Year 1 Geography
Chapter 1: Introduction to geography
Chapter 3: Water and its spatial distribution
Chapter 4: Management of water resources
Chapter 5: Distribution of rainforests and mangroves
Chapter 6: Management of tropical rainforests and mangroves
Others

Geography Intro

- Physical geography is the branch of geography focusing on the study of the physical environment
- The Physical environment consists of all living and nonliving things found naturally, as well as natural processes and has 4 components

1. Atmosphere

- This refers to the layer of gases and tiny particles surrounding the earth, with examples including nitrogen,oxygen and carbon dioxide
- This is further divided into 5 layers, troposphere, stratosphere, mesosphere, thermosphere and exosphere
- The condition of atmosphere known as weather includes temperature, humidity, and wind **2. Hydrosphere**
- Refers to all water found on the earth and in the atmosphere, which includes water in solid,liquid and gaseous states
- The Hydrological cycle enables water to move continuously between the earth's surface, atmosphere and underground

3. Lithosphere

- This refers to the solid layer of rock forming the earth's surface, up to a few hundred km in thickness
- Magnificent landforms such as mountains are also created by movement of large layers of rock in the lithosphere

4. Biosphere

- This refers to all living things on earth, including plant and animal life found on land and sea
- It is also dependent on other components of the physical environment ● For example, plant growth requires suitable temperature

What is human Geography?

- It is the branch of geography involving the study of human life in the built environment ● The built environment is created through human made changes to the physical environment and it provides setting for variety of human activities, with many aspects such as housing and transport systems

1. Housing

- Structures/buildings developed by people to shelter themselves from the

elements, which can be temporary or permanent
- An example of temporary housing is a tent, while an example of permanent housing is HDB flats

2. Transport systems

- Equipment,infrastructure and networks supporting movement of people and goods, such as public transport and airports

Geographical concepts

- Important idea used to understand the world

1. Space

- Physical area on the earth's surface
- Location is an idea closely related to Place
- Expressed using coordinates which are based on latitude and longitude
- Location of geographical features arranged across an area in a particular way, known as spatial pattern, identified as linear or cluster

2. Place

- Area of the earth's surface holding special meaning for people, eg my classroom
- Space can be place and vice versa
- Place has attached meaning, like Singapore v Borkum or Maastricht

3. Environment

- Physical and built environment and processes occurring naturally/result of human action
- Geographers interested in studying the interactions between humans and environment

4. Scale

- Level of detail at which geographers study something
- 3 types of scale, map scale, time scale and geographic scale

4a.Map scale

- Relationship between a distance on a map and actual distance on the ground

4b.Time scale

- Period of time during which something happens
- Processes and changes in environment occur at variety of time scale

4c.Geographic scale

- Spatial extent of something, divided into local, national, regional and global scale

Geographical inquiry

- Posing questions and carrying out investigations,using 5W 1H
- These can be used with the geog concepts to pose geog questions on anything

Stages

1. Ask key questions
2. Formulate hypotheses
3. Collect sources (primary and secondary)
4. Analyse and present data (present using maps, graphs, tables)
5. Draw conclusions
6. Reflect and take action (improve investigation)

3.Water and its spatial distribution

Physical states of water

1. Solid–ice (under cold temp water freezes into ice)
2. Liquid-water (flows freely,no set shape,fixed volume)
3. Gas-water vapour+steam (always in the air around us)

Where is water found?

- Found in water stores
- Water stores are places where water is contained in and can be categorised as freshwater and saltwater
- Glaciers,rivers etc contain freshwater,and can be used easily unlike oceans ● Unevenly distributed on the earths surface
- Water can move from 1 store to another and these movements are known as flows **1. Oceans**
- Large masses of water connected to one another
- Pacific (biggest), Atlantic, Indian, Arctic and Southern

2. Glaciers

- Masses of ice resting on land/float in sea
- Found in places snowing a lot
- Move slowly due to mass

3. Lakes

- Water bodies surrounded by land
- Receive water from rain,snow and rivers

4. Rivers

- Natural wide flows of fresh water across land
- Store water temporarily before water flows into another body
- Flow from higher elevations to lower elevation due to gravity
- River source marks where a river begins
- River mouth marks where a river flows into another body

5. Soil

- Loose topmost layer of earth's surface where plants grow
- Has different names,contains different material
- Water passes through the soil through small openings known as pores ● Water stored in soil called soil moisture

6. Groundwater

- Found below surface of the earth
- Water enters the ground through pores in the soil+gravity

