ENVIRONMENTAL CHANGE AND MANAGEMENT

NSW: STAGE 5, YEAR 10

Dr. Susan Bliss
GeoWorld 7,8,9,10 (Macmillan)

GTANSW ANNUAL CONFERENCE FRIDAY 10 MARCH 2017, NOVOTEL

http://www.earthlymission.com/wp-content/uploads/2016/03/destroying-nature-robin-wood-2.jpg

NSW SYLLABUS: CONTENT

1.

ENVIRONMENTS

Investigate role and importance of 'natural' environments

2.

ENVIRONMENTAL CHANGE

Investigate human-induced environmental changes across range of scales (local, national, regional, global)

3.

ENVIRONMENTAL MANAGEMENT

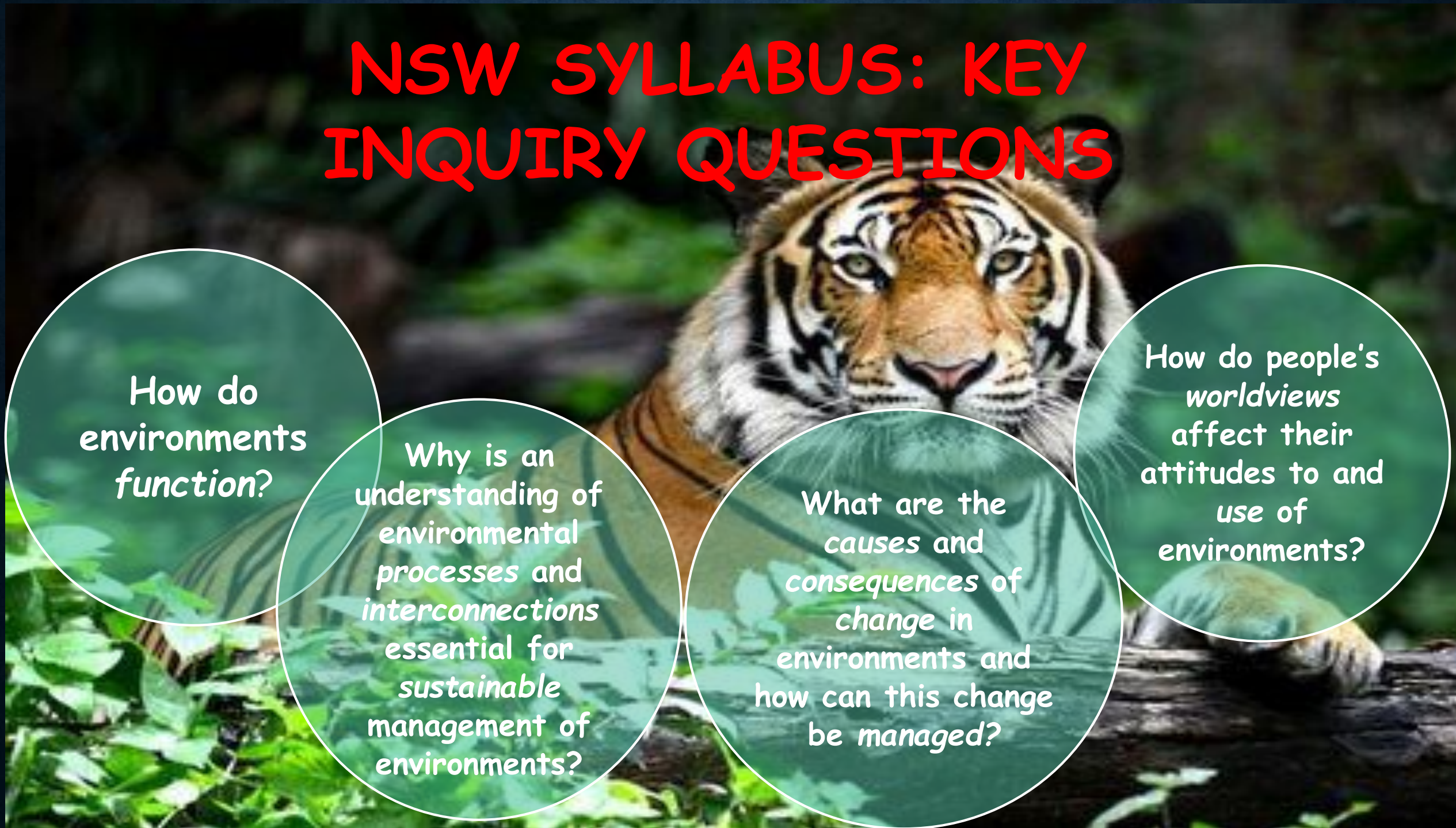
Investigate environmental management, different worldviews, management approaches of Aboriginal and Torres Strait Islander Peoples

Dot points mandatory
Dash points optional

4.

INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.

NSW SYLLABUS: KEY INQUIRY QUESTIONS



How do environments *function*?

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed*?

How do people's *worldviews* affect their attitudes to and *use* of environments?

NSW SYLLABUS: SCALE

Wetland environment: human induced changes and management

NSW SYLLABUS: OUTCOMES

GE5-8: Student communicates geographical information to a range of audiences using a variety of strategies

GE5-2: Student explains processes and influences that form and transform places and environments

GE5-3: Student analyses the effect of interactions and connections between people, places and environments

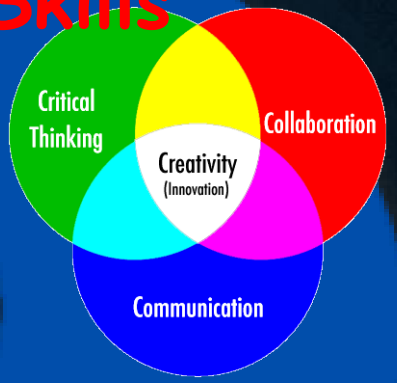
GE5-7: Student acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

GE5-5: Student assesses management strategies for places and environments for their sustainability

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

INTEGRATE IN TEACHING PROGRAM

21st Century Skills



NSW Syllabuses

- 3 Cross Curriculum Priorities
- 10 General Capabilities

NSW Geography Syllabus

- 7 Geographical Concepts
- 5 Geographical Tools
- 3 Geographical Inquiry Skills

GE5-8: Student communicates geographical information to a range of audiences using a variety of strategies

INTEGRATE VISUAL LITERACY

Advertisements
Cartoons
Charts
Collages
Comic books
Diagrams
Dioramas
DVDs
Graphic Novels

Graphs
Icons
Infographics
Magazines
Maps
Memes
Multimodal Texts
Paintings, Photographs

Pictograms
Satellite imagery
Signs
Slide shows
Storyboards
Symbols
Tables, Timelines
YouTube, Videos, Websites


ENVIRONMENT TAUGHT K-9
TOO MUCH REPETITION!
SO MANY CHOICES!
• Program-Scope and Sequence
• Determine prior knowledge
• Stage 5 requires deeper understanding

1.
ENVIRONMENTS
Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

INTERCONNECTIONS: NATURAL ENVIRONMENT

ATMOSPHERE

- weather
- climate

HYDROSPHERE

- water cycle,
- rivers
- oceans

BIOSPHERE

- flora
- fauna

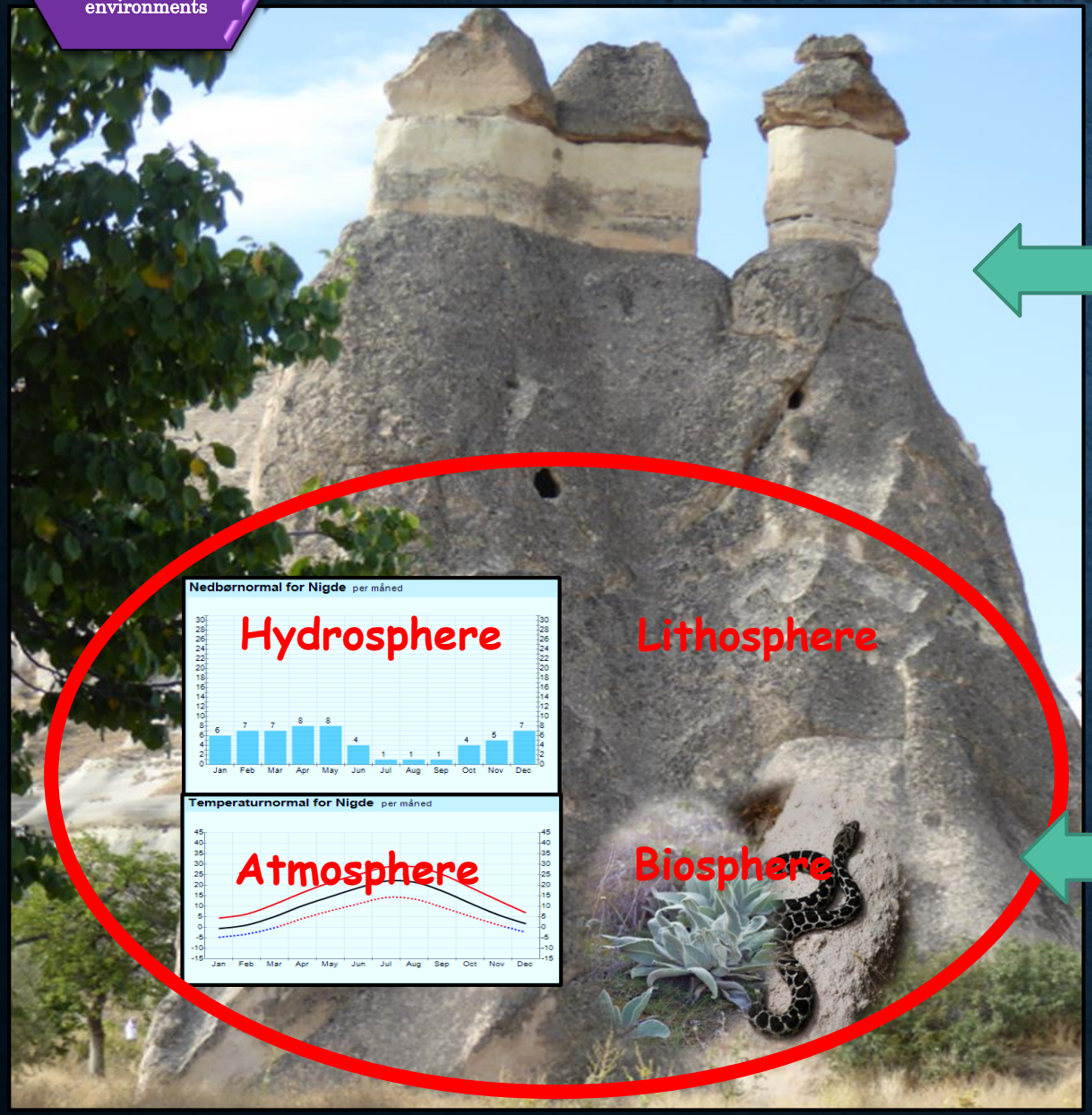
LITHOSPHERE

- landforms
- soil
- weathering
- tectonic forces

GEOGRAPHICAL TOOL: diagram

GE5-2: Student explains processes and influences that form and transform places and environments

PROCESSES AND INTERCONNECTIONS UNIQUE ENVIRONMENT FAIRY CHIMNEYS-CAPPADOCIA, TURKEY



Processes transformed Cappadocia

Landform

- eruption of volcanoes
- hard stone eroded slowly and protected underlying soft rock (tufa) from erosion
- column of soft tufa with a hard boulder perched on top

Now popular tourist destination and **World Heritage Site** to be managed sustainably

Environmental interconnections

- **Landform**: volcanic plain over 1000masl. **Soil**-rich tufa
- **Hydrosphere and Atmosphere**: dry summers, cold winters
- **Biodiversity**: small flora (shrubs) and small fauna (birds, lizards). Result of interactions between A, H and L

GEOGRAPHICAL TOOL: climate graph

NATURAL ENVIRONMENTS
1000'S ECOSYSTEMS

Brisbane Seamounts rise 3500 metres above seafloor, making them roughly same height as Mt Fuji.

Diversity across Earth according to:

- **latitude:** hot-cold temperatures
  - rainforests, tundra, arctic
- **altitude:** low-high landforms
  - ocean trenches, plains, coasts, plateaus, mountains
- **distance:** coastal versus inland (continental)
- **terrestrial versus marine:** grasslands, rivers, wetlands, coral reefs, seamounts

Activity:
How do seamount environments *function*?

https://i.ytimg.com/vi/QUmS0ItTelA/maxresdefault.jpg

GEOGRAPHICAL TOOL: Undersea technology

How do environments *function*?

OCEAN 71% OF EARTH

DIVERSITY OF NATURAL OCEAN ENVIRONMENTS

FROM COASTS TO DEEP SEA

- Littoral zone
- Intertidal zone
- Estuaries
- Kelp forests
- Coral reefs
- Ocean banks
- Continental shelf
- Neritic zone
- Straits
- Pelagic zone
- Oceanic zone
- Seamounts
- Hydrothermal vent
- Cold seeps
- Demersal zone
- Benthic zone

Activity: In groups describe and compare the functioning of two ocean environments

http://oceanheroes.org/wp-content/uploads/2011/06/Ocean-Bound.07.30.2006.png

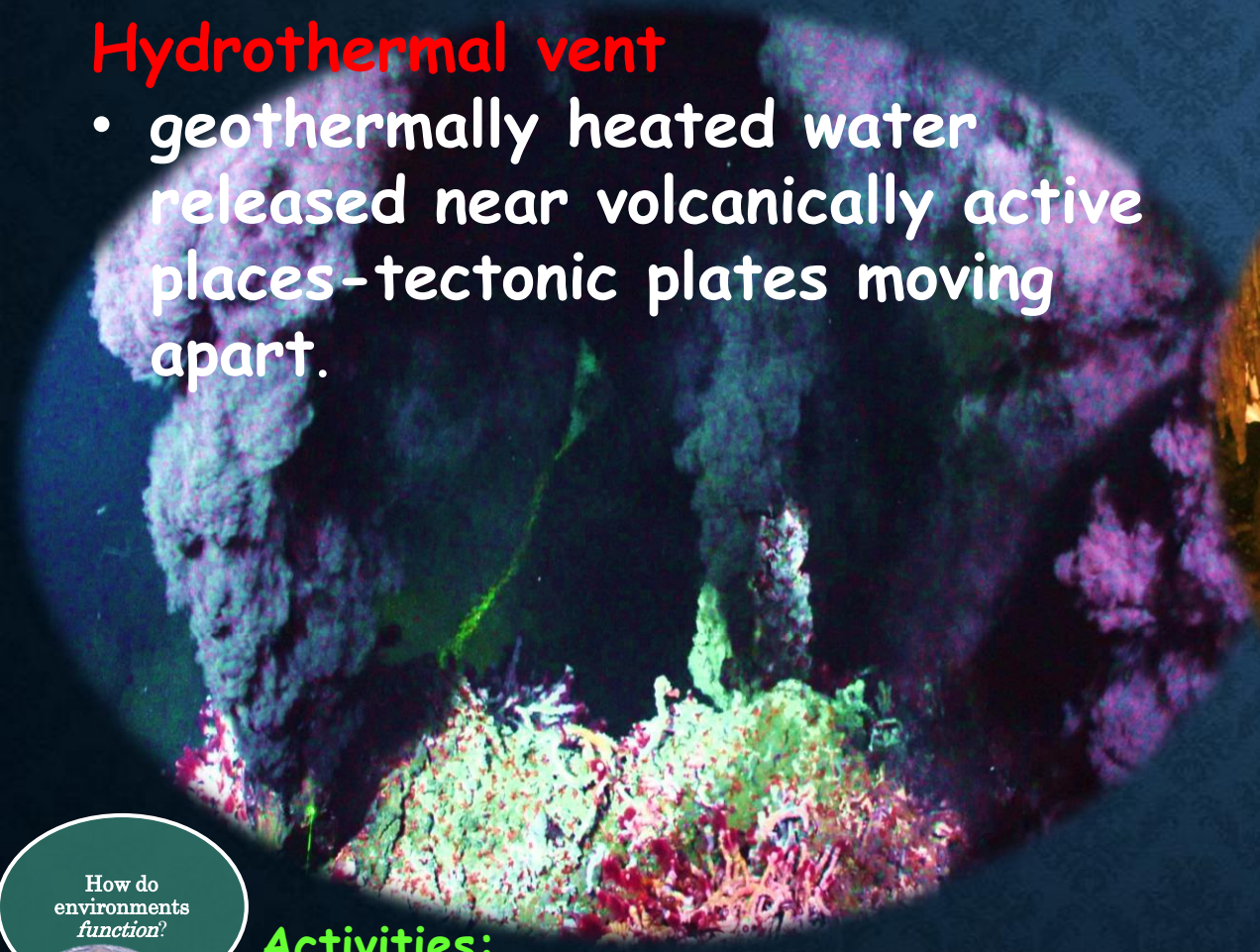
GEOGRAPHICAL TOOL: Multimodal- table, photo

GE5-2: Student explains processes and influences that form and transform places and environments

LET'S GO DEEP!
UNDERSEA VERSUS UNDERGROUND

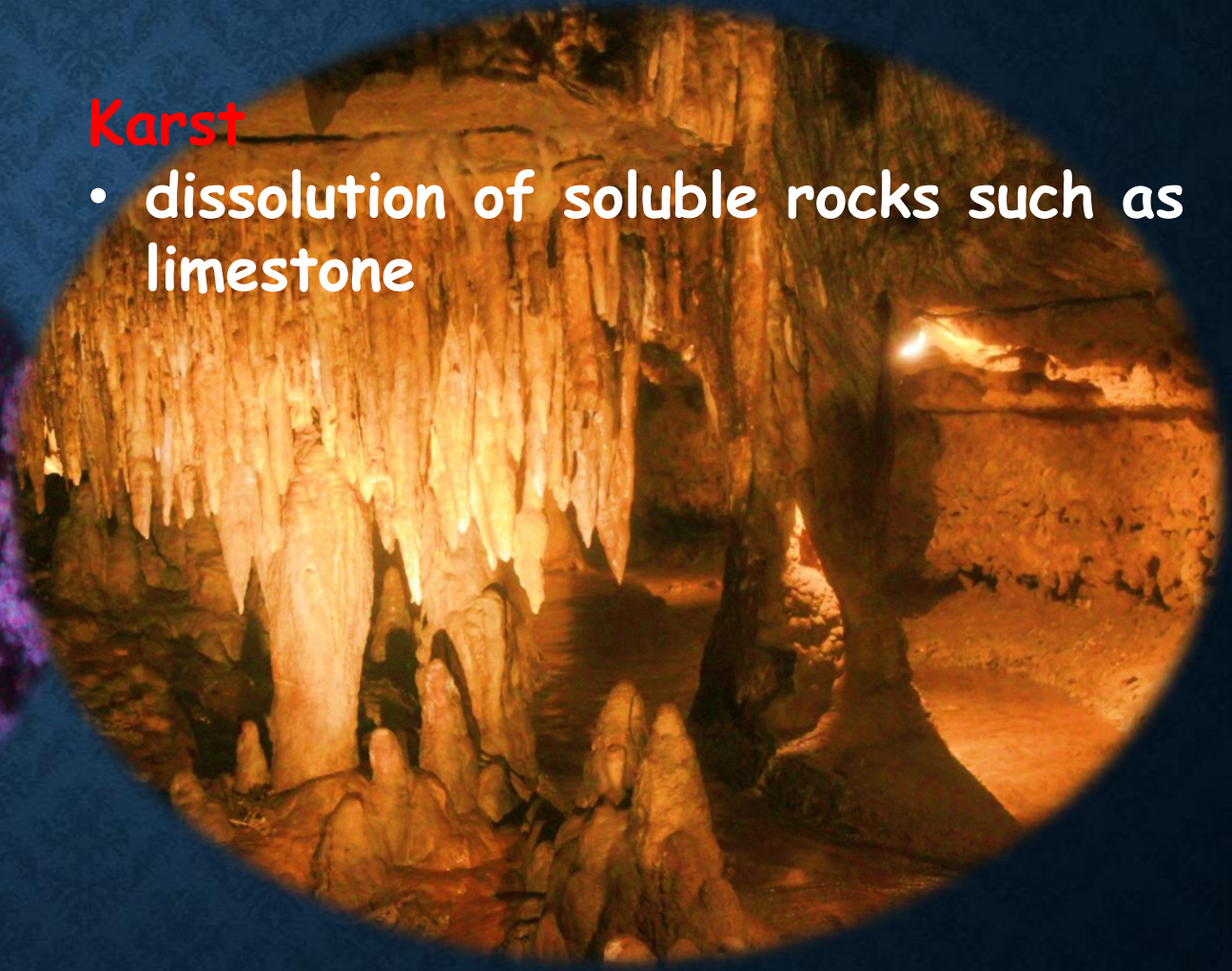
Hydrothermal vent

- geothermally heated water released near volcanically active places-tectonic plates moving apart.



Karst

- dissolution of soluble rocks such as limestone



How do environments *function*?

Activities:

- Where are these environments located?
- How were they formed (processes)?
- Compare the functioning of the two environments.

GEOGRAPHICAL TOOL: photographs

IT'S COMPLICATED!

How do environments *function*?

GE5-2: Student explains processes and influences that form and transform places and environments

DESERT DIVERSITY

PHYSICAL PROCESSES

- Erg (sand)
- Reg (gravel)
- Hamada (rocky plateaus- mesa, buttes)
- Oasis

LOCATION

- Mid latitude
- Rain shadow
- Coastal
- Monsoon
- Polar

Activities:

In groups describe physical processes (e.g. weathering) that formed two desert environments. Compare a polar desert with a coastal desert.

GEOGRAPHICAL TOOL: photographs

1. Investigate role and importance of 'natural' environments

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

WHY DO NATURAL ENVIRONMENTS MATTER

Hawaiian senior scientist:

- Protects
- Nourishes
- Strengthens
- Inspires
- Empowers
- Quenches

http://www.hawaiibusiness.com/20-for-the-next-20-2017-hawaiis-people-to-watch/6/

1. Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ROLE AND IMPORTANCE OF NATURAL ENVIRONMENTS

SOCIAL

recreation, food, aesthetic appreciation, religious and spiritual values, improve human wellbeing, medicine and creativity

ENVIRONMENTAL

oxygen, water, energy source, food webs

ECONOMIC

employment, economic growth, industrial products, energy, eco-tourism

Activities: Why do you need to understand the role and importance of natural environments?
List the role and importance of the natural environment to you, today!

GEOGRAPHICAL TOOL: multimodal

1. Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ROLE, IMPORTANCE RIVER ENVIRONMENT

Animal, plant and aquatic habitat

Water use- domestic, agriculture, industry, mining

Religion e.g. Ganges for Hindus

Energy- Hydroelectricity

Transport

Recreation and tourism

Food

Activities: Describe the role and importance of clean water.
Draw a two column table illustrating the causes and consequences of polluted rivers on people, places and environments in a developing country.

GEOGRAPHICAL TOOL: diagram

1. Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ROLE: IMPORTANCE FOREST ENVIRONMENT

- removes CO^2
- provides O^2
- food (food webs)
- habitats for animals and birds
- provides timber, fuel, rubber
- 300 million people live in forests- shelter, food, clothes, lifestyle

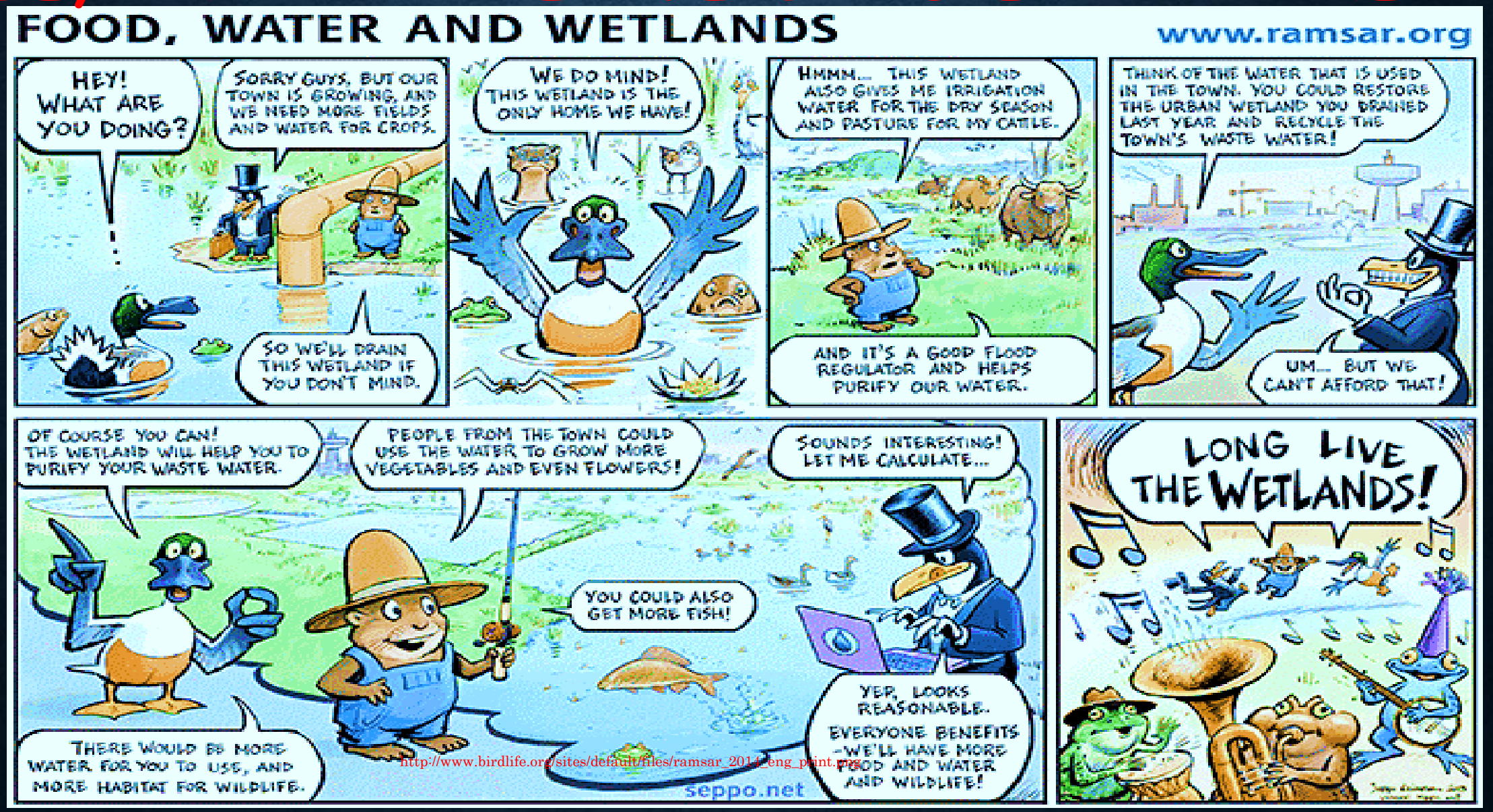
Activities: In groups, research the role and importance of forest environments to traditional forest dwellers. For example in India, Australia, PNG or Indonesia

GEOGRAPHICAL TOOL: multimodal

ROLE, IMPORTANCE: WETLAND ENVIRONMENT

1. Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?



http://www.birdlife.org/sites/default/files/ramsar_2014_eng_print.pdf

Activities: List importance of wetlands to the environment. What are the threats to wetlands?

GEOGRAPHICAL TOOL: cartoon

1. Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ROLE, IMPORTANCE

Coral Reef

Ecosystem Services

Tourism & Recreation

Coral reefs attract millions of tourists every year, bringing important income to coral reef communities. Some countries derive **more than half of their gross national product** from coral reef industries.

Medicine

Coral reef species are **providing new medical compounds and technology** to treat serious diseases. More than half of all new cancer drug research is focusing on marine organisms.

