Need of Ocean Studies

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Oceanography

It’s a branch of science that deals with all the aspect of sea and ocean.

Braches of Oceanography

- Physical Oceanography
- Chemical Oceanography
- Biological Oceanography
- Geological Oceanography

Importance of ocean studies

The ocean influences our lives in many ways

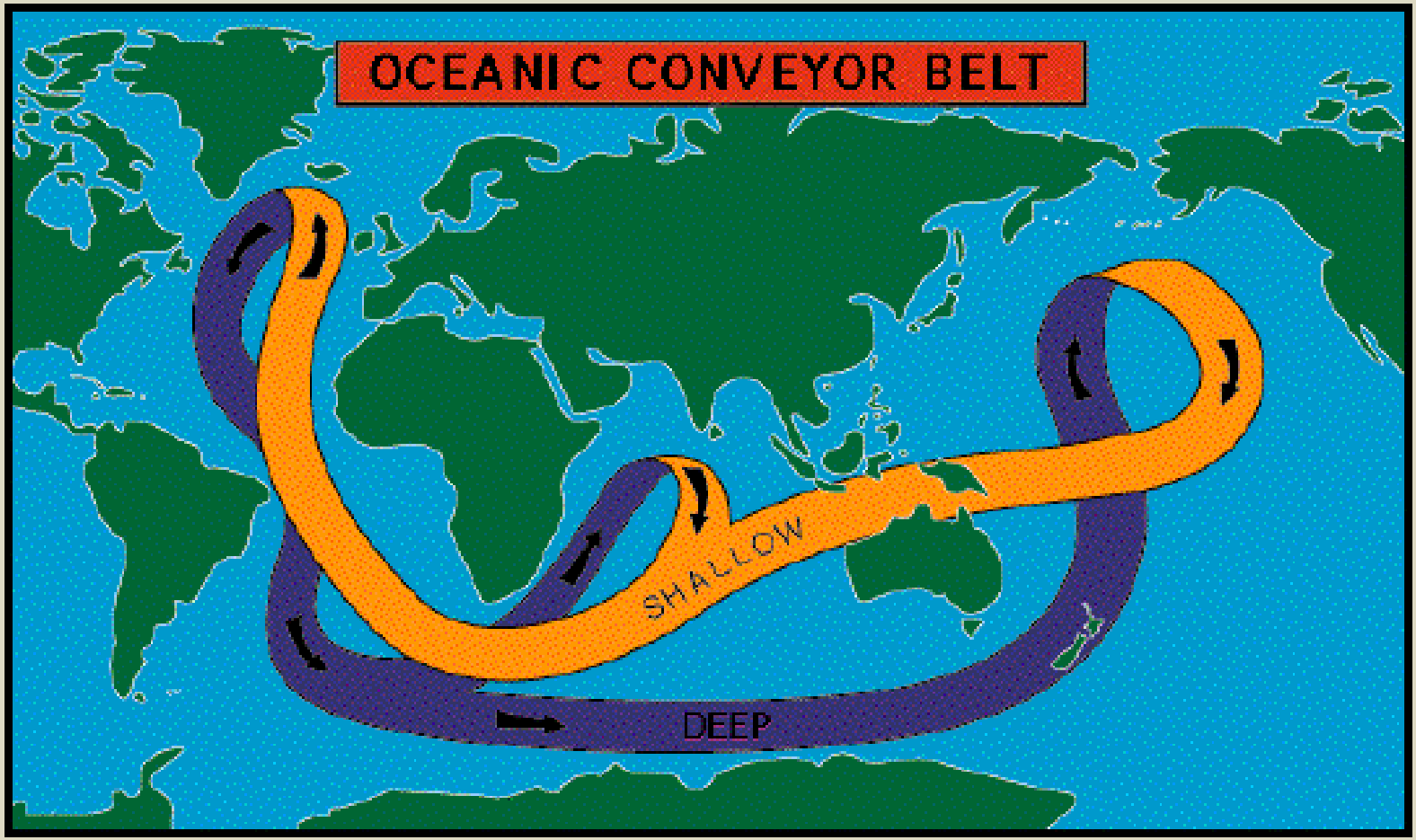
- **Climate system**
- **Oceanic processes.**
- **Resources of the ocean are important.**
- **Energy from ocean**
- **Transportation**

Climate system

- The ocean strongly influences climate including earth's surface temperature, by influencing:
  - The amount of CO_2 in the atmosphere,
  - The transport of heat from the tropics to polar regions.
  - The operation of the hydrological cycle.(Monsoon)
  - Earth's carbon cycles.

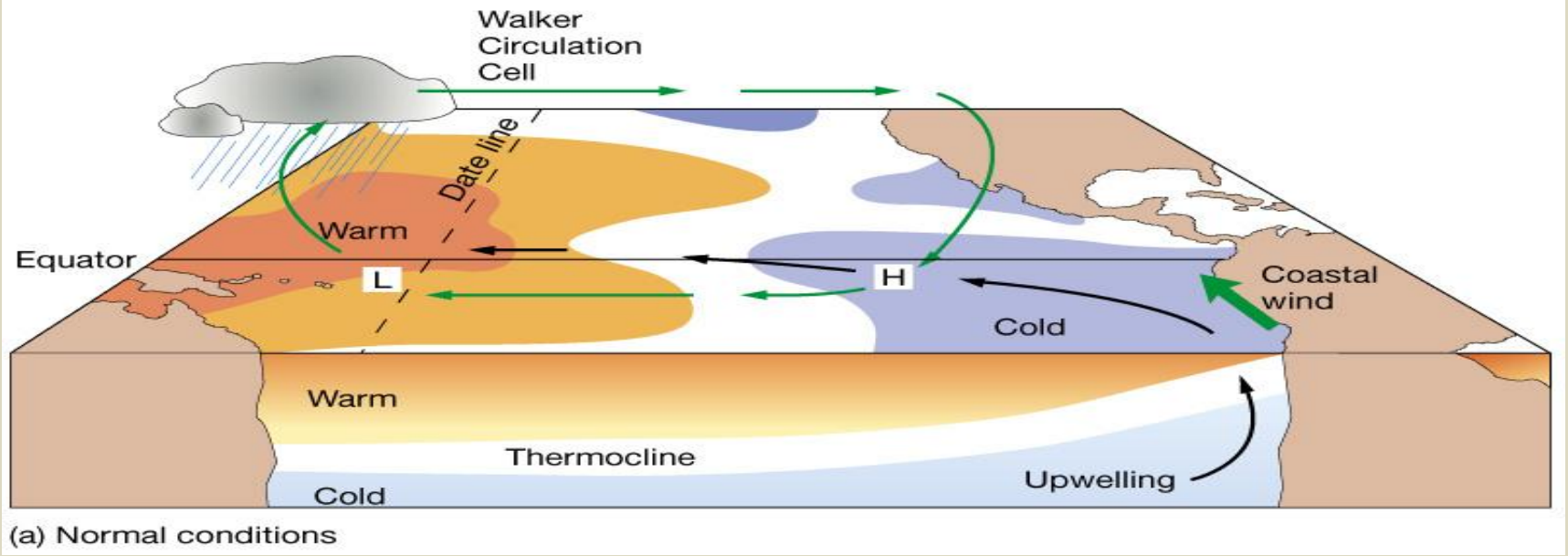
- Most of the oxygen in the atmosphere comes from the oceans.

