

ENVIRONMENTAL ENGINEERING

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Chapter Description

- Topic
 - Environmental system overview
 - Environmental legislation & regulation
 - Environmental Ethics
- Topic Outcomes
 - Described briefly the content of environmental engineering
 - State the environmental legislation and regulation practices in Malaysia
 - Recognise Environmental Ethics
- References
 - Peavy, H.S., Rowe, D.R. and Tchobanoglous, G., Environmental Engineering, McGraw Hill, 1985.
 - Mackenze, I.D., Introduction to Environmental Engineering, 4th Edition, Davis A. Cornell, McGraw Hill, 2008.
 - Sawyer, C.N. Chemistry for Environmental Engineerin. 4th Edition, McGraw Hill, 1994.
 - Martin, T.A. and David, W.H. Fundamental of Environmental Engineering. 2003.
 - Environmental Quality Act 1974 (Subsidiary Legislation), International Law Book, Service June 2002.

COURSE CONTENT

Chapter 1: Introduction of environmental engineering

- Environmental system overview
- Environmental legislation & regulation
- Environmental Ethics

Chapter 2: Water and wastewater quality management

- Physical parameters (suspended solids, turbidity, color *etc.*)
- Chemical parameters (TDS, hardness, alkalinity, *etc.*)
- Biochemical parameters (BOD, microorganisms)

Chapter 3: Engineered system for water treatment

- Physical processes
- Chemical processes
- Biochemical processes

Chapter 4: Engineered system for wastewater treatment

- Primary treatment
- Secondary treatment
- Sludge treatment
- Advanced wastewater treatment

Chapter 5: Air pollution control

- Classification
- Air quality management

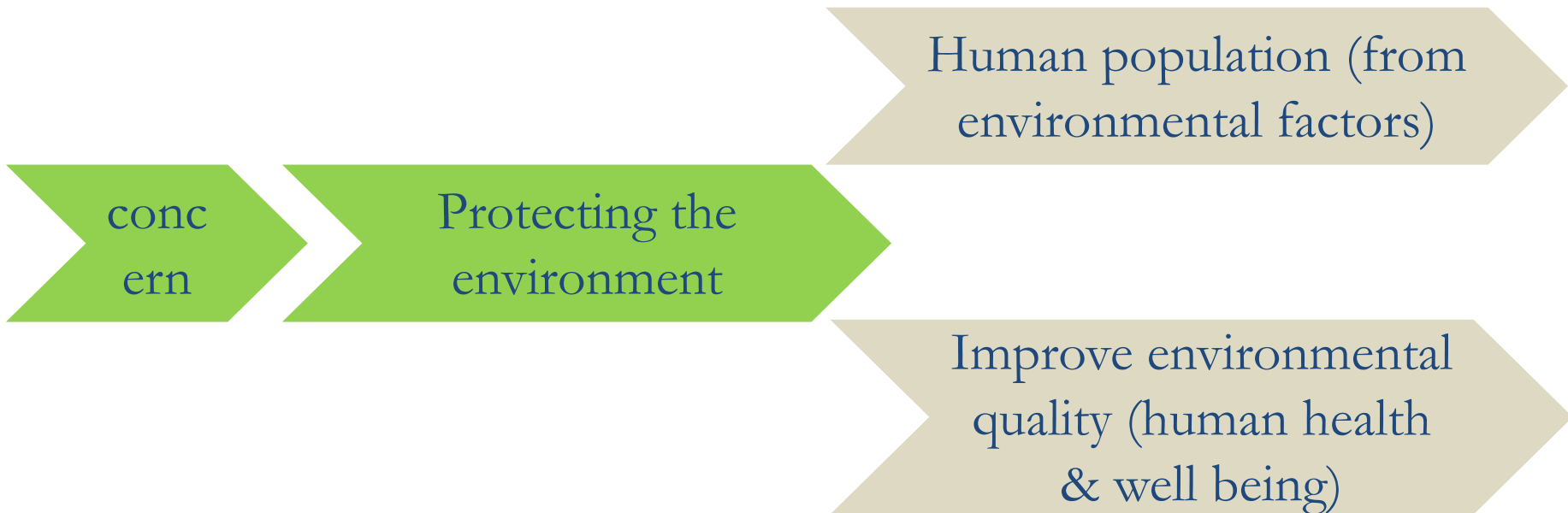
Chapter 6: Solid and Hazardous waste management

- Types of solid and hazardous waste
- Properties of solid waste
- Solid and hazardous waste management

Chapter 1: Introduction To Environmental Engineering

*Environmental System Overview, Environmental
legislation and Regulation, Environmental Ethics*

Environmental Engineering?