Food & Fishing

Coral reefs sustain the fish and shellfish populations that **provide protein for 1 billion people.** Reefs are nurseries for many commercially valuable species.

Coral reefs provide nearly **$400 billion a year to millions of people** in economic goods and ecosystem services.

Coastal Protection

Coral reefs act as natural wave barriers that **protect coastal communities and beaches** from storm damage.

Coral reefs act as homes and nurseries for 25% of all marine life.

Though they cover less than 1% of the ocean floor, coral reefs provide habitat for **250,000 known species,** including more than **4,000 species of fish and 700 species of coral.**

Many coral reef species have yet to be discovered. Scientists believe that **more than 1 million species** are associated with coral reefs.

Coral Reefs

are created by many tiny **animals** called **coral polyps.**

The coral polyps' **limestone skeletons** build up over time, forming the base of the complex reef habitat that supports the world's **highest level of marine biodiversity.**

Coral reefs are found in over 100 countries

http://kdegnr.weebly.com/uploads/2/1/5/7/21574882/9037993_orig.jpg

Activities: Why are coral reefs important? What is their role in the ocean ecosystem?
Explain processes that cause coral bleaching and its impacts on coral reef ecosystems.
Why is an understanding of environmental processes important for sustainable management of coral reefs?

GEOGRAPHICAL TOOL: infographic

1. Investigate role and importance of 'natural' environments

ROLE, IMPORTANCE FERTILE SOIL

ECONOMIC

employment (agriculture), exports (minerals, crops)

SOCIAL

health, improved human wellbeing

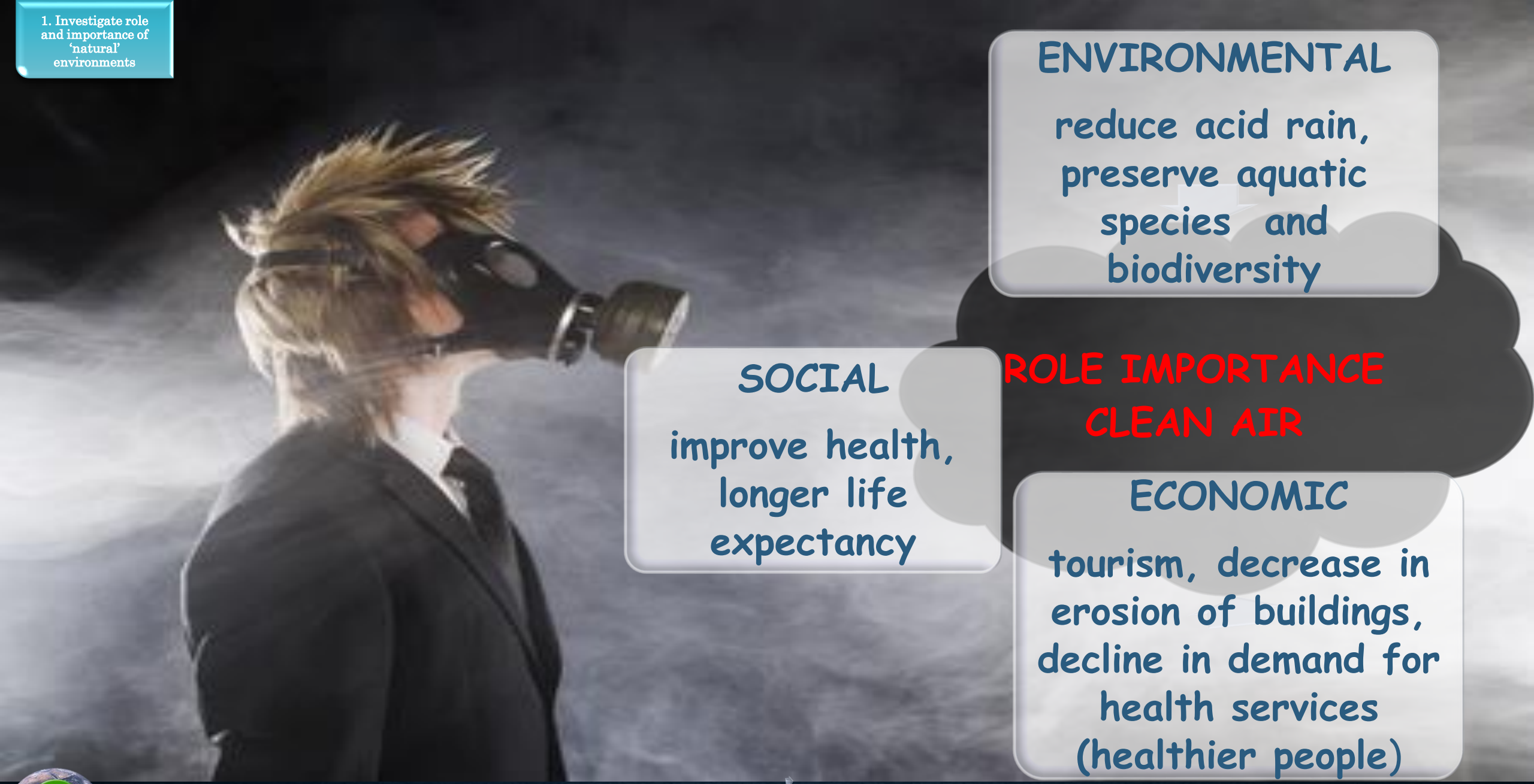
ENVIRONMENTAL

productive land, conserve food species, organic, permaculture farming

Activity: Explain the role and importance of soil for food security

GEOGRAPHICAL TOOL: diagram

1. Investigate role and importance of 'natural' environments



ENVIRONMENTAL

reduce acid rain, preserve aquatic species and biodiversity

SOCIAL

improve health, longer life expectancy

ROLE IMPORTANCE CLEAN AIR

ECONOMIC

tourism, decrease in erosion of buildings, decline in demand for health services (healthier people)

GEOGRAPHICAL TOOL: diagram

Activity: Research air pollution in China (causes and impacts). Present as a mind map.
Compare air pollution in Sydney with Chinese city today (AQI)-include maps, statistics.

1. Investigate role and importance of 'natural' environments

GE5-8: Student communicates geographical information to a range of audiences using a variety of strategies

Activities

- Discuss importance of the 'natural' environment as an e-Mind Map.
- Name four components of the natural environment
- List role and importance of forests and rivers
- Explain environmental, economic and social importance of clean air, fertile soil and coral reefs.
- In groups, refer to the infographic and discuss the role and importance of the coconut tree as a short response.

Infographic: http://media.mercola.com/assets/images/infographic/coconut-uses.jpg

GEOGRAPHICAL TOOL: infographic

ALTERNATIVE TEACHING APPROACH

Kakadu National Park Wetlands

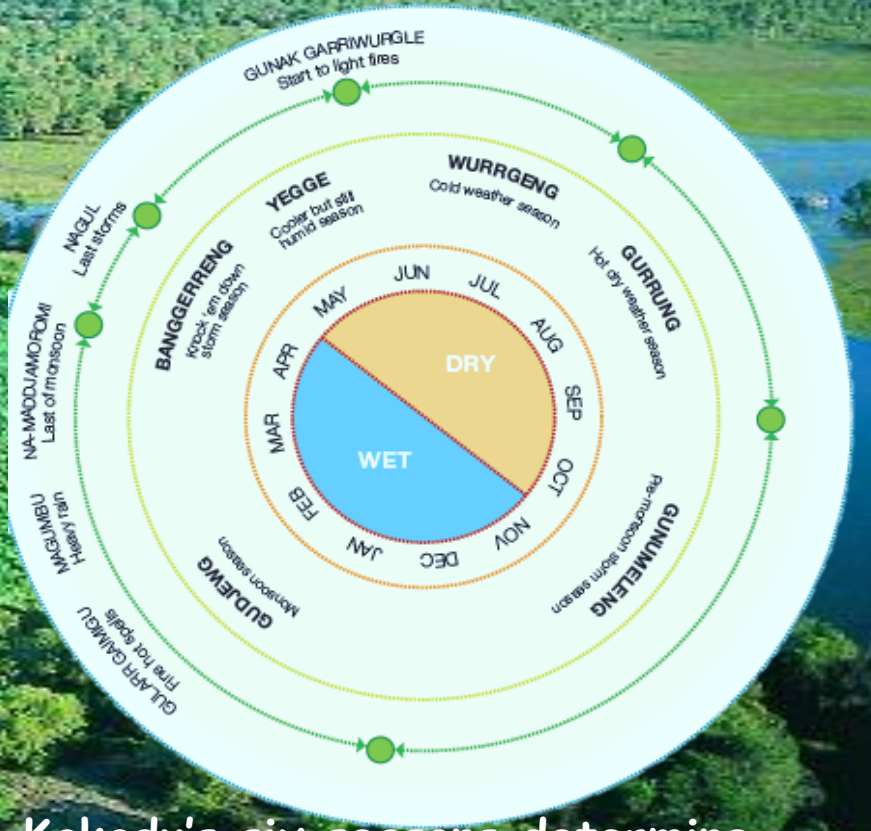
1. ENVIRONMENTS
Investigate role and importance of 'natural' environments

2. ENVIRONMENTAL CHANGE
Investigate human-induced environmental changes across range of scales (local, national, regional, global)

Integrate 1,2,3,4 of Syllabus e.g. Wetlands

3. ENVIRONMENTAL MANAGEMENT
Investigate environmental management, different worldviews, management approaches of Aboriginal and Torres Strait Islander Peoples

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.



Kakadu's six seasons determine sustainable use of environmental resources

Comparisons

Asia : Backwaters of Kerala, India

Africa: Okavango, Botswana Africa

GEOGRAPHICAL TOOL: pie graph

2. Investigate human-induced environmental changes across range of scales (local, national, regional, global)

2. ENVIRONMENTAL CHANGE HUMAN-INDUCED ACROSS RANGE OF SCALES

http://www.see-change.org.au/wp-content/uploads/2014/12/Environment_Project.jpg

Image: www.ourbreathingplanet.com/communicating-climate-change-where-did-scientists-go-wrong

LIVING IN THE ANTHROPOCENE

Anthropocene: new geologic epoch
Began 10,000 years ago with end of last glacial period

http://sydney.edu.au/environment-institute/wp-content/uploads/2013/12/The-Banker_Landscape.jpg

POPULATION	
1804	1 billion
2018	7.5 billion
2050	9 billion
2300	36 billion

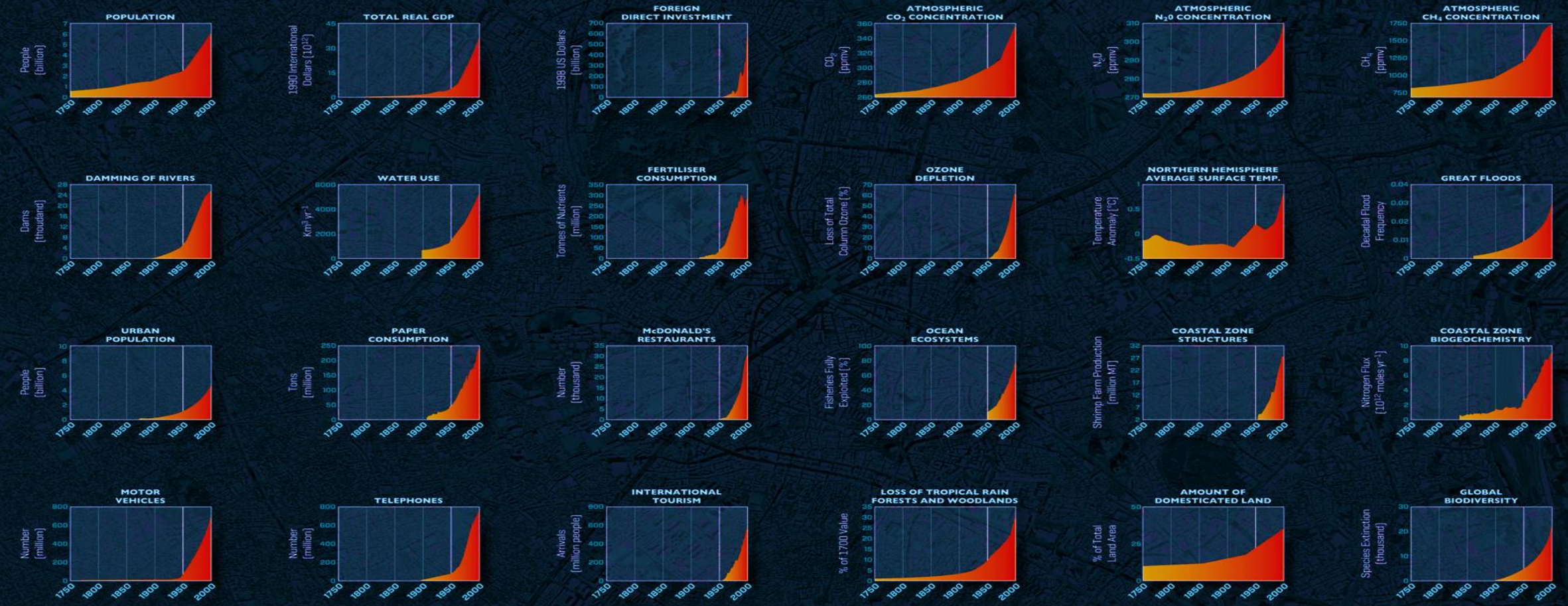
https://evolution-institute.org/wp-content/
1073x630.png

THE ANTHROPOCENE

The Anthropocene defines Earth's most recent geologic time period as being human-influenced, or anthropogenic, based on overwhelming global

Activity: Refer to the following line graphs and explain how humans have changed atmosphere, hydrosphere, lithosphere and biosphere. Include statistics (numeracy)

2. Investigate human-induced environmental changes across range of scales (local, national, regional, global)



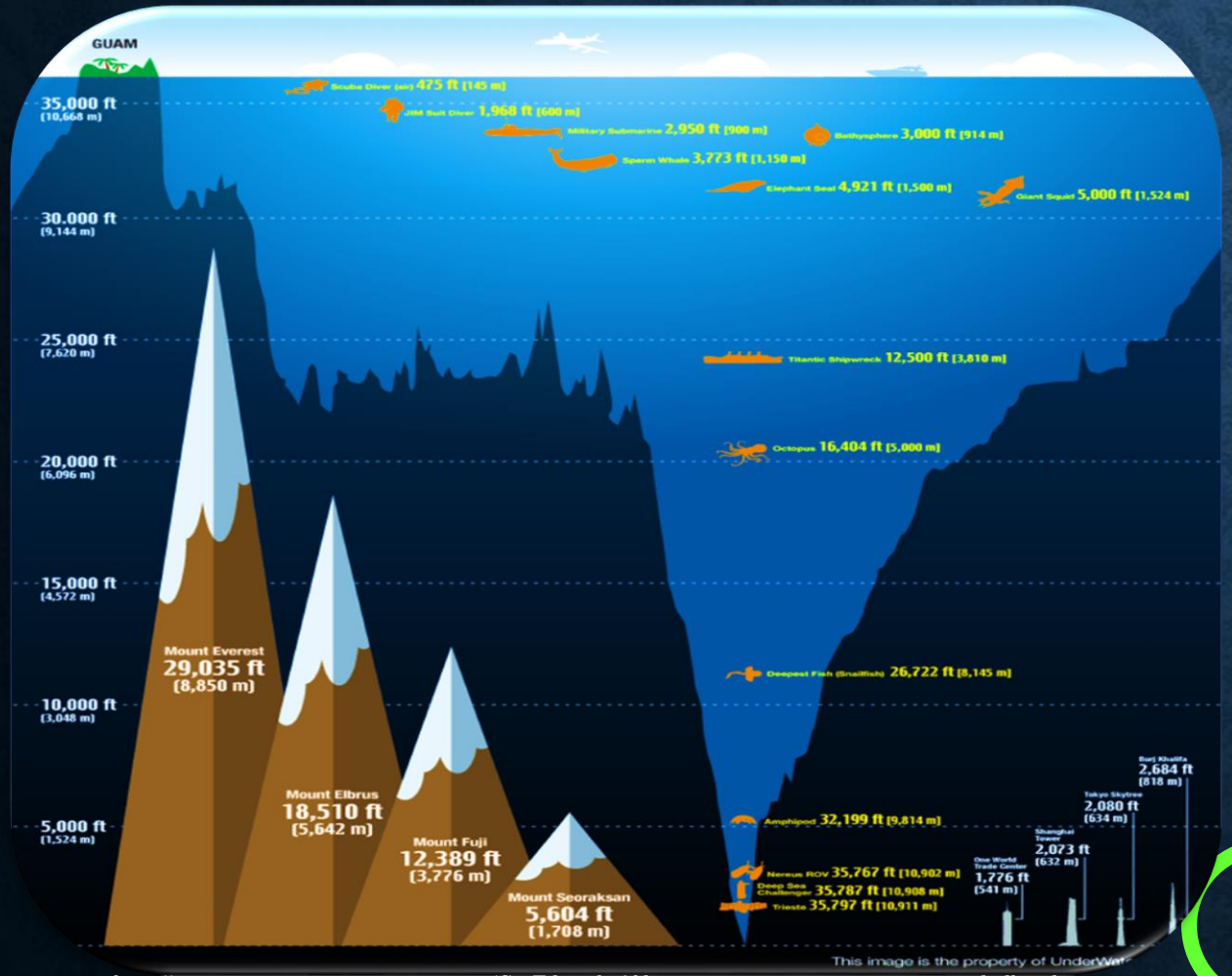
SOURCE: igbp.net | Steffen et al., 2005, Global Change and the Earth System, Springer, pp. 132-133
DESIGN: Globaia.org

http://globaia.org/wp-content/uploads/2013/09/the_anthropocene_igbp_globaia1.jpg

GEOGRAPHICAL TOOL: graphs

2. Investigate human-induced environmental changes across range of scales (local, national, regional, global)

EVEN EARTH'S EXTREME ENVIRONMENTS ARE AFFECTED BY HUMAN ACTIVITIES



http://iucncongress.ipostersessions.com/GetFile.ashx?file=ee365570-e00a-4840-8256-3182d0db20de.png
https://s-media-cache-ak0.pinimg.com/736x/75/c6/46/75c6463e6dd823ef192544f5944363af.jpg

NEWS ITEM!

'Human waste left by climbers on Mt Everest is causing pollution and could spread diseases'

'Mariana Trench-marine animals contaminated with persistent organic pollutants'

Compare Mariana Trench with Mt Everest

- Where are they located?
- How were they formed?
- Explain their unique environments
- Human fingerprint is found at both locations. Explain this statement
- Explain why they should be managed sustainably

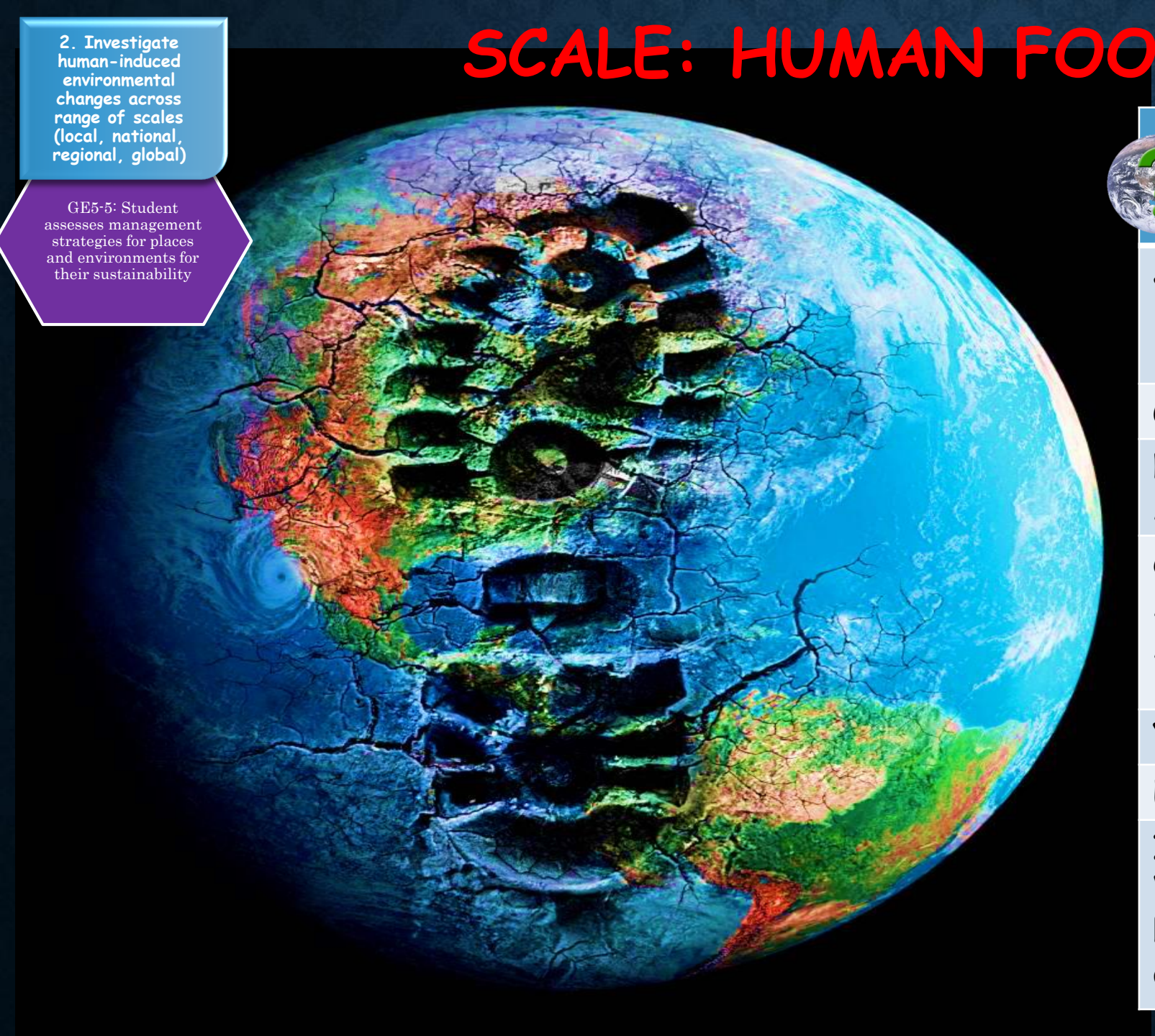
Watch life in the Mariana Trench video http://www.abc.net.au/news/2017-02-14/earths-deep-ocean-mariana-and-kermadec-trenches-highly-polluted/8260168

GEOGRAPHICAL TOOL: multimodal

SCALE: HUMAN FOOTPRINT

2. Investigate human-induced environmental changes across range of scales (local, national, regional, global)

GE5-5: Student assesses management strategies for places and environments for their sustainability



Activity
Large and growing Ecological Footprint (EF)

Scale	What is the EF?	How can EF be reduced?
Global		
National- Australia		
Country in Asia, EU, Africa		
You		
Explain reasons for differences		
Is this sustainable? What actions from local-global should be taken to live sustainably? (Civics and Citizenship)		

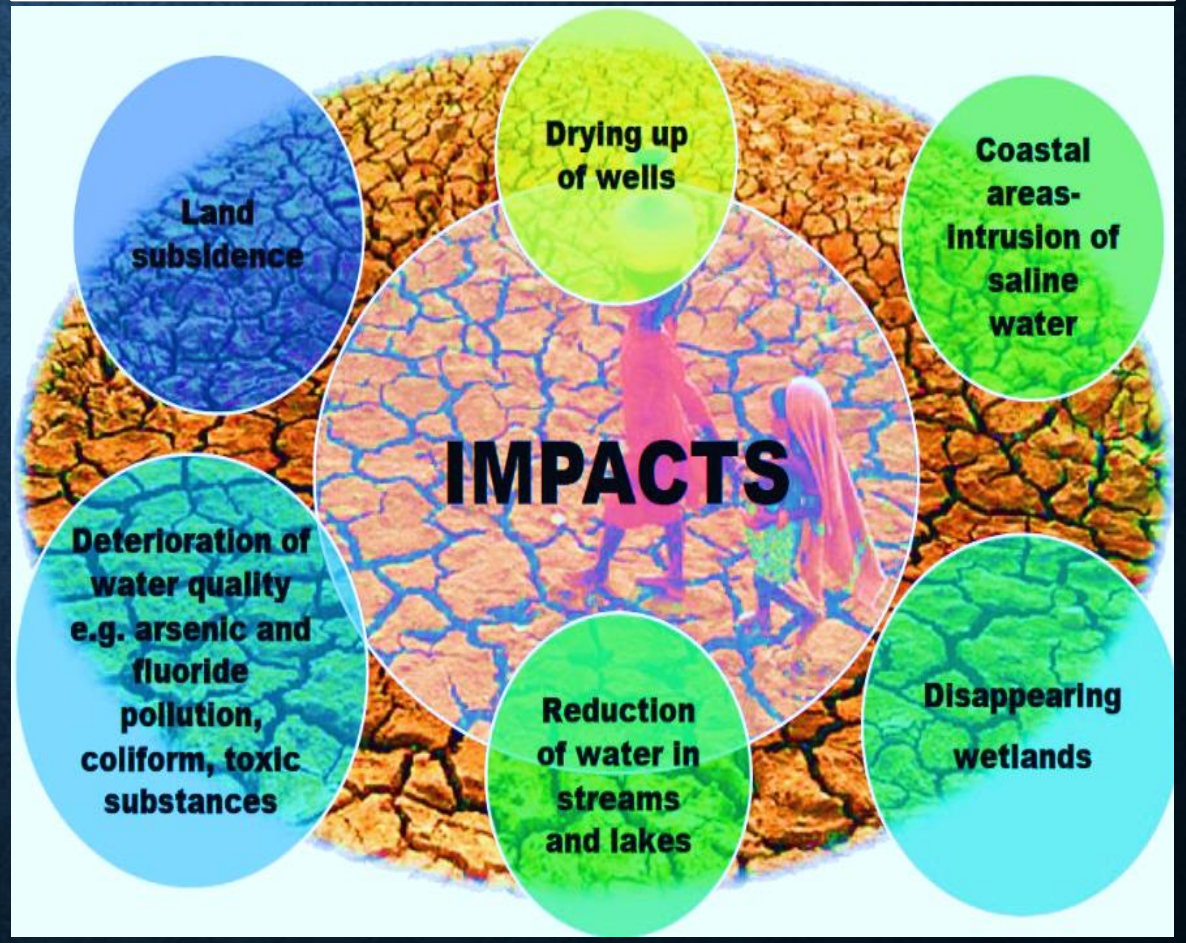
GEOGRAPHICAL TOOL: table

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-2: Student explains processes and influences that form and transform places and environments

UNDERGROUND ENVIRONMENTS IMPACT ON ABOVE GROUND ENVIRONMENTS (processes, interconnections)