- The oceans may be responsible for abrupt climate change.

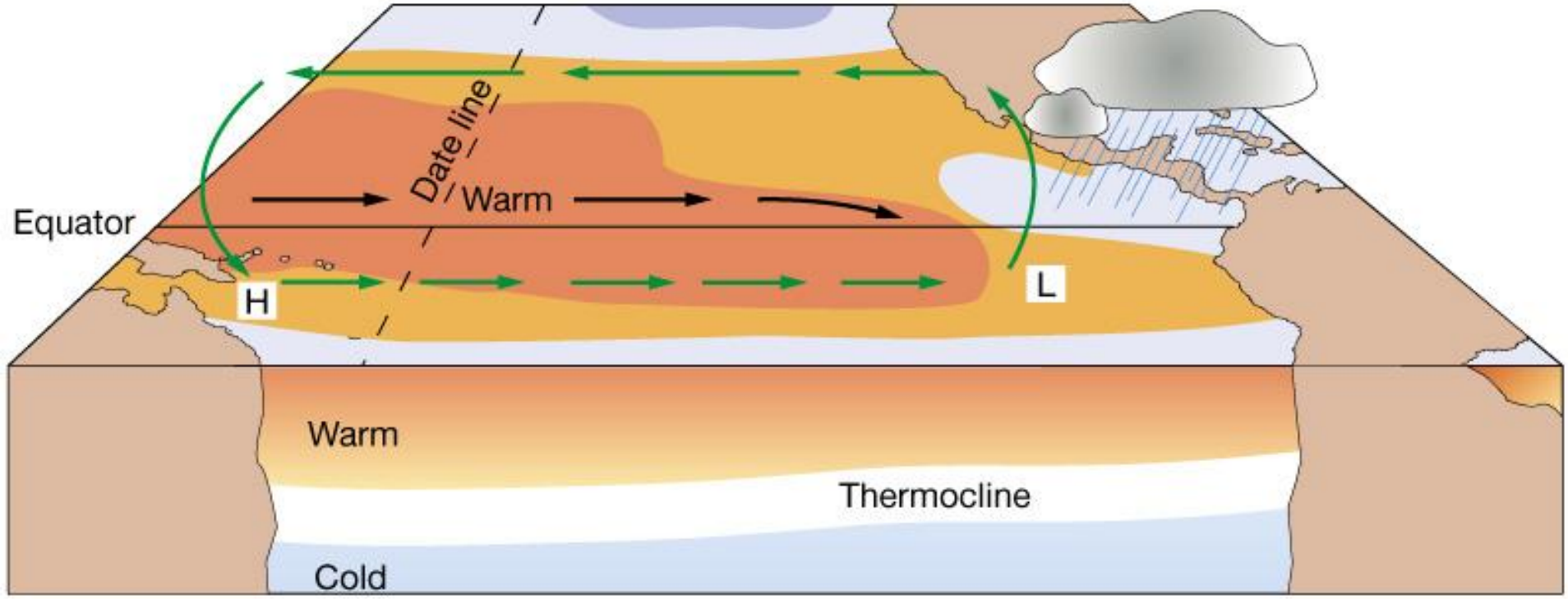

OCEANIC CONVEYOR BELT
SHALLOW
DEEP

El Niño and other oceanic processes change weather patterns.

- The ocean strongly influences weather patterns.
- The largest source of year-to-year change in the weather is El Niño, which is a disruption of the interaction of the atmosphere and ocean in the Pacific.
- A change of temperature of surface water in the western north Pacific and in the tropical Atlantic can cause drought in Texas, the great plains, and the and west.