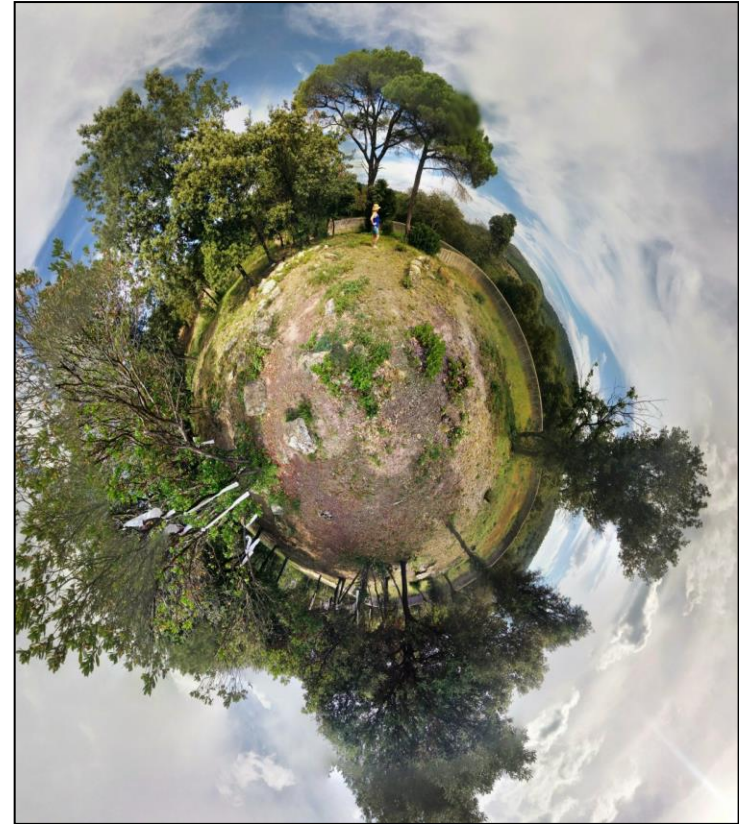


A scenic view of a Swiss village by a lake with snow-capped mountains in the background. The image shows a large, multi-story building with a dark roof and white facade, surrounded by other smaller houses. The lake is a vibrant turquoise color, and the mountains in the background are covered in snow and dense evergreen forests. The sky is clear and blue.

What is Environment?

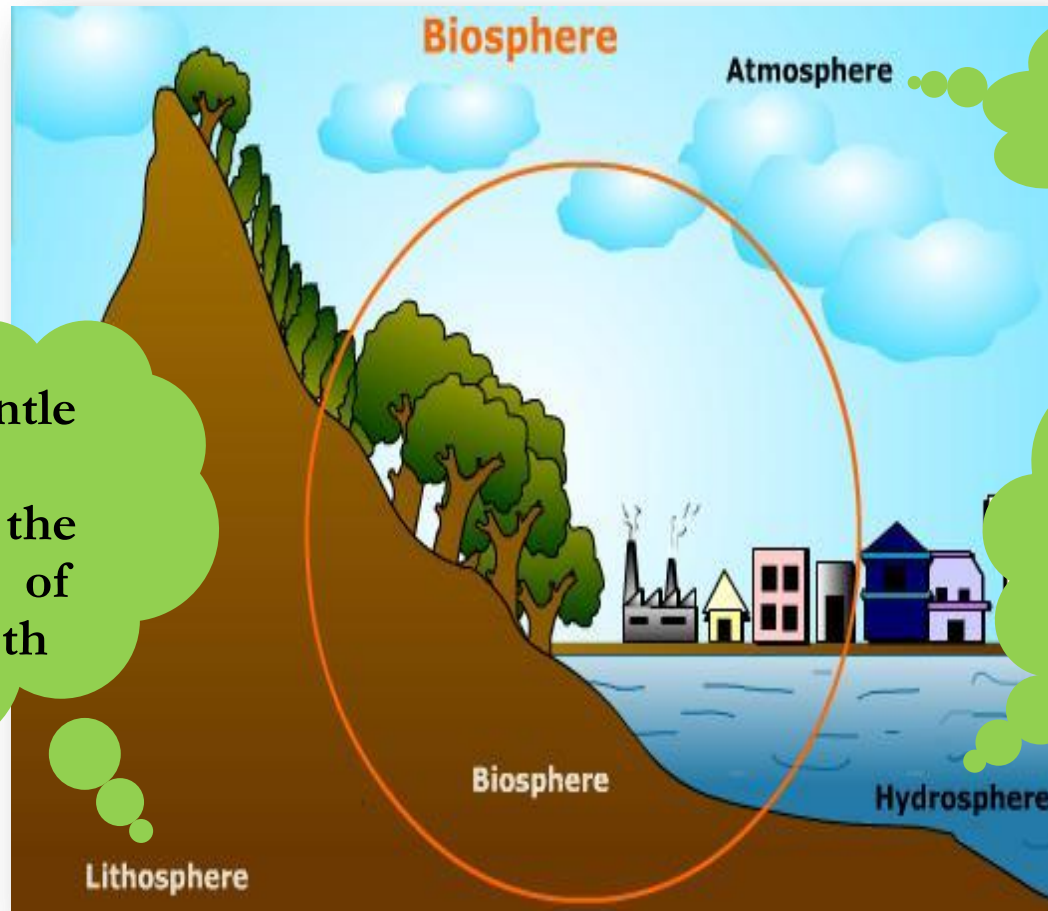
Environment??

