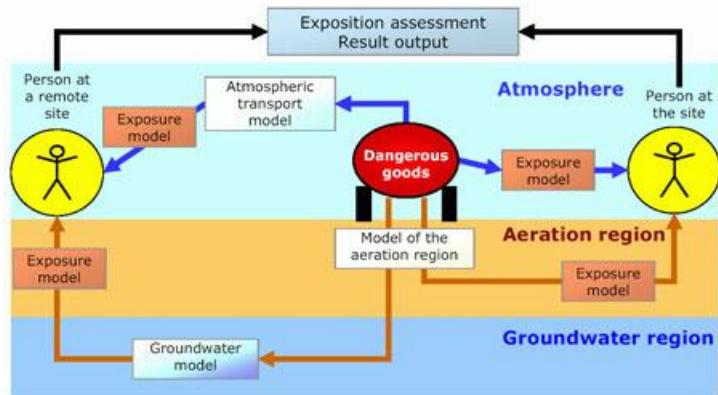


Special Issues in Energy, Environment & Climate Change

Environmental Impact Assessment



John A. Paravantis
PROFESSOR
October 2024

Let's define
Sustainable Development
("Βιώσιμη Ανάπτυξη")



SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND

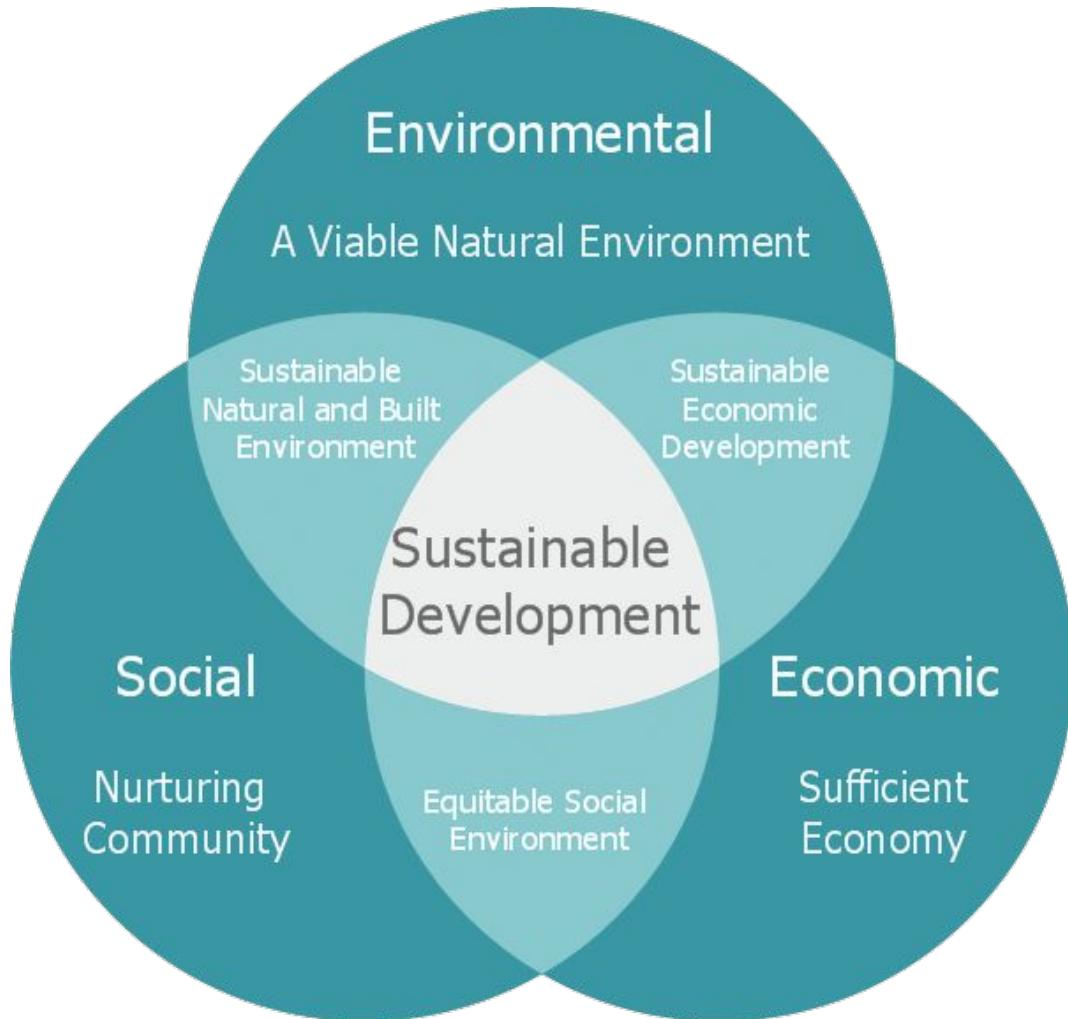


16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS





Assimilative capacity (“Αφομοιωτική ικανότητα”)

- Every natural system (air, water, soil) has a limited assimilative capacity
 - This is its ability to absorb, break down, and neutralize pollutants without being degraded or losing its functionality
 - When this capacity is exceeded, toxins are accumulated, ecosystems degrade, and biodiversity is lost
- Sustainable development ensures that pollution levels do not exceed assimilative capacity

Consumption of nonrenewable resources

- Nonrenewable resources (e.g. fossil fuels, minerals) are finite and cannot be regenerated on a human timescale
 - Sustainable development requires that their use be minimized and that alternatives (such as renewable energy sources) be developed
 - Slowing down consumption of nonrenewable resources extends their availability
 - Invest in technologies and practices that reduce dependence on nonrenewable resources
 - Recycling, reuse, and sustainable substitutes limit the depletion of nonrenewable materials

Consumption of renewable resources

- Renewable resources (e.g. forests, freshwater, fish) should be used at a rate that does not exceed their regeneration capacity
 - Sustainable development requires that the harvest rate of renewable resources be in balance with their natural replenishment rate
 - This ensures that the resource base remains intact for future generations
- Overharvesting beyond a resource's capacity to regenerate leads to depletion, biodiversity loss, and ecological imbalance

Sustainable development ensures environmental integrity by

- Managing the consumption of **renewable resources** to remain within their regeneration capacity
- Minimizing the use of **nonrenewable resources** to extend their availability
- Controlling **pollution** levels to stay within the assimilative capacity of natural systems

This balance protects ecosystems for future generations

The Balance We Must Keep

by ChatGPT

To walk in balance with the Earth,
Where future blooms can find their birth,
We harvest what the land renews,
Within the bounds of nature's cues.

We guard the gifts that cannot last,
And stretch their days before they pass,
With mindful care, we seek to find
A future shaped for humankind.

Pollution's reach we must constrain,
To keep the sky and waters clean,
For ecosystems wait in trust,
That what we take won't turn to dust.

For those to come, we leave the key,
A world sustained in harmony.

The lecture will deal with the topic of preparing
Environmental Impact Studies
(Environmental Impact Assessment)

- Theoretical concepts
- Methodology
- Good practices
- Overview of EIA contents
- Institutional framework for EIA preparation

Conceptual model for the environment:

1. Atmosphere

- Air pollution

2. Hydrosphere

- Water pollution

3. Lithosphere or geosphere

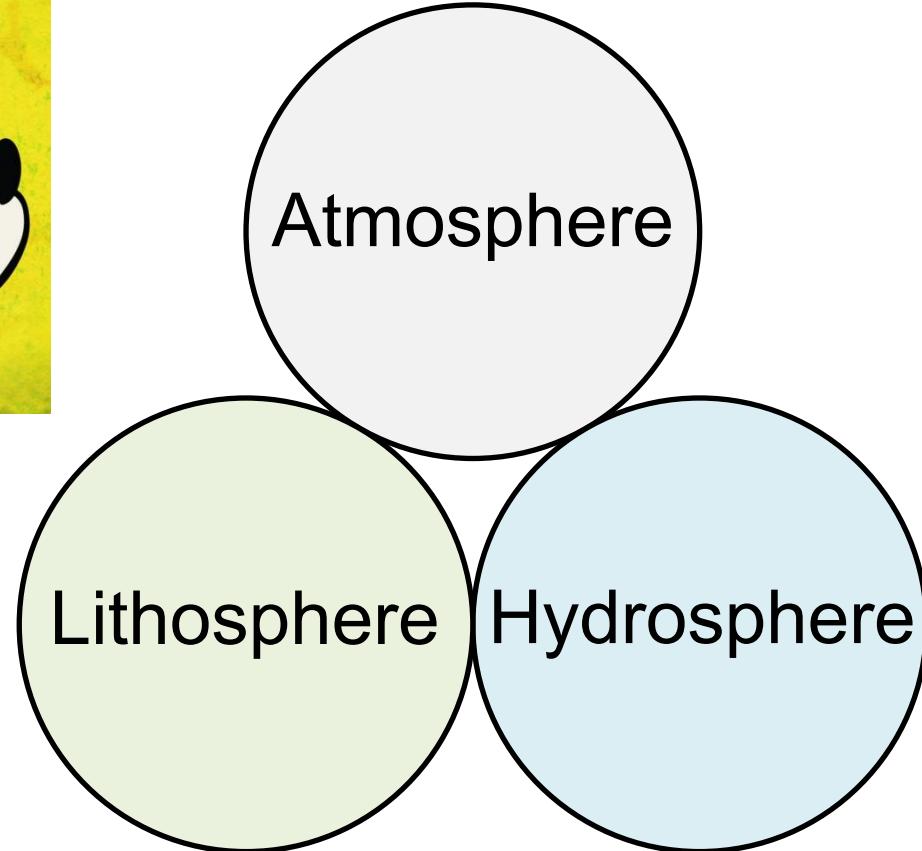
- Soil and subsoil
- Erosion

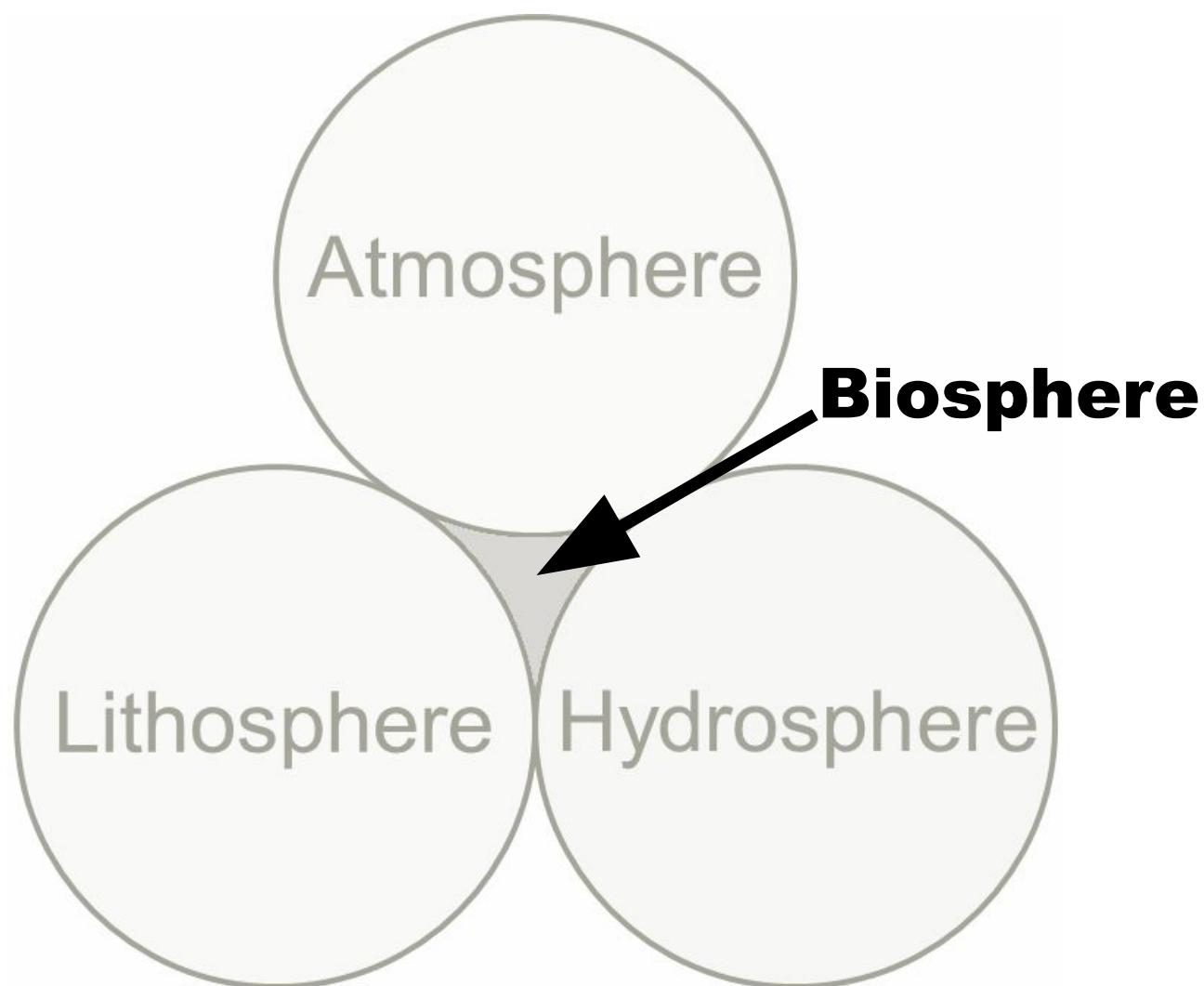
4. Biosphere

- Fauna and Flora
- Ecosystems

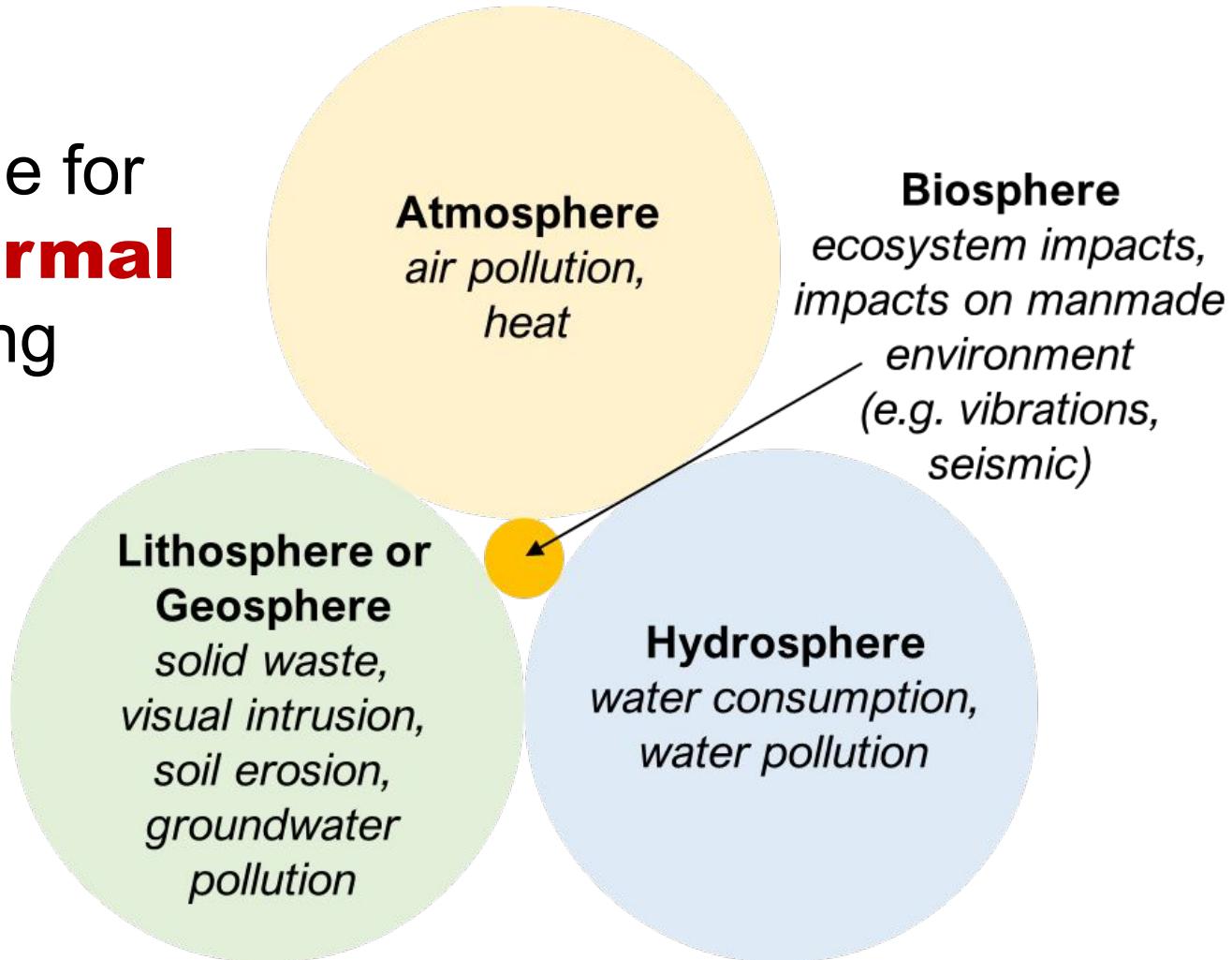


Let's draw a
Mickey Mouse
head





Example for **geothermal** drilling



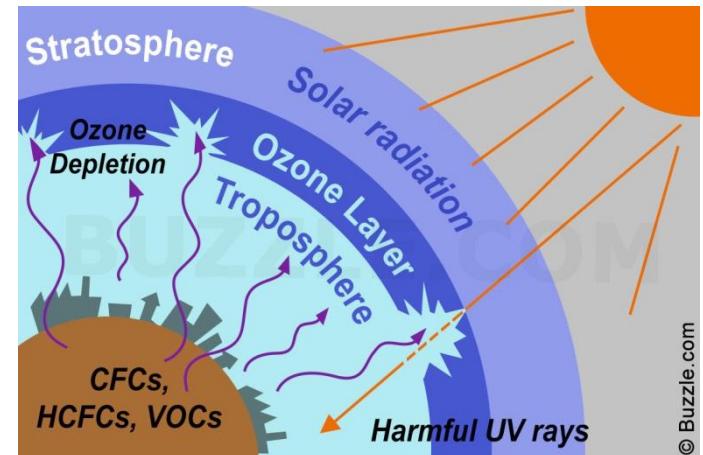
In the **atmosphere** we encounter local and global problems

Global problems

- Global climate change/global warming (and the greenhouse effect)
- Ozone (layer) depletion

Local problems

- Traffic pollution (cars)



The **hydrosphere** contains

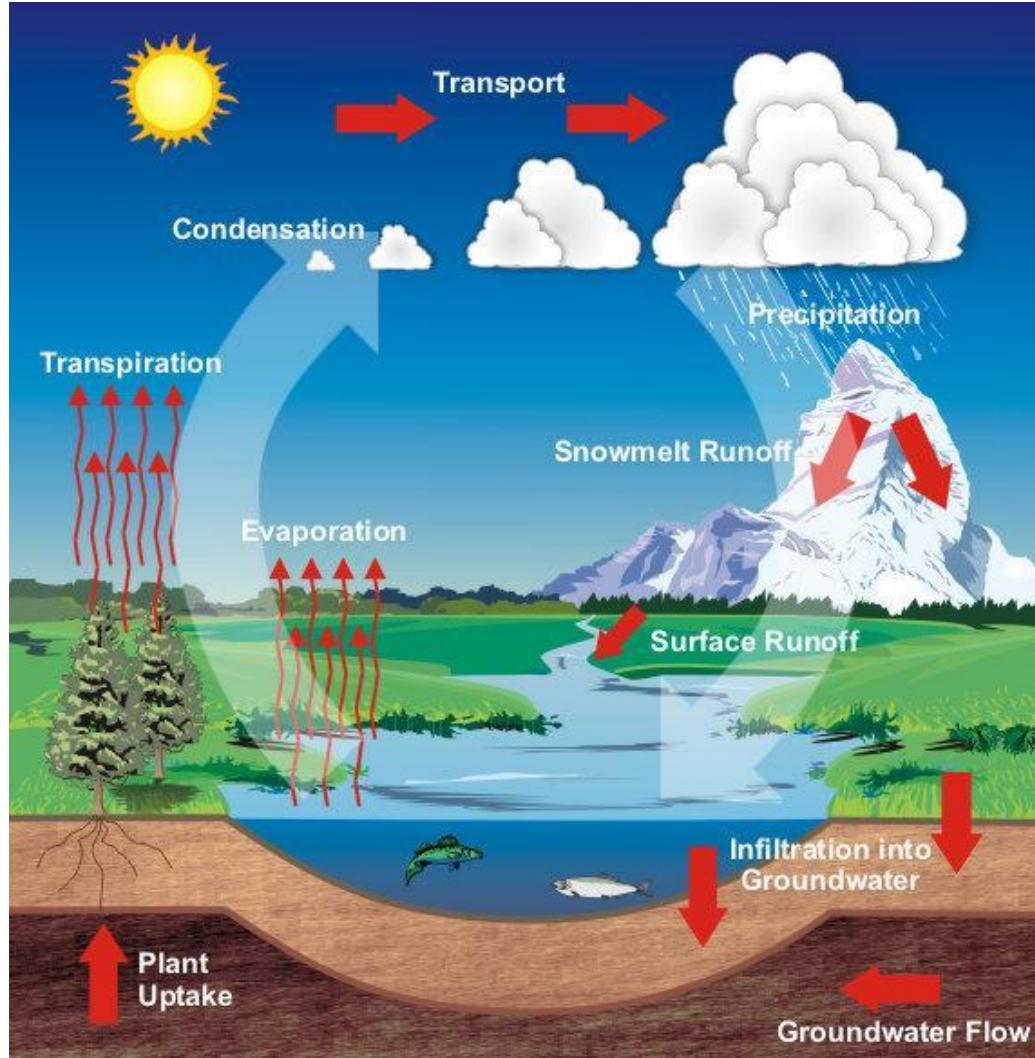
- Saltwater
 - Oceans, seas
- Freshwater
 - Lakes, rivers, wetlands, groundwater

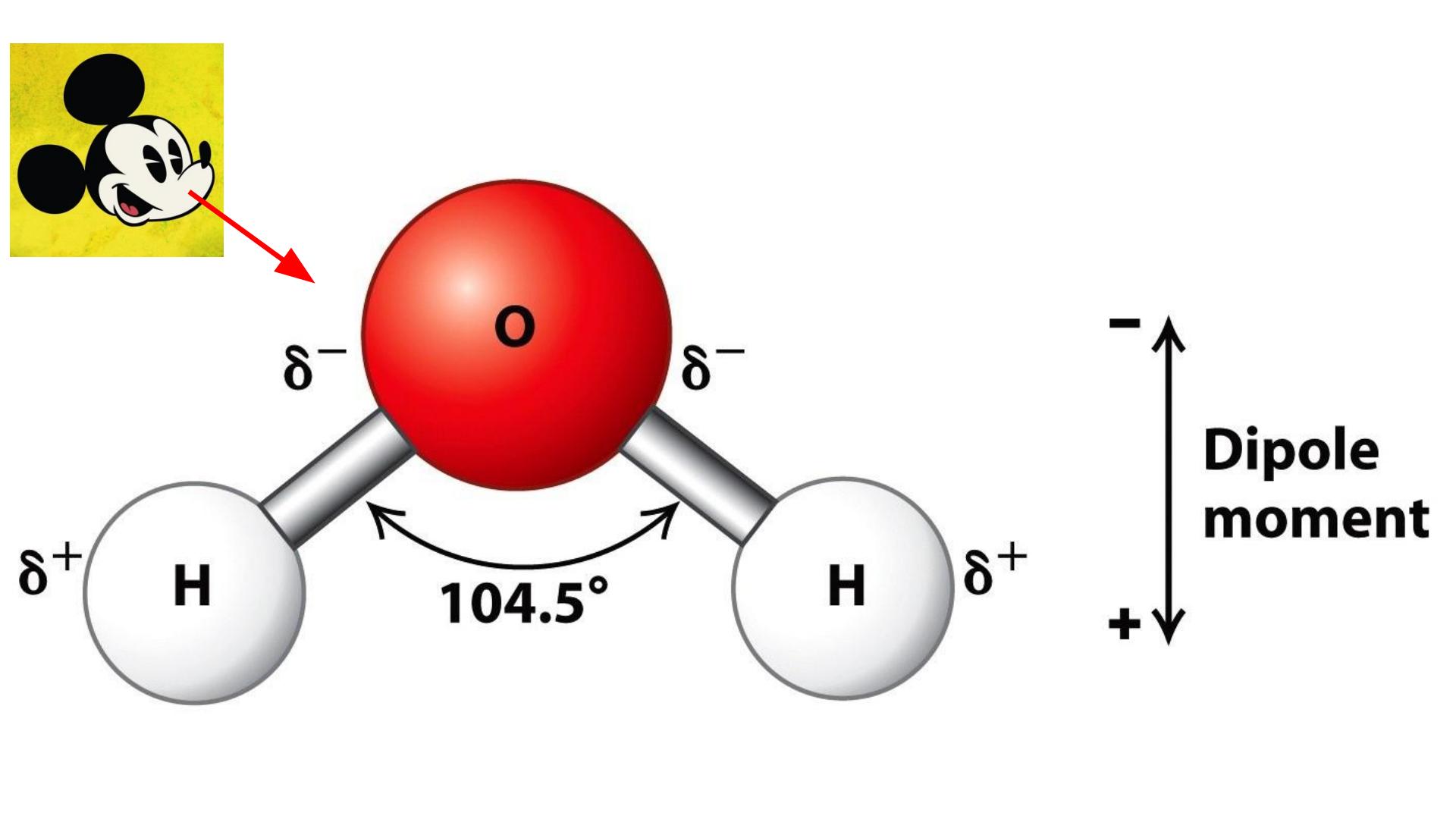
Ecotone is the transition area between two biomes, e.g.