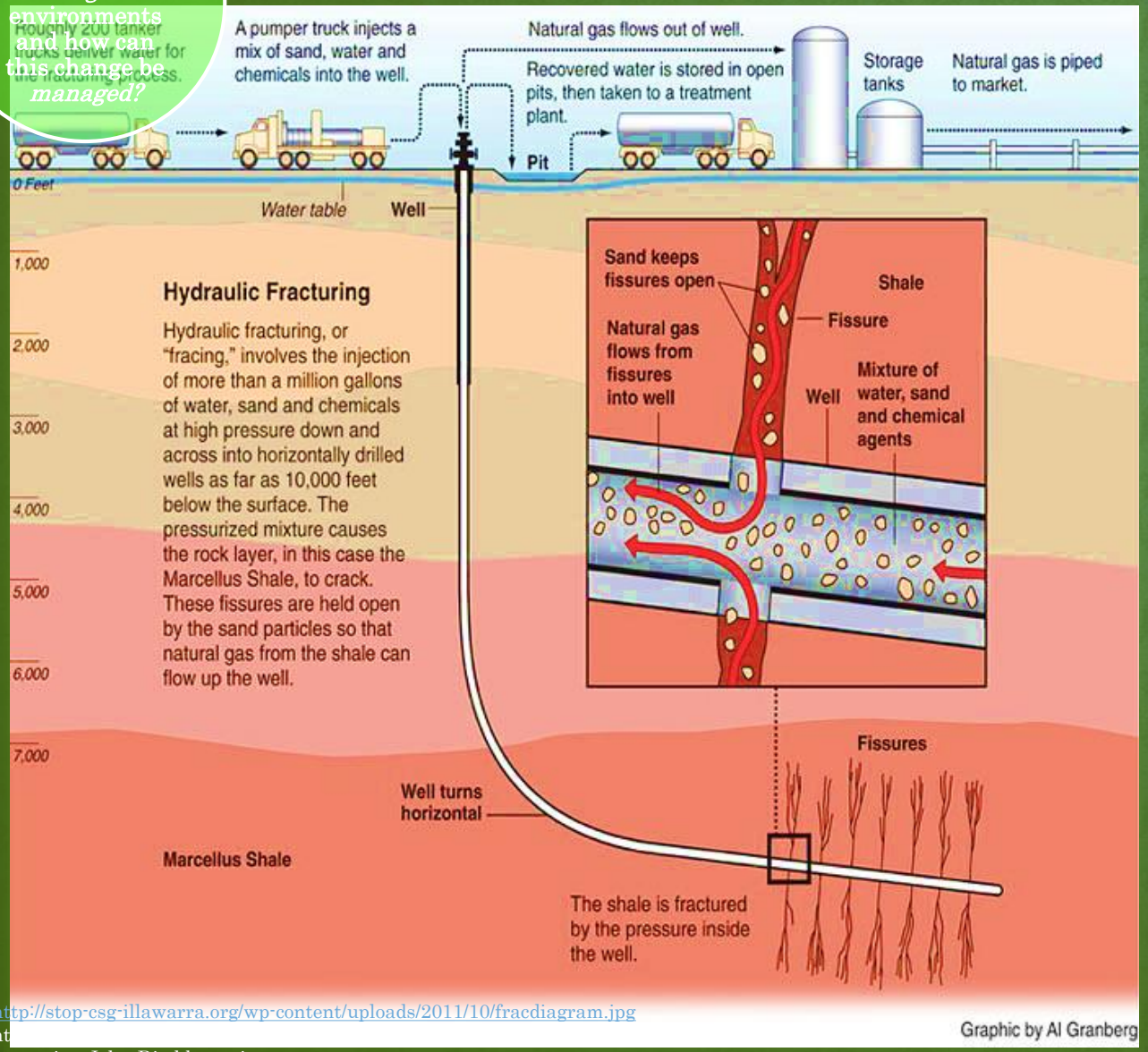
Impacts of human over-extraction of groundwater on above environments



GEOGRAPHICAL TOOL: diagrams

COAL SEAM GAS AND FRACKING THREATENS WETLANDS, RIVERS, GROUNDWATER

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*



http://stop-csg-illawarra.org/wp-content/uploads/2011/10/fracdiagram.jpg

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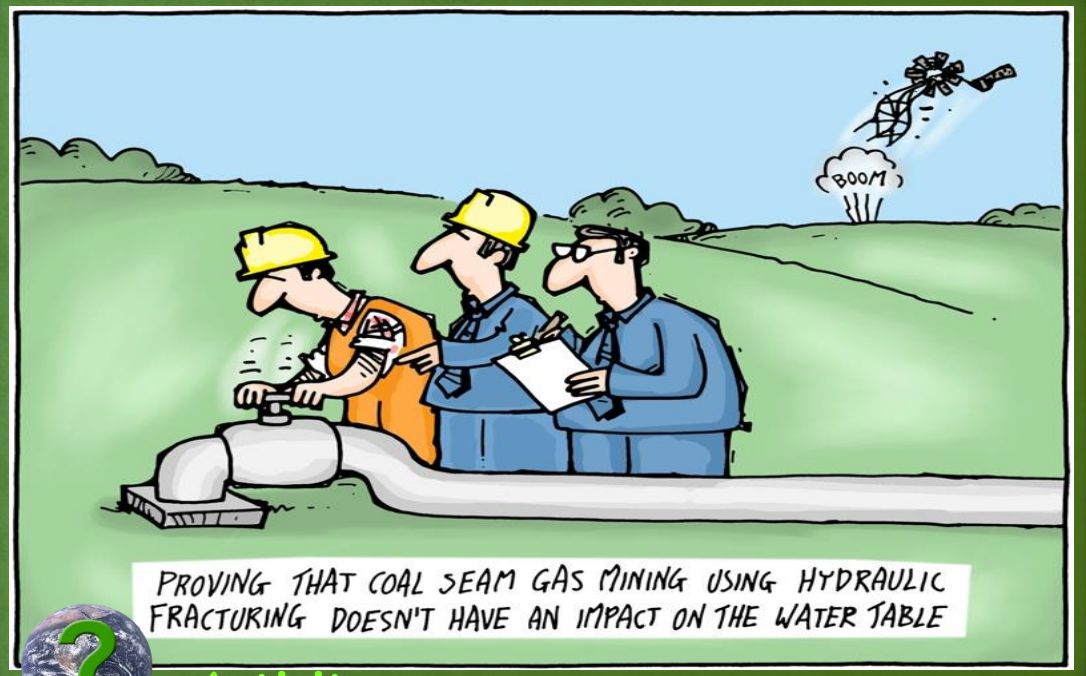
fracturing-John-Ditchburn-.jpg



Activity

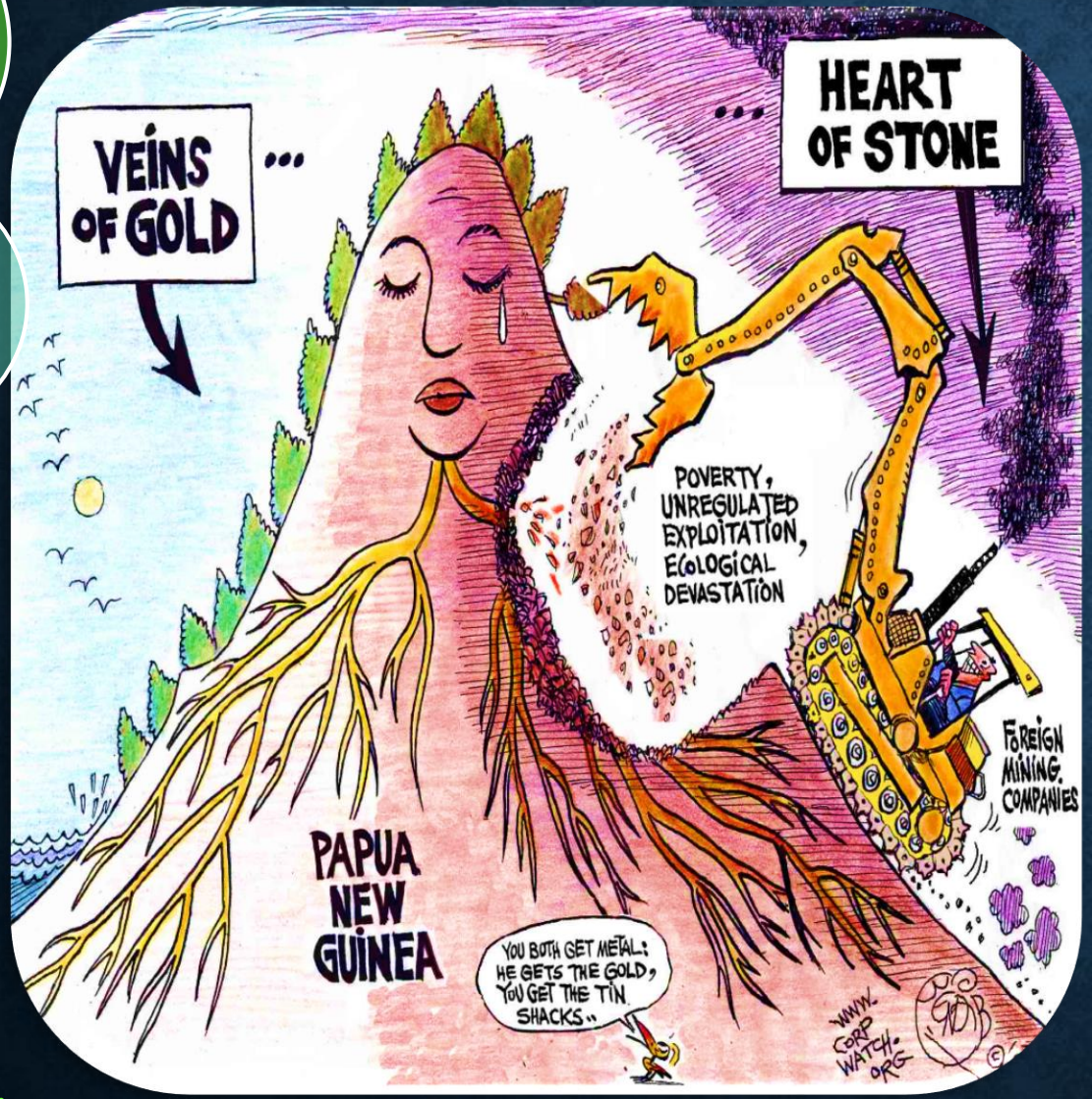
- What is fracking?
- Where does fracking occur?
- What are the adverse impacts of fracking on the environment?
- Explain different perspectives on this controversial issue.
- Discuss the message in the cartoon

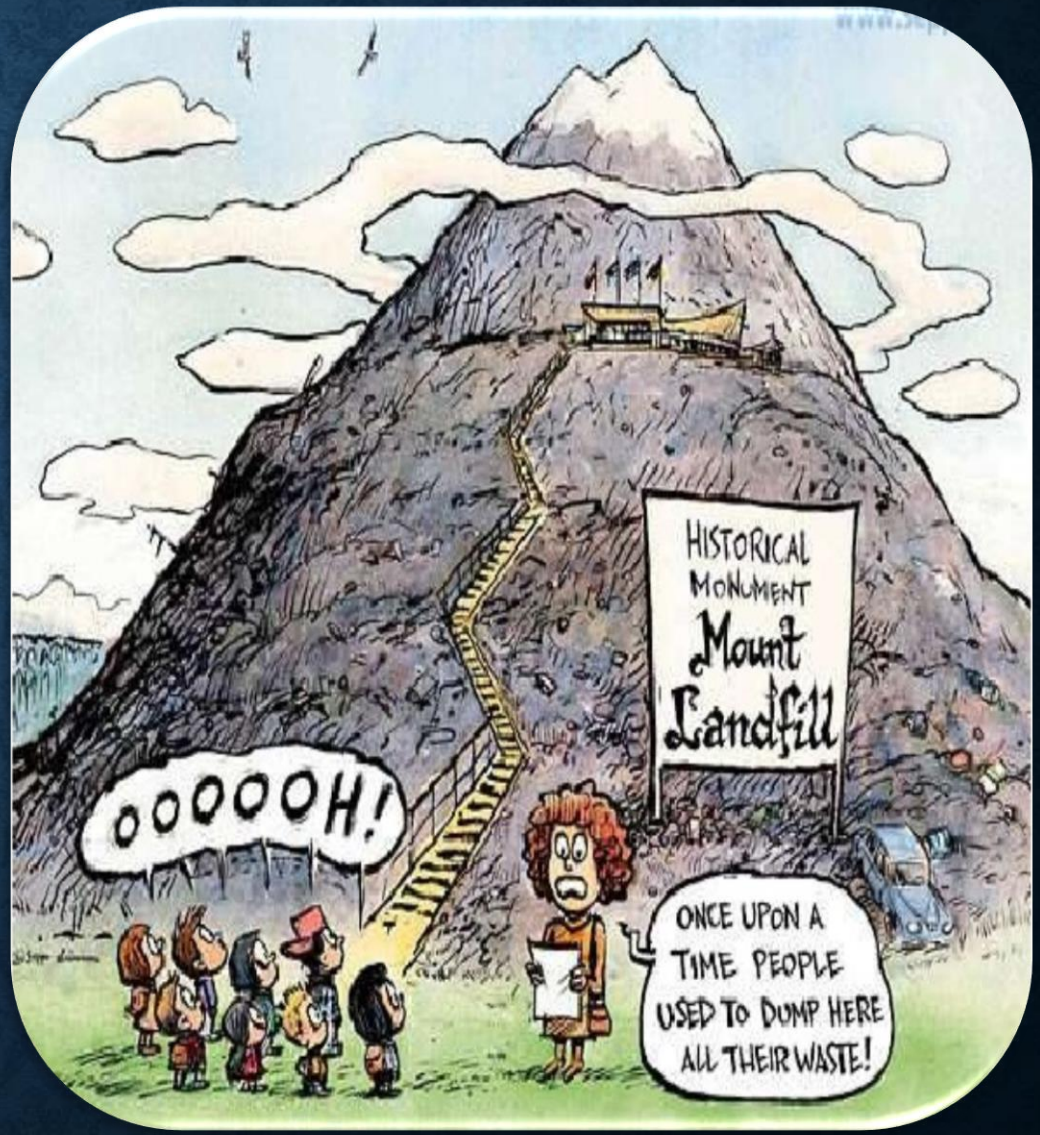
GEOGRAPHICAL TOOL: cartoon, diagram

VANISHNG LAND VERSUS EXPANDING LAND

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?





Activity:
Explain the causes and consequences of human-induced environment changes?
Suggest management strategies

GEOGRAPHICAL TOOL: cartoons

GE5-7: Student acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

ABOVE GROUND: STORIES BEHIND SATELLITE IMAGES
INLAND SEA: ARAL SEA, UZBEKISTAN, KAZAKHSTAN

http://storymaps.esri.com/stories/landsatcompare/

Diversion of rivers for cotton irrigation shrunk Sea by 75% over last 50 years.

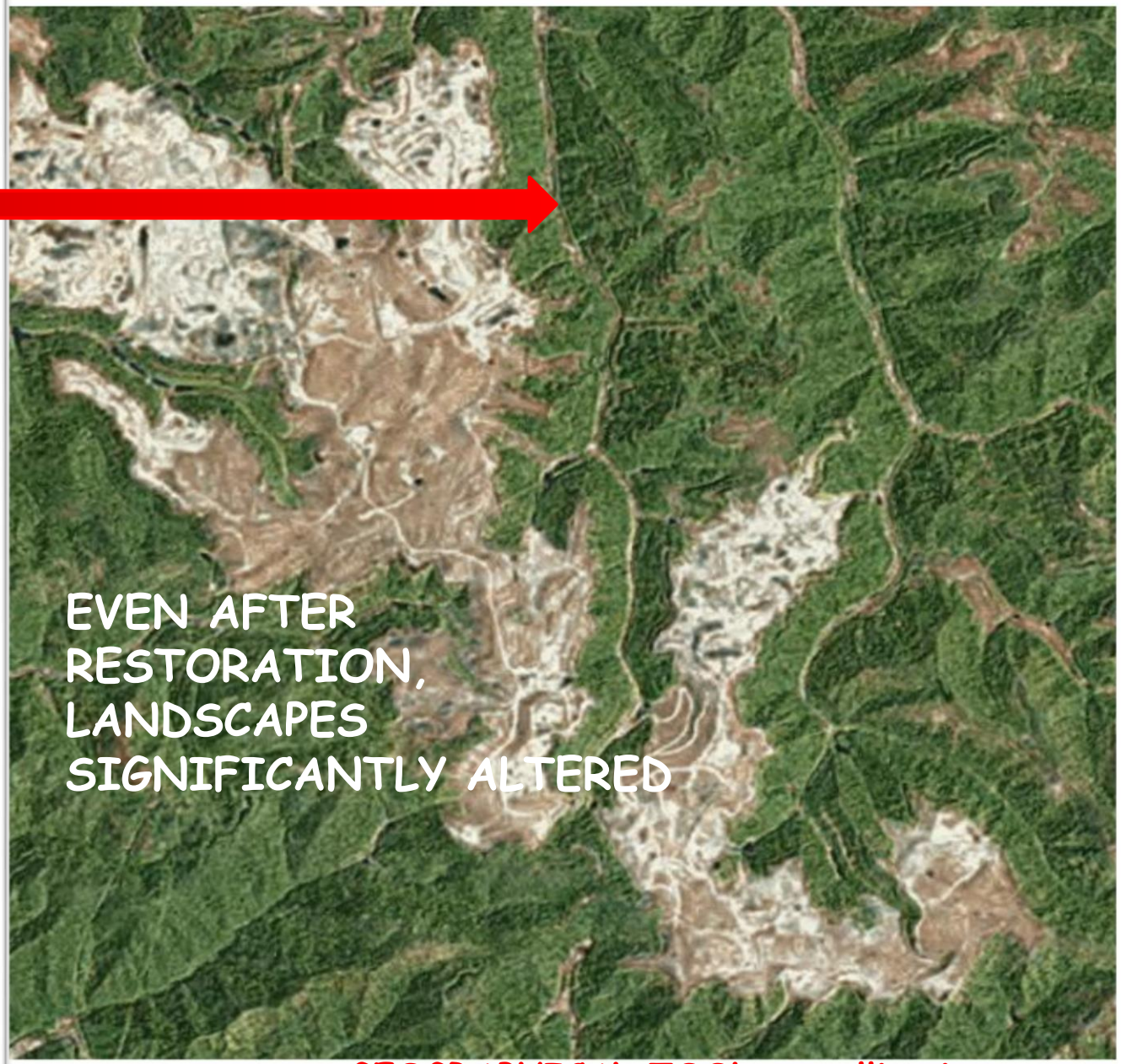
What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

GEOGRAPHICAL TOOL: satellite imagery

MINING: MOUNTAINTOP REMOVAL, VIRGINIA USA

http://storymaps.esri.com/stories/landsatcompare/



What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GEOGRAPHICAL TOOL: satellite imagery

AGRICULTURE: CATTLE FEEDLOT TEXAS, USA

http://www.dailymotion.com/thirtyeight

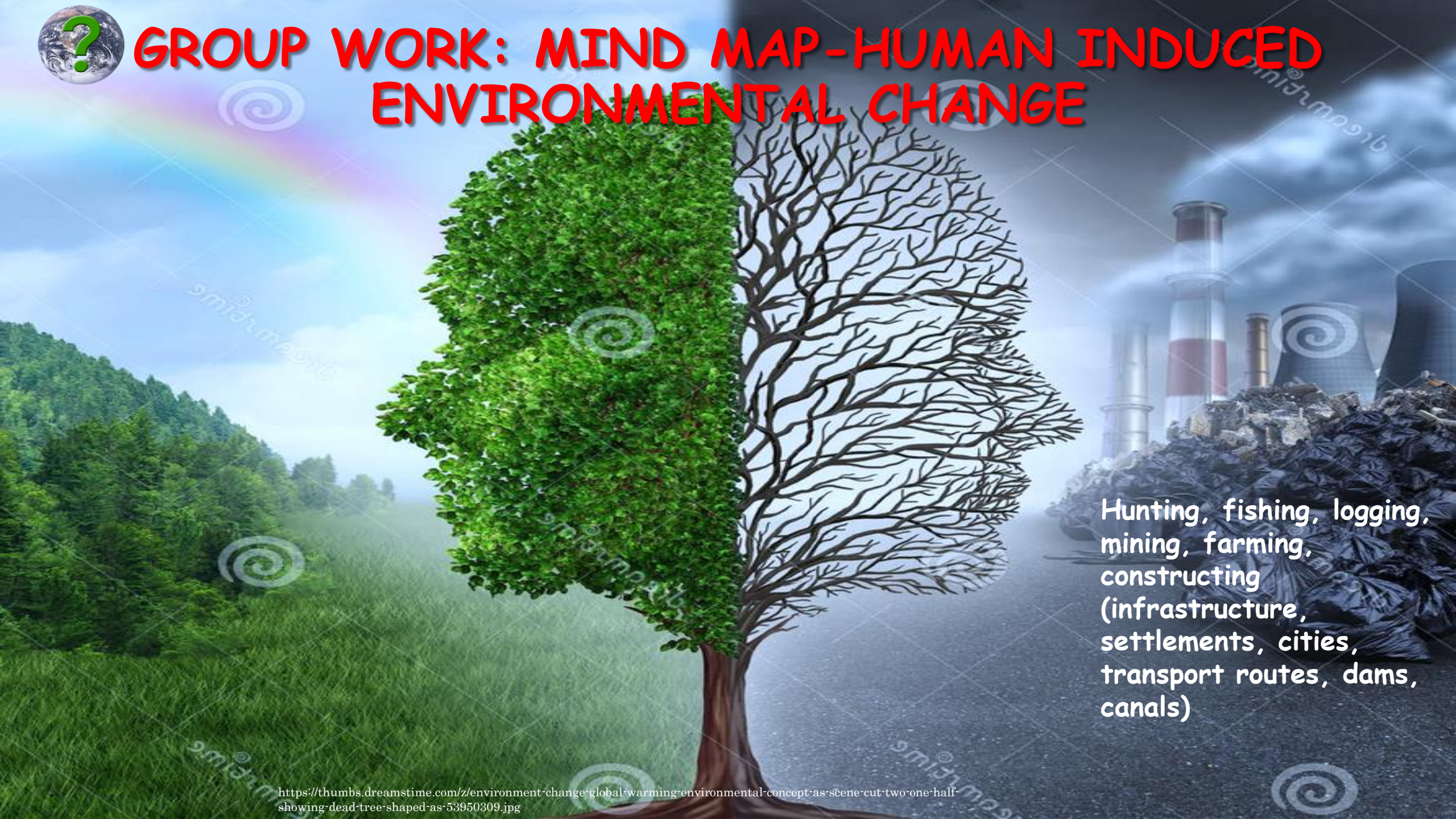
URBAN-TOURISM: DUBAI BUILDS ARTIFICIAL ISLANDS

http://www.vox.com/2015/4/7/8352381/anthropocene-nasa-images

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GEOGRAPHICAL TOOL: satellite imagery

GROUP WORK: MIND MAP-HUMAN INDUCED ENVIRONMENTAL CHANGE



Hunting, fishing, logging, mining, farming, constructing (infrastructure, settlements, cities, transport routes, dams, canals)

https://thumbs.dreamstime.com/z/environment-change-global-warming-environmental-concept-as-scene-cut-two-one-half-showing-dead-tree-shaped-as-53950309.jpg

Activity: Divide class into 4 groups-lithosphere, biosphere, hydrosphere, atmosphere. Investigate five human induced environmental changes using a variety of sources.

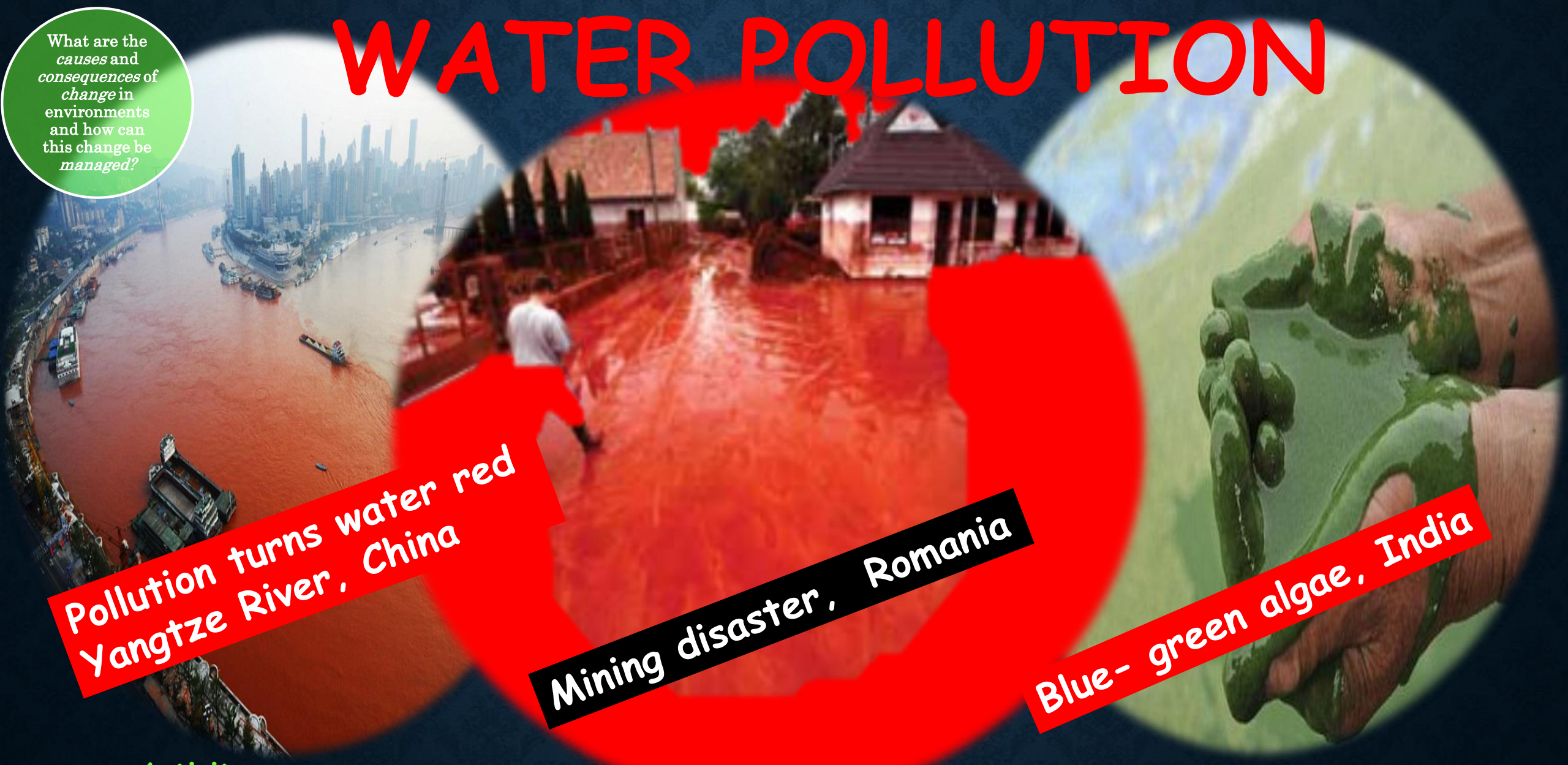
http://www.businessinsider.com.au/china-water-pollution-2013-6?r=US&IR=T

Present investigation using web 2.0 tools such as a Prezi.

https://static1.squarespace.com/static/53bdd66be4b0817cc87aaf13/t/53e70241e4b0c0d88b59f26b/1407648328995/Honey+Bee+-+Honeycomb+Yellow.jpg?format=1500w

WATER POLLUTION

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*



Pollution turns water red
Yangtze River, China

Mining disaster, Romania

Blue- green algae, India

Activity:
Select and annotate 10 examples using visual literacy. Identify scale.
What are the causes and consequences of these environmental changes?

GE5-2: Student explains processes and influences that form and transform places and environme

GE5-3: Student analyses the effect of interactions and connections between people, places and environments

WATER POLLUTION IN CHINA

What are cancer villages?

Where are cancer villages located?
What are the links to polluted rivers?

What are the human-induced changes causing cancer villages?

What are the consequences of polluted rivers to people and environments?

What is the relationship between industry and agriculture and the different types of water pollution affecting cancer villages?

How does cancer causing toxic waste enter water bodies, soil and crops? (processes)

Why is an understanding of environmental processes and interconnections essential for the sustainable management of environments?

What are the government plans to reduce cancer villages?
What are the future trends if the implementation of sustainable plans are ignored?

