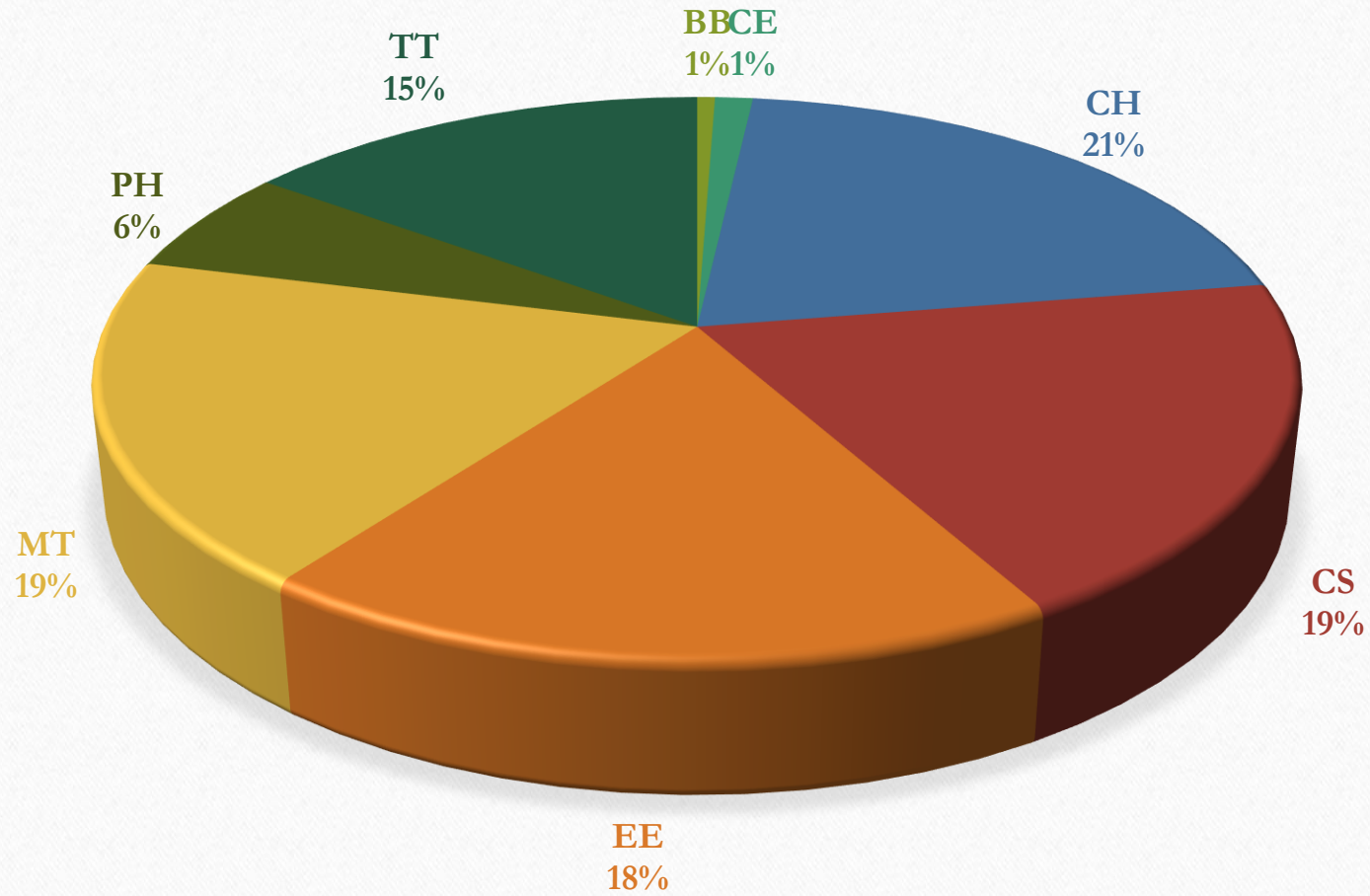


Introduction

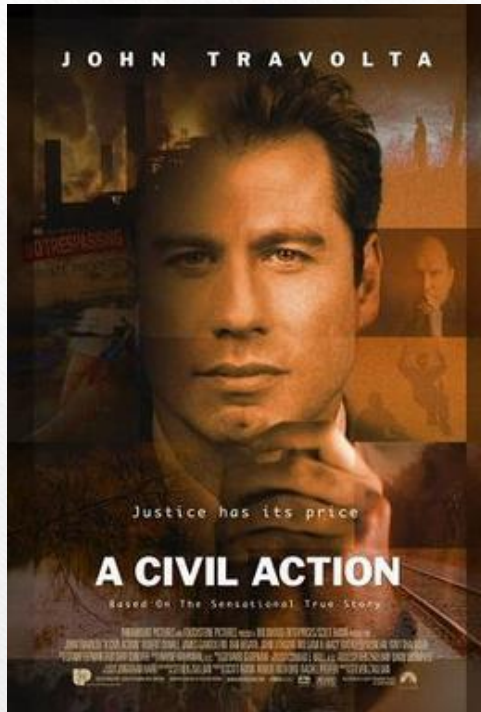
Week-I

Why is this course
important?

DISTRIBUTION OF STUDENTS



Interesting Movies



The court case around trichloroethylene, an industrial solvent, and its contamination of a water body. A lawsuit was filed over industrial operations that appeared to have caused fatal cases of leukemia and cancer, as well as a wide variety of other health problems, among the citizens of the city.