- Environment can be defined as one's surroundings
- For an environmental engineer the environment may refer to a very localized area in which a specific problem must be addressed



Source: <https://get.pxhere.com/photo/tree-plant-flower-environment-reflection-symbol-natural-environmental-solar-globe-energy-eco-ecology-green-energy-earth-design-planet-icon-recycle-organic-woody-plant-green-natural-853847.jpg>

Global Environment



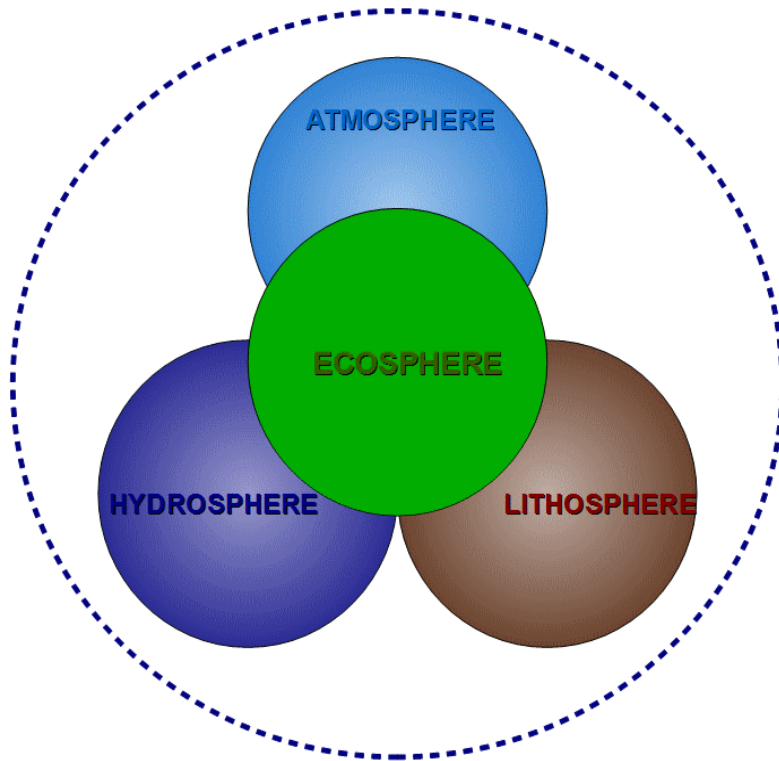
a mixture of
gases

soil mantle
that
wraps the
core of
the earth

consists of
oceans, the
lakes and
streams,
groundwater

Source : <http://images.tutorvista.com/content/environment/biosphere-illustration.jpeg>

