ENVIRONMENTAL BIOPHYSICS

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Introduction to environmental Sciences

Environmental problems and their Causes

① exponential growth

② Inequitable Distribution of economic wealth and population

③ Sustainability and Resources

④ Pollution.

Exponential Growth: / the root cause

↳ Value of something increases by **fixed** percentage
of the whole each time. %

J shaped value vs time curve.

linear growth: increase is a **fixed Amount** for each
time increment.

initial increas - total increas.

Human Population.

2×10^6 years	⟹	1 billion
123 years	⟹	2 billions
33 years	⟹	3 billions
14 years	⟹	4 billions
13 years	⟹	5 billion
12	⟹	6 billion
[prediction] at 2013	⟹	7 billions
2028	⟹	8 billions
2050	⟹	9 billions

population growth ⟹
resources demands growth
loss natural habitats
rate of extinction - poverty
leuds of population.

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Doubling time | $DT = \dfrac{70}{\% \text{ growth rate}}$

if increase is 10% $\Rightarrow$ $DT = 7$ years.
   Per year

   5% $\Rightarrow$ $DT = 14$ years.

ex. world population rate of growth is 1.2% per year. $\Rightarrow$ $DT = 60$ years

present population $\approx$ 6 billions. $\Rightarrow$ $\sim$ 9 billions

in 2050. $\Rightarrow$ Average hourly population increase

   is about 9000.

Inequitable Distribution of Economic wealth and population.

population

developed Counteries ← → Developing Counterie

	developed Counteries	Developing Counteries
name	First world	second and third world.
indust	highly industrialised	low to moderate industrialy
Capita	Capita GNB above 4000 $	350 $
ex.	U.S., Canada, Europe Japan, and Australia	Africa, Asia, South America
world population	20%	80%
world wealth	85%	15%
using world Resources	88%	12%
worlds wast and polkution	75%	25%
growing rate	0.1% per year	1.7% per year

↓ Coal, oil, metals, ... etc
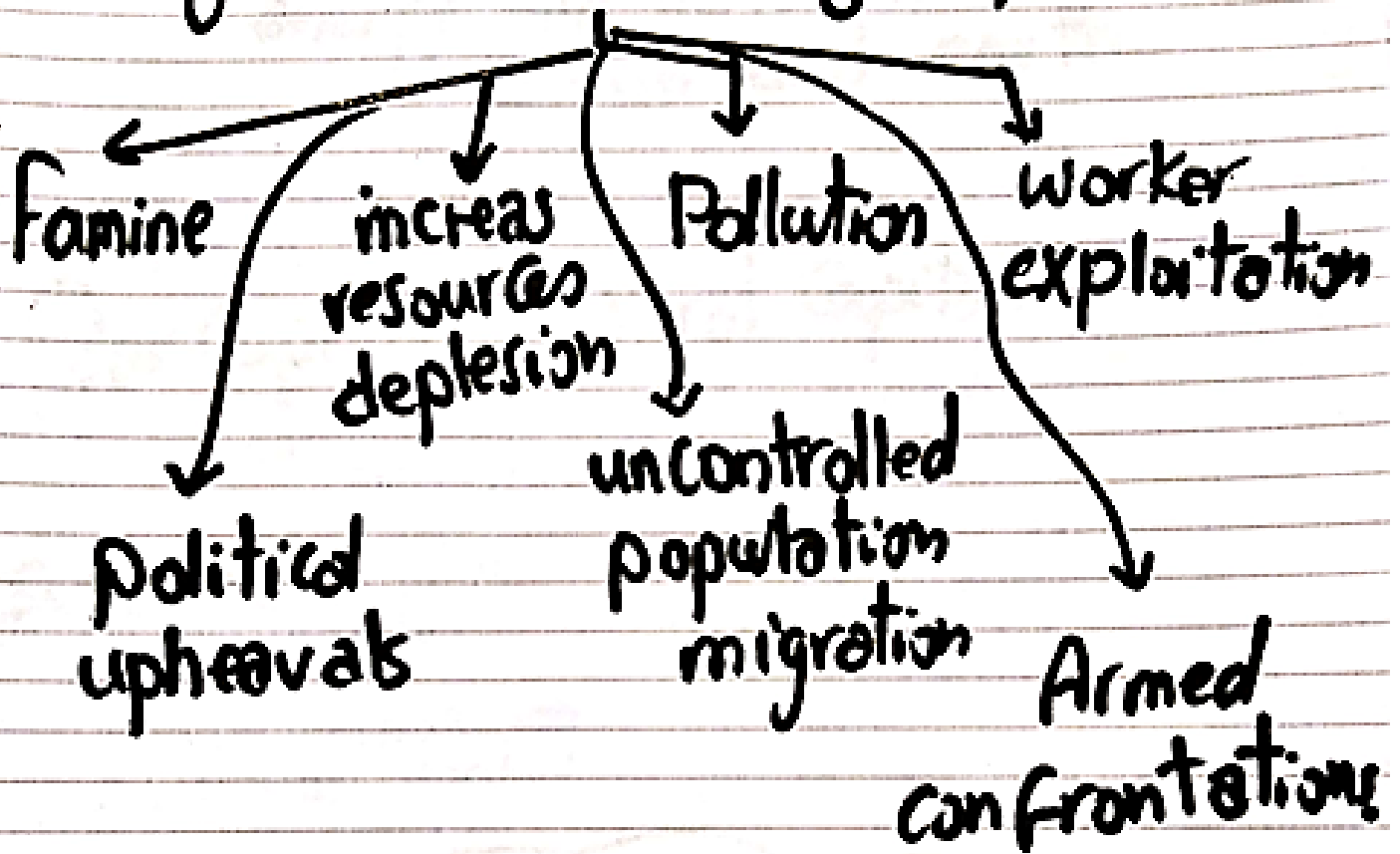
DT	41 years
	700 years