The court case 'Anderson vs. Pacific Gas Electric.' on release of Cr^{6+} a highly toxic and fatal cancer-causing chemical in water body

Any such cases in India?

Bhopal Gas Tragedy



Contamination of rivers

Environmental Problems

- Old Environmental Problems

- Smog
- Sewage Contamination
- Oil Spills
- Acid rain
- Ozone hole



- New/emerging Problems

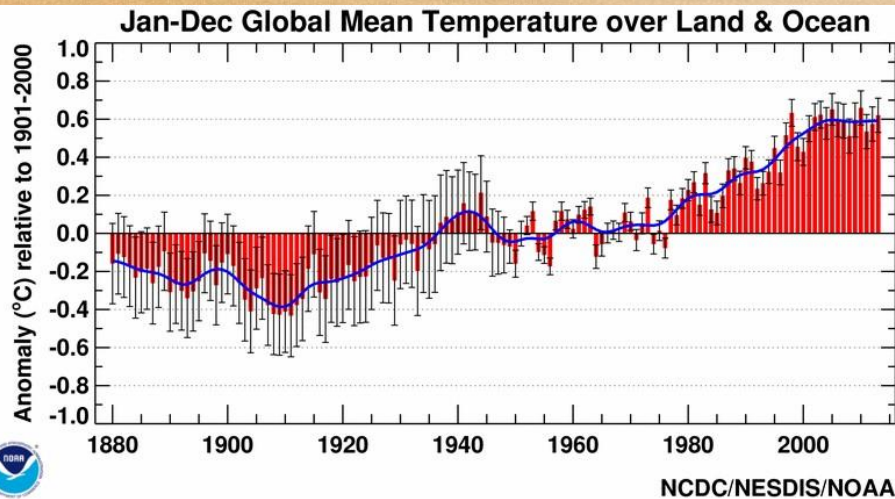
- Global warming
- Pollutants acting like carcinogens, endocrine disruptive compounds (EDC) etc.