Biosphere



BIOSPHERE

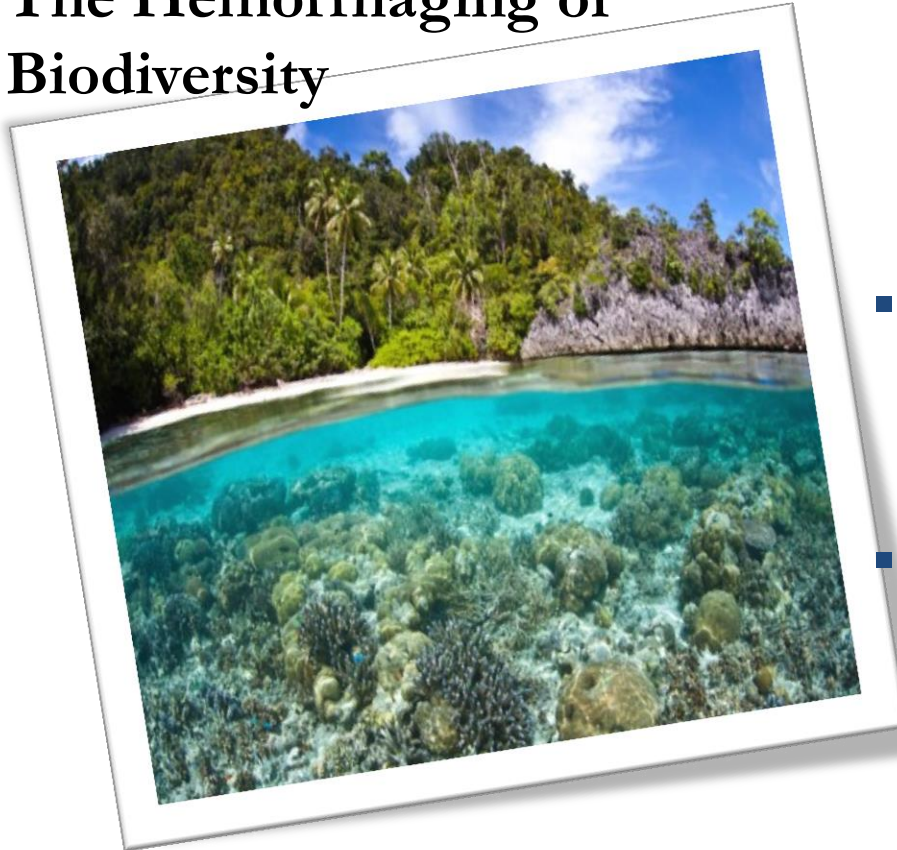
A thin shell that encapsulates the earth.

- life-sustaining resources such as air, food and water are withdrawn from the biosphere.
- Waste products in gaseous, liquid and solid forms been discharged.