Hydrological cycle

1. Precipitation

- Input
- Water falls as rain,snow or hail

2.Groundwater

- Water that seeps into the ground absorbed by plants or stored as groundwater **3.Surface runoff**
- Water flows from the highlands and over the ground surface into streams and rivers ● When groundwater increases,surface runoff decreases

4.Evaporation

- The sun's heat causes water to evaporate
- Water changes into water vapour
- Output

5.Transpiration

- Plants give out water through their leaves

6.Condensation

- Warm moist air cools as it rises
- Water vapour changes into water droplets
- Small droplets combine to form bigger droplets and clouds

Water budget

- Describes flow of water in and out of a catchment area
- Processes increasing amt of water in a catchment called input and vice versa for output ● When input more than output this is called a water surplus (more water than needed) ● When output more than input this is called water deficit (less water than needed) ● NET change in store=Input (precipitation) - Output (surface runoff, evaporation, transpiration)

4.Management of water

How do variations in precipitation affect availability of water?

1. Floods

- Overflow of water onto dry land
- Flash floods and River floods

1a. Flash Floods

- Caused by heavy rainfall over short periods of time
- Occur in dry area without enough soil and vegetation allowing infiltration ● Most rainwater becomes surface runoff flooding low lying areas

1b. River Floods

- Caused by sustained heavy rainfall/meltwater produced through melting in spring ● Large amount of rain/melt water enters streams and tributaries, flowing into rivers ● Water level in river rises rapidly and overflows the banks

2. Droughts

- Long period of little to no rainfall in an area
- May last months/years
- Not enough water available to replenish amount used for human activities **How does water support river ecosystems?**
- Water supports river ecosystem as precipitation provides regular supply of water to rivers ● Food chains show relationships among organisms as energy is transferred ● Bottom of food chain are aquatic plants,zooplankton,insects,fish,humans **How do people use water?**
- Developed countries use more water than developing countries due to industrialization and items such as dishwashers

● Use water for 4 main purposes

1. How is water use for Domestic Purposes?

● Household activities such as bathing,cooking,cleaning

● Average Singaporean uses 131 litres of water/day

2. How is water used for recreational purposes?

● Enables people to carry out water sports eg kayaking,sailing and fishing ● These sports are highly dependent on water conditions and quality

3. How is water used for agriculture?

● Largest use of water worldwide

● Used to grow crops and rear animals for consumption

● Different animal and plants require different amounts of water

4. How is water used for industry?

● Many industries require water to function

● Used to cool equipment in factories and power plants as they generate a lot of heat ● Also used to generate electricity passing through turbines in dams

● Used as a cleaning agent in wafer fabrication,which is the process of creating electronics **How do human actions lead to water pollution and its impact?**

● Human activities cause water pollutions due to various reasons eg litter in drains ● Water pollution is when harmful substance enter water bodies and cause water quality to fall

● Poses a threat to aquatic ecosystems

● Pollutants like pesticides and lead kill plants and poison animals

● Excess fertilisers from farms washed into rivers provide nutrients for growth of algae, getting decomposed, taking in oxygen and there is less oxygen, causing fish to die ● Rhine river 1986 chemical spill

How can water be managed sustainably?

1. Improve water quality

● Determined by factors eg temp,amt of dissolved oxygen,turbidity

● Affect how well aquatic plants and animals grow and survive

● Implement laws to maintain/improve water quality

● For example, China's Water Pollution Prevention and Control Law (reward/punishment system for water quality)

2. Reduce water consumption

● Tends to increase as a country's economy

● Water needs to be treated and cleaned so they need to conserve and treasure water ● Water Efficiency Labelling Scheme (WELS) of Singapore

● South Africa 2018 Drought Prevention

3. Improve water technology

● Singapore's NEWater and Desalination are reliable sources independent of weather ● Desalination requires use of energy to

reduce salt in seawater

4. Import water

● Agreements on singapore's import of water from malaysia (expire 2061) ● Kuwait importing water from serbia

5. Spatial distribution of tropical rainforest and mangrove

What is Natural vegetation?

● Plant life covering particular parts of the worlds land areas and develops without humans ● Climate of a location determines type of natural vegetation found

What is the tropical climate?