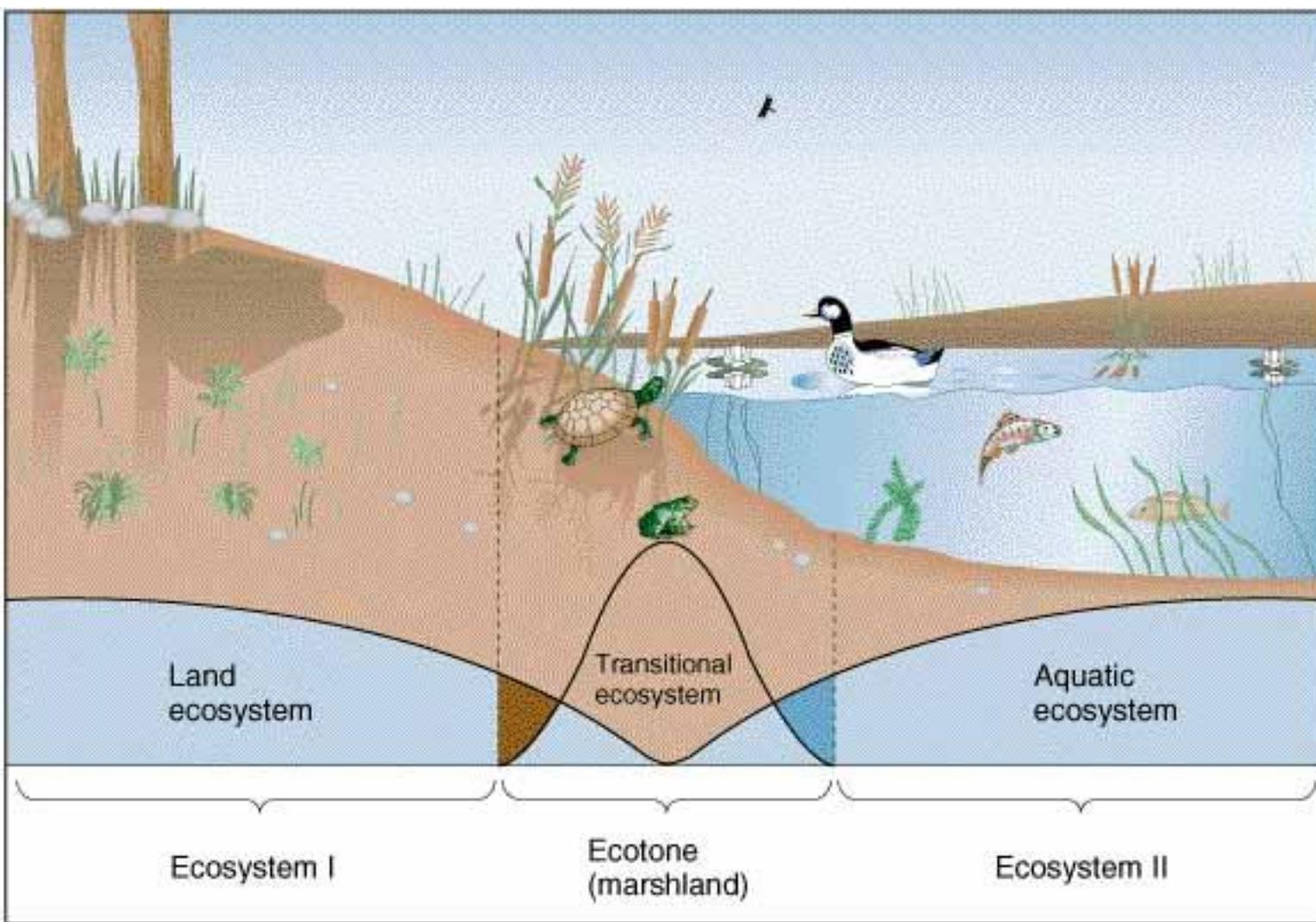
- Freshwater and saltwater in wetlands

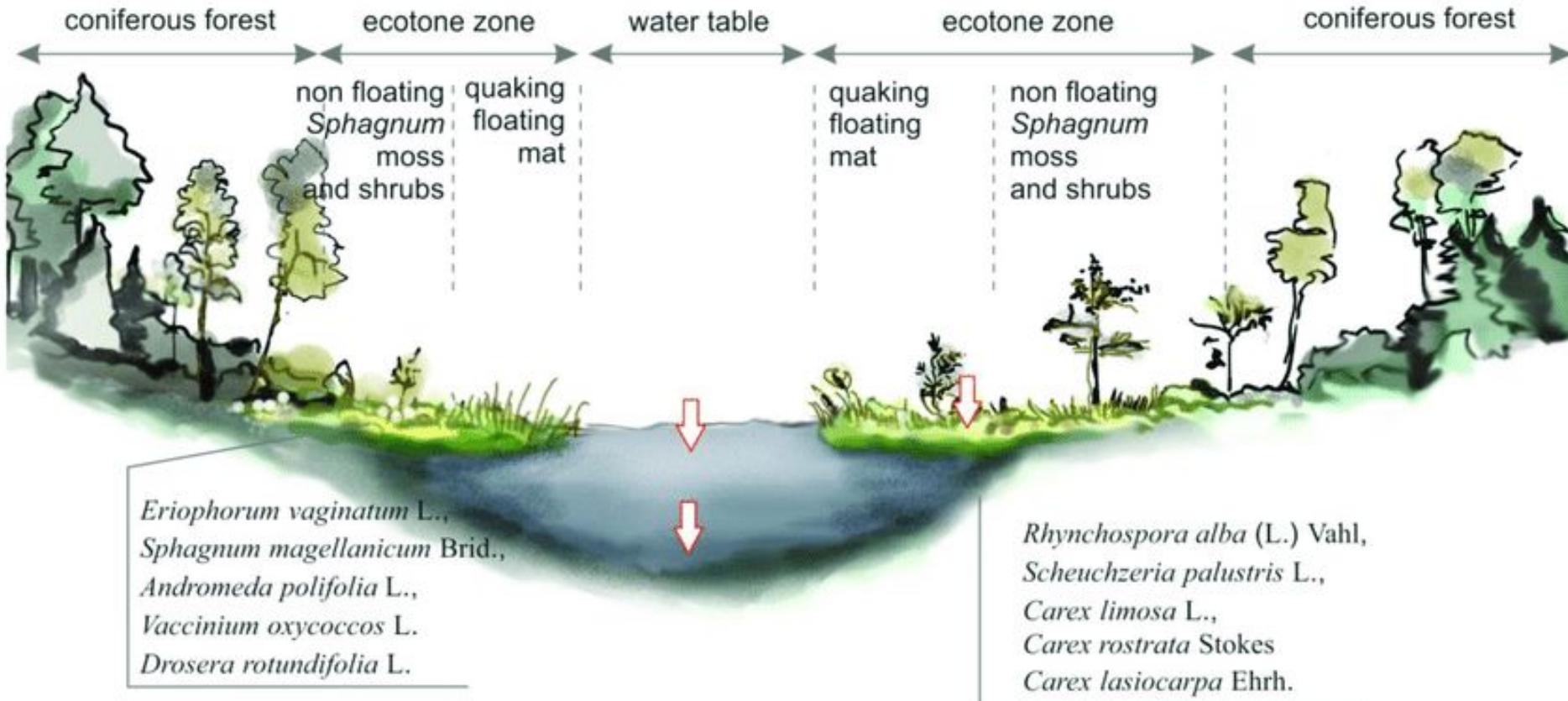
Water circulates via the **hydrologic cycle**

Hydrologic cycle









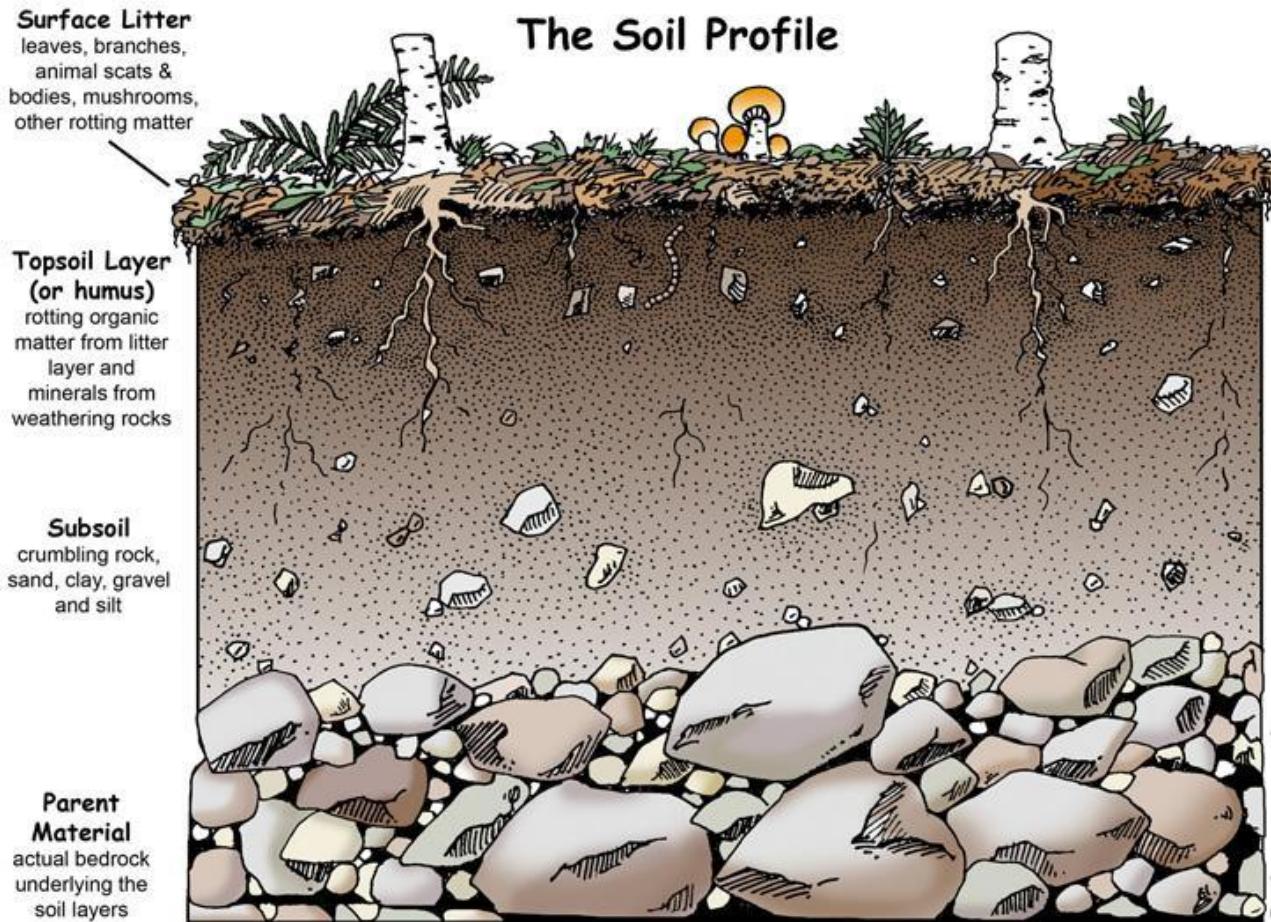
The **lithosphere** (or **geosphere**) contains the soil

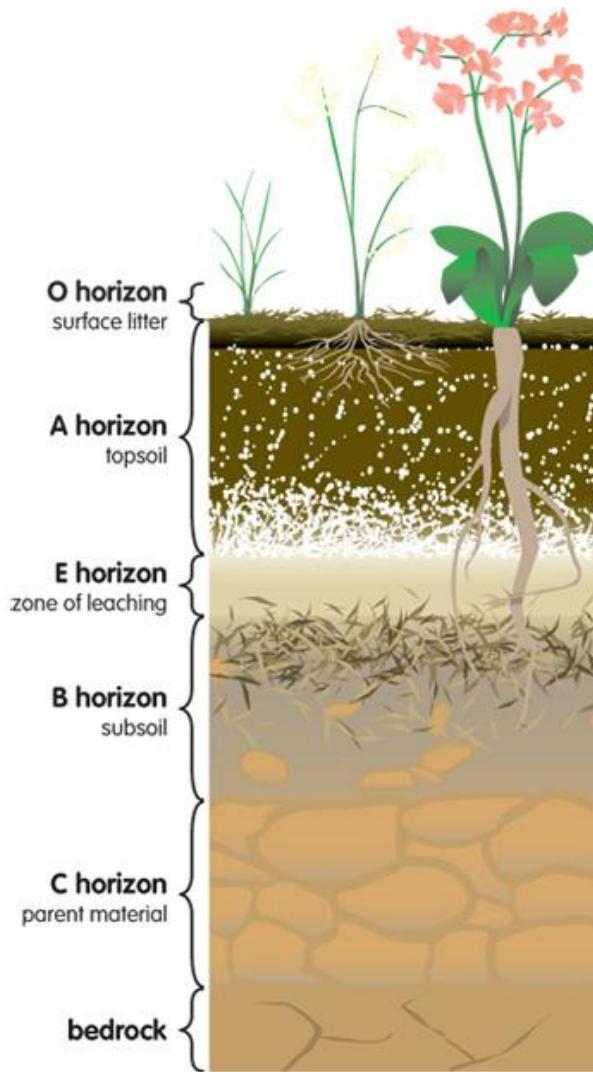
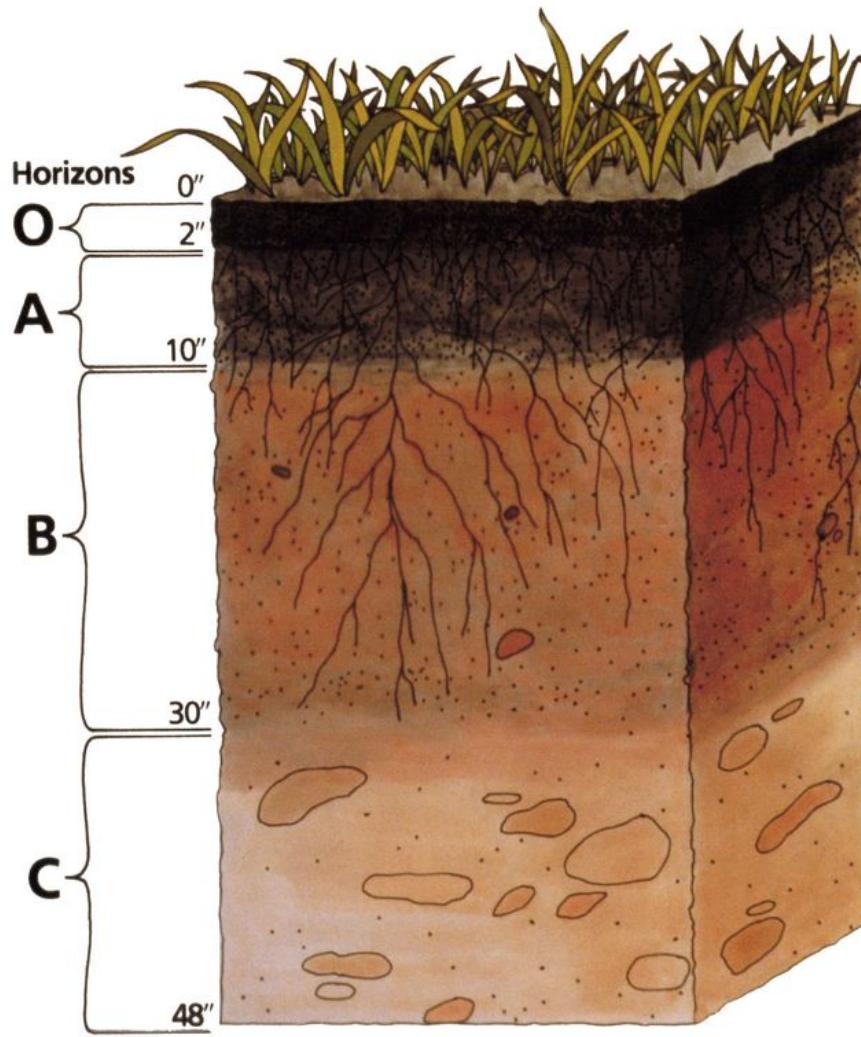
Soil = Dirt + Water + Air + Life