Source: https://upload.wikimedia.org/wikipedia/commons/b/b9/Biosphere_system.png

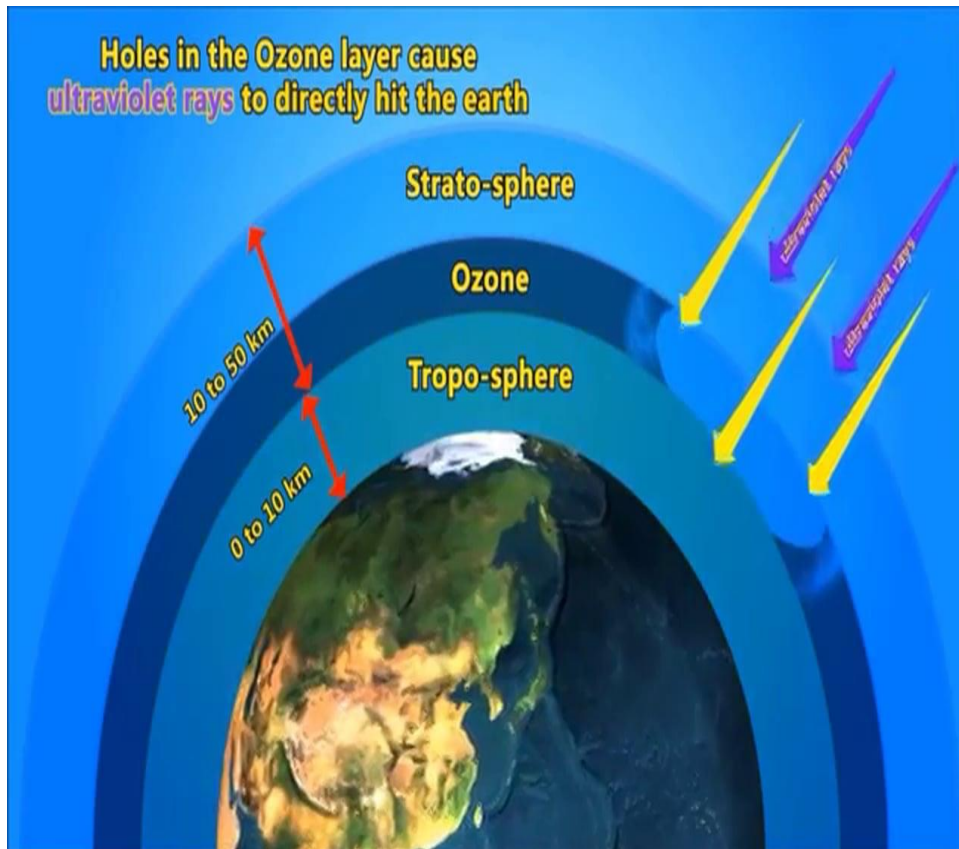
Environmental issues

1 The Hemorrhaging of Biodiversity



- Human are responsible for rapidly diminishing the diversity of life forms on this planet (*e.g.* research on marine life for medicines improvement)
- The loss of species is irreversible and the loss of old-growth natural habitats cannot be replaced within centuries.
- The fewer the species remaining on this planet, the more slightly our own existence.

2 Degrading the Ozone Layer



Source: https://www.google.com.my/imgres?imgurl=https%3A%2F%2Fi.vimeocdn.com%2Fvideo%2F517481830_1280x720.jpg&imgrefurl

- Without the protective ozone layer high above in the stratosphere we would literally fry from the sun's ultraviolet radiation.
- Certain industrial compounds, such as organohalogens (the refrigerant Freon is an example), break down ozone in the stratosphere at very high rates for long periods of time & greatly reduce the ozone's ability to protect surface life from UV radiation.

3 Changing Climates



Source:<https://encryptedtbn0.gstatic.com/images?q=tbn:ANd9GcQFjhvgH0rbTbaafIMkxN2dPP5HrVhdz7iv6R665bBsQa81WEHi>

- Humanity has released sufficient quantities of greenhouse gases into the atmosphere over the last century that we are now starting to feel the effects of an inevitably warmer world (*e.g.*: flood, wildfires, *etc.*).
- Humanity is already committed to a great deal of change in our global climate.
- By reducing greenhouse gas production and creating more efficient technologies and production systems now will benefit future generations.

4 Toxins



Source: https://upload.wikimedia.org/wikipedia/commons/thumb/0/0b/Radioactive_keeper_drums.JPG/1280px-Radioactive_keeper_drums.JPG

- Radioactive materials, pesticides, herbicides, fungicides, nematocides—all of these man-made products kill or harm life.
- All nuclear reactors should immediately be retrofitted with safer fuel pellets and gravity-fed cooling systems.
- Similarly, the heavy use of pesticides, herbicides, fungicides and other toxins will continue to have highly deleterious effects on the health and well-being of people and ecosystems.
- What can one do? At least buy organic bananas, rice, and cotton three of the most toxin-producing crops and advocate for reducing the use of toxins throughout industry and agriculture.

5 Our Dying Oceans



Source: https://encryptedtbn0.gstatic.com/images?q=tbn:ANd9GcRFv0SEFbEf9DAVSv6QoN0ovLhPwSPZ6MEMf7H8ocwt1_47WzZHw

- Overfishing has destroyed most fisheries and the oceans are now do not have over 95% of its larger predatory fish, such as sharks, Bluefin tuna, and billfish.
- Coral reefs are degrading almost everywhere in which occur due to warming and acidifying (caused by more carbon dioxide in the atmosphere) seas.
- The tons and tons of discarded plastic that ends up in the ocean kills and sickens marine life up and down the food chain.
- As this plastic breaks down the resulting micropellets will continue to cause lasting harm in ecosystems.

Impact of Humans to Environment

- **Satisfying natural needs** - Human used natural resources to satisfy their needs- unprocessed resources
- However, pollutions start overload when human turned to satisfy their **acquired needs**.
- Due to industrial revolution-items being processed or manufactured. (*e.g.* Processed foods and beverages).
- **Anthropogenic – human induced** pollutants have overloaded the system

BONTANG, Kalimantan Utara

"Setakat ini, kami masih tidak mengetahui bagaimana perkara ini boleh terjadi " - penduduk

"Namun, kebanyakan warga di sini percaya air tersebut berubah kerana terdapat aktiviti membuang sisa-sisa cat atau pewarna ke dalam sungai,"



Source:© Utusan Melayu (M) Bhd 15/02/2014

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In pictures: Lake pollution



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Raw sewage

Increased pollution is threatening the sustainable use of Lake Victoria, a vital resource for Kenya, Uganda and Tanzania, reports the BBC's Noel Mwakugu.