EDC effects

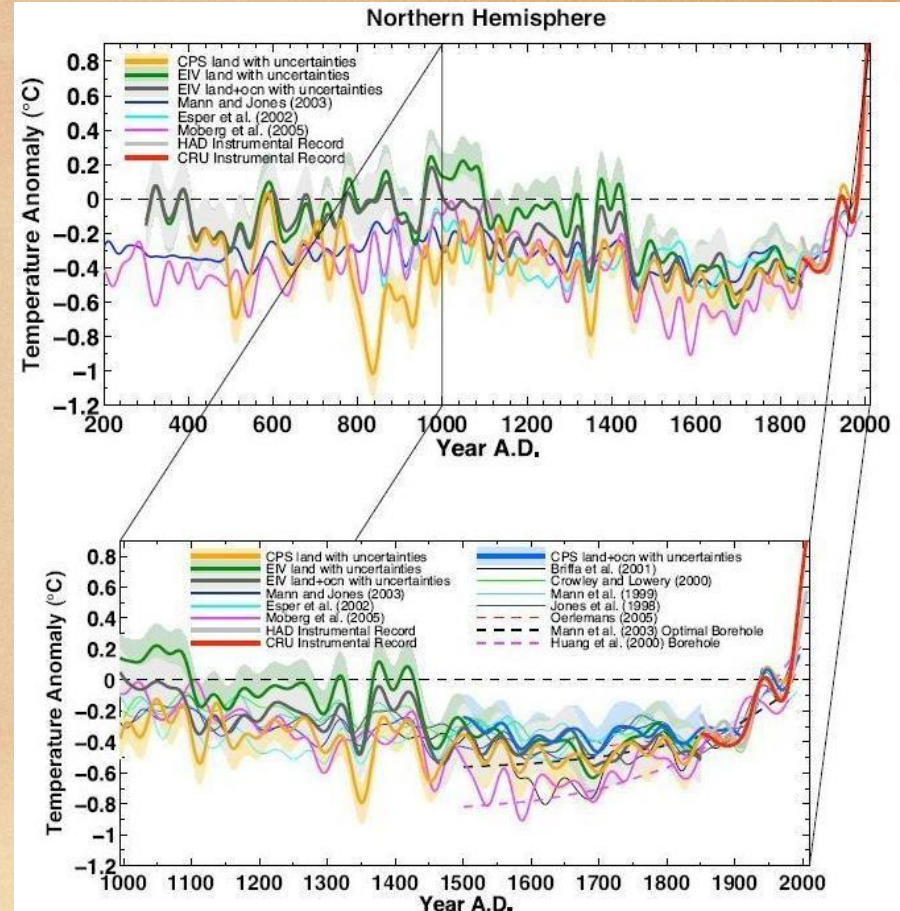
- Eggshell thinning in bird populations due to DDT
- Abnormal reproductive development in alligators in Lake following pesticide spill
- Simultaneous presence of both male and female reproductive organs in mollusks exposed to alkyltins
- Synthesis in male fish living near sewage outfalls of a hormonally regulated protein (vitellogenin) normally found only in female fish