Source: http://forum.thefreedictionary.com/poststt34235_Chinese-Cancer-Villages-Officially-Acknowledged.aspx

Activity

- Complete questions
- Investigate causes and impacts of arsenic in water such as in Bangladesh.
- Answer the outcomes 2 and 3 (see above). Present research using web 2.0 tools

GEOGRAPHICAL TOOL: multimodal

COCA COLA CAUSES WATER CRISES IN INDIA

GE5-2: Student explains processes and influences that form and transform places and environments

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Activity:

Explain cause-effect interactions e.g. factories pollute rivers, decline in biodiversity and food security.

How have active citizens responded?

Debate whether these changes to the environment are sustainable

Civics and Citizenship (GC), Asia (CCP)

GEOGRAPHICAL TOOL: multimodal

Ampersand by B. Deutsch amptoons.com

ISN'T IT ARROGANT OF COKE TO COME TO INDIA AND USE UP OUR CLEAN WATER, WHICH WE NEED FOR FARMING AND DRINKING, JUST TO MAKE SOFT DRINKS?

ACTUALLY, LESS THAN A THIRD OF THE WATER IS EVEN USED TO MAKE COKE PRODUCTS!

THEN WHERE DOES—?

MOST OF IT GOES TO WASHING CRATES AND FACTORY FLOORS. WE COULD USE RECYCLED WATER, BUT THAT WOULDN'T MAKE THE FLOORS SPARKLE!

YOU USE MY FAMILY'S FRESH DRINKING WATER TO WASH YOUR FLOORS?

I KNOW! WHAT AN HONOR FOR YOU!

CAN'T THEY JUST WATER THEIR CROPS WITH COKE?

GEOGRAPHICAL TOOL: cartoons

INVESTIGATE WATER FOOTPRINT OF CUP OF COFFEE

What are the *causes* and *consequences* of *change* in environments?

When you pay $3 for cup of coffee have you wondered about its water footprint?

Over 200 litres of water to make one large café latte

Least amount of water-brew coffee
Largest amount-grow coffee

Most of world's coffee requires water to ferment and wash coffee prior to drying beans.

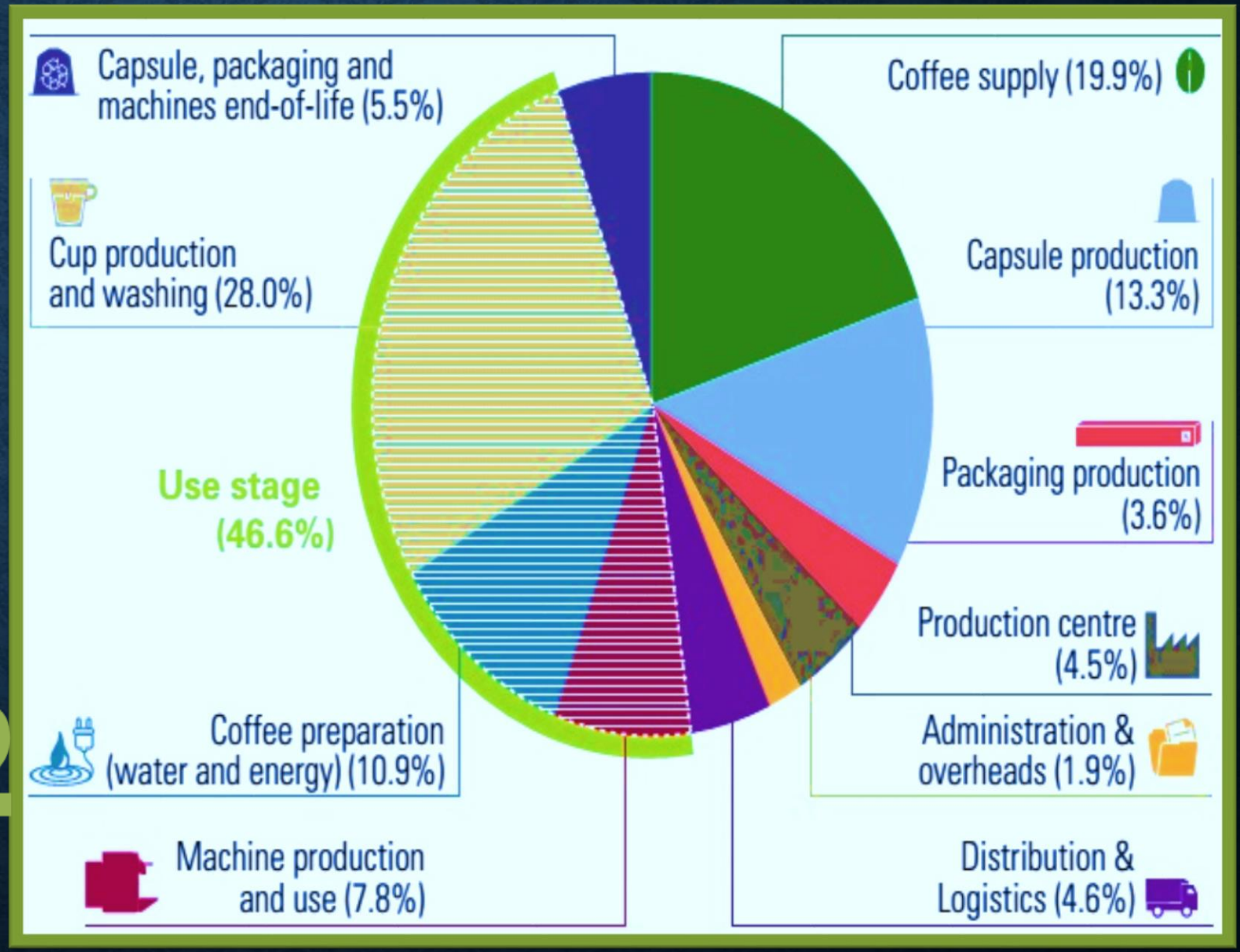
Scale moves from global (trade from producer to consumer) to personal

Product	Litres of water
Grow coffee	142.8
Brew coffee	0.05
Process coffee and grow sugar	7.6
Produce milk	49.4
Plastic lid, paper cup and sleeve	8.1

GEOGRAPHICAL TOOL: graph, visual literacy

CARBON FOOTPRINT: NESPRESSO CUP OF COFFEE

What are the *causes* and *consequences* of *change* in environments?



http://www.eco-business.com/media/uploads/ebmedia/fileuploads/carbon_footprint_of_a_nespresso_cup_of_coffee_in_2012_actual.jpg

GEOGRAPHICAL TOOL: pie graph

MILLIONS OF KG OF WASTE DUMPED IN OCEAN

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Activity

- Why is this graphic a contemporary human-induced environmental issue?
- How long does this waste remain in the environment?
- What are the causes and impacts on people and environments?
- What strategies should be implemented for a sustainable ocean from personal to global scale?

https://37tx5035jacw32yb7m4b6qev-wpengine.netdna-ssl.com/wp-content/uploads/2014/10/ocean-garbage-decomposition.jpg

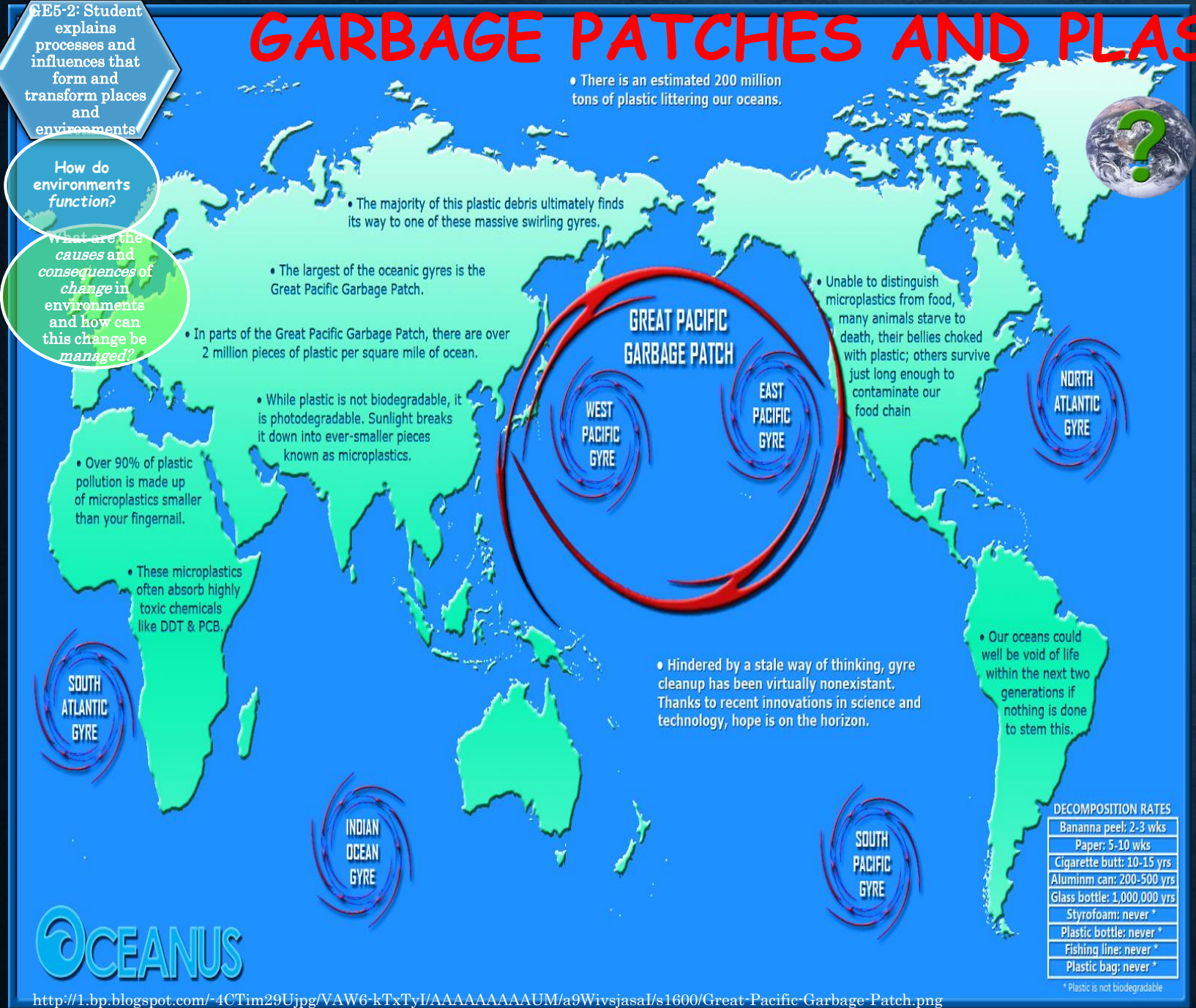
GEOGRAPHICAL TOOL: picture graph

GE5-2: Student explains processes and influences that form and transform places and environments

How do environments *function*?

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed*?

GARBAGE PATCHES AND PLASTIC WASTE



http://1.bp.blogspot.com/-4CTim29Ujpg/VAW6-kTxTyI/AAAAAAAAAUM/a9WivsjasaI/s1600/Great-Pacific-Garbage-Patch.png

Activity:

Processes (ocean gyres), cause-consequences, transforms ocean environments, urgent management

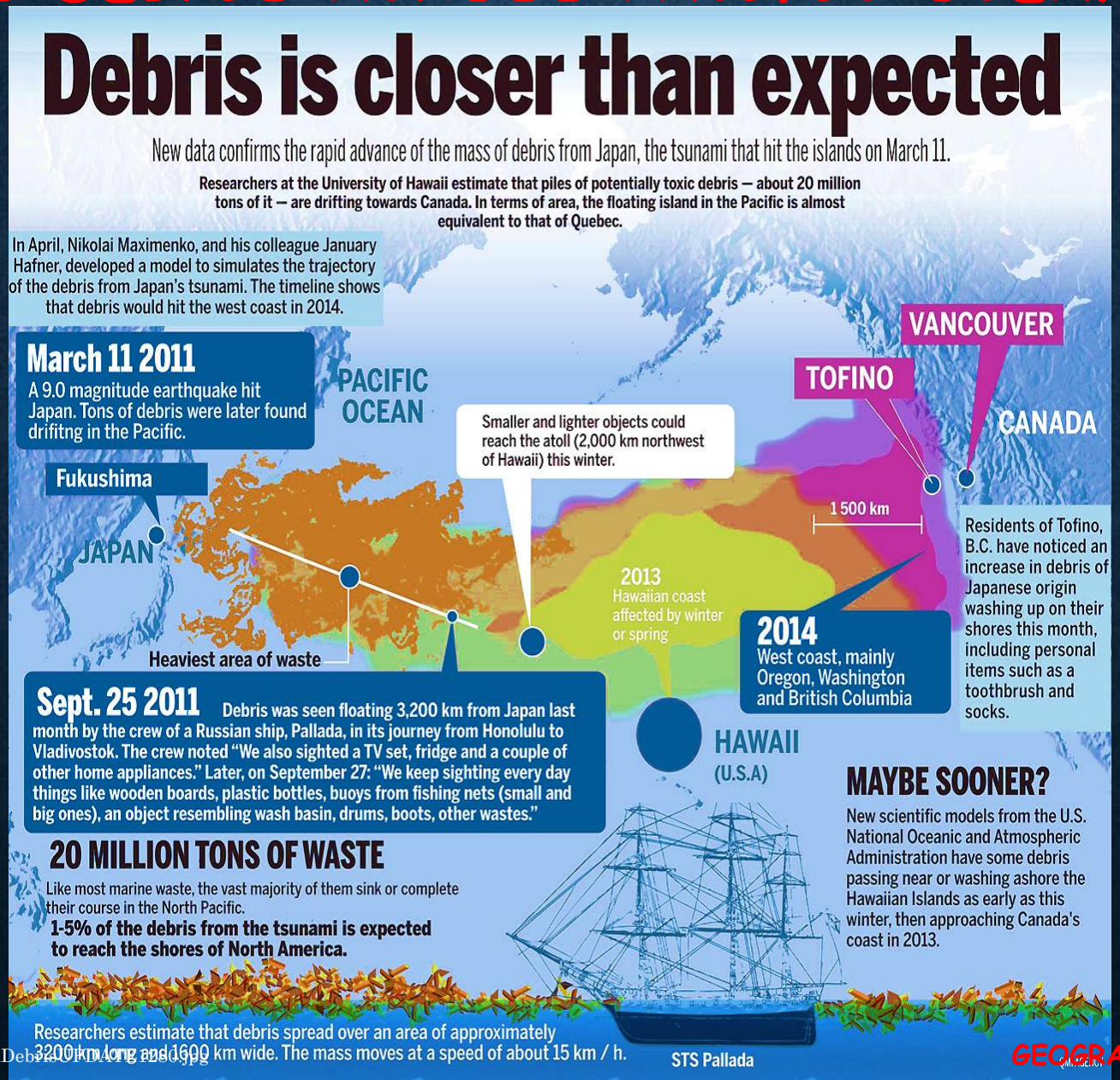
- How do ocean environments function?
- What is an oceanic gyre?
- List 6 oceanic gyres.
- Where does waste come from?
- Where does waste go?
- How does scale vary from local to global?
- Explain why clean-up of gyres is difficult?
- Cruise ships dump 1 billion tons of sewage into ocean each year. What are the consequences to people and environments?

GEOGRAPHICAL TOOL: map, table

JAPANESE EARTHQUAKE GENERATED TSUNAMI MOVES DEBRIS ACROSS PACIFIC OCEAN

Why is an understanding of environmental processes and interconnections essential for sustainable management of environments?

What are the causes and consequences of change in environments and how can this change be managed?



http://cnews.canoe.com/CNEWS/Canada/2011/12/29/TsunamiDebrisOFDARG.jpg

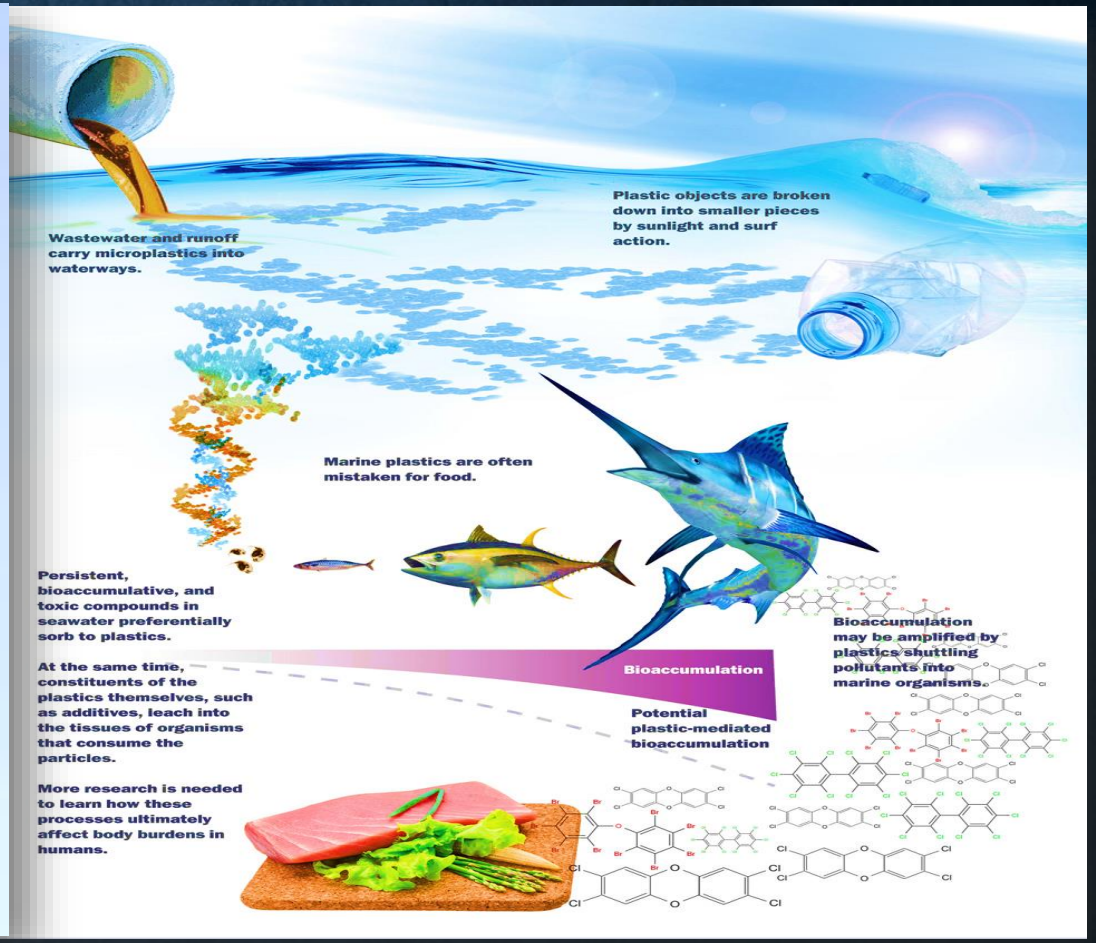
GEOGRAPHICAL TOOL: infographic, time line

How do environments *function*?

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed*?

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

MICROBEADS-FROM FACE (CLEANING TEETH), FISH AND BACK TO FACE (FOOD)



Activities

- What are microbeads?
- Processes-how can microbeads move from face back to face?
- Discuss problem of microbeads to fish, birds and humans
- Answer the three key inquiry questions

GEOGRAPHICAL TOOL: food web

3. Investigate environmental management, different worldviews, management approaches of Aboriginal and Torres Strait Islander Peoples

How do people's *worldviews* affect their attitudes to and *use* of environments?

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

3. ENVIRONMENTAL MANAGEMENT

http://sustainability.sjp.ac.lk/wp-content/uploads/sites/23/2015/08/EMS.jpg


ENVIRONMENTAL WORLDVIEWS
ABORIGINAL AND TORRES STRAIT ISLANDER PEOPLES' WORLDVIEW
linked to environmental management
SYLLABUS
ENVIRONMENTAL MANAGEMENT:
SUSTAINABILITY
SEE:
Social, Environmental, Economic
SSSS
Source, Sink, Service, Spirituality

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

How do people's *worldviews* affect their attitudes to and use of environments?

INTERCONNECTIONS
WORLDVIEW AND MANAGEMENT STRATEGIES

Human-centred

- Humans are the most important species on Earth.
- Humans manage nature to meet their ever increasing needs.
- Earth has unlimited supplies of resources and if there are shortages technology will find substitutes.
- There is almost unlimited potential for economic growth, which is good.
- Success depends on managing Earth for the benefit of humans.
- Profit maximisation takes precedence over losses of Earth's natural capital.

Earth-centred

- There is an intrinsic value of all life forms.
- Humans are part of nature and depend on it for survival.
- Nature exists not only for humans, but for all species.
- Resources are limited and should not be wasted.
- Earth-sustaining forms of economic growth are encouraged.
- Human success depends on learning *how* nature sustains itself.

GEOGRAPHICAL TOOL: perspectives table

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

How do people's *worldviews* affect their attitudes to and use of environments?

WORLDVIEW

ABORIGINAL AND TORRES STRAIT ISLANDERS

EARTH CENTRED

HOLISTIC

RESPONSIBILITIES

sustainable management of land, sea, natural resources

CUSTODIAL MANAGEMENT

differs with environment/ecosystem e.g. coral reef, coastal, wetlands, marine, grasslands.

'ONE SIZE FITS ALL MANAGEMENT'

UNSUSTAINABLE

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

Investigate-national scale:

- Indigenous marine reserves and protected areas (IPA)
- Conserving bush tucker
- Carbon offsets (grasslands)

Investigate-ecosystem scale: Custodial management differs with environments:

- Kakadu
- Uluru and Kata Tjuta
- Snowy River
- Great Barrier Reef
- Daintree Rainforest

- Fieldwork:
  - Gibberagong EEC
  - Local area

WHAT IS YOUR WORLDVIEW?

ANIMALS: ILLEGAL TRADE, CLOTHES, ARTIFACTS, MEDICINE

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

GEOGRAPHICAL TOOL: WWF advertisement

GE5-5: Student assesses management strategies for places and environments for their sustainability

SUSTAINABILITY

GEOGRAPHICAL TOOL: diagram

GE5-5: Student assesses management strategies for places and environments for their sustainability

THREE LEGGED SUSTAINABLE STOOL

- Full employment
- Fair wages
- Work security
- Fair trade

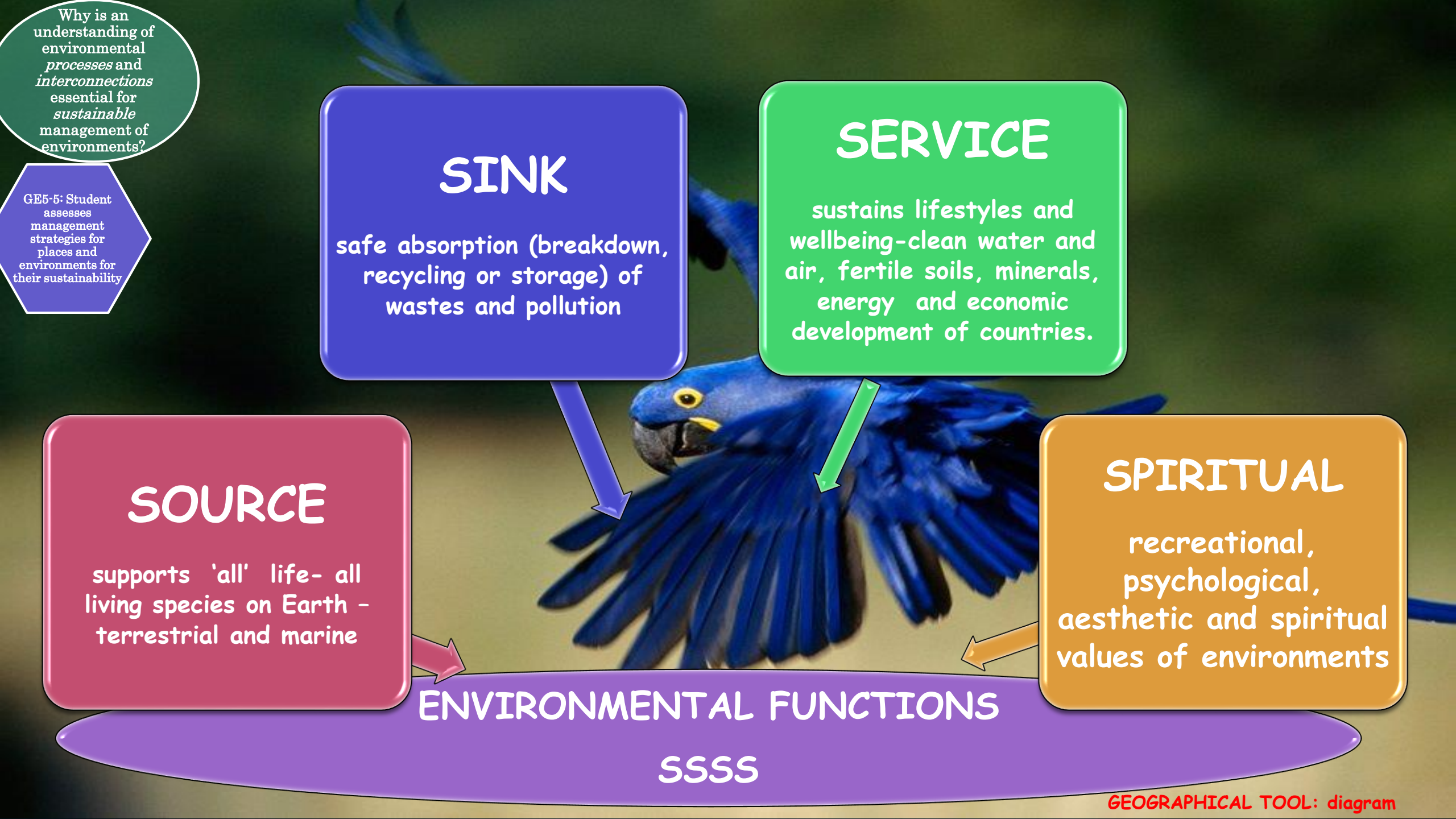
- Social equity and justice
- Health, education, housing, water, sanitation, energy, transport
- Community involvement
- Eradicate child labour

- Zero air, water, soil pollution
- Reduce ecological footprint
- Use renewable energy
- Recycle/reuse resources
- Biosphere Reserves, Marine Parks
- Restoration-wetlands, coral reefs

GEOGRAPHICAL TOOL: diagram

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

GE5-5: Student assesses management strategies for places and environments for their sustainability



SINK

safe absorption (breakdown, recycling or storage) of wastes and pollution

SERVICE

sustains lifestyles and wellbeing-clean water and air, fertile soils, minerals, energy and economic development of countries.

SOURCE

supports 'all' life- all living species on Earth - terrestrial and marine

SPIRITUAL

recreational, psychological, aesthetic and spiritual values of environments

ENVIRONMENTAL FUNCTIONS

SSSS

GEOGRAPHICAL TOOL: diagram

INLAND WATER ENVIRONMENT
GANGES RIVER, INDIA

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

S S S S

Ganges River

Activity- Ganges River, India

- What are the consequences of human-induced environmental changes on SSSS
- Discuss implementation of management strategies at a variety of scales (local-Varanasi; national-Nepal, India, Bangladesh; global organisations)?