(a) Normal conditions



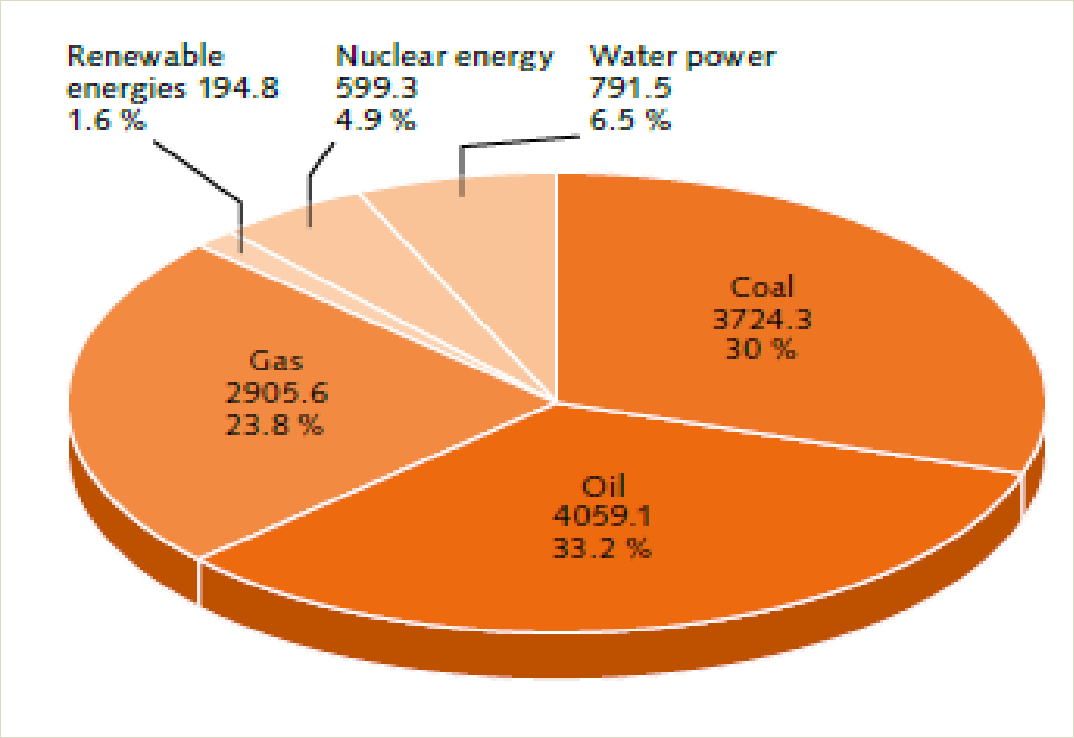
(b) El Niño conditions

Resources of the ocean

- Roughly 25% of the protein used by people comes from fish.
- Sea food have rich in good protein
- Seaweed rich in vitamins, minerals
- Medicine from sea
- Oil field
- Polymetallic and manganese nodules

Oceanic Energy

World primary energy consumption

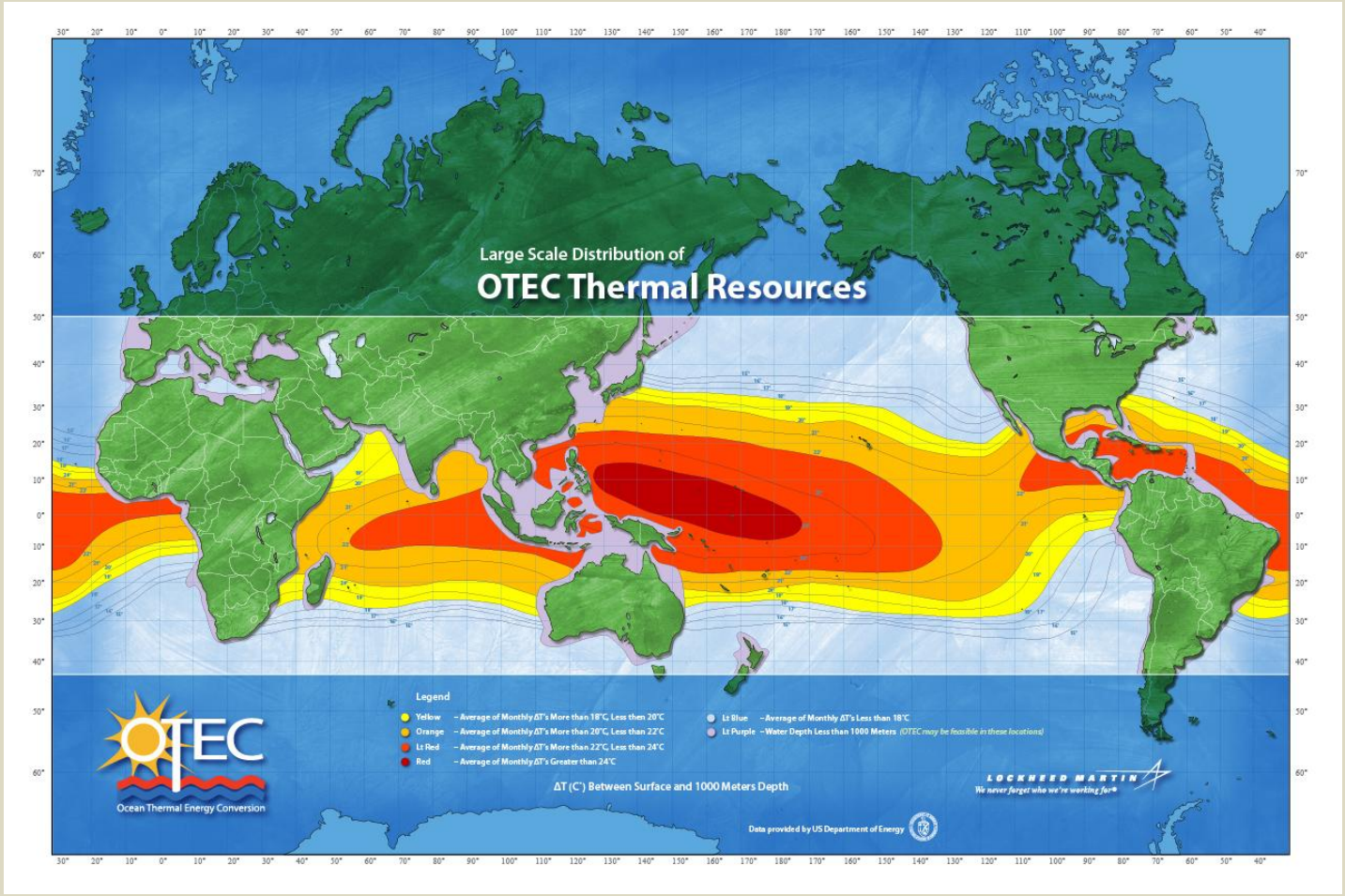


Renewable Energy

- Hydro Power
- Wind Energy
- **Oceanic Energy**
- Solar Power
- Geothermal
- Biomass