● Climate is average weather conditions of a place over a long time (more than 30 years) ● Tropical climate is climate experienced between tropic of cancer and capricorn ● Also has high annual rainfall of 2000-4500 mm/year

● Rainfall throughout the year and no month in which rainfall is low/absent

● Temperatures high throughout the year

● Mangroves found along narrow strips of coasts in the tropics

● Around 70% of coastlines are covered in mangroves

What are tropical rainforests and where are they found

● Main type of natural vegetation found in tropical climate

● Found in central/south america,west/central africa,south/southeast asia,around equator **What are the characteristics of tropical rainforests?**

● Abundant sunlight and high rainfall throughout the year

● Very suitable for plant growth

● Majority of plants are evergreen (do not shed leaves all their leaves at a particular time) ● Continuously grow new leaves to replace older ones that die and fall off (constant green) ● Large variety of plant species

● Intense competition for sunlight among plants cause them to grow really tall ● Relatively sparse vegetation on the ground

● When gaps in canopy appear,plants grow up and fill gaps quickly (read below) ● Distinct vertical forest structure

Emergent layer

● Trees here grow up to 30m or more in height

Canopy Layer

● Most trees grow to 20-30m

● As they grow very close to one another, their crowns interlock to form a thick layer of near continuous mass of branches and leaves, which prevents 97-98% of sunlight from reaching the forest floor

Undergrowth layer

● Beneath canopy layer

● Little sunlight able to reach this layer

● Not many plants able to grow here,except smaller ones growing in the shade **How have plants in tropical rainforests adapted to**

their environment? 1. Broad leaves

- Large surface area
- Plant absorbs as much sunlight as possible to make food

2. Waxy leaves

- Glossy appearance
- Helps plant reduce amount of water vapour it loses to the atmosphere through transpiration due to high temperatures

3. Drip tips

- Leaves with small,narrow tips pointing downwards
- Allow rainwater that falls onto them to flow off easily
- Helps leaves dry quickly preventing growth of fungi and bacteria

4. Buttress roots

- Keep rainforest trees upright and prevent them from toppling over
- Grow up to 5 meters above ground surface
- Require support of their roots as the rest of the roots do not extend very deep ● Nutrients concentrated in topmost layer of rainforest soils due to decomposition ● Tropical rainforest trees have shallow underground roots to absorb nutrients quickly **What are mangroves and where are they found?**
- Found along or close to the coast
- Made of plant species called mangroves,which can grow in water with higher salinity ● Grow better in areas where water salinity is high due to lack of competition from other plants
- Most areas with mangroves experience tropical climate as they cannot withstand freezing ● Grow best where average air and water temp do not fall below 20°C
- Requires calm water conditions so seedlings can take root and grow without being washed away
- Calm conditions encourage accumulation of fine sediments with nutrients ● Sheltered environments along/close to coasts like river mouths or behind islands **Characteristics of mangroves**
- Mangrove forests have only a few plant species and lower diversity of plant species ● Density of trees is lower than in a tropical rainforest,so less competition for light ● Mangrove plants need to obtain as much energy from the sun
- Mangroves are unable to tolerate shaded conditions and are uniform in terms of height ● Exhibit horizontal zonation determined by high and low tide levels
- Zonation refers to distribution of plants in specific areas

Adaptation of mangroves to their environment

1. Salt secreting leaves

- Certain species have salt secreting leaves allowing them to remove saline water absorbed ● Salt crystals will be left behind on the leaf surfaces and removed by rain or wind ● Other species also deposit excess salt in older

leaves which they shed ● Removal of salt in this manner helps prevent salt from building up in the plant **2. Salt excluding species**

● Have roots preventing salt from entering

3. Aerial roots

● Soil found in coastal environment is flooded for several hours by the tide ● As a result the soil is waterlogged,poor in oxygen,soft and unstable

● Serve functions of growing above soil surface,enabling them to take in oxygen from the air

● Help anchor mangrove plants to the soft soil preventing them from being uprooted

6. Management of tropical rainforests and mangroves

What are the environmental functions of tropical rainforests?

1. Generate Oxygen

● Rainforest and mangrove plants carry out oxygen generation through photosynthesis ● Capable of producing oxygen throughout the year as they are greeb

2. Contribute to carbon storage

● Absorb carbon dioxide from the atmosphere during photosynthesis

● Balances amount of CO_2 added into atmosphere through decomposition and respiration ● Mangroves store 60-80kg of carbon/square km every year

● Tropical rainforests store carbon at around 20-59 kg/square km every year ● As soil in mangroves is waterlogged there are few bacteria available to break down carbon stored there

3. Provide habitats for animal life

● Rich in biodiversity

● Warm climate+abundance in water and food makes them suitable habitats for animals ● Dead leaves and branches falling from mangroves broken down which animals feed on ● These smaller animals are eaten by tigers and crocodiles

● Mangroves are also breeding grounds for fish as their dense root network provides shelter from predators

● Branches of mangroves provide nesting sites for many species of birds such as pelicans **4. Provide protection from soil erosion**

● Rainforest plants can help prevent soil erosion from happening

● This is because they provide a protective layer over the ground surface,slowing down falling raindrops

5. Provide protection from coastal erosion

● They help reduce power of coastal storms as the waves lose a significant amount of energy as the root, trunks and branches of mangroves cause friction when waves hit the coast

How is tropical forest used by people?