Each day gallons of raw sewage and rubbish flows into the lake from houses and industries near its shores.

In Kisumu, on the Kenyan side of the lake, sewage from 20% of homes flows into the waters.

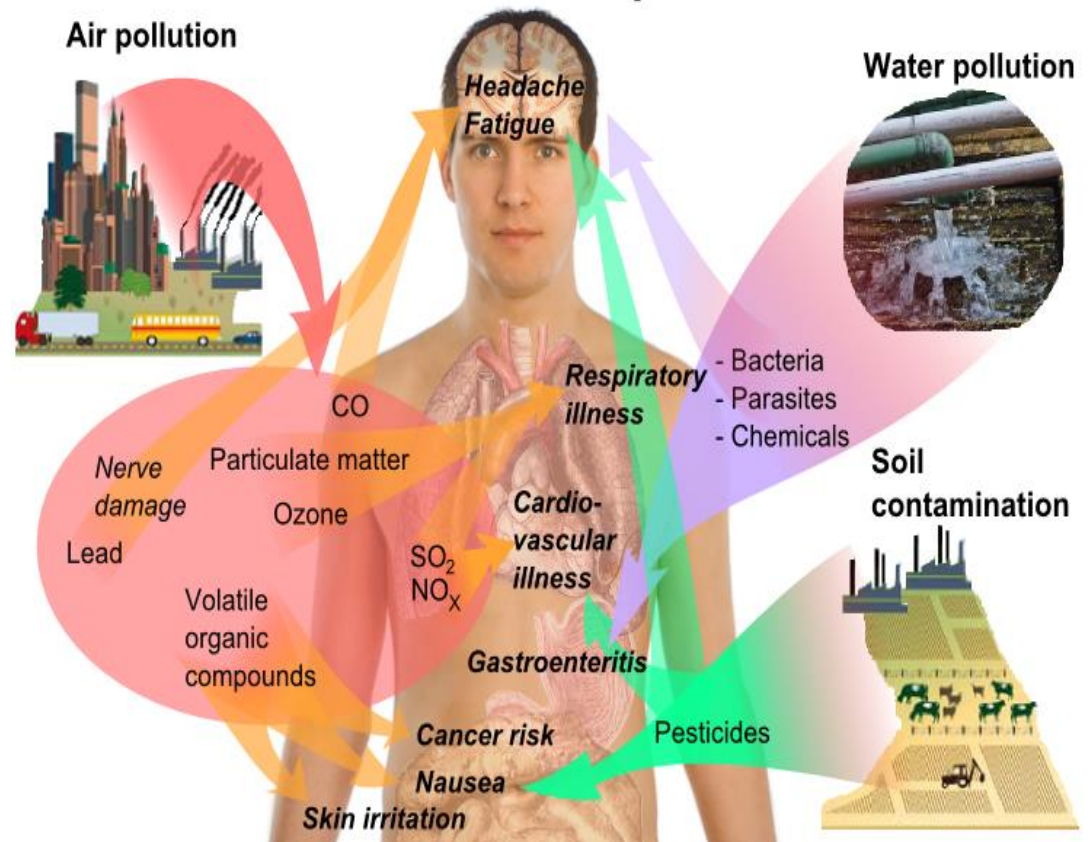
-image of the **Victoria lake** being amongst the most polluted lakes in the world, and that its waters are responsible of a large number of endemic deceases in the area.

Source: http://news.bbc.co.uk/2/shared/spl/hi/picture_gallery/07/africa_lake_pollution/html/2.stm

Impact of Environment to Humans

1. **Polluted environment :** to health and well being.
2. **Health concerns:**
 - Harmful chemical & biological agents
 - Direct & indirect effect to health
 - Chemical toxin
 - People in crowded cities suffered from ill effects – air pollutants