Some Specific Aspects

Global Temperature change



From 1880-2013



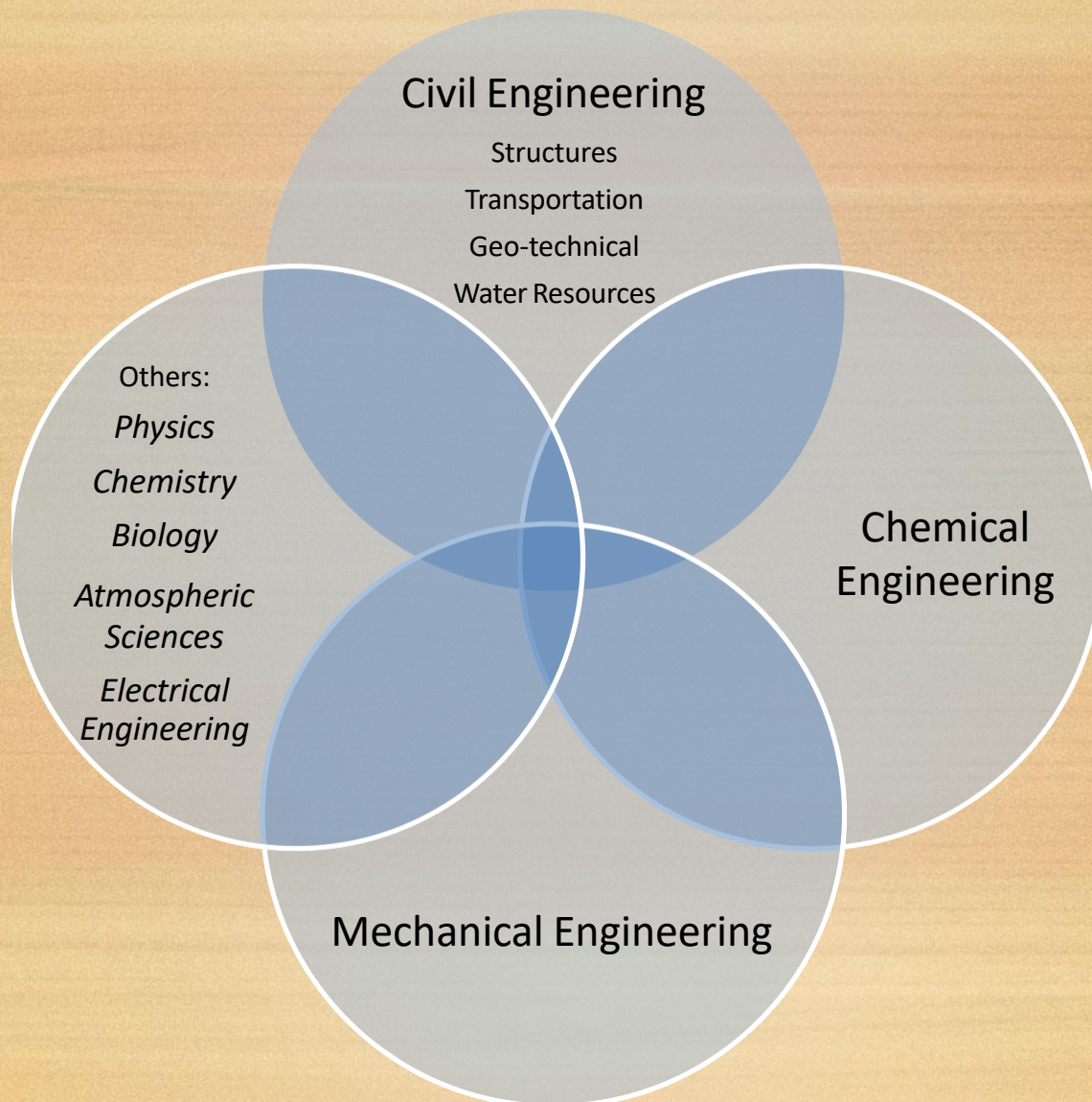
Over past 1000 years

Are chicken a source for pollution?

What's Environmental Science/Engineering

- It's a combination of science and engineering principles for safeguarding and improving natural environment, to provide healthy air, water, and land for habilitation of human and other organisms.
 - Water/waste water
 - Solid/Hazardous waste
 - Land Remediation
 - Risk Assessment
 - Air Pollution

Highly Interdisciplinary!



Standards as per Indian Government

[भाग III—खण्ड 4]

भारत का राजपत्र : असाधारण

3

NATIONAL AMBIENT AIR QUALITY STANDARDS CENTRAL POLLUTION CONTROL BOARD NOTIFICATION

New Delhi, the 18th November, 2009

No. B-29016/20/90/PCI-L—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM ₁₀ µg/m ³	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM _{2.5} µg/m ³	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O ₃) µg/m ³	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m ³	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m ³	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH ₃) µg/m ³	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	<ul style="list-style-type: none"> Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organised)	B	<ul style="list-style-type: none"> Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	<ul style="list-style-type: none"> Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	<ul style="list-style-type: none"> pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ul style="list-style-type: none"> pH between 6.0 to 8.5 Electrical Conductivity at 25°C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

International Protocols

- **Montreal Protocol**

- Protect Ozone layer

- Discussion started in 1989 at Helsinki (Sweden) and ended in 2007 at Montreal (Canada)
- Regulate Chlorofluorocarbons (CFCs)
 - CFCs are stable compounds which reach stratosphere and release Chlorine.

Kyoto Protocol

- Reduce anthropogenic Green house gases.
 - Mainly target developed nations.
 - India signed in 2002.
 - India and China are not obligated to reduce emissions