Sources of Energy from Ocean

- OTEC
- Water currents
- Waves
- Tide


Large Scale Distribution of
OTEC Thermal Resources
Legend
Yellow – Average of Monthly ΔT's More than 18°C, Less then 20°C
Orange – Average of Monthly ΔT's More than 20°C, Less than 22°C
Lt Red – Average of Monthly ΔT's More than 22°C, Less than 24°C
Red – Average of Monthly ΔT's Greater than 24°C
Lt Blue – Average of Monthly ΔT's Less than 18°C
Lt Purple – Water Depth Less than 1000 Meters (OTEC may be feasible in these locations)
ΔT (C°) Between Surface and 1000 Meters Depth
OTEC
Ocean Thermal Energy Conversion
LOCKHEED MARTIN
We never forget who we're working for®
Data provided by US Department of Energy

OTEC

Ocean Thermal Energy Conversion

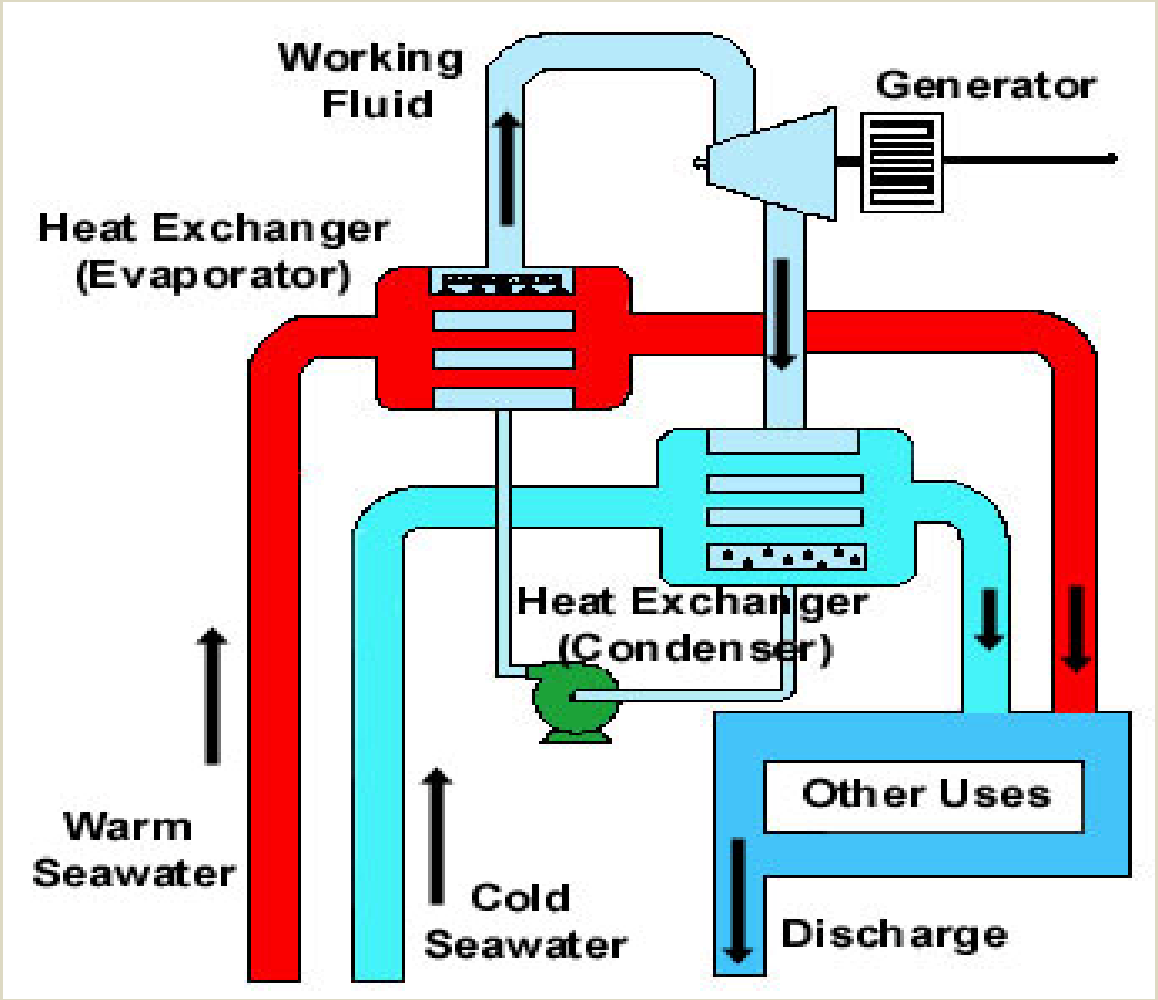
- Depends on the difference in temperature between surface and water at 600 - 1000m depth