GEOGRAPHICAL TOOL: map, satellite, photo- multimodal

GEOGRAPHICAL TOOL: diagram

GE5-5: Student assesses management strategies for places and environments for their sustainability

INTERCONNECTING MANAGEMENT STRATEGIES

SCALE

INDIVIDUAL
reduce ecological footprint

GLOBAL
NOAA-use of satellite imagery

COMMUNITY
dune restoration, waste recycling

REGIONAL GLOBAL
ASEAN, EU, transboundary management

REGIONAL STATE
public transport, smart cities

NATIONAL
catchment management MIA

ORGANISATIONS

NON-GOVERNMENT ORGANISATIONS (NGO)
e.g. Greenpeace

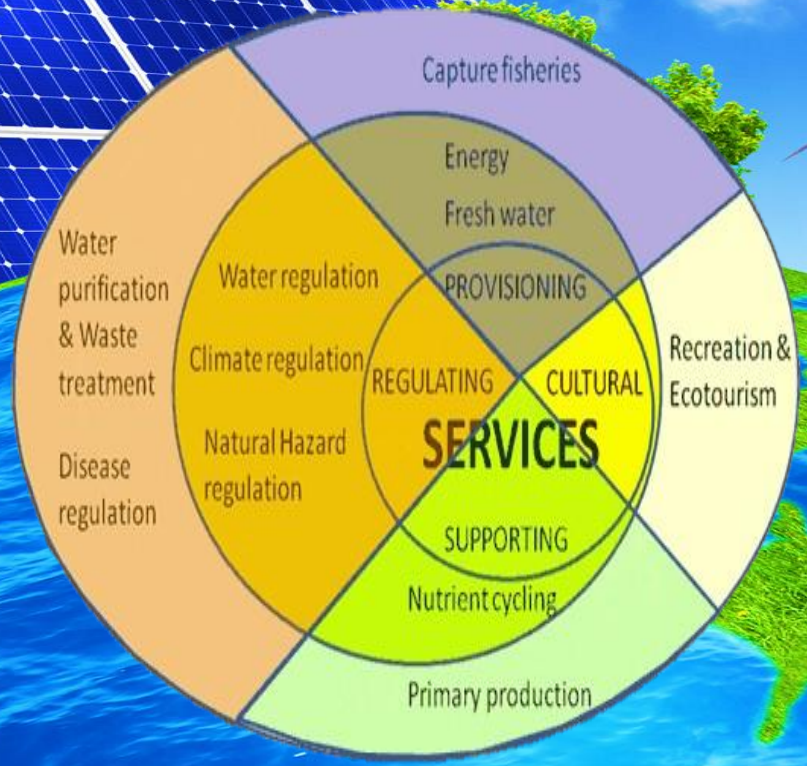
GOVERNMENTS
e.g. Australia- Great Barrier Reef Marine Park

INTERNATIONAL GOVERNMENTAL ORGANISATIONS (IGO)
e.g. IUNC Red List, IWC (Whales)

GEOGRAPHICAL TOOL: diagrams

UNITED NATIONS ENVIRONMENTAL PROGRAMS

GE5-5: Student assesses management strategies for places and environments for their sustainability



Activity

What are UNEP main activities?

Select one UNEP activity. Include location, environmental problems and management strategies. Analyse effectiveness of management strategies

https://image.slidesharecdn.com/unep1-150301202230-conversion-gate02/95/unep-73-638.jpg?cb=1444667

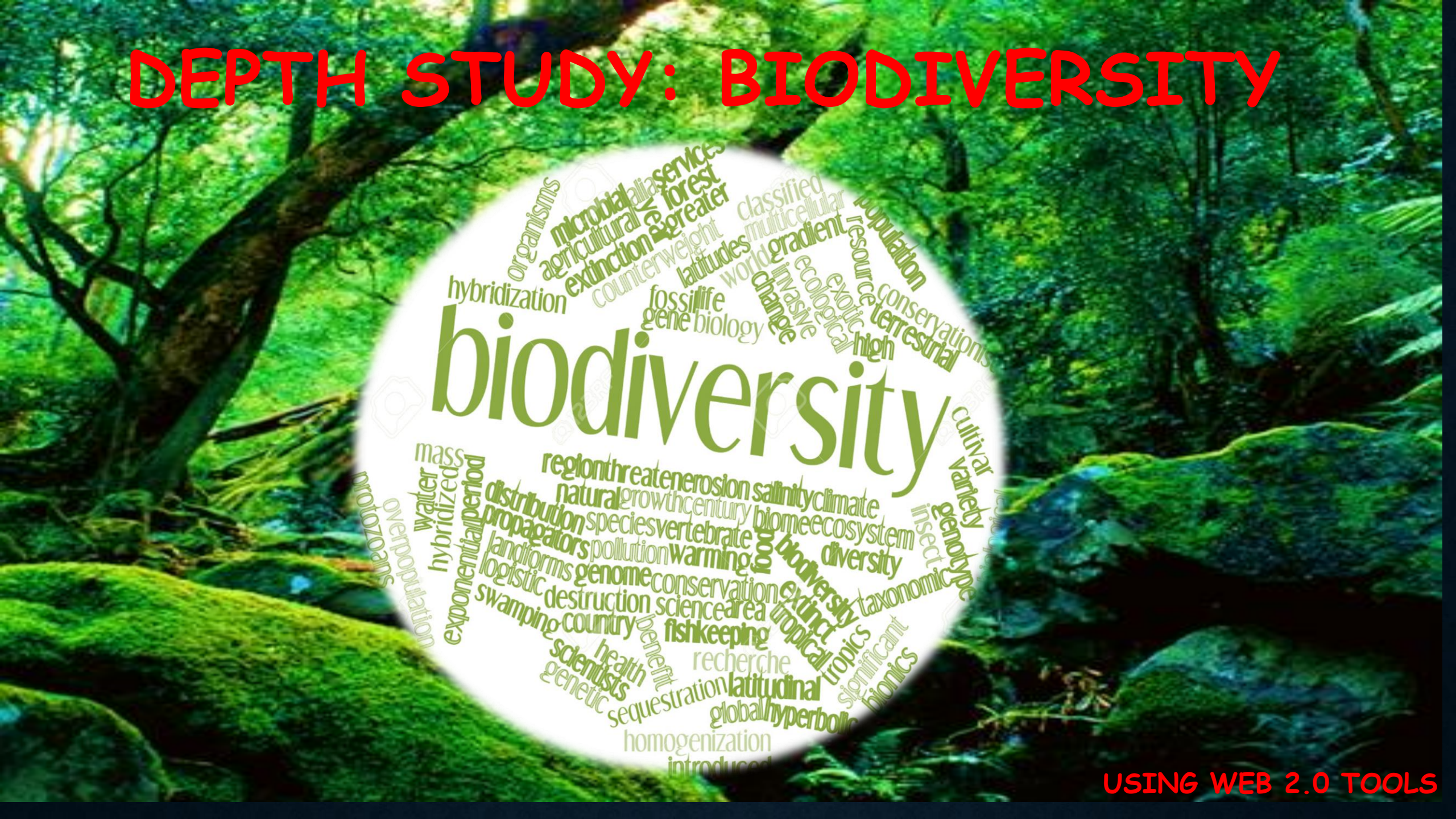
GEOGRAPHICAL TOOL: multimodal

GE5-5: Student assesses management strategies for places and environments for their sustainability

GLOBAL SCALE: POST 2015 SUSTAINABLE DEVELOPMENT GOALS
* 9: MAJOR FOCUS ON ENVIRONMENT

GEOGRAPHICAL TOOL: picture table

DEPTH STUDY: BIODIVERSITY



USING WEB 2.0 TOOLS

INQUIRY QUESTIONS

- What is biodiversity?
- What are biodiversity hotspots?
- What is biodiversity's role and importance in natural environments?
- What are human-induced changes to biodiversity?
- What are the effects of human-induced environmental changes on sustainability of SSSS functions of the environment?
- How can biodiversity be managed sustainably?

BREADTH:
Overview human induced changes to biodiversity and management strategies

DEPTH:
- Investigate biodiversity in a country or region and its management. Make comparisons (Asia-Australia)
- Examine different worldviews e.g. Asia-palm oil developers versus indigenous population in Indonesia.

- **Fieldwork:** transects, quadrants
- **Civics and citizenship:** action-sustainable management strategies

BIODIVERSITY UNSUSTAINABLE PERSPECTIVES

GEOGRAPHICAL TOOL: poster

1. Investigate role and importance of 'natural' environments

ROLE
IMPORTANCE
PRESERVING BIODIVERSITY

ENVIRONMENTAL

maintain biological diversity and energy flows.
preserve food webs for food security- IRRI, Seed Banks

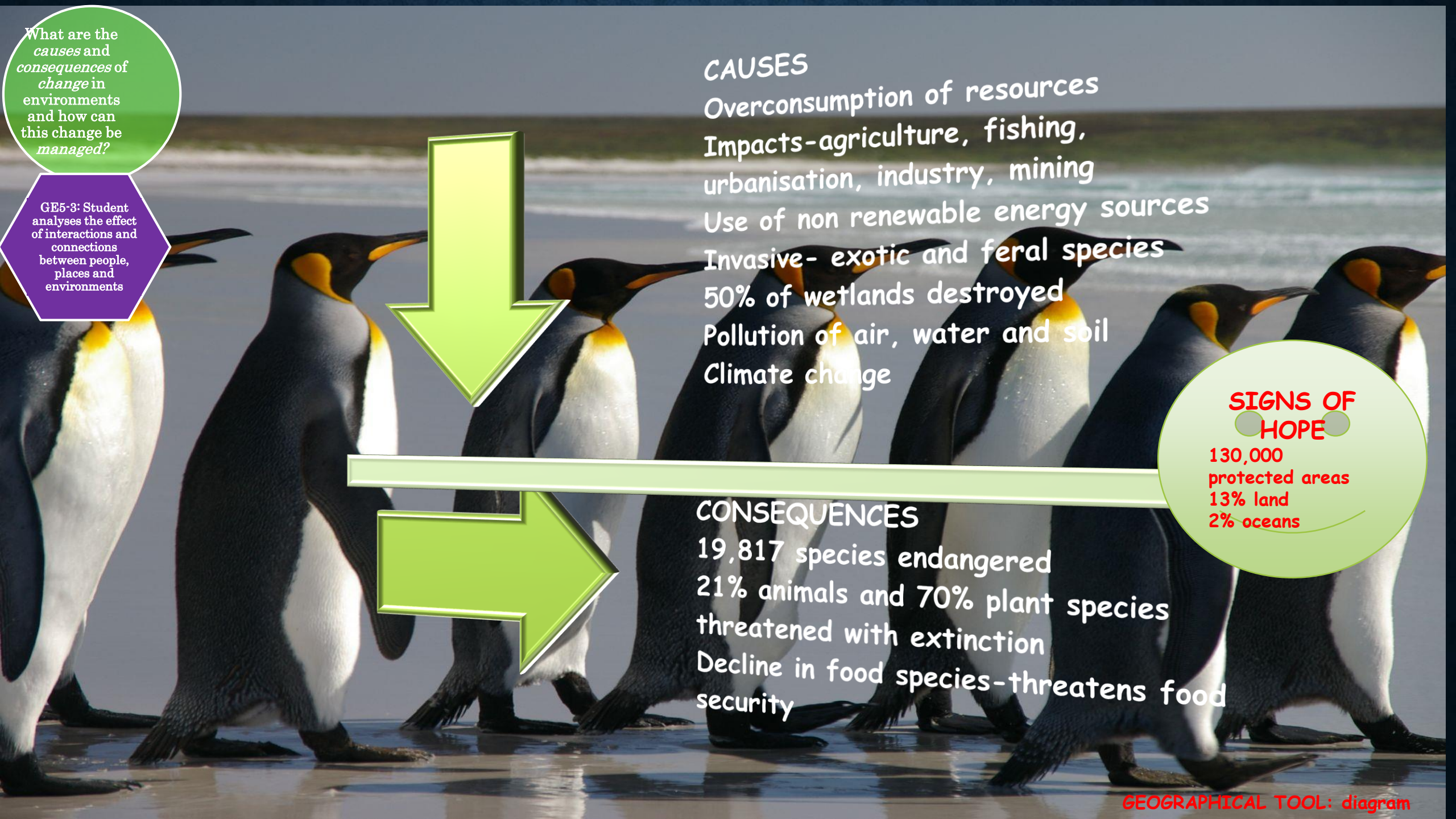
ECONOMIC

ecotourism, exports of environmental goods (forest food, medicines, fish)

SOCIAL

essential for human existence, recreational (fishing, snorkelling in coral reefs), cultural and spiritual nourishment

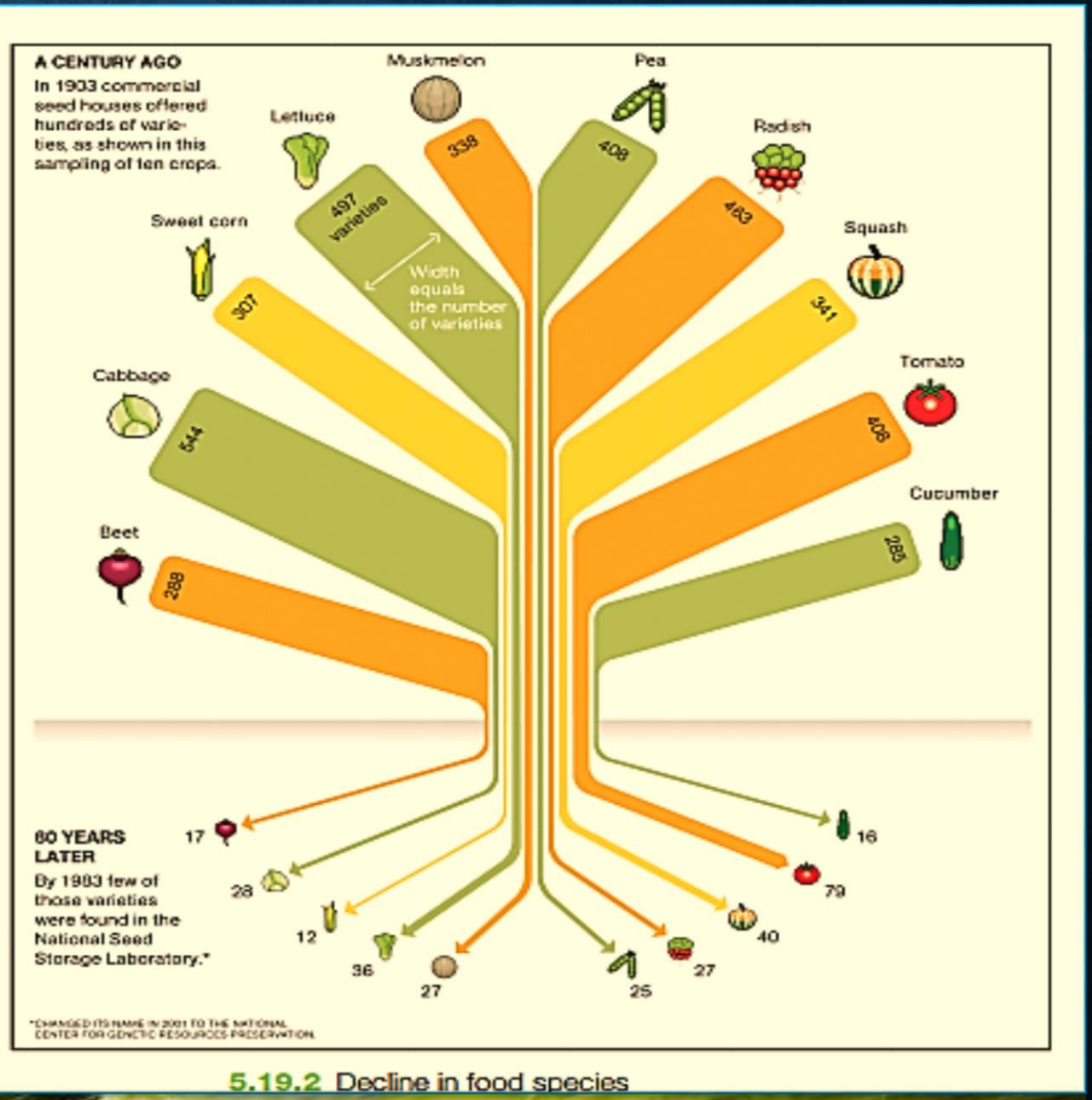
GEOGRAPHICAL TOOL: diagram


What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*
GE5-3: Student analyses the effect of interactions and connections between people, places and environments
CAUSES
Overconsumption of resources
Impacts-agriculture, fishing, urbanisation, industry, mining
Use of non renewable energy sources
Invasive- exotic and feral species
50% of wetlands destroyed
Pollution of air, water and soil
Climate change
SIGNS OF HOPE
130,000 protected areas
13% land
2% oceans
CONSEQUENCES
19,817 species endangered
21% animals and 70% plant species threatened with extinction
Decline in food species-threatens food security
GEOGRAPHICAL TOOL: diagram

HUMANS CONSUME 7,000 PLANT SPECIES AS FOOD

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

Decline in food species
1903-1983
Lettuce 338-27
Tomato 408-79



5.19.2 Decline in food species

GEOGRAPHICAL TOOL: picture graph

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ASIA(CCP)

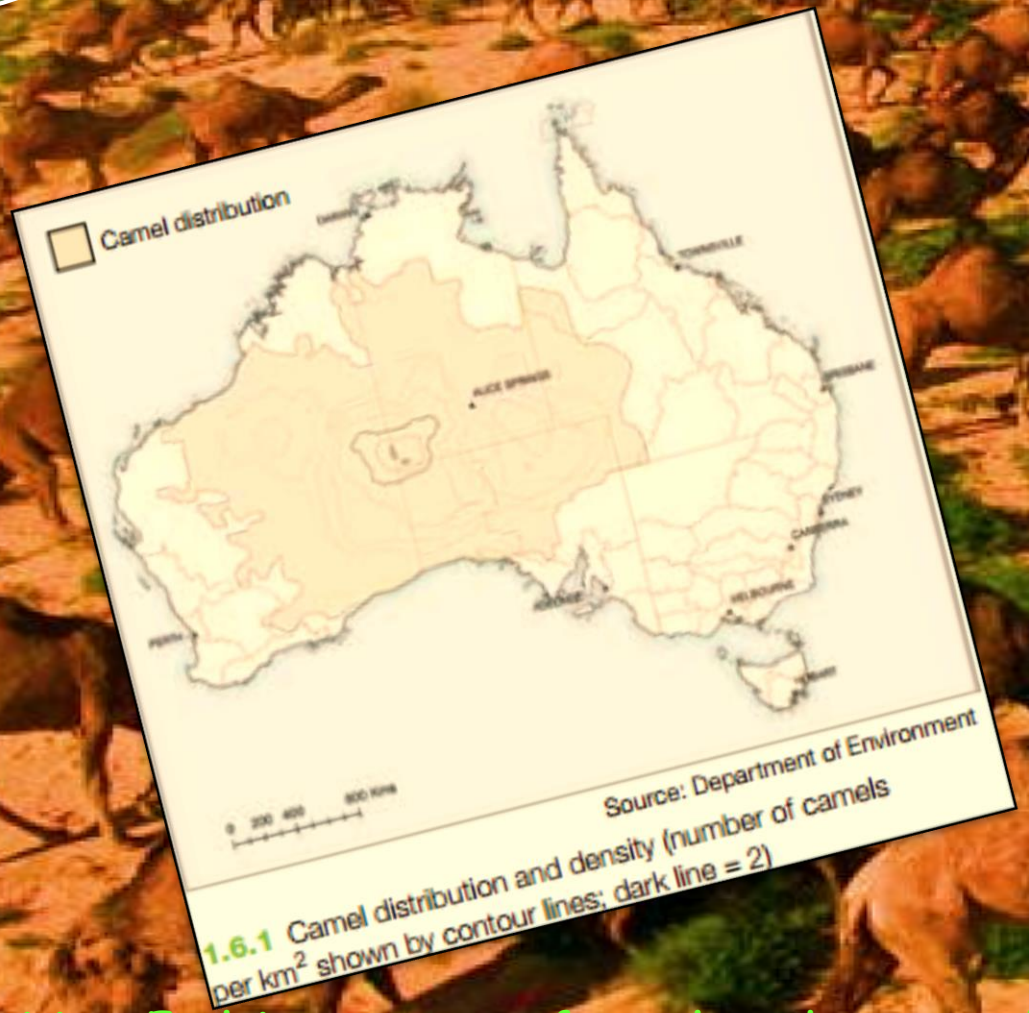
Deforestation for palm oil- endangered Orangutan and Sumatran tiger

1.7.3 Asia Pulp and Paper (APP) is destroying the rainforests of Sumatra to fuel toilet paper production. Since the company started logging in Sumatra in 1984, APP has pulped 2 million ha of forest. With only about 400 Sumatran tigers and fewer than 2800 Sumatran elephants left in the wild, this last remaining natural habitat is critical to the survival of these species.

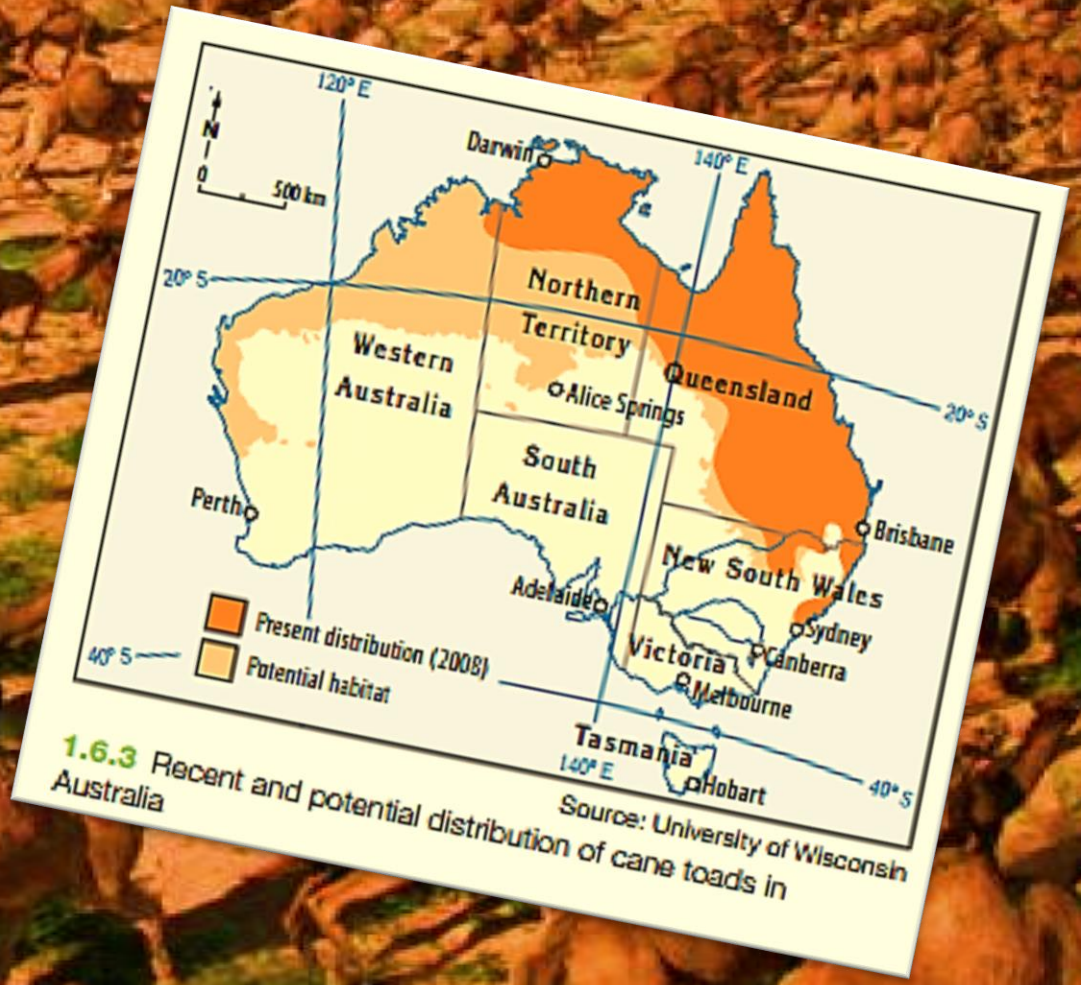
GEOGRAPHICAL TOOL: poster

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

THREATS TO AUSTRALIA'S BIODIVERSITY
CAMELS, CANE TOADS, RABBITS



1.6.1 Camel distribution and density (number of camels per km^2 shown by contour lines; dark line = 2)



1.6.3 Recent and potential distribution of cane toads in Australia

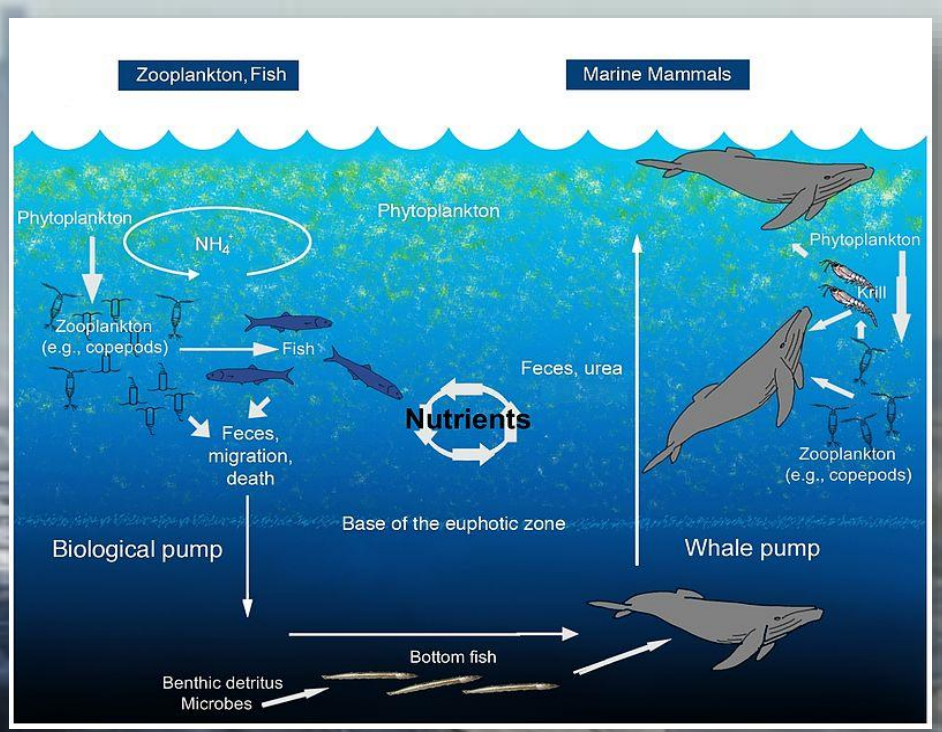
Activity: Explain movement of camels and cane toads across Australia
List the impacts of camels, cane toads and rabbits on environments
Research implementation of management strategies to control numbers and their effectiveness

GEOGRAPHICAL TOOL: maps changes over time

1.
ENVIRONMENTS
Investigate role and importance of 'natural' environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ROLE AND IMPORTANCE OF WHALES



ENDANGERED WHALES

At least ten whale species listed as endangered.
Blue whale depleted by 90%
The International Union for Conservation of Nature (IUCN) placed fin whale on Red List of Threatened Species.