1. Place for habitation

● Several million people around the world living in tropical rainforests
● Indegenious people
● Depend on the physical environment for food,water,shelter and clothing ● Korowai tribe (new guinea) and moken people(myanmar/thailand)

2. Recreation

● Recreational sites for people living in towns and cities
● Trekking.camping and birdwatching are activities that they take part in ● Visiting forests has a positive effect on people's health
● Natural sights,smells and sounds of the forest have calming effects on people ● Also a way for exercise and lead a healthy lifestyle

3. Source of food

● Food from plants in the forest eg cucumber,brazil nuts,pepper
● Popular desserts made from ingredients from rainforests eg nipah palm(ice kacang) ● Hunting of wild animals such as fish and deer
● This is known as hunting and gathering
● However this is not enough for larger groups so they convert into farms to rear fish and shellfish for sale (aquaculture)

4. Source of raw materials

● Valuable sources of wood for building and carpentry such as teaks,mahogany and rosewood, which are valued for strength, durability and colour
● Many things made from them such as floors,doors,furniture
● Wood obtained also used to build houses,fuelwood or charcoal
● Mangrove trees also cut down to produce paper
● Iron,metals and minerals also found beneath rainforests
● These are valuable as they can make wide variety of products eg copper for pipes ● Process of obtaining stuff below ground called mining
● Rainforest first cleared through burning or bulldozing then heavy machinery used to dig up these materials

What are the consequences of extracting resources from tropical rainforests? 1. Deforestation

● Permanent removal of forest is called deforestation
● Occurs due to unsustainable cutting down of trees for their wood
● Other stuff like mining and aquaculture also contributes as they need large areas of forest cleared
● Tropical forest even when reforested will lack biodiversity of an untouched forest] ● May take 1000 years for a reforested forest to reach the same level as an untouched forest ● Amazon mass extinction

- 35% of mangroves have been destroyed

2.Enhanced greenhouse effect

- Earth behaves like a greenhouse
- Gases such as CO_2 can trap heat (greenhouse gases)
- Greenhouse gases keep the Earth's surface warm at an average temp of 15°C ● Without them, Earth would be -18°C
- CO_2 is one of the most important greenhouse gases
- It is released when living things respire and decompose
- Deforestation is responsible for around 20% of the amt of CO_2 added to atmosphere ● This is because burning/cutting down of plants causes carbon stored in plants to be released as CO_2
- There is also less plants left behind to absorb increased amount of CO_2 from the atmosphere
- This leads to the enhanced greenhouse effect

How can tropical rainforests be managed sustainably?

1. Establishing protected areas

- Restrict human activity although it varies from country to country
- Government puts laws in place to ensure people don't damage these areas ● People who break these laws are fined heavily/sent to jail
- Effectiveness of this depends on enforcement of these laws which is a challenge is less developed countries
- Singapore has 4 protected areas, Bukit Timah and Central Catchment Nature Reserve, Sungei Buloh Wetland Reserve and Labrador Nature Reserve
- Parks and Trees Act (2005)
- Protected areas known as national parks or biosphere reserve
- Some are really big, bigger than Singapore
- Approximately 669 biosphere reserves worldwide, such as the Gunung Leuser Biosphere Reserve

2. Regulating forest activities

- Hard for government to set aside all remaining tropical forests as protected area due to high economic value of resource extraction activities
- This provides people with jobs and enable country to earn money
- Must strike a balance between obtaining economic benefits and conserving resources ● Controlled logging

3. Rehabilitating distributed areas

- Aims to reintroduce some plant and animal species originally found there ● Reforestation helps rehabilitate a deforested area by planting new trees ● Sometimes non native tree species are planted as they can grow quickly ● Rehabilitation of mangrove forests on Pulau Semakau, Ubin and Tekong

4.Promoting public education

- Many deforestation occurring is due to peoples consumption of products made from resources obtained from rainforests
- Many people are unaware they depend on tropical rainforests or they are responsible for deforestation
- Products we buy in Singapore may link them to deforestation in Indonesia or Brazil ● If people know the importance of tropical rainforests and understand why they are under threat, they will be more likely to play a part in reducing deforestation