- Two types of OTEC System

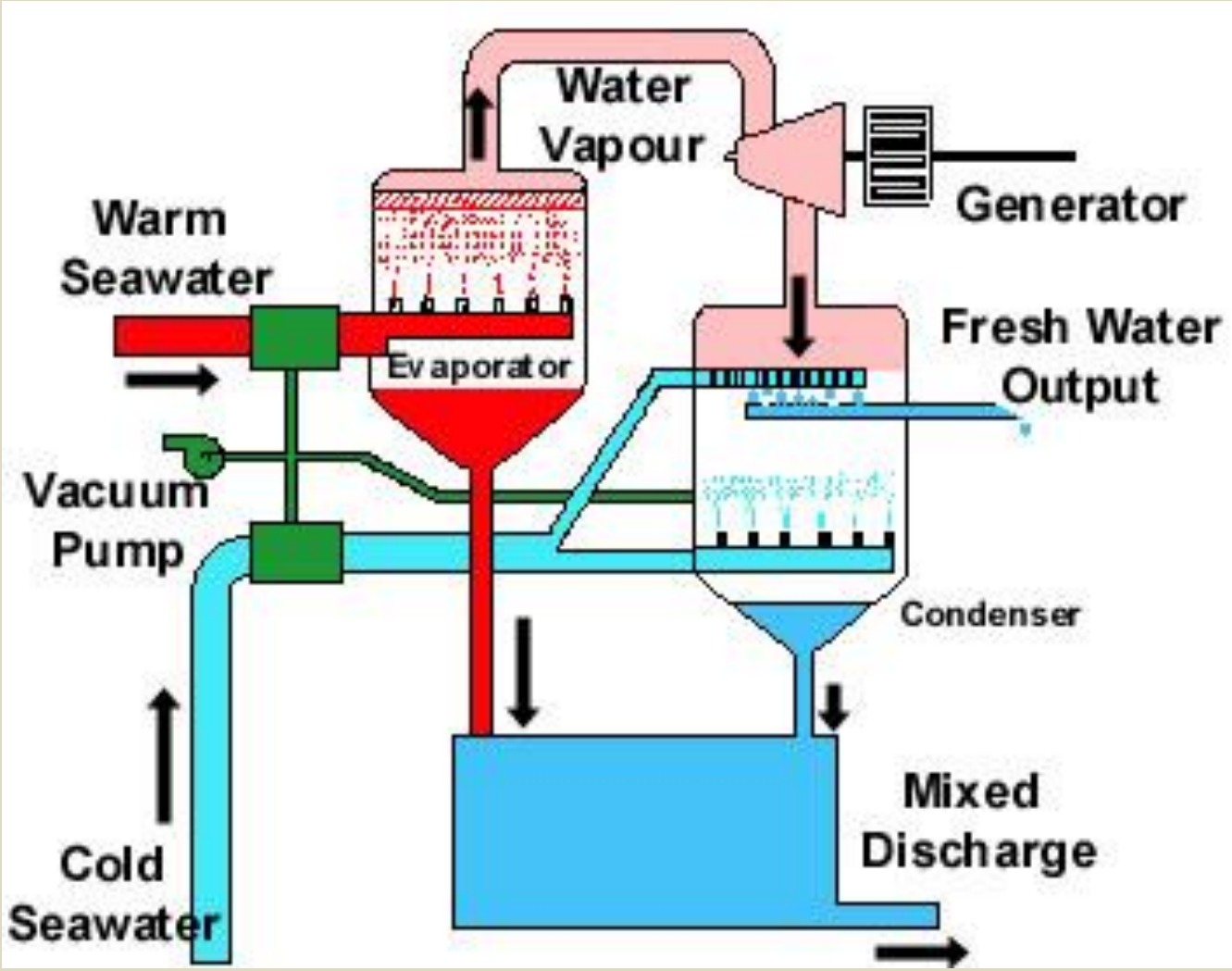
  Closed Cycle – low boiling point liquid(Ammonia)