© AAP

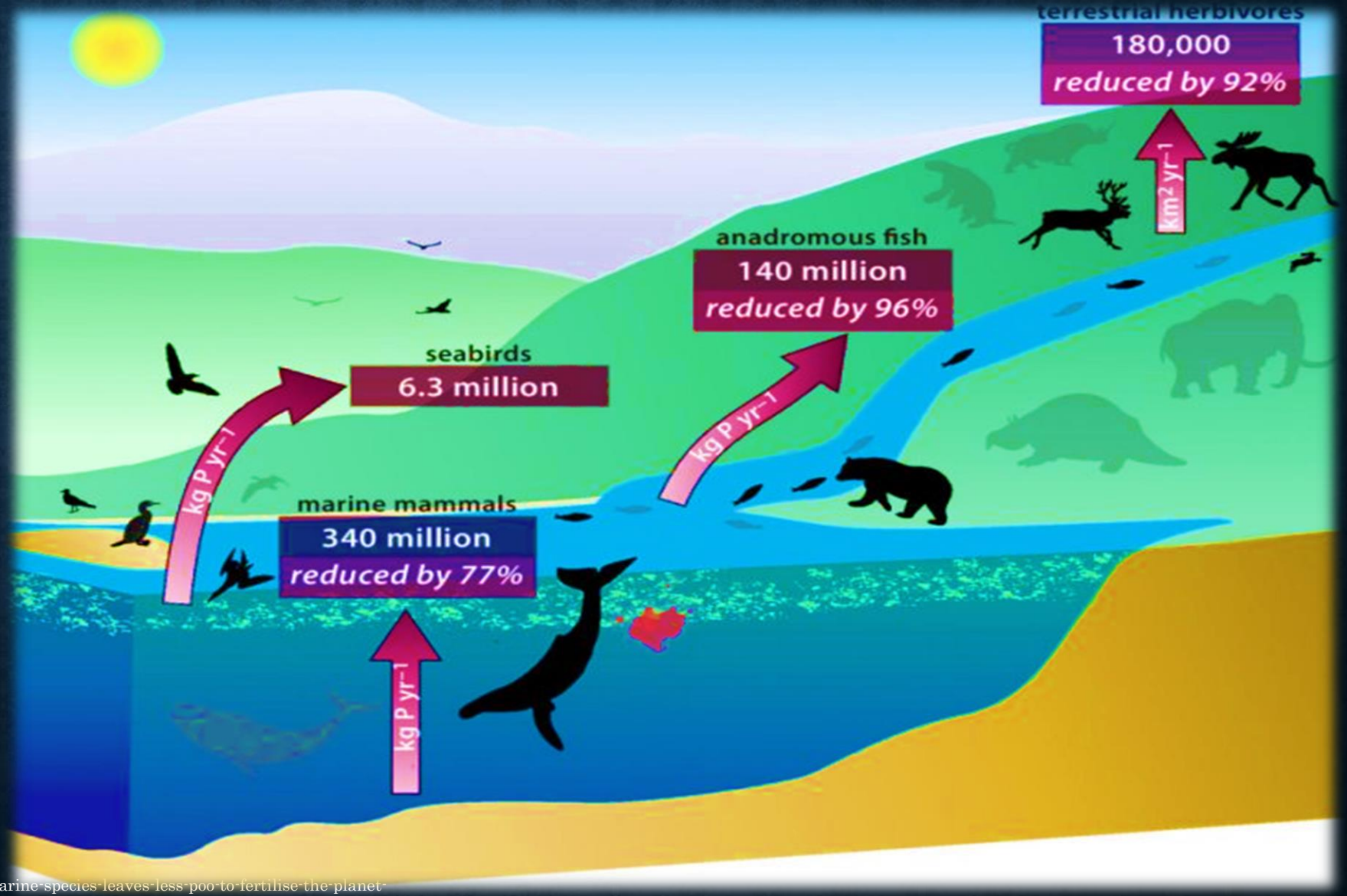
GEOGRAPHICAL TOOL: process- food web

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-2: Student explains processes and influences that form and transform places and environments

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

CAUSE: WHALES LEAVE LESS POO TO FERTILISE PLANET
CONSEQUENCE: DECLINE IN LAND AND MARINE SPECIES

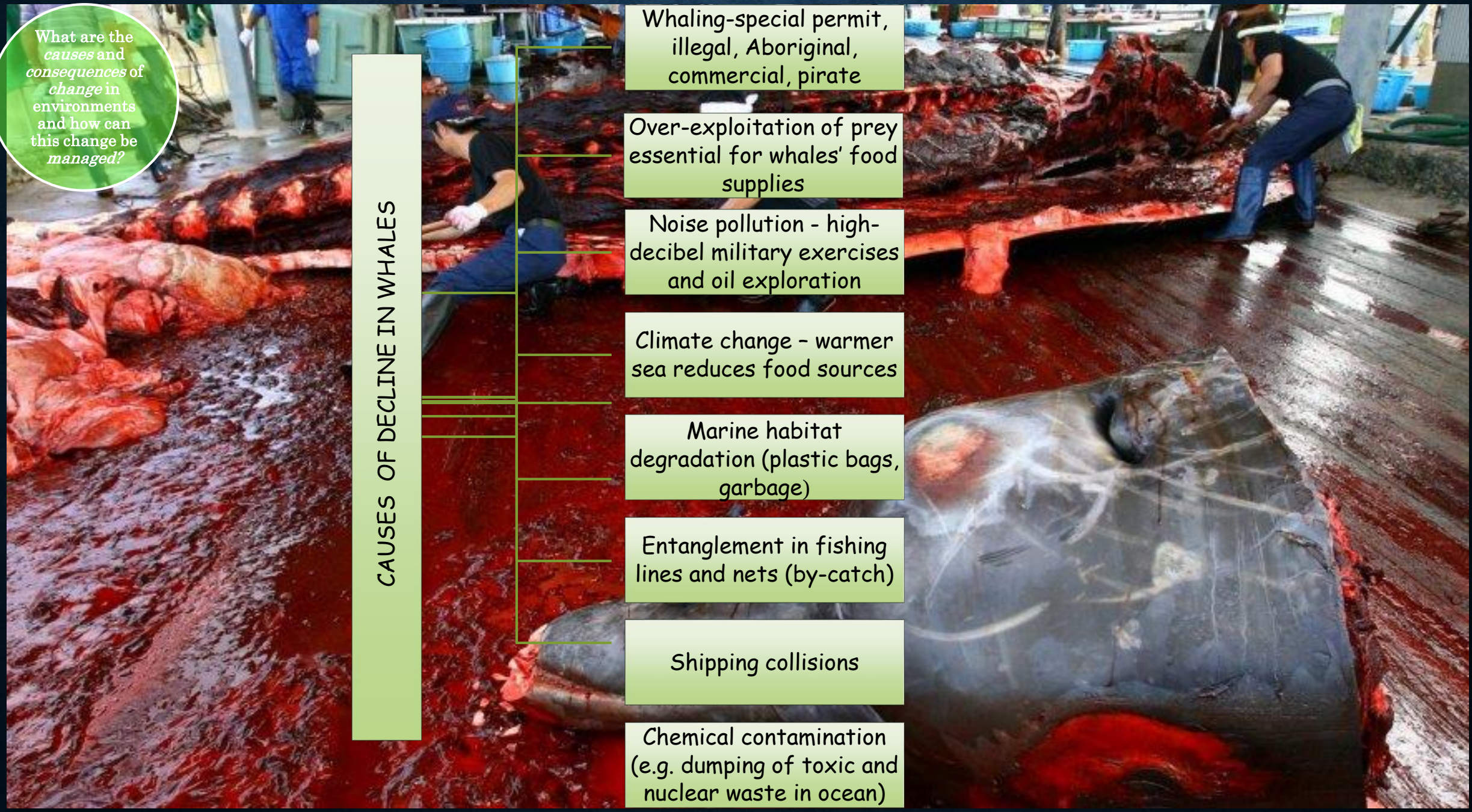


PROCESS

Whales act as a "distribution pump," transporting nutrients like phosphorus from ocean floor to surface.
However ability been reduced 75%

http://www.smh.com.au/environment/animals/decline-in-land-and-marine-species-leaves-less-poo-to-fertilise-the-planet-20151027-gkjlde.html?eid=socialn%3Afac-14omn0013-optim-nnn%3Anonpaid-25062014-social_traffic-all-organicpost-nnn-smh-o&campaign_code=nocode&promote_channel=social_facebook

GEOGRAPHICAL TOOL: diagram



GEOGRAPHICAL TOOL: diagram

3. ENVIRONMENTAL MANAGEMENT

Investigate environmental management, different worldviews, management approaches of Aboriginal and Torres Strait Islander Peoples

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

How do people's *worldviews* affect their attitudes to and use of environments?

DIFFERENT WORLDVIEWS: CULTURAL DIFFERENCES

INDIGENOUS AUSTRALIANS PERSPECTIVE

TO EMPEROR OF JAPAN

We respectfully request to cease the slaughter of our sacred spiritual totem - Mugga Mugga (whale)
Every living thing is here for a purpose, all elements, mankind, flora, fauna, we are dependent on each other's existence, Aboriginal people of Australia, have known this since our ancestors
The Woppaburra language name for the humpback whale is 'Mugga Mugga', which is our 'Sacred Spiritual Totem', our sacred emblem - it is our life-long responsibility to protect them and the environment in which they live.
The beautiful songs and singing of our whale is the way they communicate, and we believe, they also sing songs of sorrow, sorrow for mankind.

Each year, on the commencement of their migration journey from the Antarctic to the Great Barrier Reef to breed, the Woppaburra People of the Keppel Islands, rejoice and wait in anticipation and celebrate in knowing that their sacred spiritual totem, Mugga Mugga, will soon be home for another year. They hope and pray their Sacred Spiritual Totem, Mugga Mugga will continue to have safe passage as they travel their annual migratory journey.

It is a 'good omen' that all elements of our mother earth are continuing and there is 'balance' in the life cycles of all living things. We will always feel the 'full fury' of our Mother Earth, as a global family - it is her warning, to stop and think, before it's too late.

Letter: From Woppaburra people to the Emperor of Japan (reduced)

JAPANESE PERSEPCTIVE

Small type coastal whaling

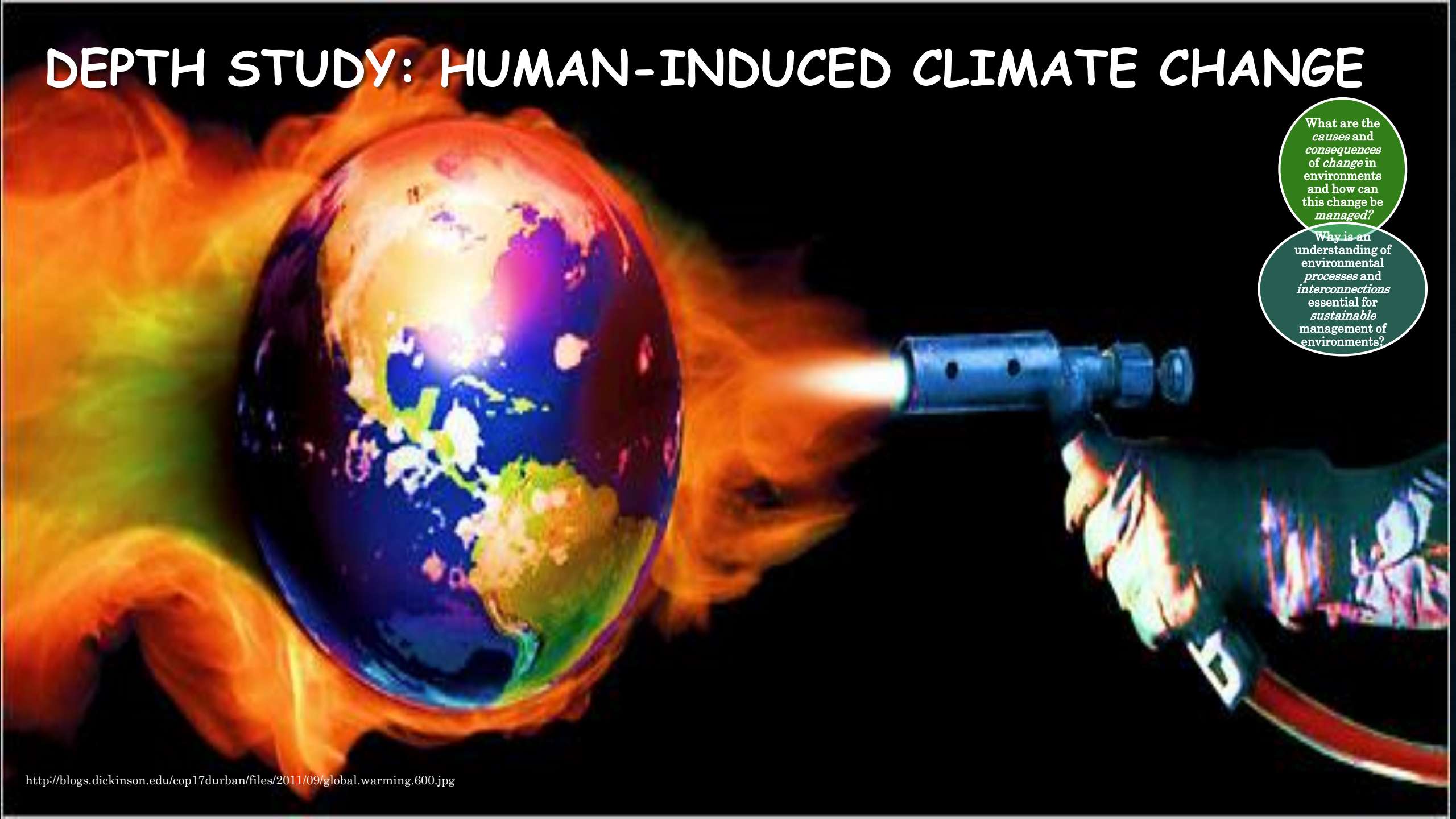
- 'Japanese small type whaling' in Japanese coastal seas should be viewed as **'indigenous/aboriginal subsistence whaling** as authorised by the IWC, in USA, USSR and Denmark.

Hunting endangered whale species

- Japan officially **supports the protection of endangered whale species.**
- Most whales they pursue, such as minke whales, are not endangered.
- Number of endangered humpback whales they hunt each year is sustainable.

GEOGRAPHICAL TOOL: diagram

DEPTH STUDY: HUMAN-INDUCED CLIMATE CHANGE



What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

http://blogs.dickinson.edu/cop17durban/files/2011/09/global.warming.600.jpg

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

https://c2.staticflickr.com/8/7033/6640496953_101daffb26_b.jpg

GEOGRAPHICAL TOOL: poster

1. Environmental change
Distinguish between natural and human induced climate change. Examine climate change across a range of scales using geographical tools

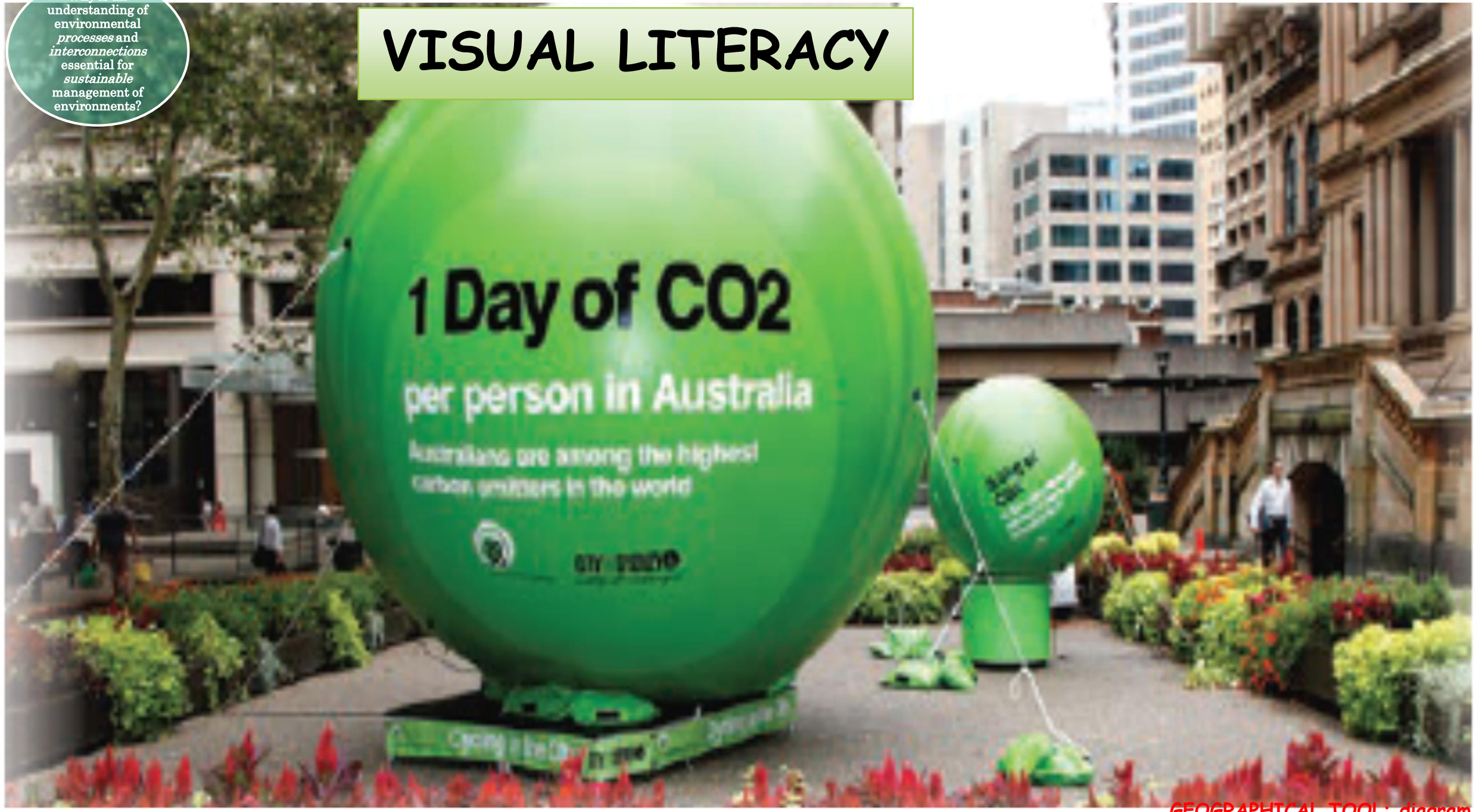
2. Environmental management
Investigate environmental management, including different worldviews and the management approaches of Aboriginal and Torres Strait Islander Peoples

3. Investigative study
Study impacts and management of human induced climate change in Australia and at least one another country

GEOGRAPHICAL TOOL: diagram

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

VISUAL LITERACY

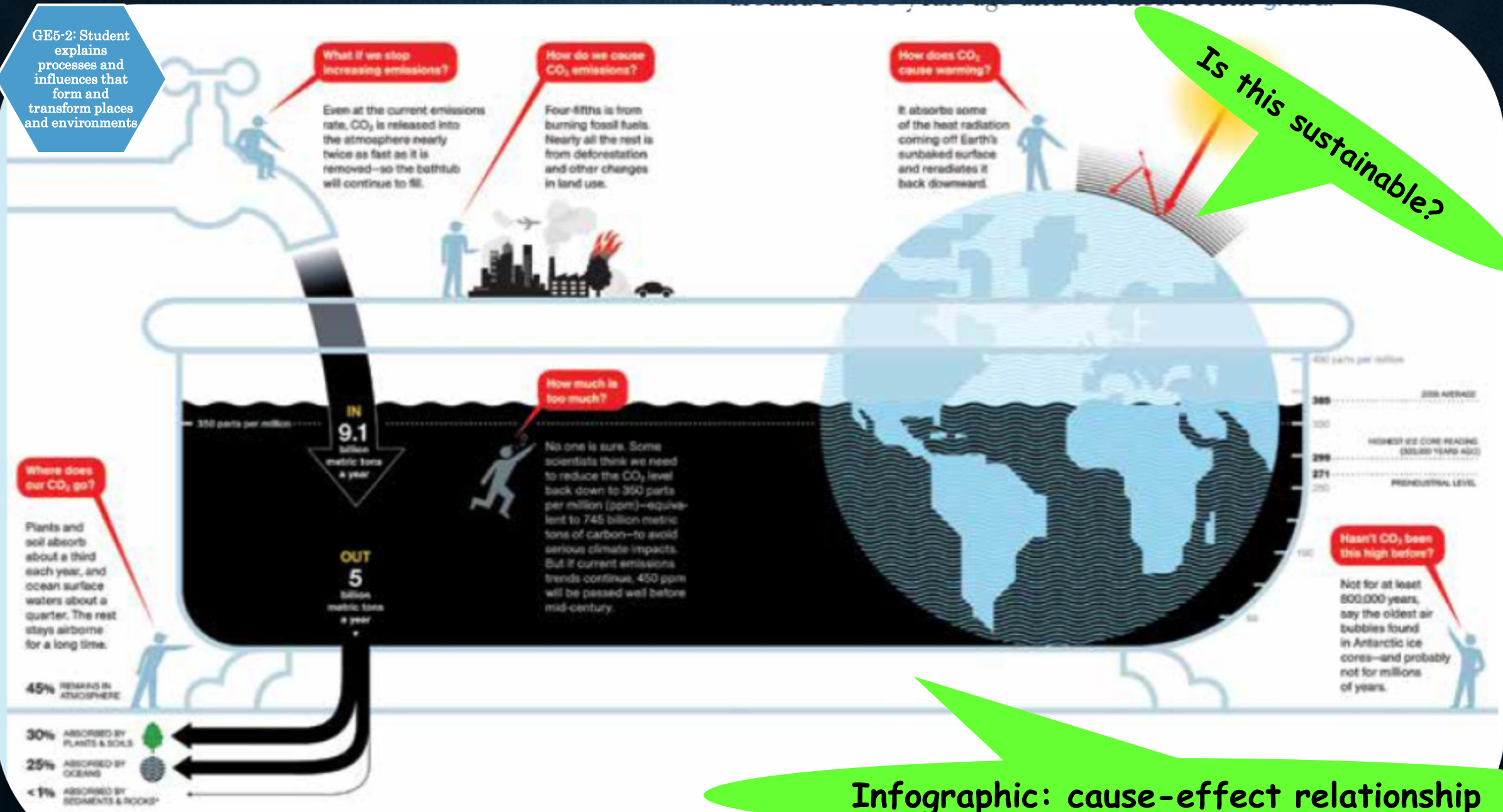


GEOGRAPHICAL TOOL: diagram

GE5-2: Student explains processes and influences that form and transform places and environments

GLOBAL SCALE

Is this sustainable?



Infographic: cause-effect relationship

2.1.1 Carbon bathtub: inputs and outputs

Source: National Geographic

GEOGRAPHICAL TOOL: infographic

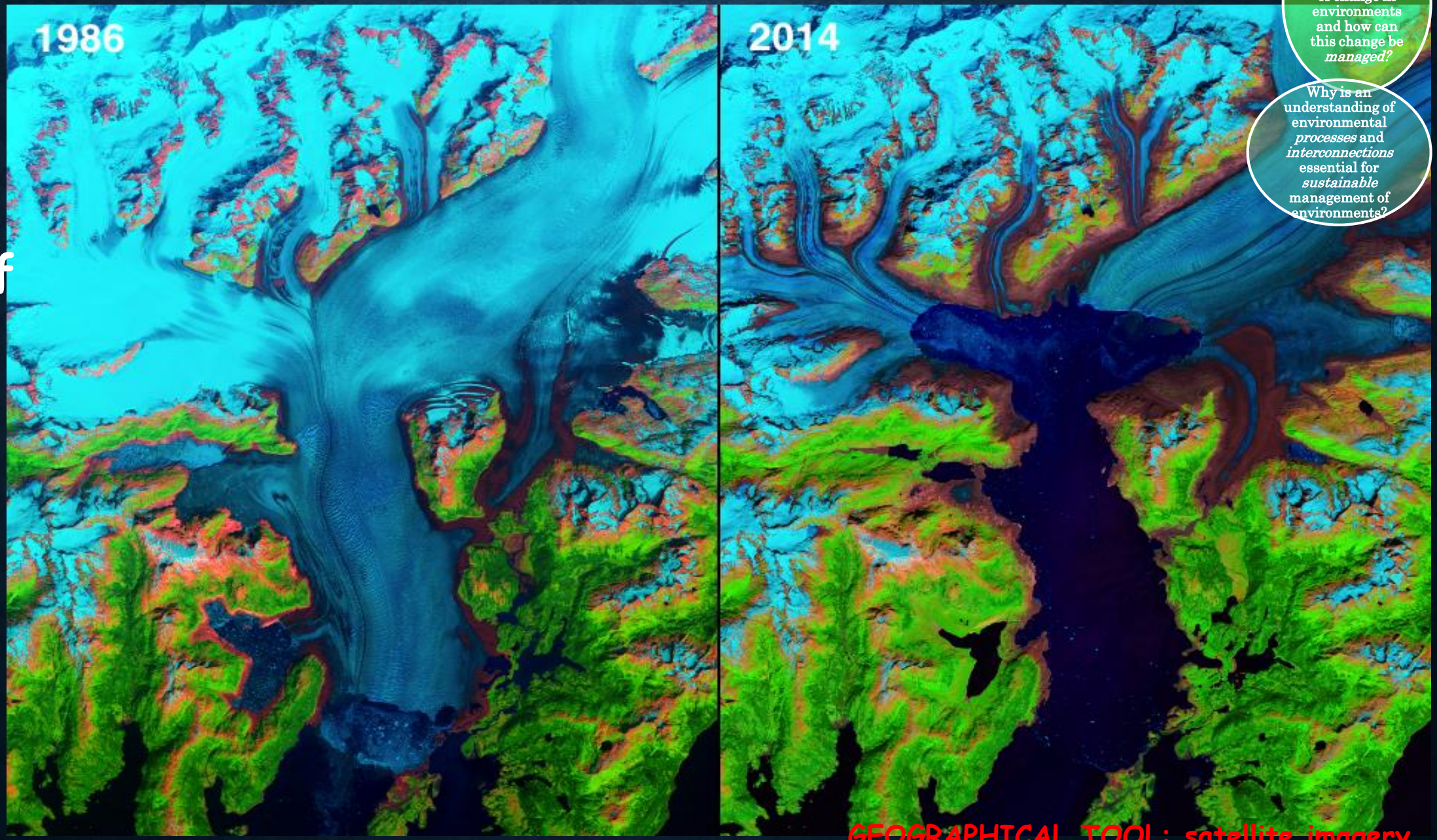
GLACIER: ALASKA'S COLUMBIA GLACIER

http://www.vox.com/2015/4/7/8352381/anthropocene-nasa-images

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

Glacier receded result of climate change



GEOGRAPHICAL TOOL: satellite imagery

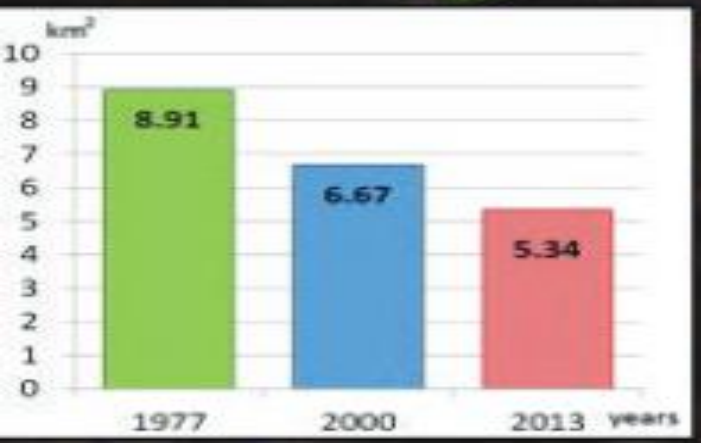
RETREATING GLACIERS, TURKEY

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-2: Student explains processes and influences that form and transform places and environments