Problems of the lithosphere include

- Soil erosion
- Groundwater pollution

The Soil Profile





GRAVEL



SAND



SILT



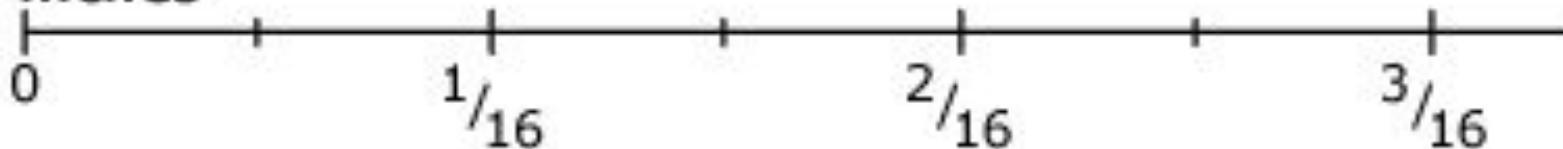
CLAY

invisibl[e] at
this scale

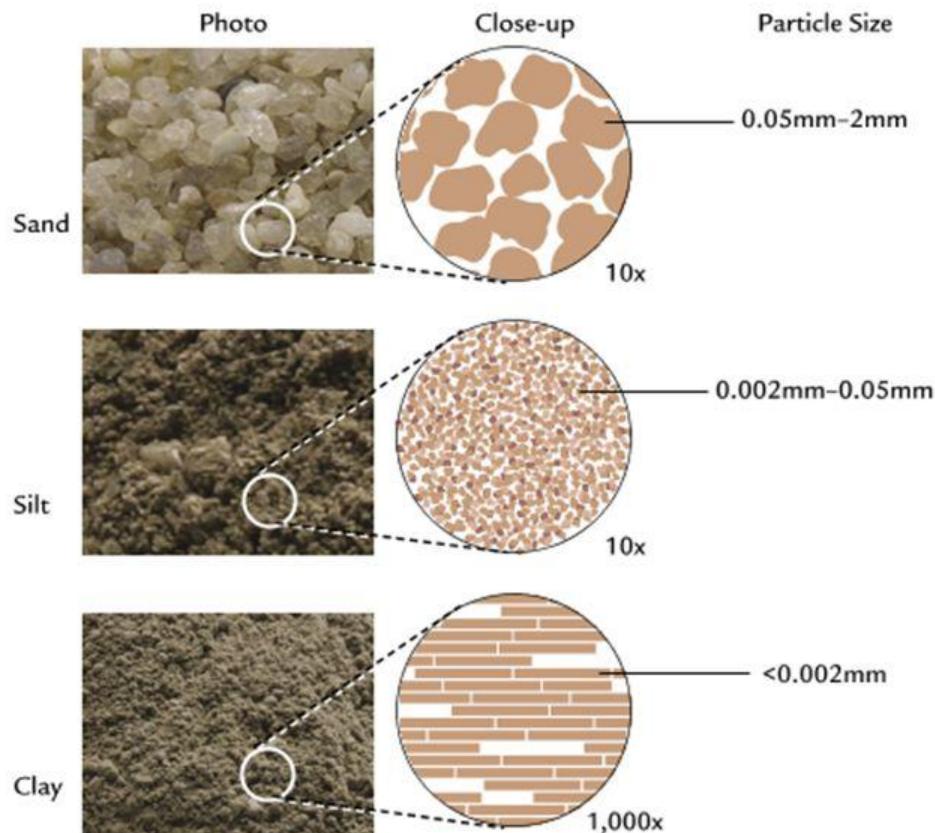
mm



inches



Sand, Silt, and Clay





Sand

Silt

Clay

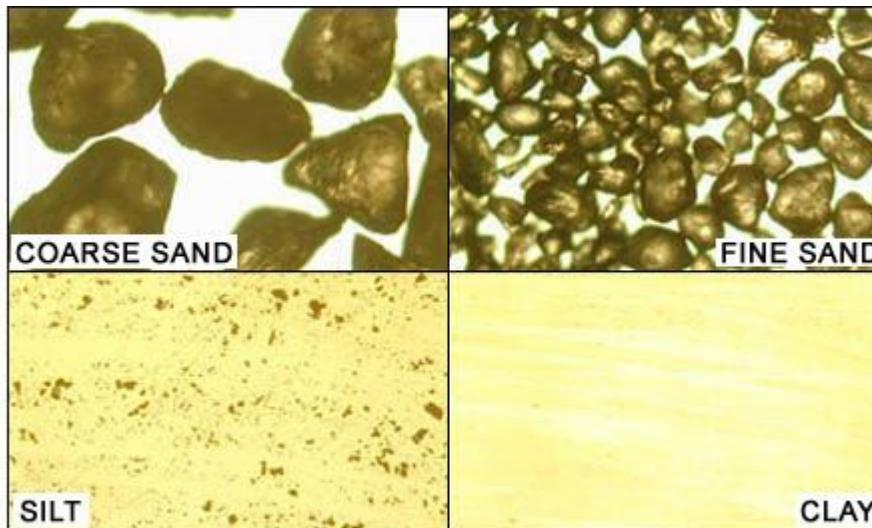


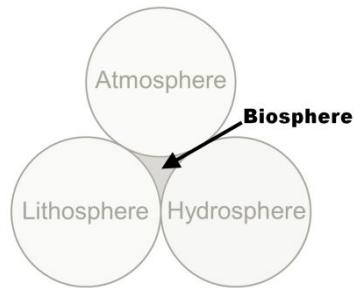
PHOTO CREDIT: VAHE PEROOMIAN

TYPES OF ROCK GRAINS

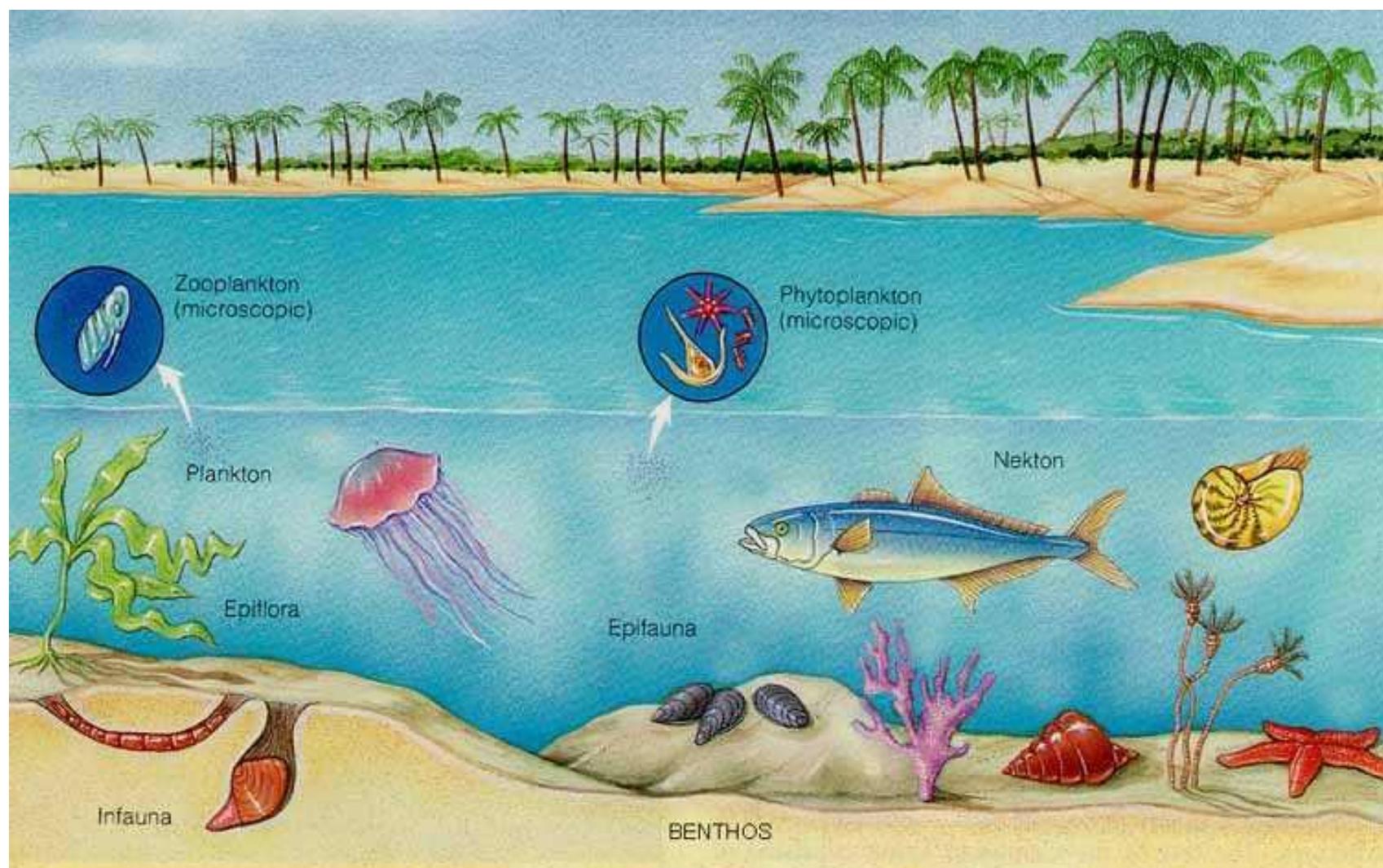
Ability of Sand, Silt, and Clay Particles to Conduct Water

<https://youtu.be/cC7SPH2KEY4?t=19>

The **biosphere** lives at the intersection of the other spheres:

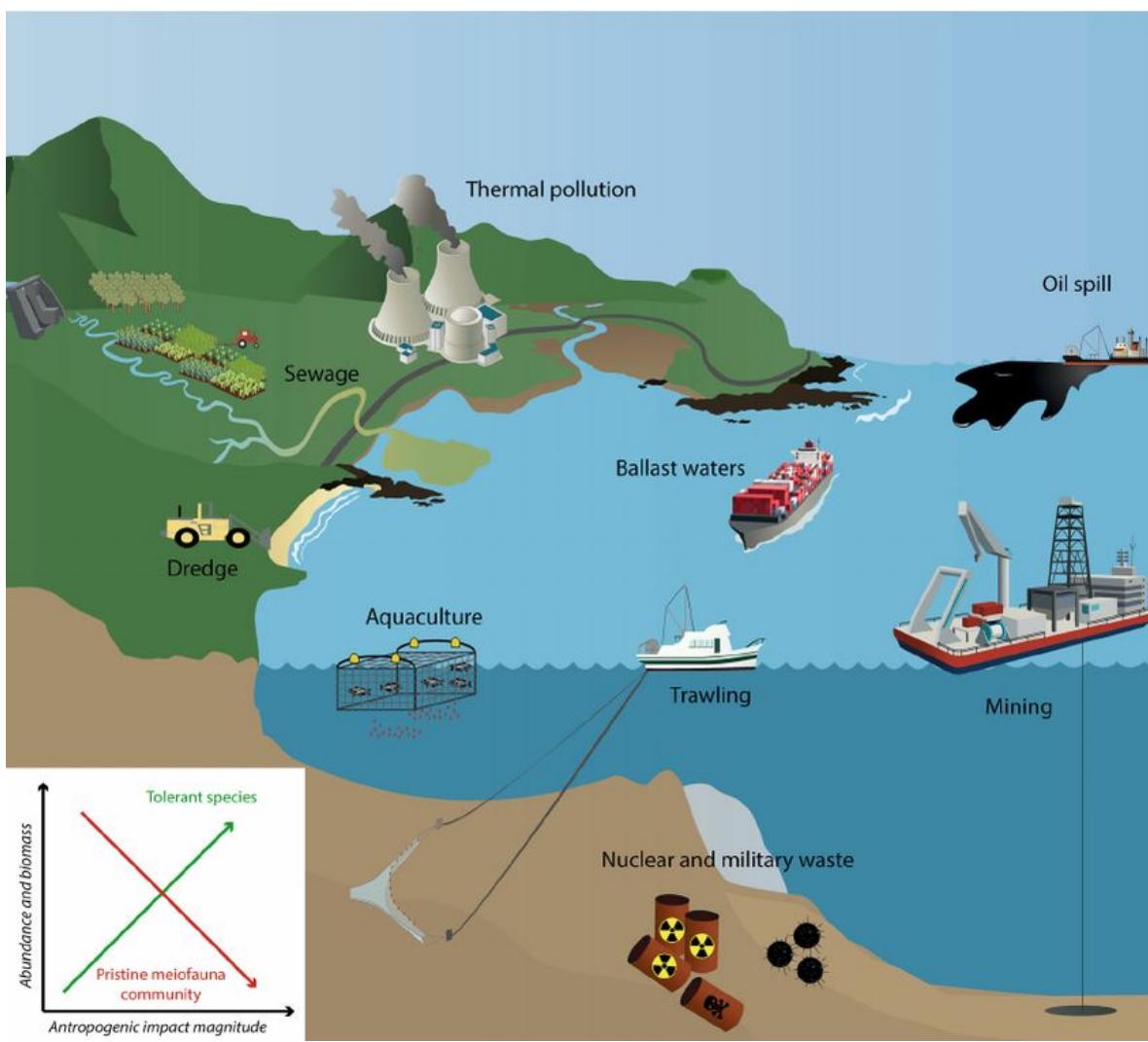


- Between atmosphere and lithosphere
 - Surface of earth
- Between hydrosphere and lithosphere
 - Bottom of sea (**benthos**)
- Between atmosphere and hydrosphere
 - Surface of sea



Natural and **anthropogenic** environment:

- Natural environment contains animals (**fauna**) and plants (**flora**)
- Anthropogenic environment contains men, cities, transportation infrastructure, industries, mining, agriculture, shipping etc.



Biotic and **abiotic** components of the environment

- Biotic components include the biosphere
 - Flora and fauna
- Abiotic components include the other three spheres, i.e. atmosphere, lithosphere and hydrosphere
 - Rocks (*but not all rocks are just rocks*)
 - Streams
 - Clouds

Abiotic components of the environment

- **Air**: Oxygen, nitrogen, carbon dioxide
 - Essential for photosynthesis and respiration
- **Water**: Oceans, rivers, lakes, groundwater
 - Vital for all living organisms
 - Plays key role in regulating Earth's temperature and climate
- **Soil**: Mixture of minerals, organic matter, and microorganisms
 - Plant growth and nutrient cycling

More on **abiotic** components of the environment

- **Sunlight**
 - Energy for photosynthesis
 - Temperature, weather patterns, seasonal cycles
- **Temperature**
 - Affects metabolic rates of organisms
 - Influences habitats
 - Controls ecosystem structure and function
- **Minerals**: Calcium, phosphorus, magnesium etc.
 - Essential for growth and development of organisms

More on the **abiotic** components of the environment

- **Wind**
 - Influences weather patterns
 - Disperses seeds and pollen
 - Affects erosion and deposition of soil
- **pH**
 - Acidity or alkalinity of soil and water
 - Affects availability of nutrients to plants
 - Determines the health of aquatic ecosystems

Fauna, flora and vegetation

- **Fauna** refers to animals
- **Flora** includes plants and trees
 - (Predominant) **vegetation** refers to the prevailing grasses, plants and trees
- E.g. pine forest
 - 200~400 species of flora!
 - Vegetation may include pines (*Pinus halepensis*) and understory shrubs (typically *Quercus coccifera* pronounced “KWER-kus koh-SIF-er-uh”)



Pollution (“ρύπανση”) and contamination (“μόλυνση”)

- **Pollution** refers to physical, chemical or biological pollutants
- **Contamination** usually refers to chemical or biological agents and implies health effects







Stonehenge



Acropolis (Athens)



ENVIRONMENTAL ETHICS

- The philosophical discipline that studies the moral relationship of human beings and also the value and moral status of the environment and its non human contents.
- It considers the ethical relationship between humans and the environment.



Environmental Ethics

Anthropocentrism
Non-Anthropocentrism
Biocentrism
Ecocentrism

ARE ANIMALS MORAL AGENTS?

- Moral agent
 - Responsible for own actions
 - Deciding whether an action is right or wrong
 - Altruism and protection of the vulnerable



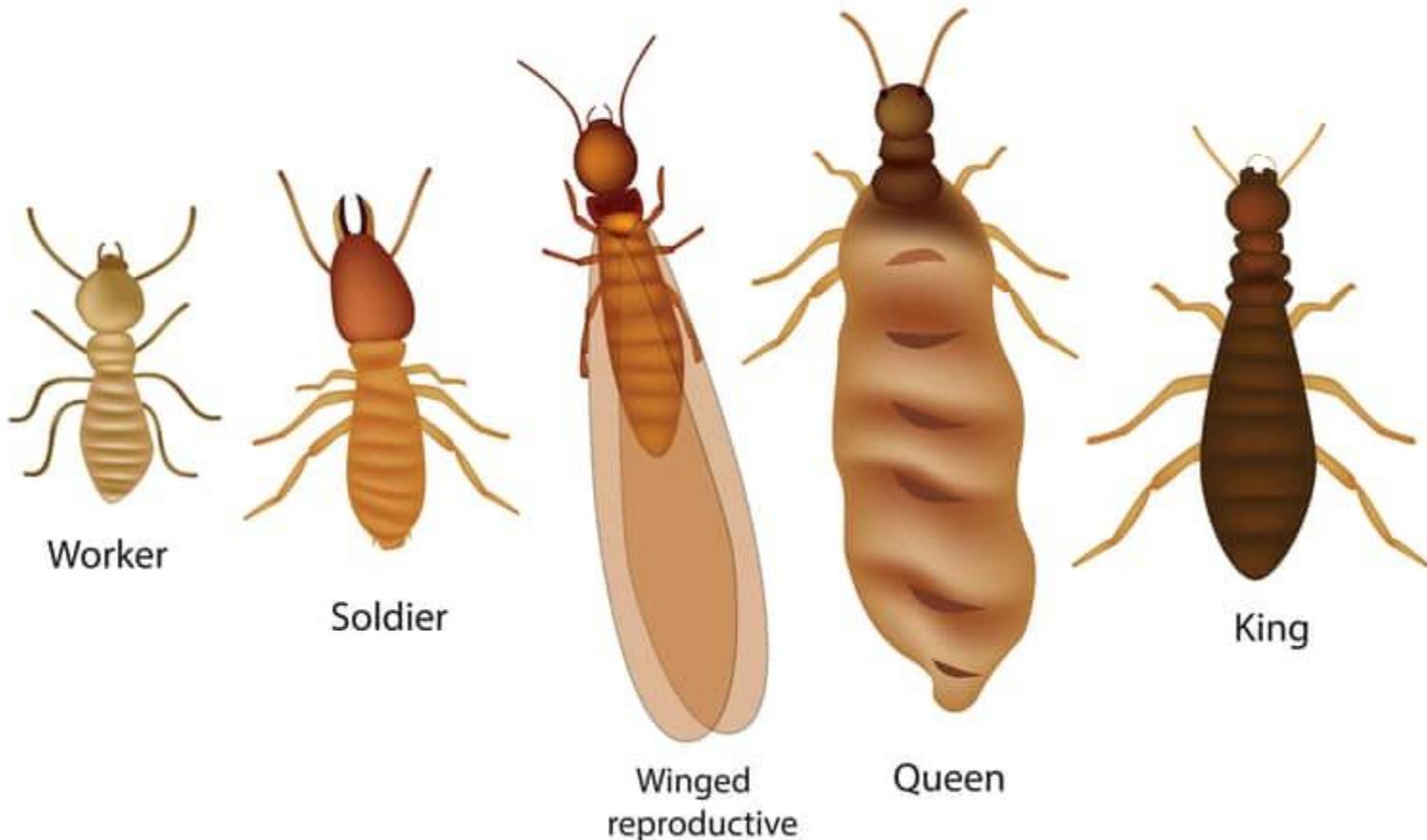








Termites

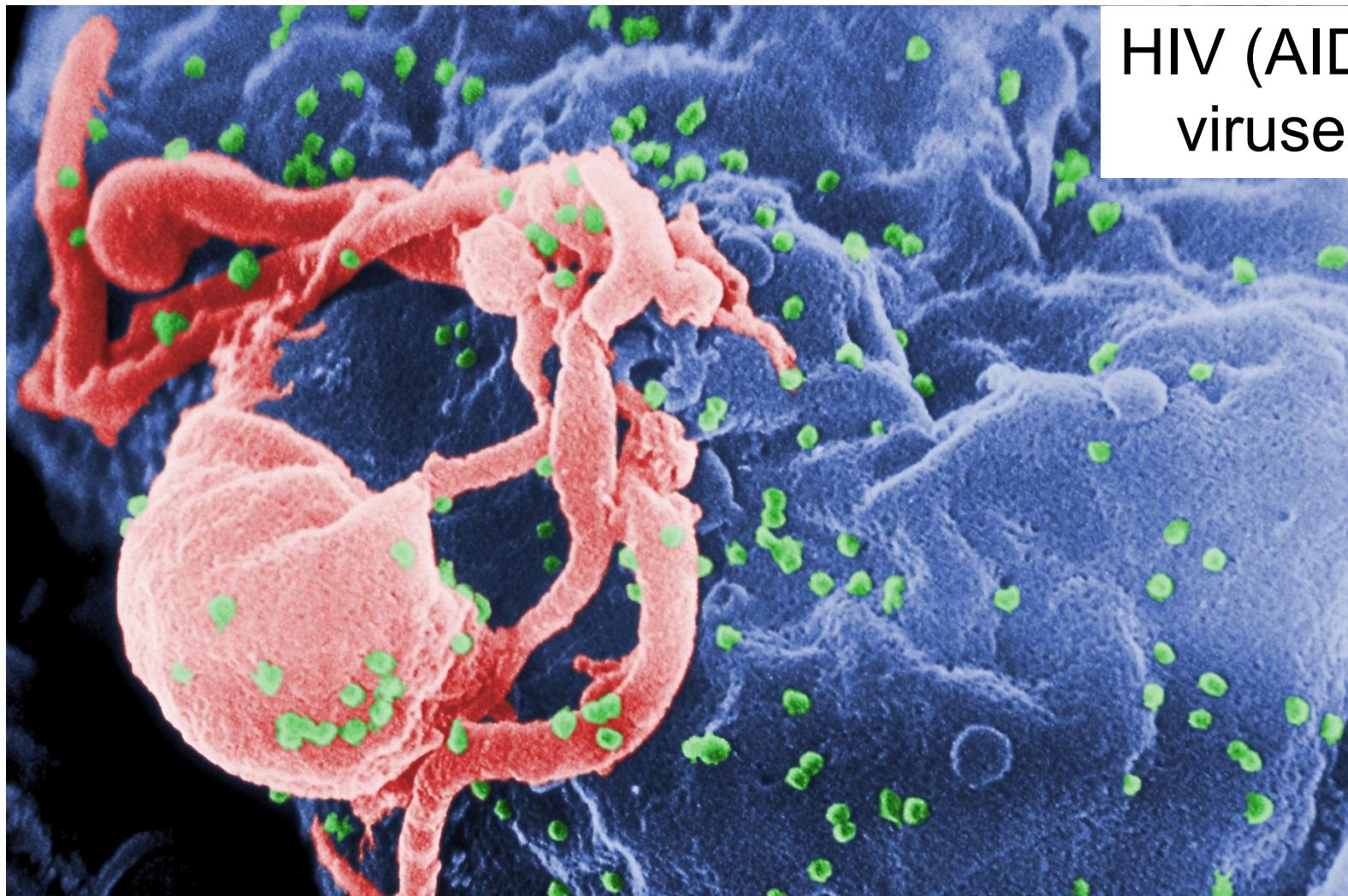




Enteric parasites
of soldier who escaped
North Korea (2017)



HIV (AIDS)
viruses



Voice your opinion on **ethical dilemmas**

- Should a country prioritize **economic growth** through fossil fuel extraction ...
 - *... knowing it will significantly harm local ecosystems?*
- Is it ethical for a nation to source renewable energy from another country with less stringent **environmental protection** regulations ...
 - *... knowing it could lead to environmental degradation there?*
- Should countries engage with regimes that have poor **human rights** records for the sake of energy security, or should they prioritize ethical governance ...
 - *... even if it compromises energy access?*

Environmental impacts are

- Studied via **Environmental Impact Assessment** (EIA)
- Reported in **Environmental Impact Statements** (EISs, “Μελέτες Περιβαλλοντικών Επιπτώσεων”, “ΜΠΕ”)

In Greece, the **Environmental Impact Assessment** (EIA) process is a structured procedure that evaluates the potential environmental effects of a proposed project or activity