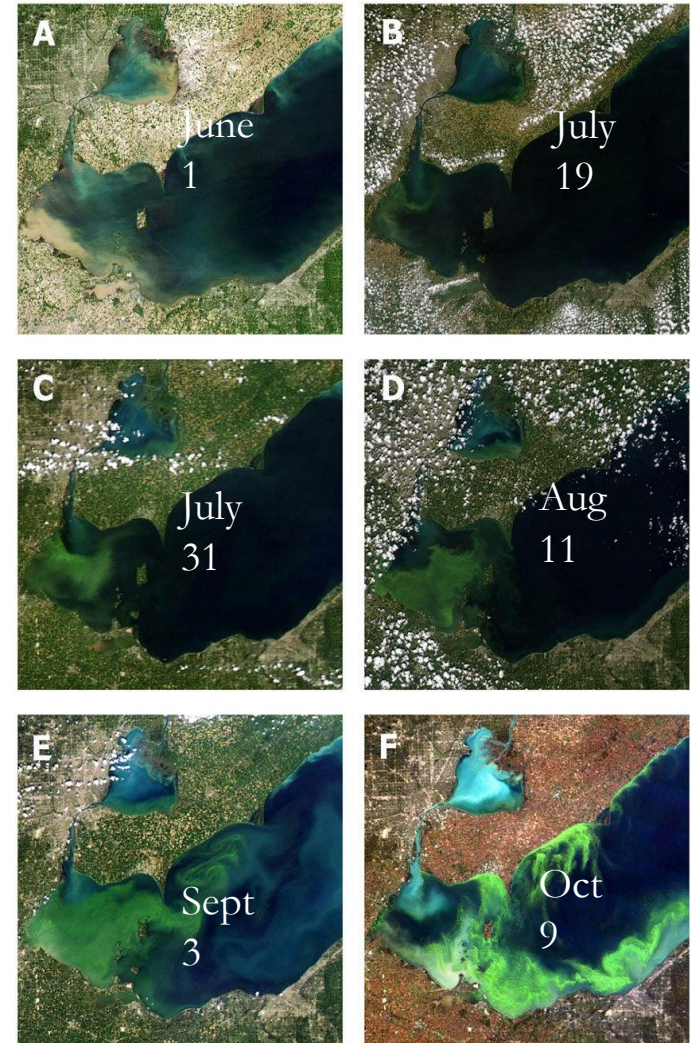
Health effects of pollution



Source: https://www.google.com.my/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjD7u3loOrVAhVKuo8KHT4IAQ0QjRwIBw&url=https%3A%2F%2Fcommons.wikimedia.org%2Fwiki%2Ffile%3AHealth_effects_of_pollution.png&psig=AFQjCNF2IdBkQKFGTnTrDWT9HwOohHnCrG&ust=1503471190504794

3. Economic threats.

- Example: **Lake Eire**, North America (supporting fishing industry, processing & shipping facilities).
- In 1960s, Lake Erie had become extremely polluted, in part due to the heavy industry that lined its shores.
- Factories dumped pollutants into the lake and the waterways that flowed into it.
- Waste from city sewers made its way into the lake too, as did fertilizer and pesticides from agricultural runoff.
- Consequence: the economic potential of the lake was nearly lost.



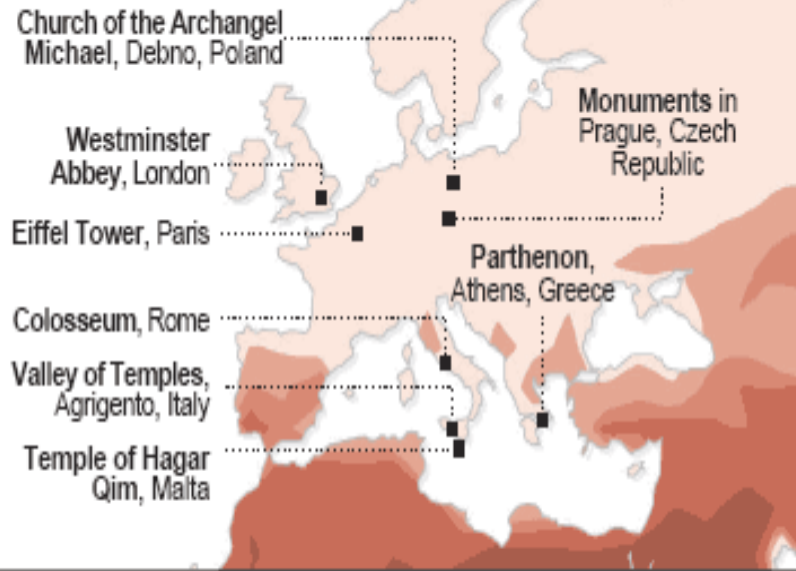
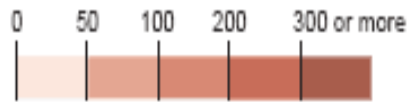
Record-sized Lake Erie toxic algae bloom of 2011 may become regular occurrence

4. Aesthetic heritage and cultural enjoyment

Climate change puts monuments at risk

High levels of internal tension caused by temperature fluctuations are making historical monuments of marble and limestone crack and break.