  Open Cycle – Sea water to Stream

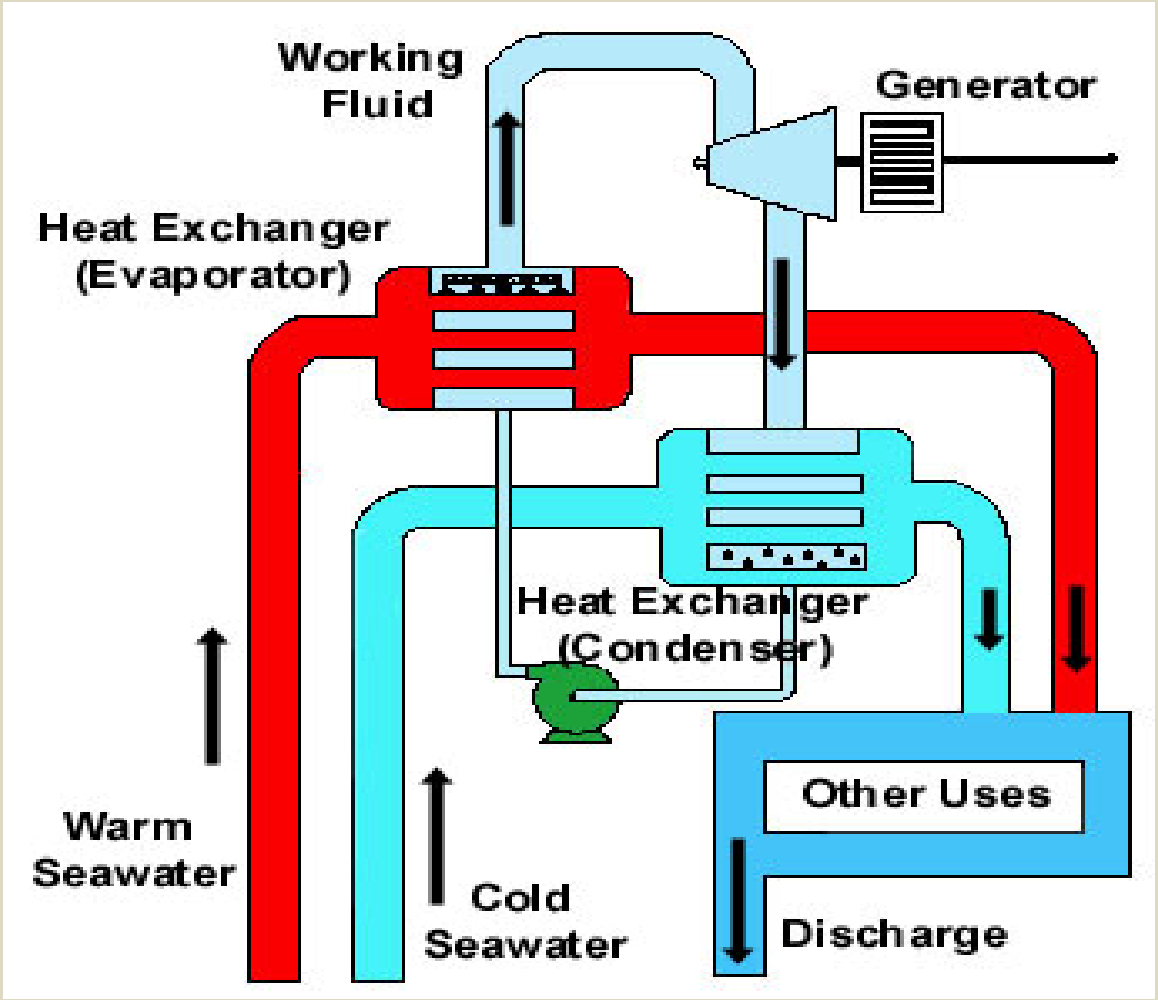
Closed Cycle - OTEC



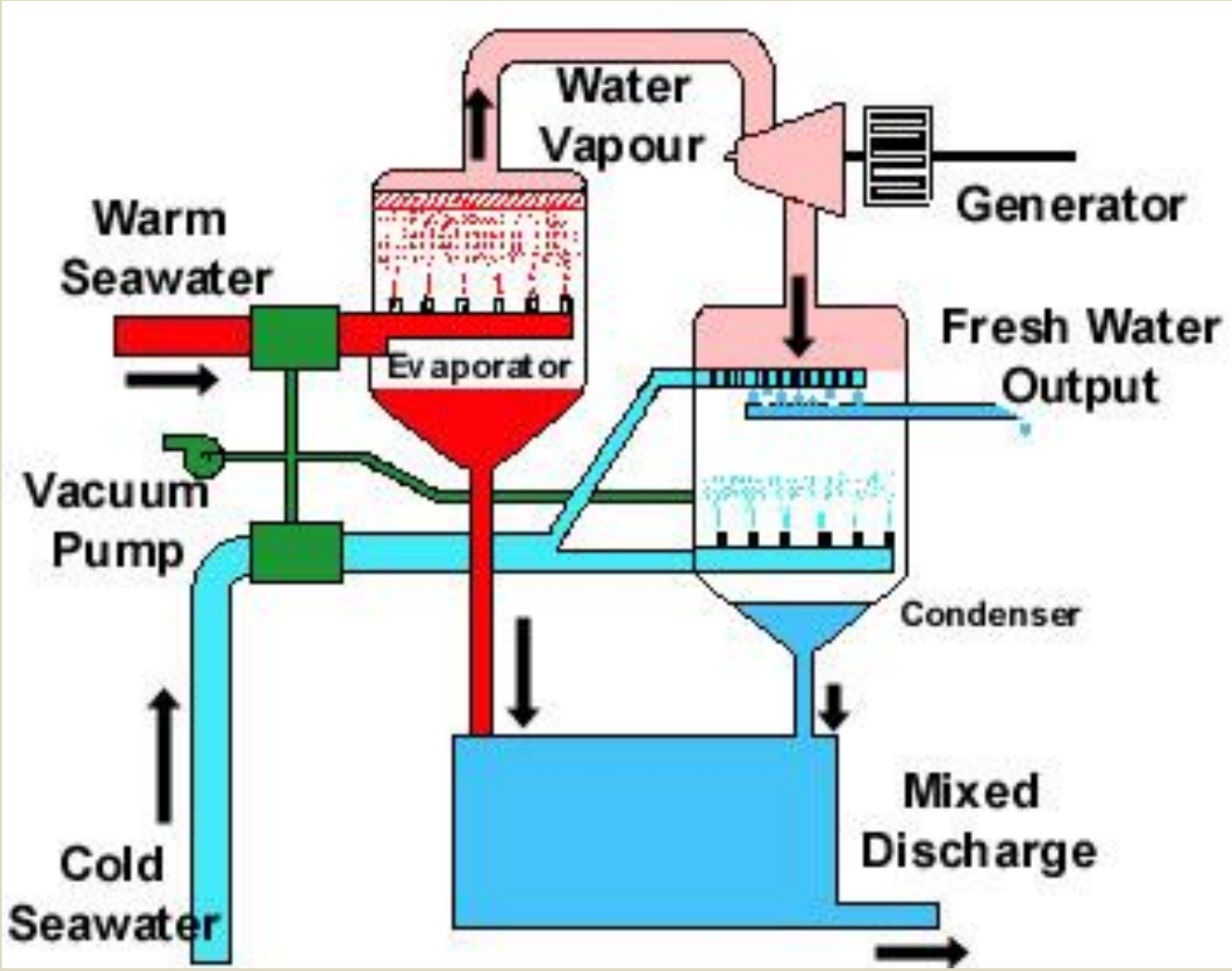
Open Cycle – OTEC



Closed Cycle - OTEC



Open Cycle – OTEC



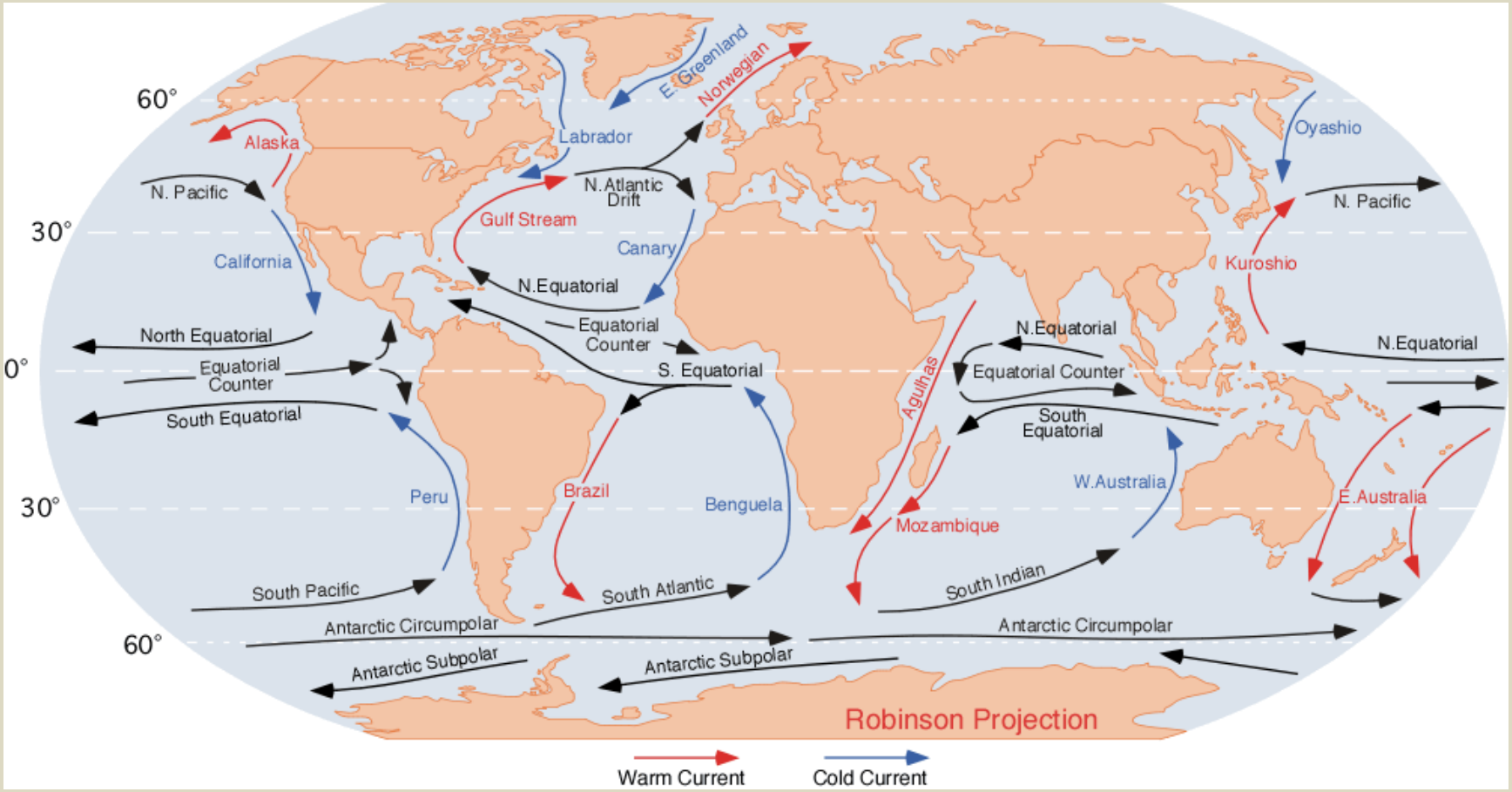
Water currents

Ocean currents

An ocean current is a continuous, directed movement of seawater generated by following forces Breaking waves, Wind, the Coriolis effect, cabbeling, temperature and salinity differences

Tidal currents

Tides are caused by the gravitational pull of the Sun and Moon