- EIA is required for projects that may significantly affect the environment
 - Large-scale infrastructure developments, industrial facilities, energy projects
- The EIA process in Greece aligns with EU directives and national legislation

Key Steps in the Greek EIA Process

1. **Screening**
2. **Scoping**
3. Preparation of the **Environmental Impact Statement** (EIS, “Μελέτη Περιβαλλοντικών Επιπτώσεων”, “ΜΠΕ”)
4. **Public consultation**
5. Review and decision-making
6. Monitoring and compliance

Screening

- Determine whether project requires EIA
- Projects classified into two categories
 - **Category A:** Projects and activities with significant environmental impact (e.g., major infrastructure, energy plants) require full EIA
 - Subcategory A1: Very important environmental impacts
 - Subcategory A2: Less important environmental impacts
 - **Category B:** Projects with less significant but still notable environmental impact only need simpler environmental assessments
 - Local and not important environmental impacts

Scoping

- If full EIA is required, authorities and stakeholders discuss the scope and content of
 - Environmental impacts that should be examined
 - Corresponding environmental studies that must be conducted

Environmental Impact Statement (EIS)

- Project developer commissions an EIS (“Μελέτη Περιβαλλοντικών Επιπτώσεων, ΜΠΕ”)
- The EIS includes detailed assessments of the following
 - Air quality
 - Water resources
 - Soil and geology
 - Biodiversity (flora and fauna)
 - Noise pollution
 - Cultural heritage
 - Socioeconomic impacts
 - Landscape and visual impact
- The EIS critically outlines mitigation measures

Let's consider **scoping** in class

- The construction of a **solar farm** on **agricultural land** is proposed



List major
environmental impacts you
anticipate to be
associated with the
chosen renewable
energy project



<https://shorturl.at/WBJUQ>

Public consultation

- The EIS is made available for public review
- Relevant stakeholders can submit their opinions or objections
 - General public
 - Non-governmental organizations (NGOs)
 - Local authorities
- Public consultation is (supposed to be) a crucial element
 - Often lasting 30 to 60 days

Review and decision-making

- The Ministry of Environment and Energy, along with regional environmental authorities, reviews the EIS and public feedback
 - Based on the findings, the authorities make a decision to approve (usually) or reject (rarely) the project
 - If the project is approved, specific conditions (“Περιβαλλοντικοί Όποι”) are imposed to mitigate environmental impacts
 - The project may be rejected if the environmental risks are deemed too high or cannot be sufficiently mitigated

Monitoring and compliance

- Once a project is approved, it is subject to ongoing environmental monitoring to ensure compliance with the imposed conditions
- Authorities may conduct inspections to verify that the project operates within the legal environmental framework

Conflict between industrial development and Indigenous beliefs

- Common theme in environmental and cultural preservation disputes
- A prominent example is from Alaska
 - Tensions between an engineer of a company aiming to develop an area
 - A local indigenous tribe believed their ancestral cemetery was located there

A company was planning to build a plant or facility in a region of Alaska with valuable natural resources, likely for energy or industrial purposes

The proposed site was sacred to a local indigenous tribe

- They believed the site was the location of their ancestral cemetery, a place of spiritual significance
- The tribe's oral history and deep connection to the land made the area sacred, even if there were no visible or formal markers of the burial site
 - The tribe's leaders and community members opposed the project, fearing it would desecrate their ancestors' resting place and disrupt their spiritual practices

Legal Framework

- EU Directives
 - Greece follows the EU EIA Directive **2011/92/EU**, as amended by **2014/52/EU**, which provides guidelines for assessing environmental impacts within the EU
- Greek Law
 - The Greek national law implementing the EU EIA directives is **Law 4014/2011**, which governs environmental permitting and EIA procedures in Greece
- This process aims to
 - Balance development needs with environmental protection
 - Ensure that projects are sustainable and minimize their ecological footprint

Innovations introduced with **Law 4014/11**

- Fewer projects and activities for which the preparation of an Environmental Impact Statement (EIS) is required
- Simplified procedures and streamlines environmental licensing
 - Reduced time required for issuing relevant decisions
- Establishment of mandatory periodic regular and emergency controls
 - By competent agencies and even private inspectors
- Overlapping licenses (sewage, waste, etc.) abolished
 - Incorporated in the decision on the approval of environmental terms
 - Minister co-signatures for issuance of environmental terms are abolished

Innovations introduced with **Law 4014/11**

- Duration of validity of Environmental Terms lengthened to 10 to 14 years
- The obligation to submit an Preliminary Environmental Impact Study (PPE) became optional
- Submission and assessment of a Special Ecological Assessment for environmental licensing of projects and activities within the Natura 2000 network
- Electronic environmental register and electronic submission of the EIA with monitoring of the process of issuing, amending or renewing the AEPO
 - <http://aepo.ypeka.gr/>

Typical chapters included in a Greek EIS

1. Introduction

- **Project overview**: Brief description of proposed project, purpose, objectives
- **Legal framework**: Reference to relevant national and EU legislation governing the EIA process
- **Methodology**: Description of methods used to assess environmental impacts

(A summary of the EIS may appear as Chapter 2)

Typical chapters included in a Greek EIS (continued)

2. Alternatives considered

- **No-action alternative:** Scenario where project is not implemented
- **Alternative locations:** Evaluation of other potential locations for the project
- **Alternative designs or technologies:** Comparison of different construction methods, technologies, or layouts that could reduce environmental impact

(This may not be a separate chapter)

Typical chapters included in a Greek EIS (continued)

3. Description of project

- **Project location:** Geographic location, maps, site plans
- **Project components:** Main facilities, structures, installations involved
- **Technical characteristics:** Specifications regarding the scale of the project, construction methods, materials, energy consumption, other technical details
- **Timeline:** Start and end dates of construction and operational phases

Typical chapters included in a Greek EIS (continued)

4. Baseline environmental conditions

- **Physical environment**: Air quality, water resources (surface and groundwater), geology, climate
- **Biological environment**: Local ecosystems, flora, fauna, protected species or habitats
- **Land use and landscape**: Current land uses, visual intrusion, proximity to urban or protected areas
- **Socioeconomic environment**: Local population, economic activities, potential social impacts
- **Cultural and archaeological sites**: Cultural heritage or archaeological sites that might be affected

Typical chapters included in a Greek EIS (continued)

5. Assessment of environmental impacts

- **Air quality**: Emissions during construction and operation, impacts on air quality
- **Water resources**: Potential impacts on surface waters, groundwater, aquatic ecosystems
- **Soil and geology**: Potential land degradation, soil erosion and contamination, geological disturbances
- **Biodiversity**: Impacts on local flora, fauna, and habitats, with emphasis on endangered species and protected areas
- **Noise and vibration**: Noise levels during both construction and operation, potential vibration impacts

Typical chapters included in a Greek EIS (continued)

5. Assessment of environmental impacts

(continued)

- **Waste management**: Solid and hazardous waste generation, handling, and disposal
- **Energy and resource use**: Consumption of natural resources (water, energy, raw materials)
- **Visual and landscape impacts**: How the project may affect the visual character of the area
- **Socioeconomic impacts**: How the project will affect local communities, employment, infrastructure, and public services

Typical chapters included in a Greek EIS (continued)

6. Mitigation measures

- **Preventive measures:** Steps to avoid or minimize negative environmental impacts (e.g. pollution controls, land restoration)
- **Compensatory measures:** Actions to offset unavoidable impacts, such as habitat restoration or biodiversity conservation
- **Environmental monitoring plan:** Description of the ongoing monitoring to be conducted during and after project implementation to ensure compliance with environmental standards

Typical chapters included in a Greek EIS (continued)

7. Public Consultation and Stakeholder Engagement

- **Public involvement:** Description of public consultation process
 - How was information shared with the local community
 - How feedback was integrated
- **Responses to concerns:** Documentation of concerns raised by the public or stakeholders
 - How were these addressed in the EIS

Typical chapters included in a Greek EIS (continued)

8. Conclusions

- **Summary of key findings:** Overall assessment of project's potential impacts and benefits
- **Final recommendations:** Suggestions for mitigating impacts, managing environmental risks, and ensuring sustainable development

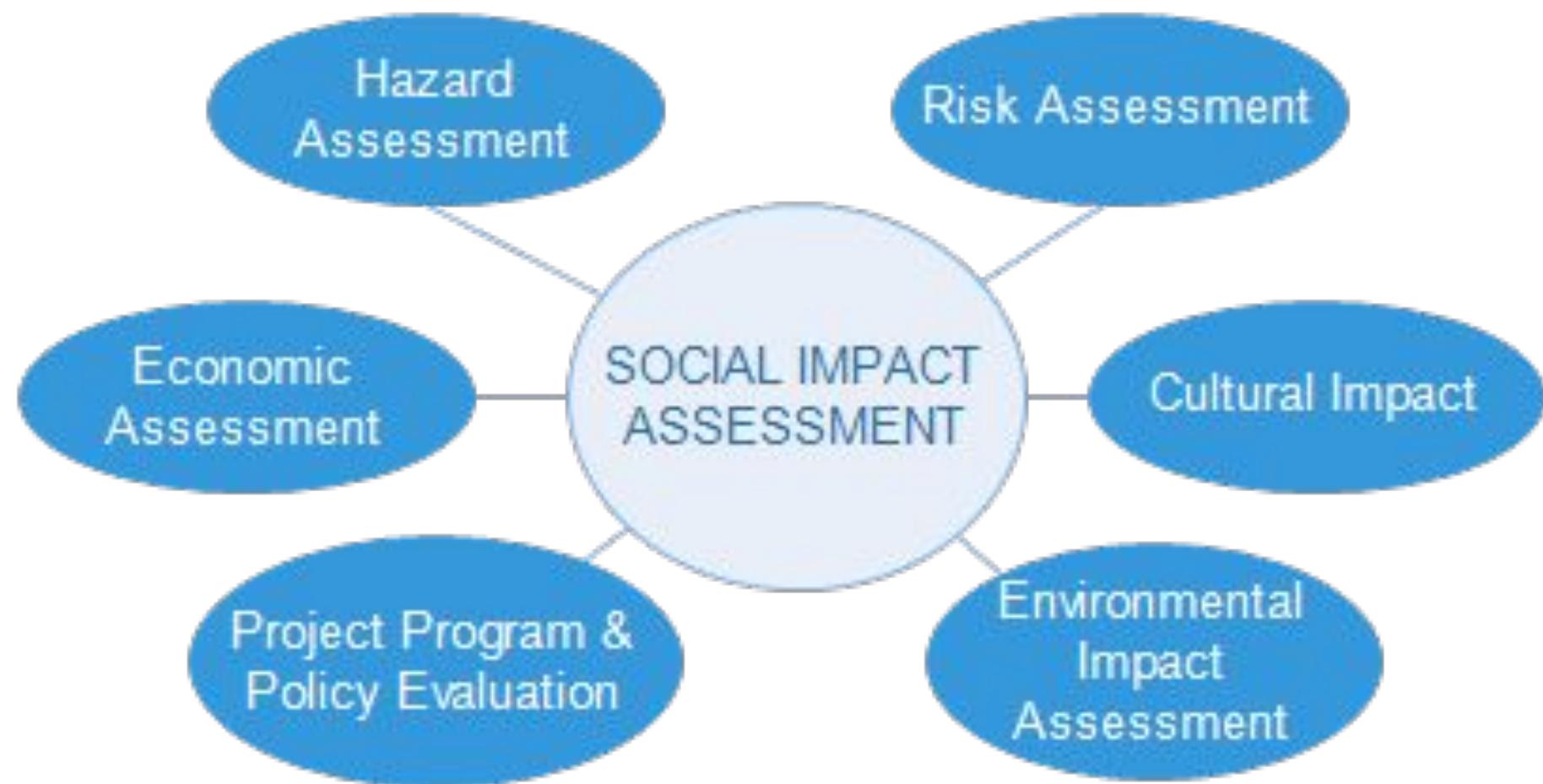
9. Annexes

- **Technical studies:** Maps and figures supporting the EIS findings.
- **Environmental monitoring:** Historical or baseline environmental monitoring data used in the assessment

The Environmental Impact Assessment Process

Major steps in the EIA process are:

- Screening
- Initial Environmental Examination (IEE)
- Scoping
- Full-Scale Assessment
- EIA Review and Decision Making
- Monitoring and Follow-Up





MULTIFUNCTIONAL
DEEP-WATER
TERMINAL

BEAU PORT 2020

ENVIRONMENTAL
IMPACT
STATEMENT
Amended version

September 2016

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Let's talk a little bit about **Environmental Risk Assessment**

- Types of impacts
 - Unfavorable or favorable
 - Direct or indirect
 - Long term or short term
 - Reversible or irreversible

Qualitative Criteria	Choice	Description
NATURE	<ul style="list-style-type: none"> • Direct • Indirect 	Refers to the origin/source of an impact – does the SOURCE activity DIRECTLY or INDIRECTLY act on the environmental target (species or natural communities).
TYPE	<ul style="list-style-type: none"> • Positive • Negative 	Positive impacts imply species or natural communities will have a higher likelihood of persistence and increase in viability, Negative impacts imply the opposite.
LIKELIHOOD	<ul style="list-style-type: none"> • Not Likely • Potential • Certainty 	<i>Not likely</i> means there is roughly a 10% chance of an impact occurring, <i>Potential</i> means 10 to 70% and <i>Certainty</i> means that an impact has a greater than 70% chance of occurring.
SCALE	<ul style="list-style-type: none"> • Specific habitats • Island environs • Regional • National or International 	Scale of the impact will be defined as restricted to specific habitats, impacts that impact the entire island environment