Future events per year that will place structures at risk of dangerous levels of internal tension, 2010 to 2039



SOURCE: Noah's Ark

AP

Source:<http://www.nbcnews.com/id/19114202/>



The Parthenon in Athens, Greece, is among the European structures seeing thermal stress from climate change. Less rain in southern Europe will also force authorities there to spend more money to clean monuments blackened by pollution.

The role of environmental engineer..

Your role??

- ▶ Adapt the principles of natural mechanisms to engineered systems for pollution control. *e.g.*: containers used for disposal of hazardous wastes such as toxic chemicals and radioactive materials must be isolated from the environment.
- ▶ Understand the biological and chemical reactions involved in processes, the chemistry and microbiology aspects.
- ▶ To build a bridge between biology and technology by applying all the techniques available.

- ▶ Protect the environment from the potentially harmful effects of human activity.
- ▶ Protection of human populations from the effects of adverse environmental factors.
- ▶ Improvement of environmental quality for human health and well-being.

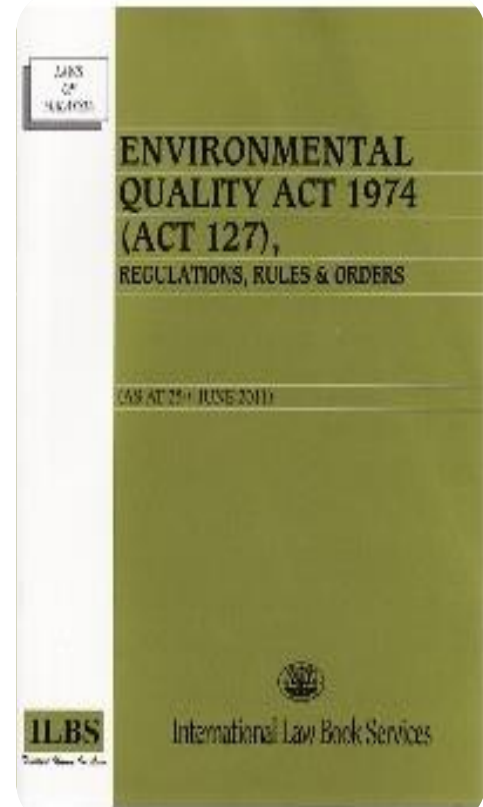


https://c1.staticflickr.com/6/5061/5601371786_d7c87e8c0f_b.jpg

Environmental Legislation & Regulation in Malaysia

Environmental Quality Act (1974)

- An Act relating to the prevention, abatement, control of pollution and enhancement of the environment.
[15 April 1975, P.U. (B) 113/1975]
- Faced with worsening water pollution caused by the three traditional industries of **tin mining, natural rubber, and palm oil** on the one hand, and by new industrial pollution on the other, brought about by industrialization policies pursued since the late 1960s and fostered by foreign capital inflow, Malaysia in 1974 enacted its first framework environmental legislation in the form of the Environmental Quality Act 1974.



Environmental Quality Act (Amendment) 2001

Example (part of the amendment) :

Section 5. New section 29AA

The principal Act is amended by inserting after section 29A the following section:

'Exclusion from "open burning"'. '

29AA. (1) The Minister may by order published in the *Gazette* declare that any fire, combustion or smouldering for the purpose of any activity specified in that order is not open burning as defined in and for the purpose of section 29A so long as such activity is carried out in accordance with or under such conditions as may be specified in the order and not in the place or area specified in the order.

(2) Notwithstanding that any fire, combustion or smouldering is excluded from the definition of open burning under subsection (1) or that it is for the purpose of any activity specified in an order made under subsection (1), no person shall allow or cause such fire, combustion or smouldering to occur in any area if the Director General notifies, by such means and in such manner as he thinks expedient,—

(a) that the air quality in the area has reached an unhealthy level; and

(b) that the fire, combustion or smouldering for the purpose of any activity other than those specified in the notification would be hazardous to the environment.



LAWS OF MALAYSIA

Act A1102 ENVIRONMENTAL QUALITY (AMENDMENT) ACT 2001

Date of Royal Assent :

13th June 2001

Publication :

28th June 2001

Date of coming into operation :

28th June 2001 for section 2;
19th July 2001 for sections 3, 4, 5 and 6

ARRANGEMENT OF SECTIONS

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