Mt. Ağrı/Mt. Ararat

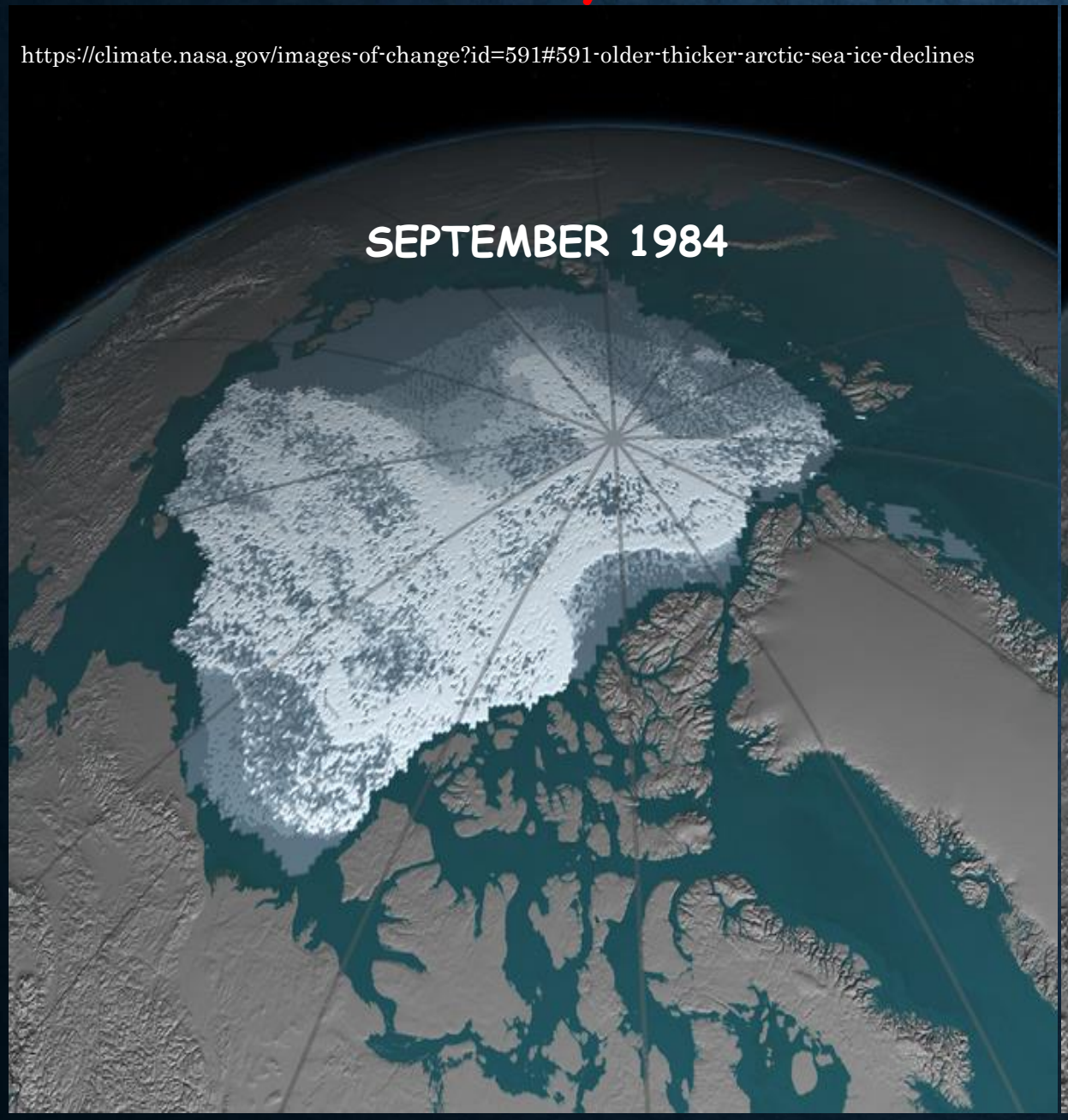
- highest (5,137masl) mountain in Turkey
- contains largest glaciers
- most glacial retreat attributed to climate change-rising summer night temperatures and minimum temperatures



GEOGRAPHICAL TOOL: topographic map

ICE CAP: OLDER, THICKER ARCTIC SEA ICE DECLINES

https://climate.nasa.gov/images-of-change?id=591#591-older-thicker-arctic-sea-ice-declines



What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

GE5-7: Student acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

GEOGRAPHICAL TOOL: satellite imagery

REGIONAL SCALE

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-3: Student analyses the effect of interactions and connections between people, places and environments

- Small Island Developing States (SIDS)
- Vulnerable to sea level rise, storm surges, coastal floods, increased severity of cyclones, and saltwater intrusion into groundwater

Indian Ocean
4 Bahrain
5 Comoros
6 Maldives
7 Mauritius
8 Seychelles
9 Singapore
10 Timor-Leste

Caribbean Sea
32 Anguilla
33 Antigua and Barbuda
34 Aruba
35 Bahamas
36 Barbados
37 Belize
38 British Virgin Islands
39 Cuba
40 Dominica
41 Dominican Republic
42 Grenada
43 Guyana
44 Haiti
45 Jamaica
46 Montserrat
47 Netherlands Antilles
48 Puerto Rico
49 St Kitts and Nevis
50 St Lucia
51 St Vincent and the Grenadines
52 Suriname
53 Trinidad and Tobago
54 US Virgin Islands

Eastern Atlantic Ocean
1 Cape Verde
2 Guinea-Bissau
3 São Tomé and Principe

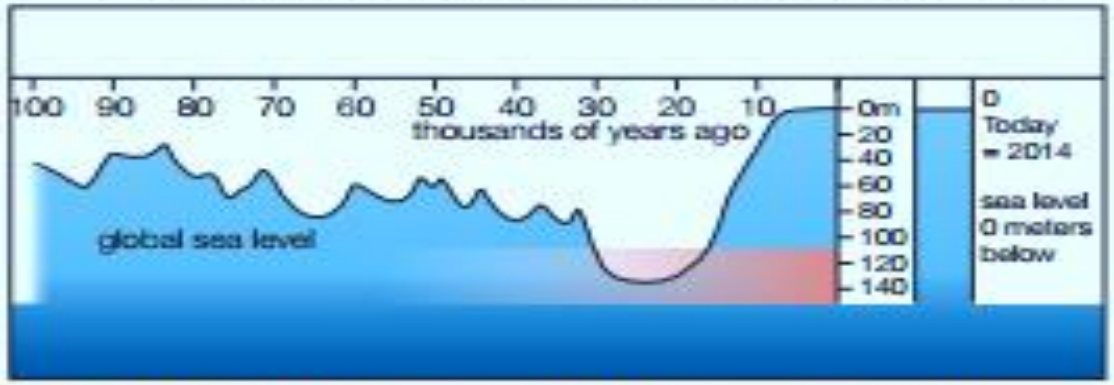
Pacific Ocean
11 American Samoa
12 Commonwealth of Northern Marianas
13 Cook Islands
14 Federated States of Micronesia (FSM)
15 Fiji
16 Kiribati
17 French Polynesia
18 Guam
19 Marshall Islands
20 Nauru
21 New Caledonia
22 Niue
23 Palau
24 Papua New Guinea
25 Samoa
26 Solomon Islands
27 States of Micronesia
28 Tokelau Islands
29 Tuvalu
30 Tonga
31 Vanuatu

GEOGRAPHICAL TOOL: map

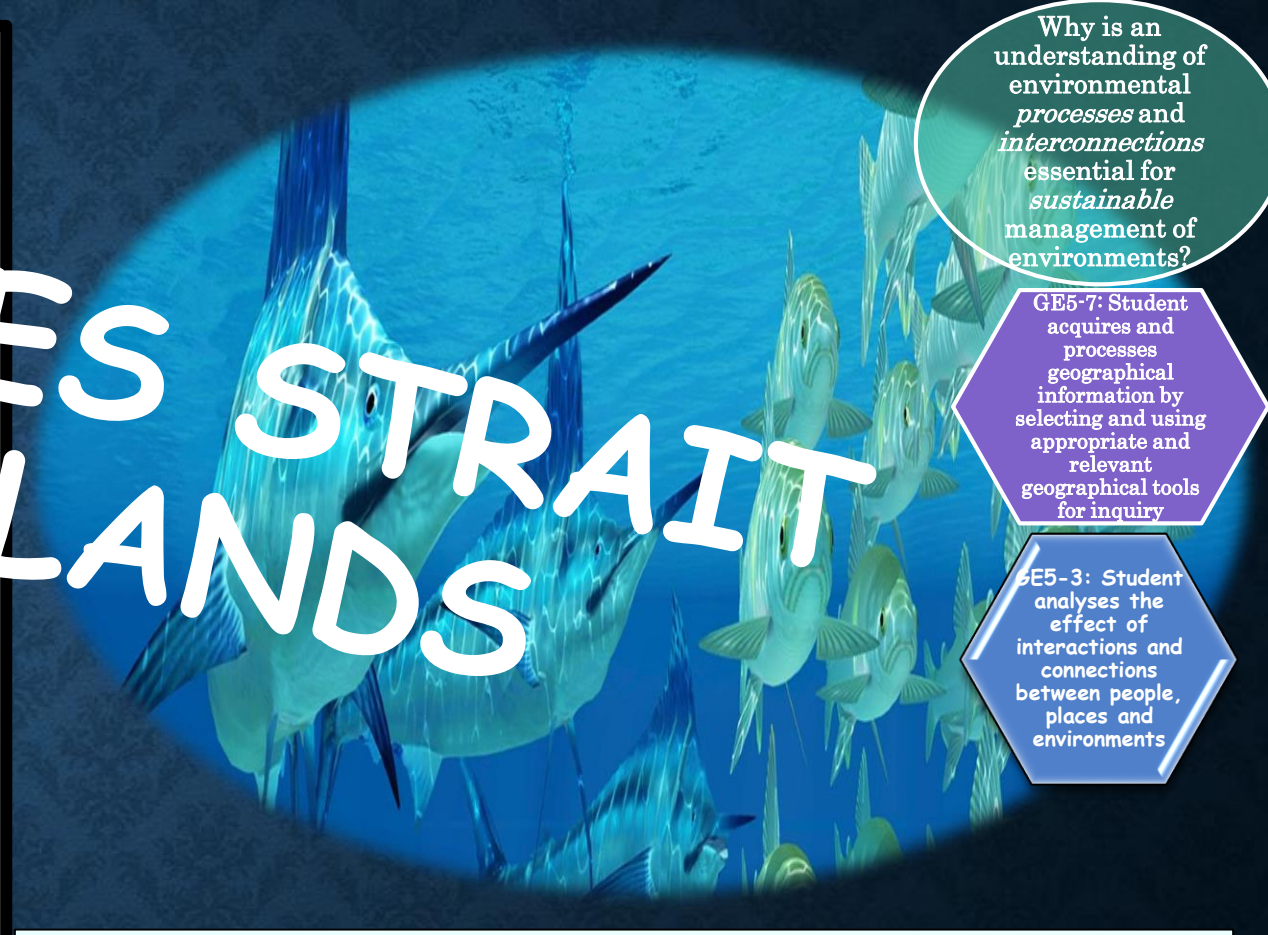
CLIMATE CHANGE: NATURAL AND HUMAN

TORRES STRAIT ISLANDS

4.21.2 A changing coastline: this image shows the Sahul coastline 25 000 years ago when the sea level was 135m lower than today. The yellow lines show the present-day coast line



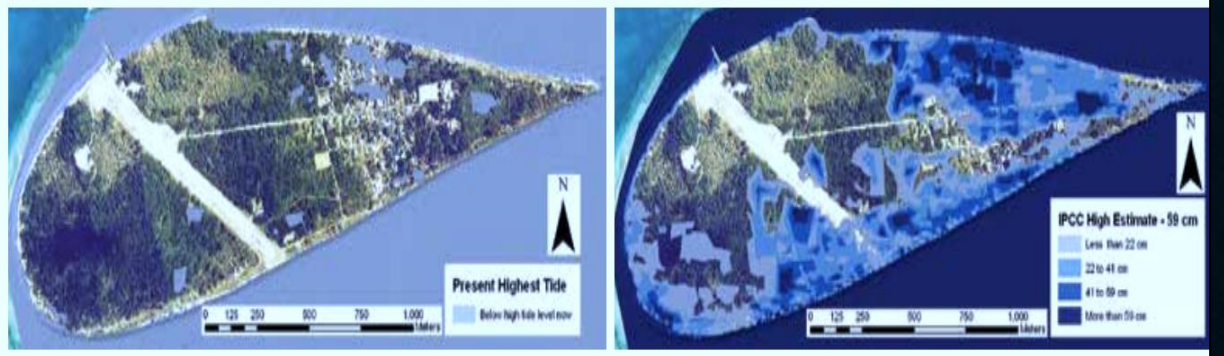
4.21.3 Sea level changes 100000 years ago until 2014



Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

GE5-7: Student acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry

GE5-3: Student analyses the effect of interactions and connections between people, places and environments



5.8.3 Masig Island: highest tides now (left) and high-tide estimates for 2100 (right)

GEOGRAPHICAL TOOL: satellite, graph, map

Northern Africa

- Climate change could decrease mixedrain-fed and semi-arid systems, particularly the length of the growing period, such as on the margins of the Sahel.
- Increased water stress and possible runoff decreases in parts of Northern Africa by 2050.

Eastern Africa

- Rainfall is likely to increase in some parts of Eastern Africa, according to some projections.
- Previously malaria-free highland areas in Ethiopia, Kenya, Rwanda and Burundi could experience modest changes to stable malaria by the 2050s, with conditions for transmission becoming highly suitable by 2080.
- Ecosystem impacts, including impacts on mountain biodiversity, could occur. Declines in fisheries in some major Eastern African lakes could occur.

Western and Central Africa

- Impacts on crops, under a range of scenarios.
- Possible agricultural GDP losses ranging from 2 to 4 per cent with some model estimations.
- Populations of Western Africa living in coastal settlements could be affected by projected rise in sea levels and flooding.
- Changes in coastal environments (such as mangroves and coastal degradation) could have negative impacts on fisheries and tourism.

Southern Africa

- Possible heightened water stress in some river basins.
- Southward expansion of the transmission zone of malaria may likely occur.
- By 2099, dune fields may become highly dynamic, from northern South Africa to Angola and Zambia.
- Food security is likely to be further aggravated by climate variability and change.

- Agricultural changes (such as millet, maize)
- Changes in ecosystem range and species location
- Changes in water availability coupled to climate change
- Possible changes in rainfall and storms
- Desert dune shifts
- Sea-level rise and possible flooding in megacities
- Changes in health possibly linked to climate change

Note: These are indications of possible change and are based on models that currently have recognised limitations.

Source: Adapted from Boko and others 2007

3.2.3 Current and predicted impacts of climate change on Africa

Confidence level

- High
- Medium
- Low

Projected changes

- Glacier melting
- Increase in temperature
- Increase in precipitation
- Decrease in precipitation
- Increase in precipitation extremes
- Longer dry spells periods
- Shorter dry spells periods
- More heatwaves
- Fewer frost days
- Higher hurricane intensity

Note: The confidence levels are based on the statistically significant levels of coincidence determined for the sign of change by a certain number of models (at least 80% for high confidence, 50–80% for medium confidence and less than 50% for low confidence)

Source: ECLAC, on the basis of information from National Institute of Spatial Research (INPE) of Brazil

12.2 Summary of climate change patterns projected for 2100 in South and America and the Caribbean

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-3: Student analyses the effect of interactions and connections between people, places and environments

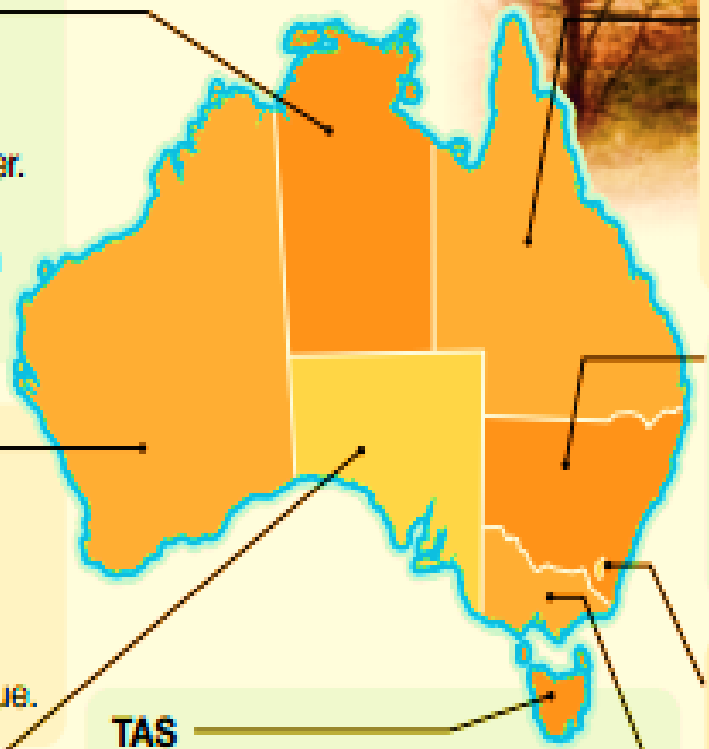
COUNTRY SCALE

GEOGRAPHICAL TOOL: maps

GE5-3: Student analyses the effect of interactions and connections between people, places and environments

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

STATE SCALE



NT
Kakadu National Park exposed to changed salinity as a result of sea level rise and saline intrusion into groundwater. Current projections are that sea level around Kakadu will rise by at least 8 cm by 2020 and up to 30 cm by 2030.

QLD
Expected decline in agricultural producti
temperatures, reduced rainfall and extrem

Approx. decline in production	Beef	
By 2030	19%	12%
By 2050	33.5%	17%

NSW
Large coastal populations may be at risk due to sea level rise. In a 1.1 m sea level rise scenario, up to 65 300 residential buildings with a current value of up to $20 billion may be at risk.

WA
Rainfall in southwest WA has already reduced by around 15% since the mid-1970s. By 2070 it is predicted the region will experience 80% more drought-months if current trends continue.

ACT
Increasing temperature and evaporation is likely to raise the risk of bushfires. Annual number of days with very high or extreme fire danger up from 23 to 38 by 2050.

SA
The economic impact of a hotter and drier climate on the water supply infrastructure for Adelaide is likely to be significant by 2070. The quality of water being delivered from the Murray–Darling Basin is also expected to decline significantly by 2050 due to rising salinity levels.

TAS
Fishing industry and marine life vulnerable to warmer oceans —waters off the east coast of Tasmania have increased by around 1.5°C since the 1950s. A rise of 3°C may result in severe stress to Tasmanian salmon, one of Australia's largest and most valuable aquaculture industries.

VIC
Significant risk to vulnerable natural ecosystems and endangered plant and animal species. Species such as the mountain pygmy possum that occupy habitats at the highest elevations and in the coldest environments will have nowhere to retreat to as the climate warms.

2.7.1 Impacts of climate change across Australia (diagram); the Murray River in drought (photo)

Source: based on Treasury data

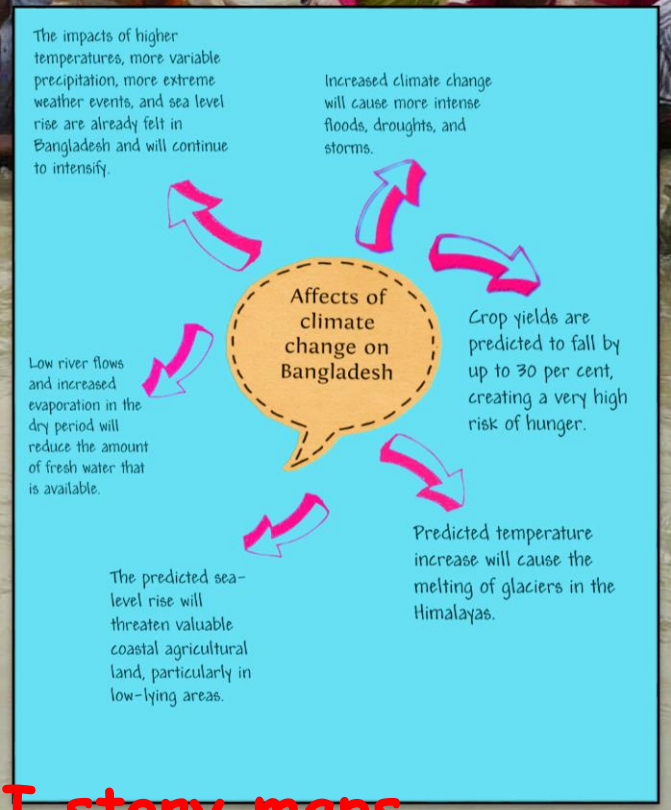
GEOGRAPHICAL TOOL: annotated map

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

COMPARE AUSTRALIA WITH BANGLADESH

Consequences

Millions of Bangladeshis expected to be displaced in next 40 years.



Lessons and worksheets: ESRI story maps

GEOGRAPHICAL TOOL: diagram, map

How do people's *worldviews* affect their attitudes to and *use* of environments?

WORLDVIEWS LINKED TO MANAGEMENT

BUSINESS AS USUAL: continue without changing our contribution of greenhouse gases e.g. use of fossils fuels instead of non-renewable resources such as wind and solar energy.

Countless household items use standby electricity or vampire power, such as Plasma TVs, cordless telephones and security systems. The average household consumes 10% more energy when goods are on standby mode.

MITIGATION: change the way we live and work to lessen the severity of climate change such as: recycling waste to reduce methane; taking public transport rather than a car, using renewable energy, and growing crops requiring less fertilisers which adds nitrous oxides a greenhouse gas into the atmosphere.

ACTION

DOING SOMETHING ABOUT IT

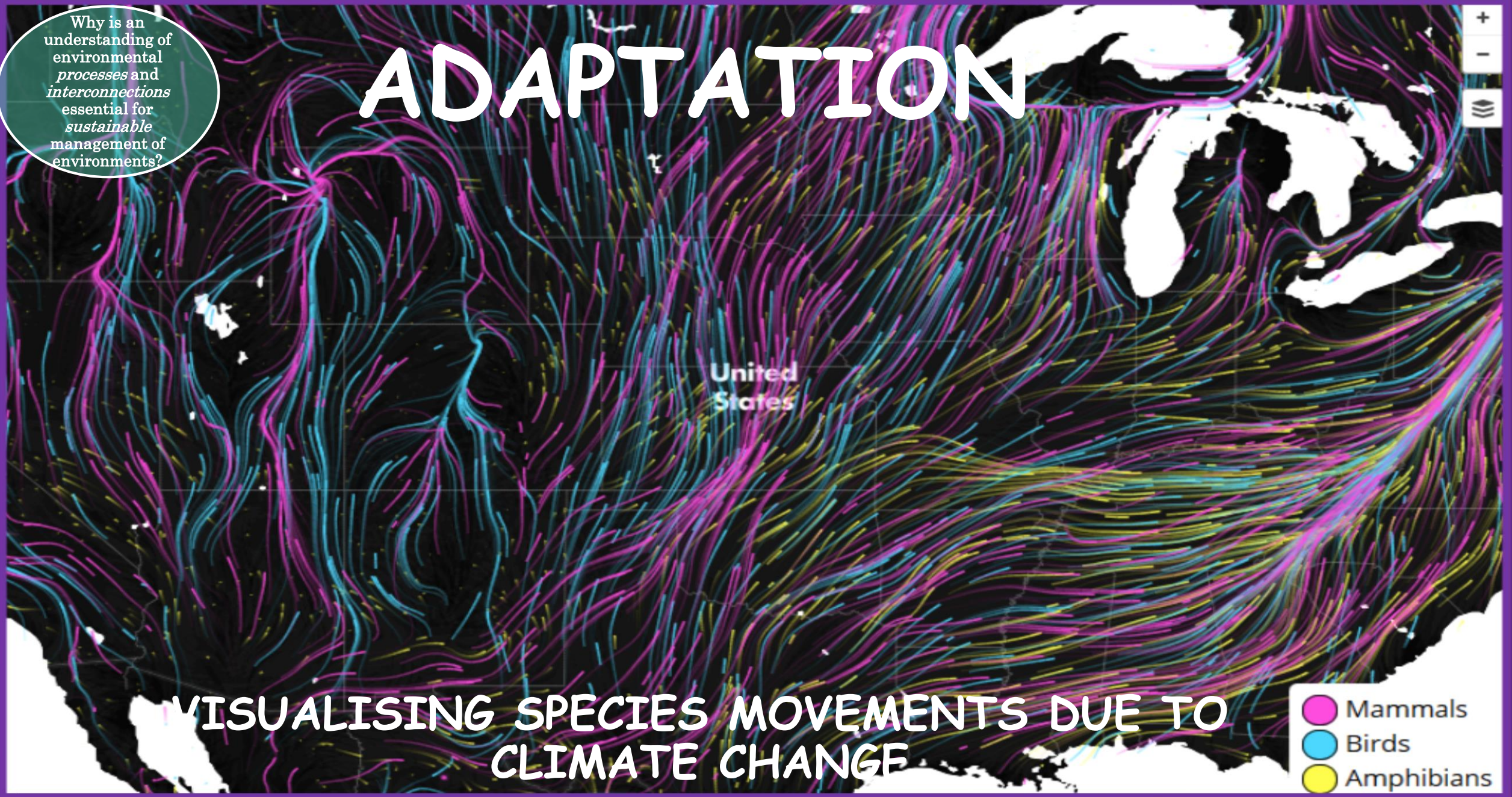
ADAPTATION: societies make themselves better able to cope with an uncertain future.