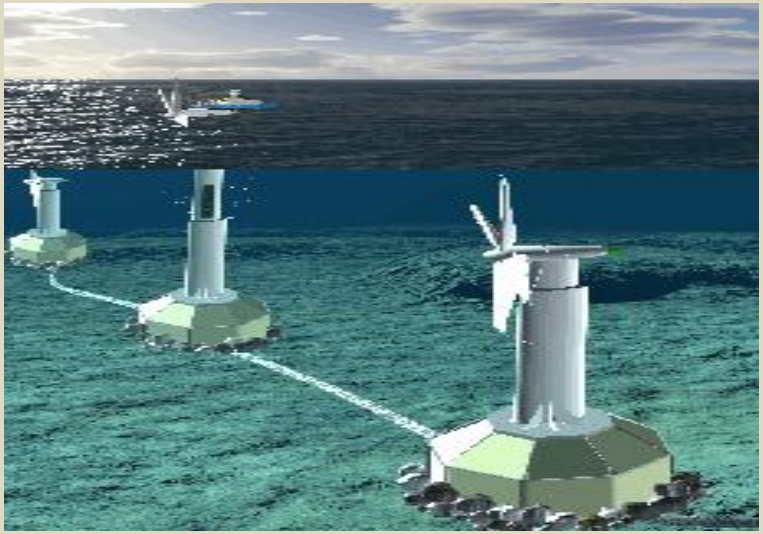

60°
30°
0°
30°
60°
Alaska
N. Pacific
California
Labrador
E. Greenland
Norwegian
N.Atlantic Drift
Gulf Stream
Canary
N.Equatorial
North Equatorial
Equatorial Counter
South Equatorial
Equatorial Counter
S. Equatorial
Peru
Brazil
Benguela
South Pacific
South Atlantic
Antarctic Circumpolar
Antarctic Subpolar
Antarctic Subpolar
Agulhas
Mozambique
South Indian
Antarctic Circumpolar
W.Australia
E.Australia
N.Equatorial
Equatorial Counter
South Equatorial
Oyashio
N. Pacific
Kuroshio
N.Equatorial
Robinson Projection
Warm Current
Cold Current