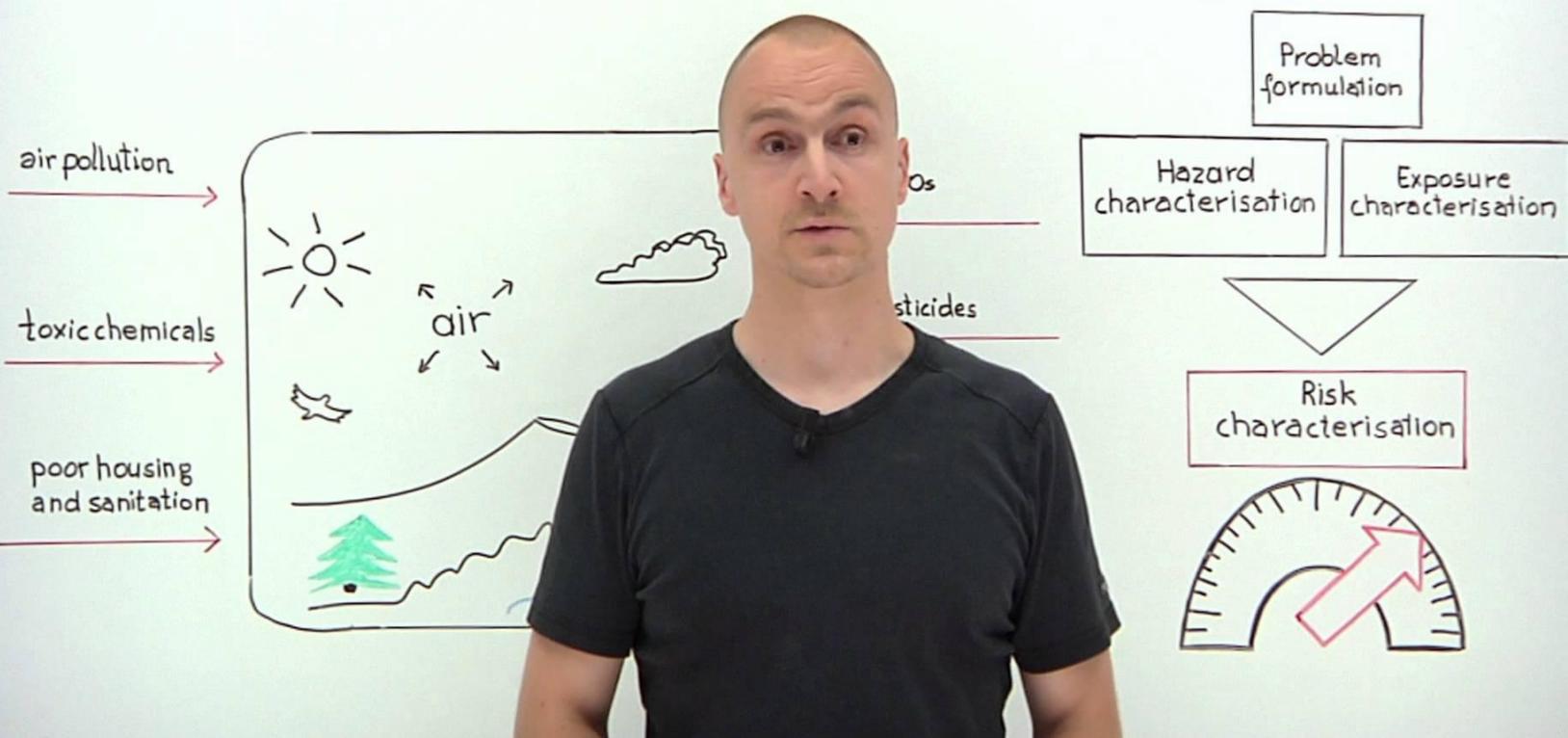
DURATION	<ul style="list-style-type: none"> • Temporary • Long-term 	Temporary refers to impacts that last less than 3 years, meaning species recover to
		pre-impact levels, or natural communities recover to no noticeable impacts. Long term refer to more than 3 years
REVERSIBILITY	<ul style="list-style-type: none"> • Reversible or • Irreversible 	Reversible implies that the impacted species or natural community will recover, Irreversible impacts mean that the species or natural community is lost to the project site, and impact should be mitigated

Table 4.1. Environmental impact characterization

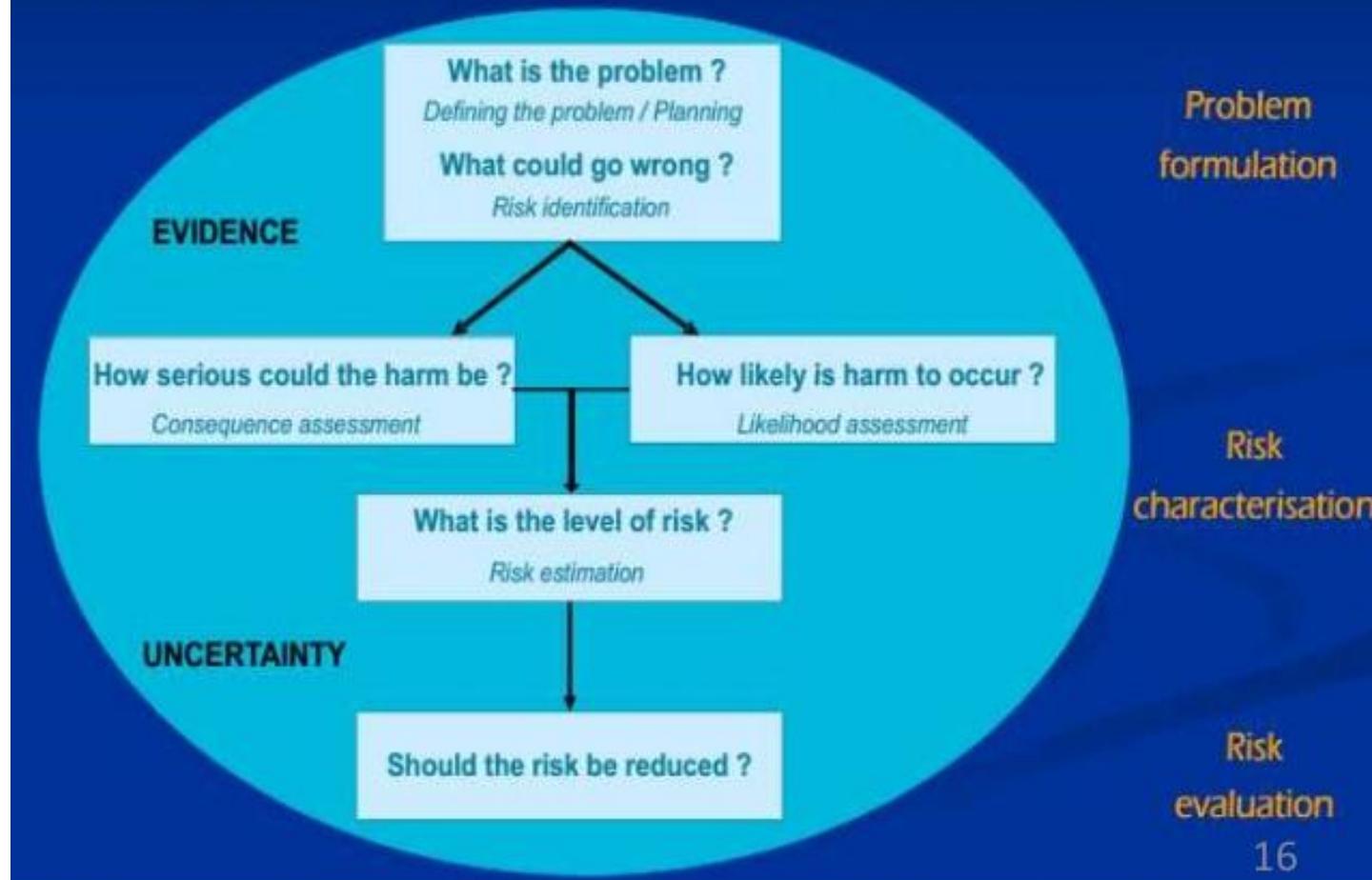
Impact	Positive (P) Negative (N)	Not likely (NL) Potential (P) Certain (C)	Temporary (T) Long term (LT)	Reversible (R) Irreversible (I)	Direct (D) Indirect (I)	Local (L) Regional (R) International (I)
Soil subsistence	N	P	T	R	D	L
Induced seismicity	N	P	T	I	D & I	R
Soil erosion	N	P	LT	I	I	L
Groundwater contamination	N	NL	LT	I	D	L
Generation of solid wastes	N	C	T	I	D	R
Land use changes	N	P	LT	I	D	L
Visual intrusion	N	P	T	R	D	L
Water consumption	N	C	LT	I	D	R
Surface runoff	N	P	LT	R	I	L
Thermal pollution	N	P	T	R	D	L
Eutrophication of surface waters	N	P	LT	I	D	L
Water pollution	N	P	T	R	D	L
Greenhouse gas emissions	N	C	LT	I	D	R
Air pollution (from rig, traffic, etc.)	N	C	T	R	D	L
Odors	N	C	T	R	D	L
Noise	N	C	T	R	D	L

Impact	Positive (P) Negative (N)	Not likely (NL) Potential (P) Certain (C)	Temporary (T) Long term (LT)	Reversible (R) Irreversible (I)	Direct (D) Indirect (I)	Local (L) Regional (R) International (I)
Ecosystem disturbance	N	P	T	I	I	L
Vegetation changes	N	P	LT	I	D	L
Biodiversity	N	P	LT	I	I	R
Effects on paleontological resources	N	P	LT	I	D	L
Effects on wildlife	N	P	LT	I	I	L
Public health (including toxicity)	N	NL	LT	R	I	L
Radiation risk from radioactive deposits	N	NL	LT	I	I	L
Effects on employment	P	C	LT	R	D	R
Effects on markets	P	C	LT	R	D	R
Effects on farming	N	P	LT	I	D	L
Resettlement	N	P	LT	I	I	R
Effects on infrastructure	N	P	LT	R	D	L
Effects on tourism	N	NL	LT	I	I	R
Effects on cultural resources	N	NL	LT	I	I	R
Environmental injustice	N	NL	LT	I	I	I
Energy consumption	N	C	LT	I	D	R
Use of materials	N	C	LT	I	D	R

ENVIRONMENTAL RISK ASSESSMENT



ENVIRONMENTAL RISK ASSESSMENT – Framework



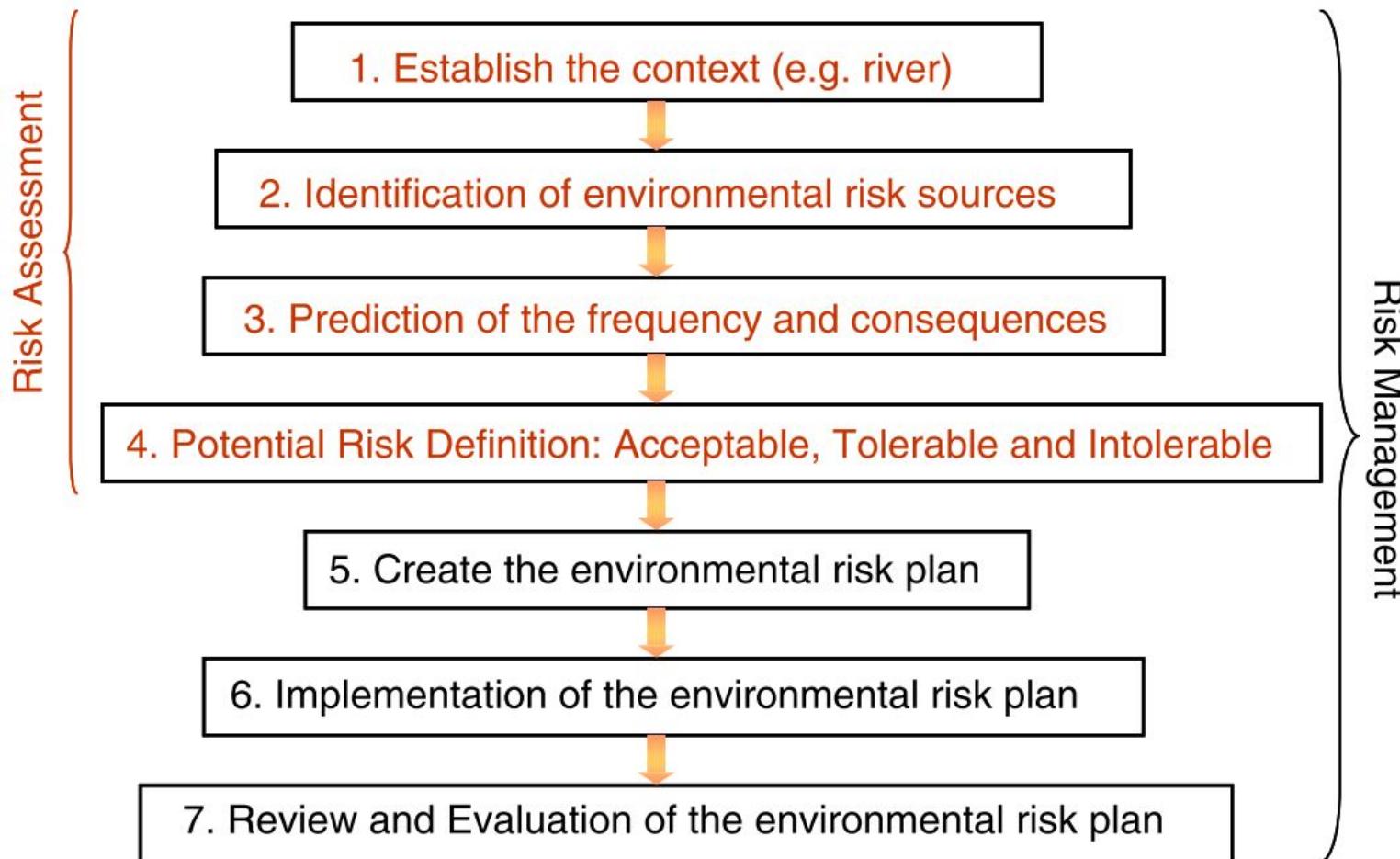


Figure 1. Steps in environmental risk management.