Other notes

Question command words

1. Describe
- Provide details and descriptions (2-4m)

2. Explain
- Provide reasons for the description (2-6m)

3. Define
- Provide meaning (1-2m)

4. Compare
- Provide similarities and differences (2-4m)
- Pair by pair
- Use connectors (but,whereas,however)
- 1 Mark for every pair
- Both human and physical geography focus on sustainability issues. Physical geography is nature oriented while human geography focuses on anthropogenic activities **5. Annotate**
- Provide details on the features drawn on the sketch (3-5m)

6a. Adjectives of spatial distribution
- Clustered–Nucleated,Densely concentrated
- Sporadic–Random—Uneven
- Linear–Along lines such as roads,rivers
- Region/country
- Cardinal points

Distribution of water storage
- Uneven distribution of water storage,ranging from less than 1% to more than 90% ● Most amount of water stores are in oceans at 96.5%
- Least amount of water stores in soil moisture at 0.001%
- There is a small proportion of water stored in glaciers at 1.7%

Describe the distribution of water used for different purposes
- Uneven distribution of water from 70% to 11%
- Predominantly water is used for agriculture at 70%
- ⅛ of water used for industrial purposes
- Least amount is used for domestic purposes at 11%

Describe the distribution of TRF
- Clustered areas of the TRF in Borneo

- Sporadic areas in Madagascar
- Densely concentrated areas in Brazil
- Even distribution along equator from 0 degrees to 15 degrees
- TRF clustered around SEA
- Linear distribution of Congo forest West of DRC

Describe the Characteristics of the areas mangroves grow in

- Grow in areas where water is at least 20 degrees celsius
- Warm and Calm water conditions
- High Salinity to prevent competition from other plants
- Sheltered areas

Compare the Characteristics of TRF with Mangroves

Similarities

- Diversity
- Both have layers
- Leaves remain evergreen throughout the year
- Buttress roots hold ground firmly
- Waxy Leaves

Differences

- TRF Vertical layering unlike Mangroves which have Horizontal layering **How to save water?**
- Take shorter showers
- Use water used to wash rice to water plants
- WELS
- Half flush
- Use a hose to wash a car
- Wash clothes on full load

Describe the structure of tropical rainforests

- Emergent layer has trees that grow up to 50m
- Canopy layer is 20-40 m in height
- Crowns interlock to form thick and continuous mass of branches and leaves ● Undergrowth layer found beneath canopy with little sunlight and little plants growing **How have plants adapted?**
- Broad leaves to get more sunlight
- Waxy leaves for glossy appearance and less water lost through transpiration ● Drip tips on leaves for water to flow down then no mold on leaves ● Buttress roots to support thin tall trunk of trees

Describe the Distribution of Mangroves

- Distribution North Coast of Australia
- Heavy concentration on Liberia
- Concentrated North of NZ North Island
- Heavy around south Luzon island (Philippines)
- Near or in between the Tropic of Cancer and Tropic of Capricorn

Describe the areas mangroves grow in

- Water 20°C

- Warm water
- Calm water
- High salinity (less competition)
- Sheltered areas

Definitions

Define Water scarcity

- Water scarcity is the lack of fresh water resources to meet the standard water demand **Define Water stores**
- Places where water is contained in

Define Hydrological cycle

- Sequence of processes that occur to ensure water is naturally replenished ● Describe the processes

Define water budget

- Flow of water in and out of a catchment area
- Tells us how much water is available in an area

Define Floods

- Overflow of a large amount of water onto normally dry lands

Define Flash Floods

- Exceptionally heavy rainfall over a short period of time

Define River Floods

- Sustained heavy rainfall or snow and ice melting flooding areas

Define Droughts

- Long period of little to no precipitation

Define water pollution

- Harmful substances entering water bodies causing water quality to fall **Define tropical climate**
- High temperature of 26-34°C
- High annual rainfall of 2500 mm/year
- High Humidity of 60-100%
- Found between tropic of cancer and tropic of capricorn

Define Natural Vegetation

- Plant life covering particular parts of the world areas
- Develops without human interference

Define Climate

- Average weather conditions of a place over a long period of time

Define Tropical Rainforests

- Main type of natural vegetation found in places that experience tropical climate **Define domestic use of water**
- Use of water in the household
- Ex. Washing hands, cooking

Define industrial use of water

- Use of water in factories or for the industry
- Ex. Cooling of machines, washing of machines

Define agriculture use of water

- Use of water in farms
- Ex. Watering the crops

Define recreational use of water

- Use of water for human recreation
- Ex. Kayaking, swimming