irvin & Johnson (Trawling Division)
Leading Light Academy
Marine Crew Services SA
Maritime & Skills College
Offshore Survival Training Facility
Project Maritime Training
SAMTRA (SA Maritime Training Academy)
SA Maritime School
SAS Saldanha Naval College
School of Shipping
Siyaloba Training Academy
South African Institute for Skippers
Academy of Maritime Medicine
SA Coast Guard Training Institute
South African Maritime School and Transport College
Unicorn Shipping and Training School



Did you now:

- 🌐 You have the **South African International Maritime Institute** which serves to:
 - ✚ Co-ordinate, promote and support the education, skills and research needs of the maritime sector;
 - ✚ Increase the quality of teaching, learning and research in the maritime sector; and support professional development in the maritime sector;
 - ✚ Facilitate international and African continental co-operation; and
 - ✚ Broaden the range of education options to meet industry needs.
- 🌐 Over 20 South Africans have done post-graduate studies at **The World Maritime University** which is in Malmö, Sweden.

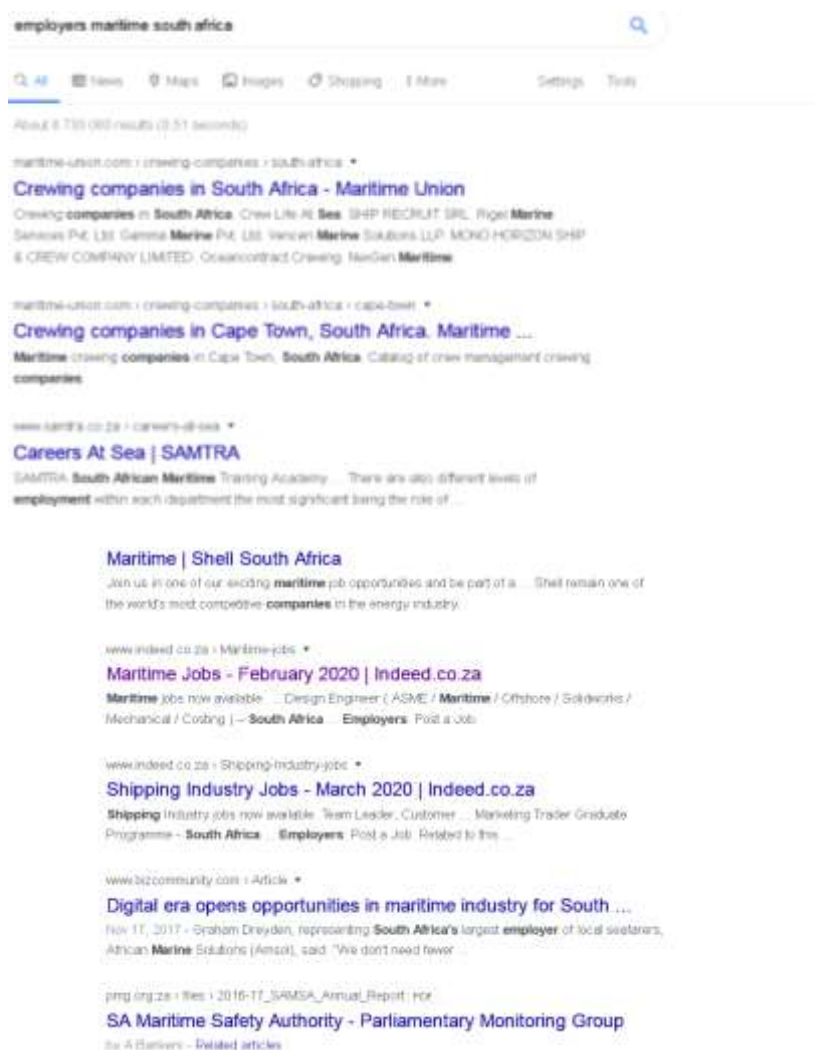
1.7.3 Potential Employers



Some of the government institutions that require maritime related skills include:

- 🌐 Department of Transport;
- 🌐 South African Maritime Safety Authority;
- 🌐 Department of Labour;
- 🌐 National Treasury and the South African Revenue Service;
- 🌐 Department of Science and Innovation;
- 🌐 Department of Safety and Security (South African Police Service);
- 🌐 Department of Defence (South African Navy);
- 🌐 Home Affairs (Immigration);
- 🌐 Transnet;

A google search for employers in maritime (using the search words: employers maritime South Africa) on 2 March 2020 came up with 8,730,000 results. Here are some of the results:



Reference List

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