Severity - Amount of damage or harm a hazard could create

Catastrophic 4. Operating conditions are such that human error, environment, design deficiencies, element, subsystem or component failure, or procedural deficiencies may commonly cause death or major system loss, thereby requiring immediate cessation of the unsafe activity or operation.

Critical 3. Operating conditions are such that human error, environment, design deficiencies, element, subsystem or component failure or procedural deficiencies may commonly cause severe injury or illness or major system damage thereby requiring immediate corrective action.

Marginal 2. Operating conditions may commonly cause minor injury or illness or minor systems damage such that human error, environment, design deficiencies, subsystem or component failure or procedural deficiencies can be counteracted or controlled without severe injury, illness or major system damage.

Negligible 1. Operating conditions are such that personnel error, environment, design deficiencies, subsystem or component failure or procedural deficiencies will result in no, or less than minor illness, injury or system damage.

Probability -the likelihood of the hazard occurring

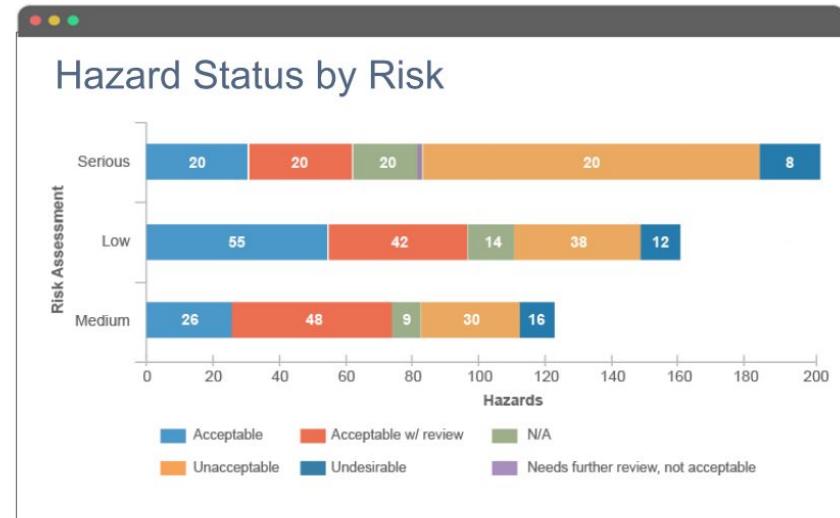
Frequency 5. Likely to occur often in the life of an item.

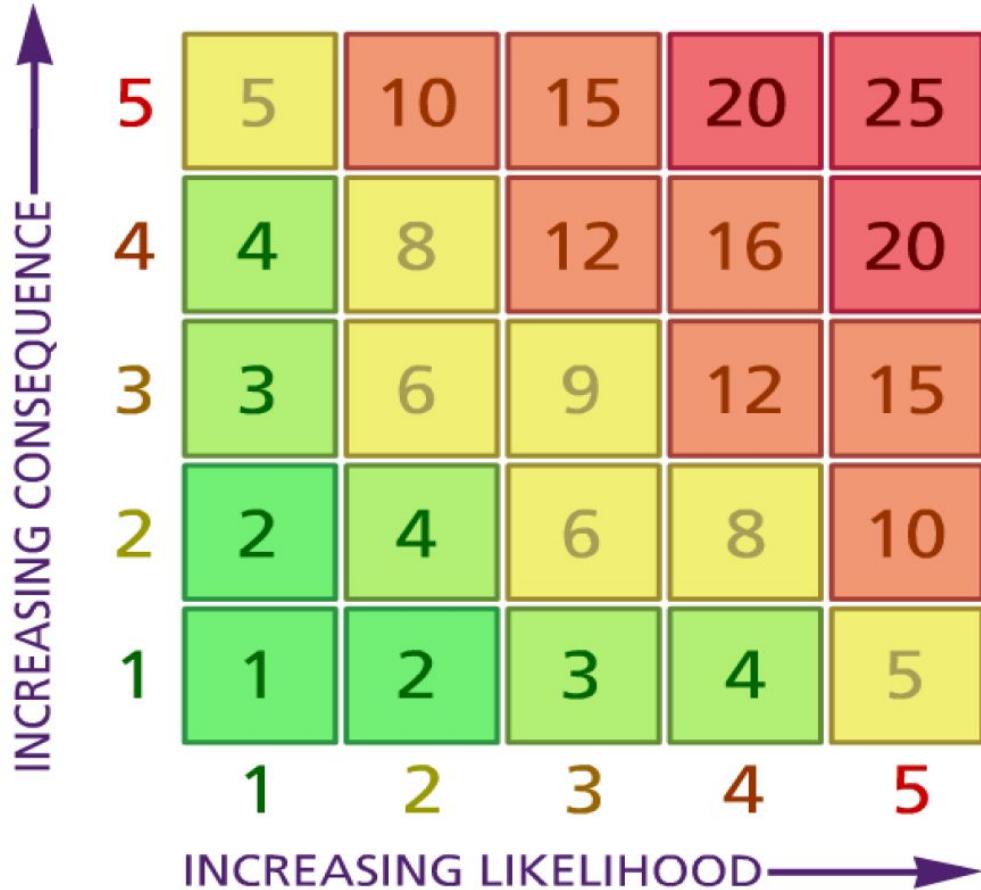
Probable 4. Will occur several times in the life of an item.

Occasional 3. Likely to occur some time in the life of an item.

Remote 2. Unlikely but possible to occur in the life of an item.

Improbable 1. So unlikely, it can be assumed occurrence may not be experienced.





17-25 **Unacceptable**

Stop activity and make immediate improvements

10-16 **Tolerable**

Look to improve within specified timescale

5-9 **Adequate**

Look to improve at next review

1-4 **Acceptable**

No further action, but ensure controls are maintained

Risk Assessment

Multiply the scores of probability and severity together

Probability	Severity			
	Catastrophic- 4	Critical - 3	Marginal - 2	Negligible- 1
Frequent - 5	High - 20	High - 15	High - 10	Medium- 5
Probable - 4	High - 16	High - 12	Serious- 8	Medium- 4
Occaisional - 3	High - 12	Serious- 9	Medium- 6	Low- 3
Remote -2	Serious- 8	Medium- 6	Medium- 4	Low- 2
Improbable- 1	Medium- 4	Low- 3	Low- 2	Low- 1

Consistent with AS/NZS ISO 31000:2009, the approach to risk assessment involved:

- 1 Establishment of context;
- 2 Risk identification;
- 3 Risk analysis;
- 4 Risk evaluation;
- 5 Risk treatment;
- 6 Monitoring and review; and
- 7 Communication and consultation.

Table 4-1 Environmental Setting

FEATURE OF ENVIRONMENT	EIS VOLUME 1 REFERENCE	EIS SPECIALIST REPORT REFERENCE
■ Overview of Setting	Section 3 – Project Description	-
■ Terrestrial Ecology	Section 7 – Terrestrial Ecology	Appendix C – <i>Terrestrial Ecology Report</i>
■ Aquatic Ecology	Section 8 – Aquatic Ecology	Appendix D – <i>Aquatic Ecology Report</i>
■ Groundwater	Section 9 – Groundwater	Appendix F – <i>Groundwater Report</i>
■ Surface Water	Section 10 – Surface Water	Appendix H – <i>Baseline Surface Water Monitoring Report</i>
■ Social environment, including:		
– Air Quality	Section 12 – Air Quality	Appendix I – <i>Air Quality Report</i>
– Acoustic (Noise) Environment	Section 13 – Noise and Vibration	Appendix J – <i>Noise and Vibration Report</i>
– Visual Amenity	Section 14 – Visual Amenity	-
– Socio-economics	Section 15 – Socio-economics	Appendix K – <i>Socio-economics Report</i>
– Cultural Heritage	Section 16 – Archaeology	Appendix L – <i>Archaeology Report</i>

Risks were systematically identified taking into consideration the full range of project activities in relation to individual aspects of the existing environment. The following aspects of the environment were considered as part of the risk assessment:

- Groundwater;
- Surface water;
- Ecology (including biodiversity issues relating to air quality and noise); and
- Social (including social issues relating to air quality, noise, visual amenity, socio-economics and cultural heritage).

Table 4-2 Ratings for the Assessment of Consequence Levels

CONSEQUENCE LEVEL	ENVIRONMENT	COMMUNITY
1	Low level impact/s to land, biodiversity, ecosystem services, water resources or air	Low-level social impacts. Low-level infringement of cultural heritage or minimal disturbance to heritage structures. Minimal impact on human rights.
2	Minor impact/s to land, biodiversity, ecosystem services, water resources or air	Minor medium-term social impacts on small number of people. Repairable damage or disturbance to property, structures or items. Minor infringement of cultural heritage. Minor, temporary human rights impacts.
3	Moderate impact/s land, biodiversity, ecosystem services, water resources or air	Moderate medium-term social impacts or frequent social issues. Moderate damage to structures/items of local cultural heritage significance/sacred locations. Moderate, temporary human rights impacts.
4	Significant impact/s (>20 years) land, biodiversity, ecosystem services, water resources or air	A breakdown of social order. Widespread damage to items of global cultural significance. Highly offensive infringements of cultural heritage. Company directly responsible or complicit in severe, long-term impacts on human rights.
5	Permanent, severe impact/s to land, biodiversity, ecosystem services, water resources or air	Complete breakdown of social order. Widespread desecration of items of global cultural significance. Company directly responsible or complicit in severe and widespread long-term impacts on human rights.

Table 4-3 Ratings for the Assessment of Likelihood

LIKELIHOOD	ENVIRONMENT
Almost Certain	Could be incurred more than once in a year
Likely	Could be incurred over a 1-2 year timeframe
Possible	Could be incurred within a 5 year timeframe
Unlikely	Could be incurred in a 5-20 year timeframe
Rare	Less than once in 20 years

Table 4-4 Risk Assessment Matrix

LIKELIHOOD	CONSEQUENCE				
	Level 1 Low level impact	Level 2 Minor impact	Level 3 Moderate impact	Level 4 Significant impact	Level 5 Severe impact
Almost Certain	High (11)	High (16)	Extreme (20)	Extreme (23)	Extreme (25)
Likely	Moderate (7)	High (12)	High (17)	Extreme (21)	Extreme (24)
Possible	Low (4)	Moderate (8)	High (13)	Extreme (18)	Extreme (22)
Unlikely	Low (2)	Low (5)	Moderate (9)	High (14)	Extreme (19)
Rare	Low (1)	Low (3)	Moderate (6)	High (10)	High (15)

Energy security vs environmental quality poll

- A country must choose between
 - Developing domestic fossil fuel resources
 - Reduce reliance on imported energy
 - Investing in imported renewable energy technologies
- *Should Greece prioritize local fossil fuel extraction?*
 - **YES** or **NO**?



<https://forms.gle/XdBvrBnCXSoYXHGe7>

In-class poll

- **Energy security** vs **environmental quality**
 - A country must choose between
 - Developing domestic fossil fuel resources
 - Reduce reliance on imported energy
 - Investing in imported renewable energy technologies
 - *Should Greece prioritize local fossil fuel extraction?*
 - **YES** or **NO**?

How did you vote?

- Briefly explain your reasoning

Let's hear your opinion

- **Energy security** vs **environmental quality**
 - How can countries prioritize both objectives without compromising one for the other?
- **Economic implications**
 - Initial costs of renewable technologies vs long-term benefits, job creation, energy independence?
 - What economic incentives or disincentives might influence these decisions?

Let's hear your opinion **(continued)**

- Global climate **agreements** (e.g. Paris)
 - What challenges do countries face in meeting their climate commitments while ensuring energy access?
- **Geopolitical relationships**
 - How can energy decisions affect international relations?
 - Can reliance on imported fossil fuels create vulnerabilities and influence foreign policy?
 - How do energy partnerships and dependencies shape geopolitical alliances?

Let's hear your opinion **(continued)**

- **Impact on local communities**
 - Implications of energy projects on local communities?
 - Particularly in regions where fossil fuel extraction is prevalent
 - Short-term benefits (job creation) vs long-term environmental consequences
 - How should community voices be integrated into decision-making processes?

Let's hear your opinion (continued)

- **Energy transition and technology**
 - What is the role of technological innovation in the transition from fossil fuels to renewables?
 - How might technological disparities between countries affect their energy choices?
- **Ethical considerations**
 - Do environmental impacts of fossil fuels disproportionately affect marginalized communities?
 - If so, how?