Tides

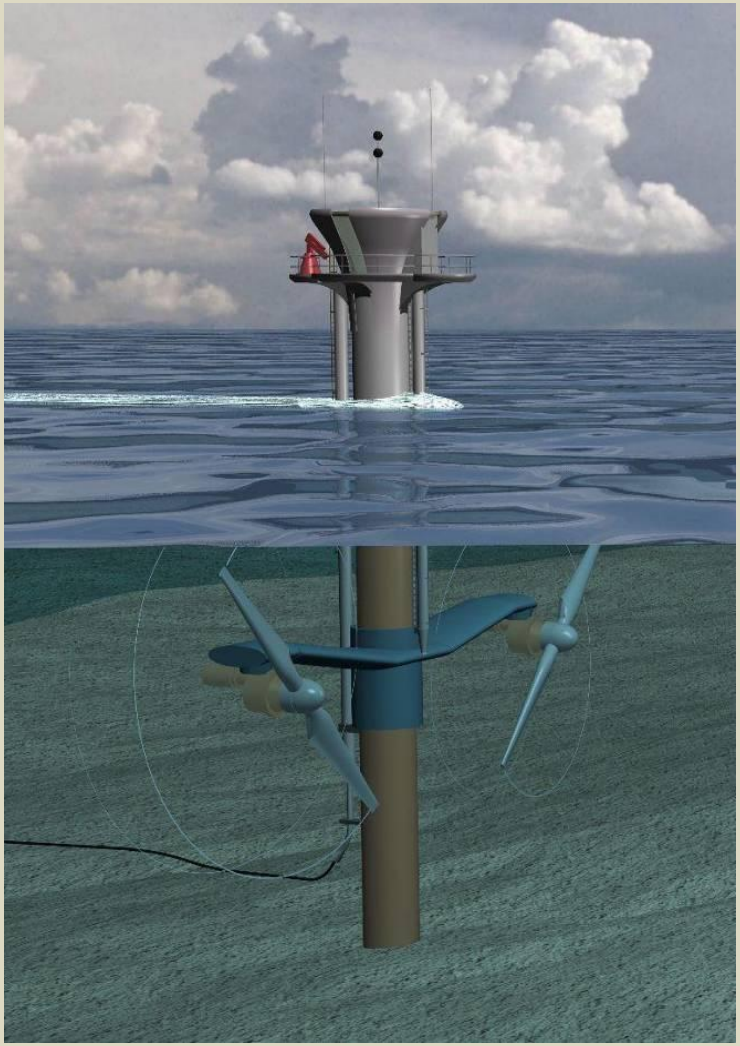
- The rise and fall in sea level is called a tide.
- Caused by a **giant wave**.
- One low-tide/high-tide cycle takes about 12 hrs and 25 min.
- Tidal range is the difference in ocean level between high-tide and low-tide

Tidal energy

1. Tidal Turbine Farms
2. Tidal Barrages (dams)

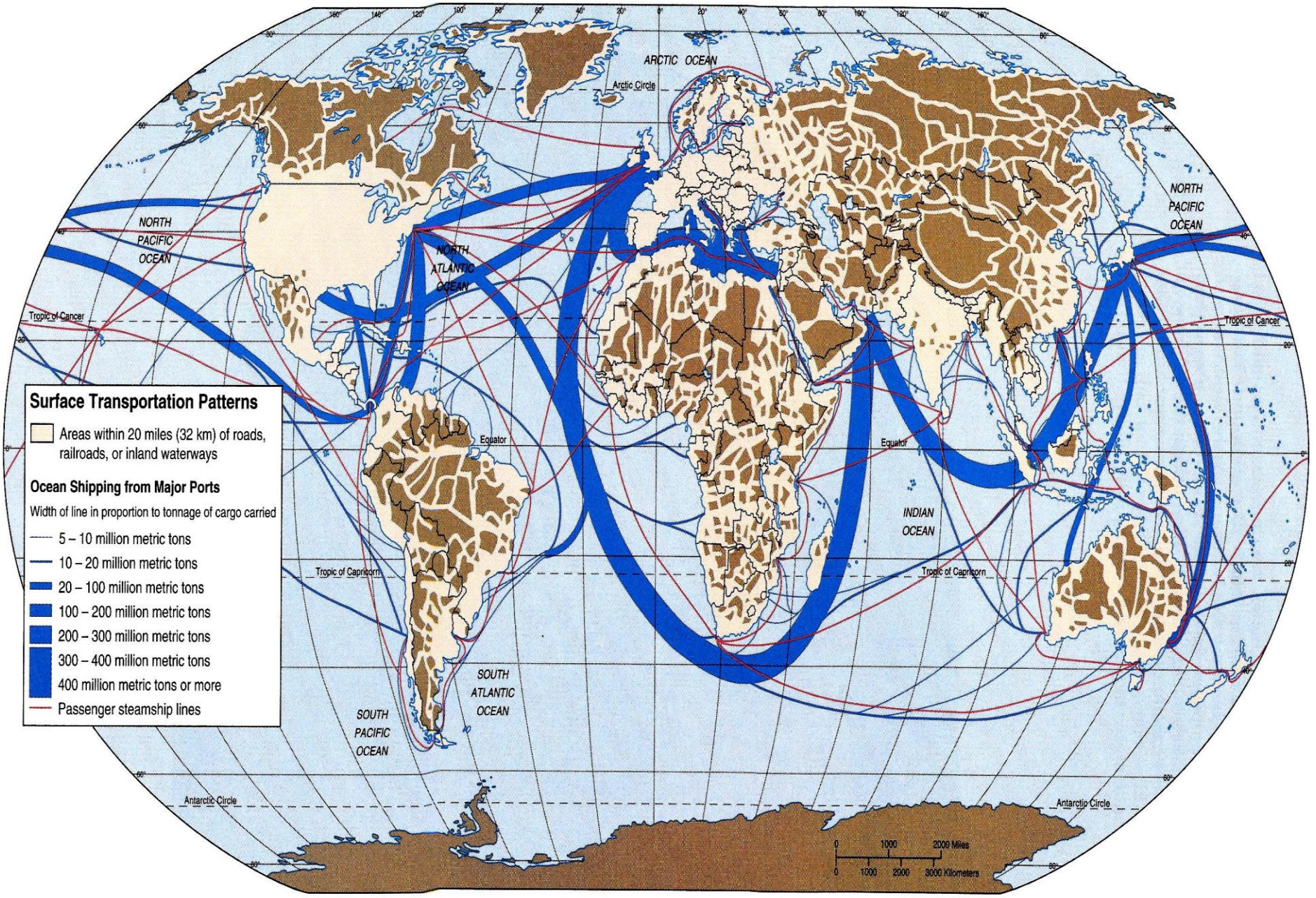


Swan turbines



MCT Seagen
Marine current Turbines

World Transportation Patterns



Advantages of Container Shipping

While aeroplanes are faster, container ships can carry more goods in one go. It would take hundreds of aeroplanes to carry all the goods that can fit on just one large container ship.

Transporting goods in large volumes makes it cheaper -

It is estimated that on average a container ship emits around 40 times less CO_2 than a large freight aircraft and three times less than a heavy truck.

Container shipping is also estimated to be two and a half times more energy efficient than rail and 7 times more so than road.