Me first	Mitigation	Environmental war	Protection
Innovation of low carbon technology and no need to change lifestyle	Sustainable forms of living - mitigation	Tough measures implemented – carbon taxes, higher price of fossil fuels	Live within countries footprints and ecosystems

GEOGRAPHICAL TOOL: diagram, table

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

ADAPTATION



VISUALISING SPECIES MOVEMENTS DUE TO CLIMATE CHANGE

http://blog.nature.org/science/2016/08/19/migration-in-motion-visualizing-species-movements-due-to-climate-change/

GEOGRAPHICAL TOOL: moving map

GE5-5: Student assesses management strategies for places and environments for their sustainability

ADAPTATION

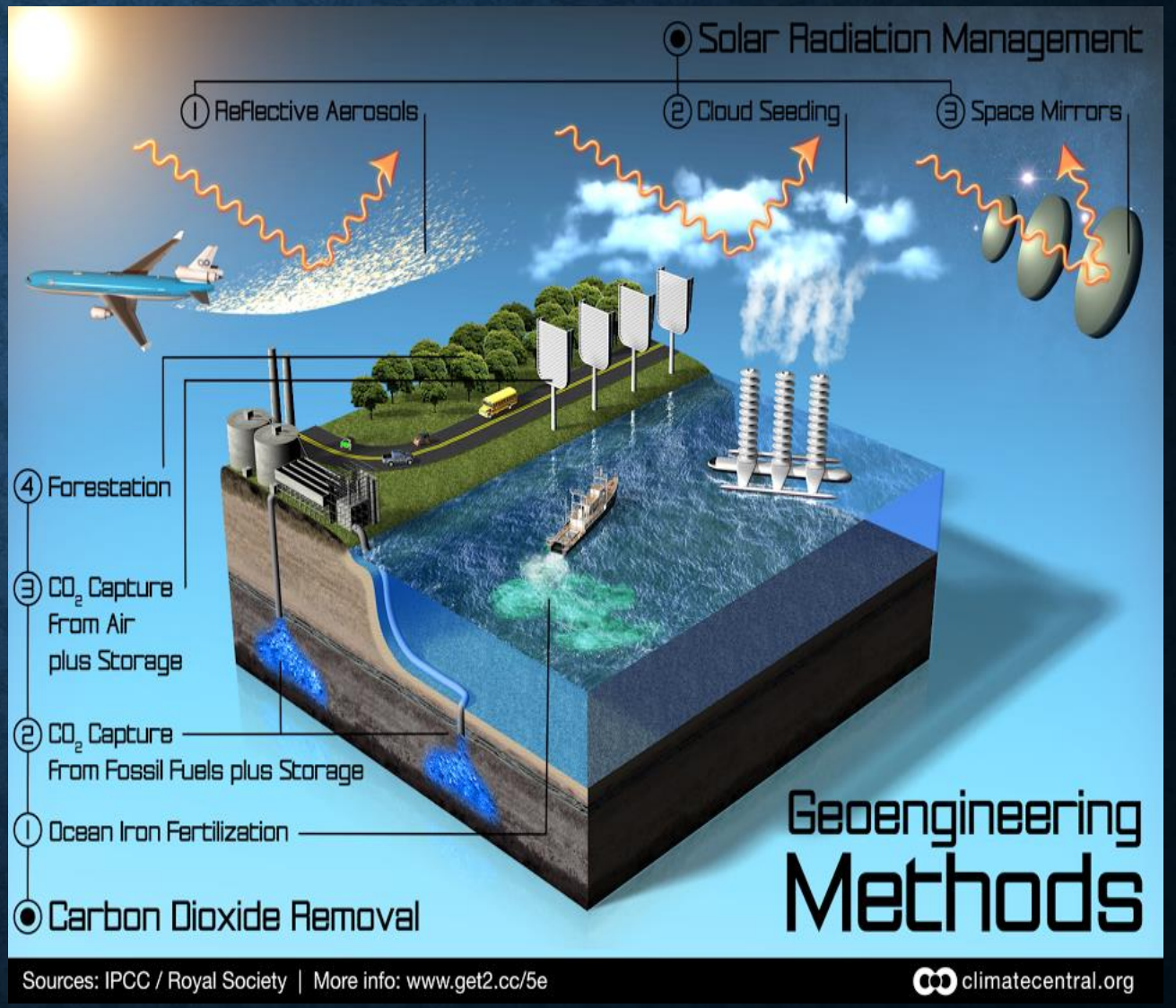
Vulnerable sectors	Anticipated adaptation
Water	Recycle water Built levees for flood control Harvest rainwater
Agriculture	Develop salt, drought and pest resistant crops Control soil erosion Construct dams for irrigation
Health	Develop early warning systems Improve housing, water and sanitation Vector monitoring
Ecosystems	Create reserves and protected areas Develop seed banks Reafforestation Promote agroforestry
Coastal	Build sea walls Protect coral reefs, mangroves and sea grass Restrict development on low lying coastal areas

United Nations Framework Convention on Climate Change (UNFCC) adaption strategies for countries in the Asia region Adapted http://unfccc.int/resource/docs/publications/impacts.pdf, page 31

GEOGRAPHICAL TOOL: photograph, table

GE5-5: Student assesses management strategies for places and environments for their sustainability

MITIGATION



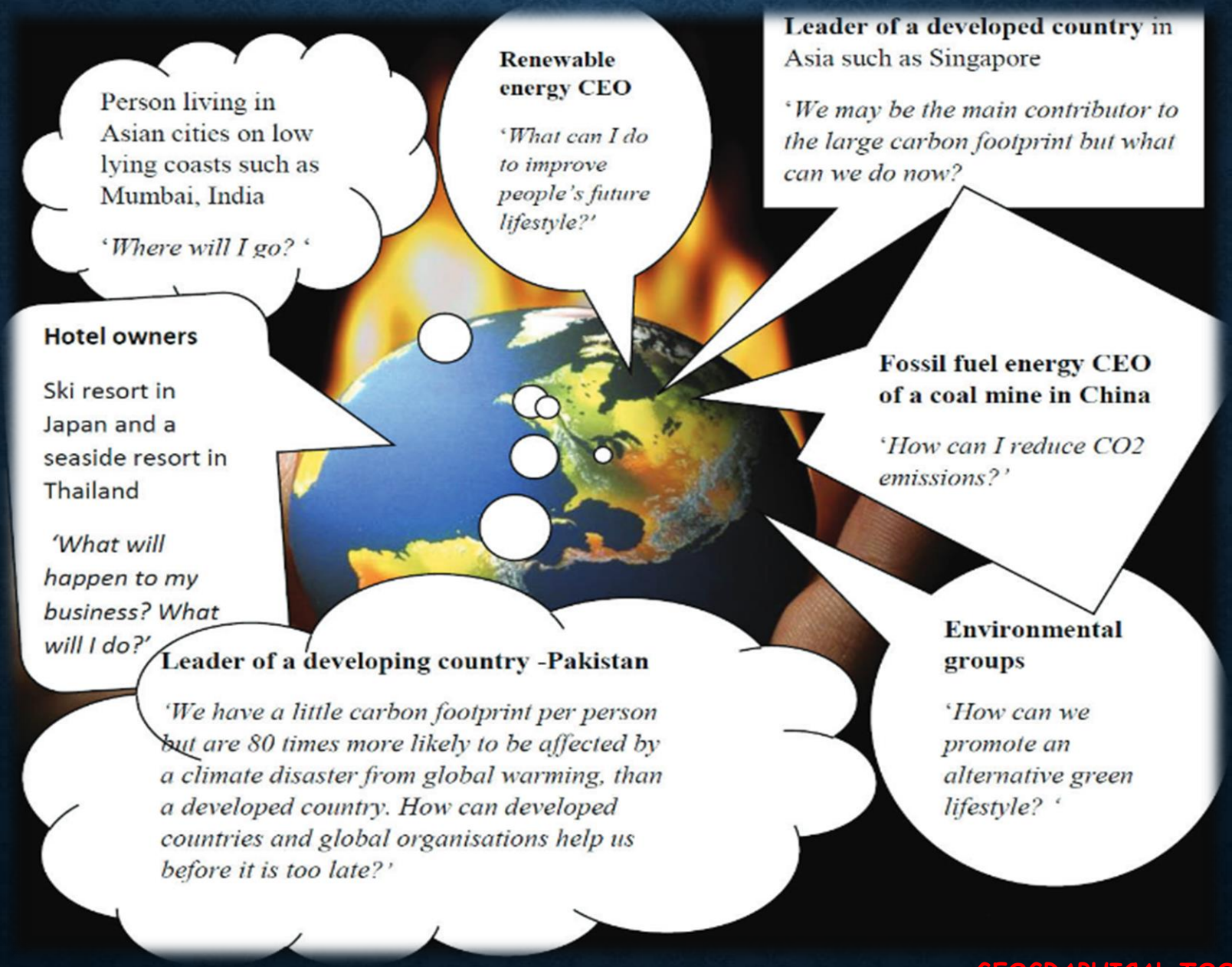
Explain how geoengineering and use of renewable energy could help reduce global warming.

GEOGRAPHICAL TOOL: photograph, table, diagram

PERSPECTIVES

How do people's *worldviews* affect their attitudes to and *use* of environments?

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues



GEOGRAPHICAL TOOL: perspectives diagram

GE5-4: Student accounts for perspectives of people and organisations on a range of geographical issues

WHAT IS TRUMP'S WORLDVIEW ON CLIMATE CHANGE?

Critics fear Trump could roll back US environmental protection-Paris Agreement?

How will it impact on people, places and environments?

Donald J. Trump
@realDonaldTrump
Following

The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.

Donald J. Trump
@realDonaldTrump
Following

NBC News just called it the great freeze - coldest weather in years. Is our country still spending money on the GLOBAL WARMING HOAX?

Donald J. Trump
@realDonaldTrump
Following

Give me clean, beautiful and healthy air - not the same old climate change (global warming) bullshit! I am tired of hearing this nonsense.

Donald J. Trump
@realDonaldTrump
Following

Snowing in Texas and Louisiana, record setting freezing temperatures throughout the country and beyond. Global warming is an expensive hoax!

GEOGRAPHICAL TOOL: technology-tweets

4. INVESTIGATIVE STUDY

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.

Why is an understanding of environmental *processes* and *interconnections* essential for *sustainable* management of environments?

GE5-5: Student assesses management strategies for places and environments for their sustainability

1. Acquire information
- identify an issue
- develop geographical questions to investigate the issue
- collect primary geographical data (e.g. fieldwork, interviews, questionnaires)
- gather geographical information from secondary sources (e.g. internet, journals, newspapers)
- record information

2. Process information
- evaluate data and information for bias and reliability
- represent information in appropriate forms such as maps, graphs, statistics, spatial technologies and visual representation
- interpret data and information gathered
- analyse findings and results
- draw conclusions

3. Communicate information
- communicate results using a variety of strategies
- reflect on the investigation findings
- propose individual or collective actions
- predict expected outcomes
- where appropriate, take action

Before it's too late. wwf.org

WWF

GEOGRAPHICAL TOOL: table

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.

Select ONE type of environment

- ACARA curriculum: choice of 5 environments
- NSW syllabus: no specific environment- other suggestions-wetlands, endorheic, arctic tundra, lakes (Titicaca), grasslands (Maasai, Mongolians), built environments-rural/regional Australia


Coast


Inland Water


Urban


Land


Marine

GEOGRAPHICAL TOOL: diagram/photo

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.

Select ONE type of environment in Australia Compare with at least ONE other country.

Include: Asian country and management of Aboriginal and Torres Strait Islander Peoples

MARINE	COASTS	INLAND WATER	URBAN, REGIONAL, TOWNS	WETLANDS	ENDORHEIC-INLAND WATER	LAND
•Great Barrier Reef •Coral Triangle-SE Asia •Raja Ampat Islands-West Papua, Indonesia •Red Sea •Bermuda	•NSW •USA •Russia's Artic Coast •Bangladesh delta •Netherlands •Singapore, Mumbai, Dubai	•Australian river (local area) •Murray Darling River •Ord River •Yellow River China •Mekong, Vietnam	•Sydney •ACT •Sao Paulo •Curitiba •New York •Shanghai •Wagga, Dubbo, Armidale	•Homebush Bay, Sydney •Kerala, India •Sundarbans Bangladesh •Alpine wetlands-Kosciusko •Hunter wetlands •Kakadu	•Lake Eyre •Lake George •Caspian Sea •Aral sea •Dead Sea •Okavango River •Lake Van	•Agriculture •Urban •Mining •Industrial •Settlements •Issues: land degradation, salinity, soil erosion •Recreation use- skiing

GEOGRAPHICAL TOOL: table

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.

ENDORHEIC LAKES

Bodies of water that do not reach the ocean. Compare Lake Eyre in Australia with an example in another country

Antarctica	Eurasian	Australia	Africa	USA
• Don Jaun Pond • Lake Vanda	• Caspian sea • Aral Sea • Dead Sea	• Lake Eyre • Lake George	• Lake Turkana • Qattara Depression	• Great Salt Lake • Crater Lake,

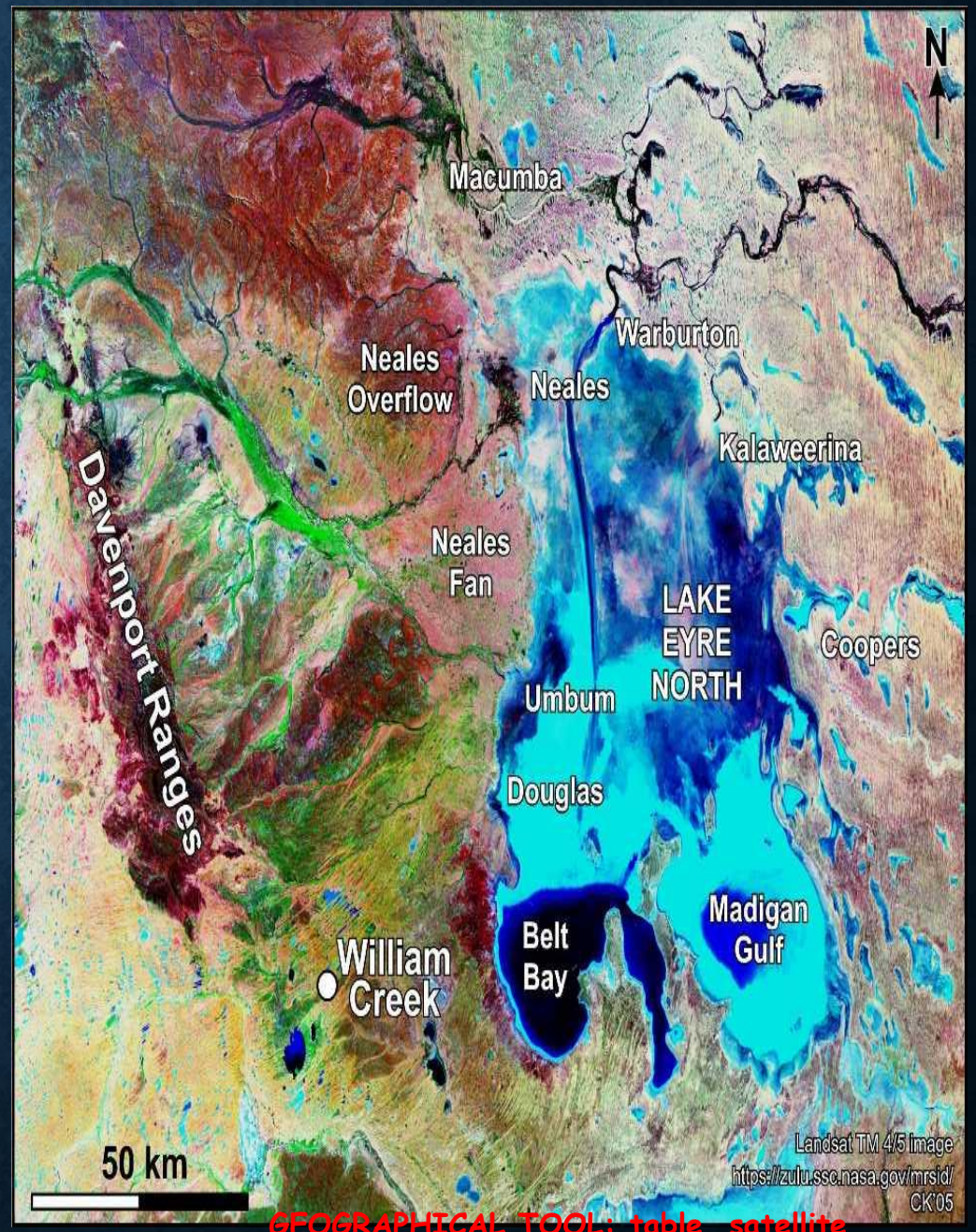
Activity:

Students investigate:

- biophysical processes of selected environment
- causes, extent, consequences-environmental change
- management of environmental change

Satellite Lake Eyre- endorheic lake

http://www.asprg.adelaide.edu.au/LEBARGwww/LEBARGIII_proposal.html



GEOGRAPHICAL TOOL: table, satellite

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country.

COMPARE GREAT BARRIER REEF WITH CORAL TRIANGLE (ASIA)

DECLINING CORAL REEFS: CAUSES, CONSEQUENCES, MANAGEMENT (MARINE PROTECTED AREAS)

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-5: Student assesses management strategies for places and environments for their sustainability

Destructive fishing practices: CT
Overfishing, cyanide fishing, blast fishing, banging on reefs with sticks (muro-ami)
Lost or discarded fishing nets (ghost nets) snag on reefs and strangle fish, sea turtles and marine mammals

Coral mining: CT
Used for cement, souvenirs and building

Ocean acidification: CT and BBR
Excessive CO_2 results in an increase in acid levels and death of species

Sedimentation: CT and GBR
Sediment from cleared land smothers coral and deprives it of light required to survive

El Niño: CT and GBR
In 2010 El Niño caused coral bleaching and death of coral as a result of increased water temperature

Coastal development: CT and GBR
Population moves to coastal cities and development of tourist sites

Water pollution: CT and GBR
Pesticides and fertilisers from farms travels to reefs and kills species
Oil spills from passing ships
Dumped garbage blocks sunlight coral requires to survive

Natural disasters: CT and GBR
Cyclones and tsunamis destroy coral reefs

Ballast discharge: CT
Transfers algal blooms and coral pathogens to coral waters in other countries

Careless tourism: CT and GBR
Trampling coral, sewage disposal, boat anchors cut coral

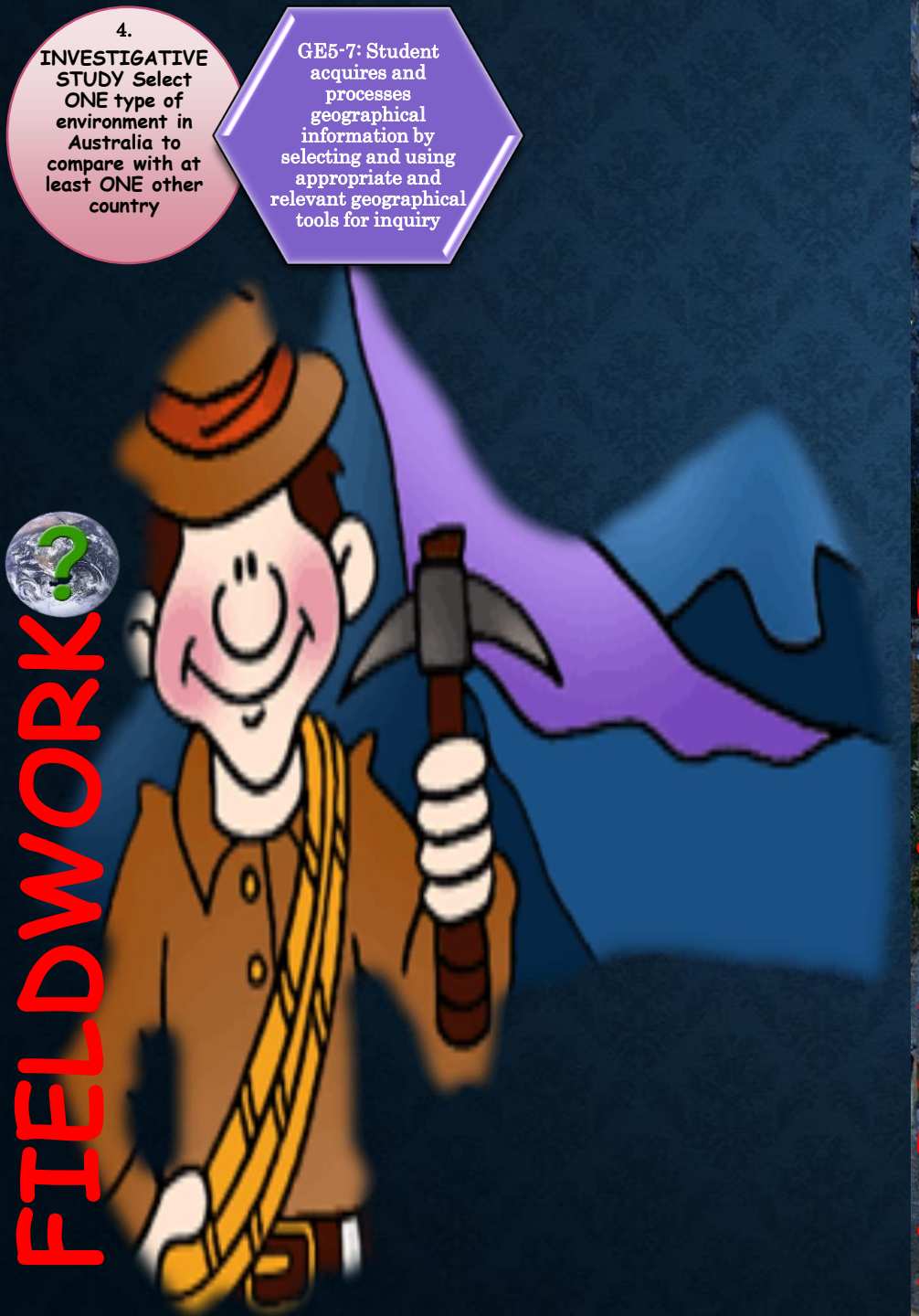
Algal blooms: CT and GBR
Runoff of fertilisers from farming and sewage onto reefs reduces photosynthesis

Viruses: CT and GBR
Infect organisms ranging from bacteria to whales

GEOGRAPHICAL TOOL: annotated photograph

4. INVESTIGATIVE STUDY Select ONE type of environment in Australia to compare with at least ONE other country

GE5-7: Student acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry



FIELDWORK

VIRTUAL FIELDWORK

VISIT AIR PANOS -360 DEGREES!
Activity: group work on different environments, changes and management

- Greenland/ice sheets and ice bergs
- Bhutan/mountains
- Maldives/islands
- Turkey/Pamukkale karst
- Java/Brolo volcano
- Indonesia-Raja Amput/coral reefs, wetlands
- Zimbabwe/Victoria Falls
- Namibia/Namib Desert
- Russia/Volcano/Kamchatka
- Cuba-coral reefs

INTEGRATE ASIA PERSPECTIVE (CCP)

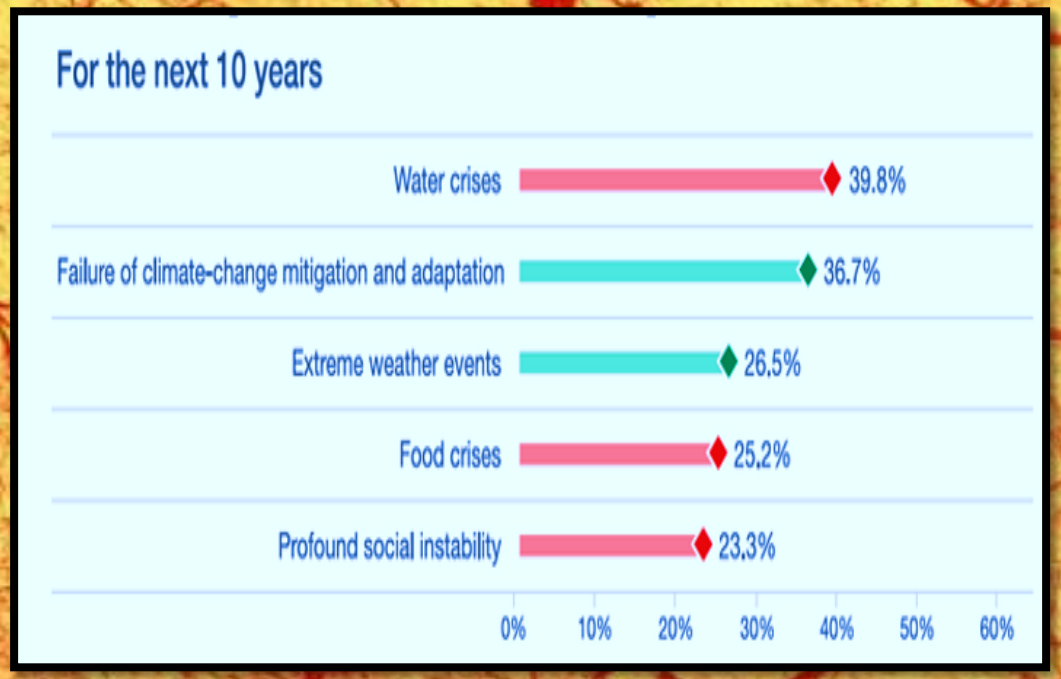
ASIA EDUCATION TEACHERS' ASSOCIATION

http://www.aeta.org.au/

- Asia news four times a year-linked to NSW syllabuses
- Free resources
- Four journals a year-over 100 pages per journal
- Updated articles linked to NSW Geography syllabus on this topic such as:
  - Sustainability
  - Climate change
  - Air pollution
  - Coca cola in India
  - Water pollution and scarcity
  - Dead and lifeless oceans
  - Palm oil
  - World view on whaling
  - Climb or not climb Mt Everest
  - Shark fin soup
  - Cancer villages in China
  - Child labour in India's mica mines

GE5-5: Student assesses management strategies for places and environments for their sustainability

WORLD ECONOMIC FORUM GLOBAL RISKS OF HIGHEST CONCERN 2016-2026



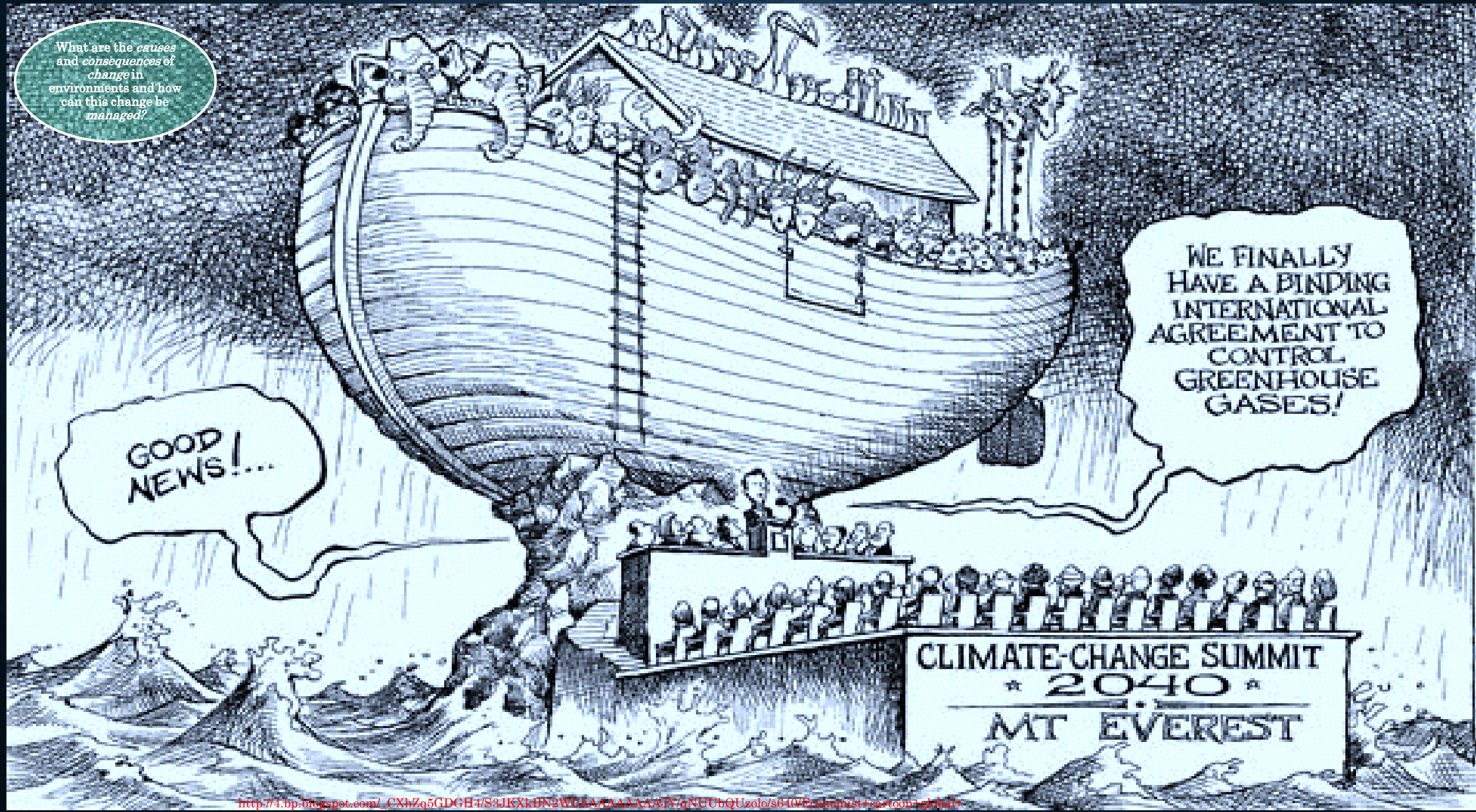
https://www.weforum.org/agenda/2016/01/climate-adaptation-is-key-to-managing-interconnected-global-risks/

What are the *causes* and *consequences* of *change* in environments and how can this change be *managed?*

GE5-5: Student assesses management strategies for places and environments for their sustainability

As informed citizens, humans have a responsibility to use and protect the environment through sustainable practices.

http://www.greenearthclean.com.au/upload/green-cleaning-service1.jpg



http://4.bp.blogspot.com/_CXhZq5GDGH4/S3JKXkBN2WI/AAAAAAAAAJY/qNUUbQUzolo/s640/Economist+cartoon+global+warming.jpg