[#] Counteries least able to afford increasing populations are those of growing the fastest.

95% of the world population increase.

Results:-

Rich get Richer, Poor get poorer

- Famine
- increas resources deplesion
- Pollution
- worker exploitation
- political upheavals
- uncontrolled population migration
- Armed confrontations

Sustainability and Resources:
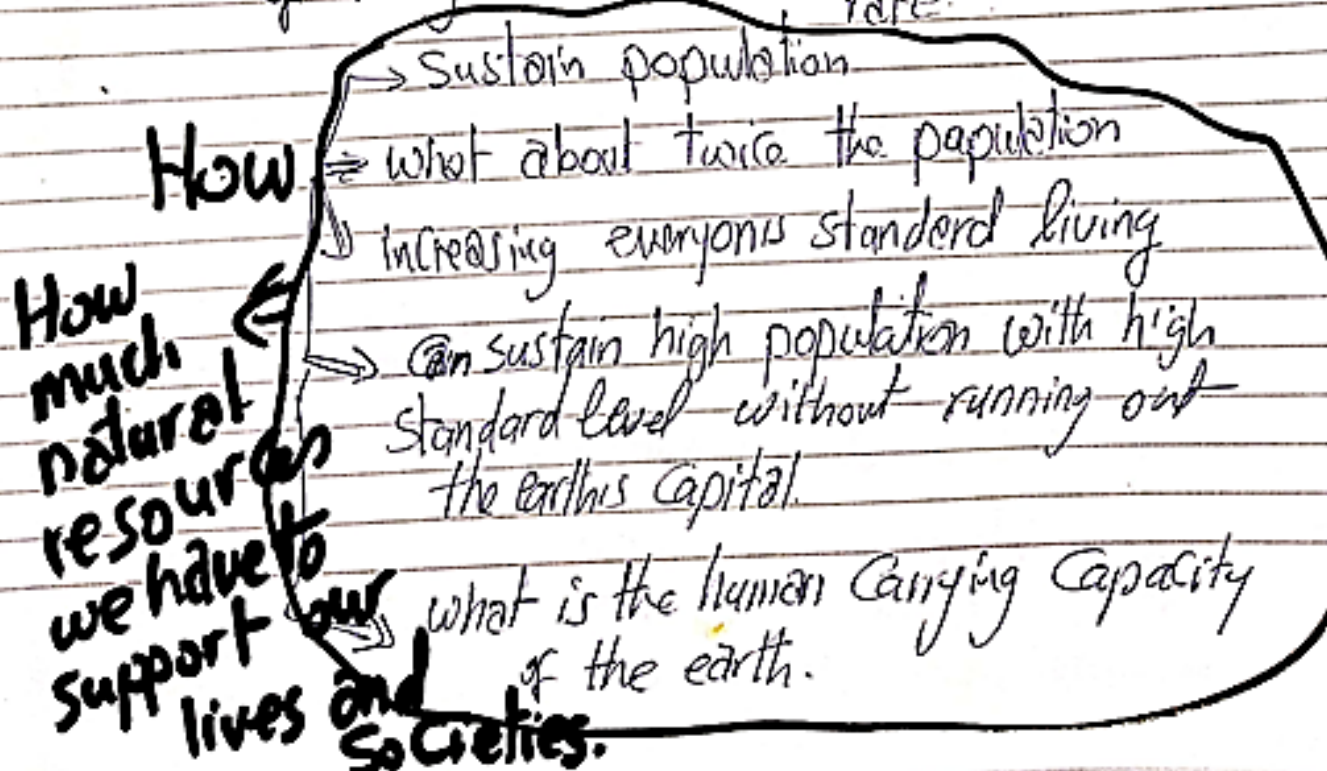## energy and materials from Sun and earth.

energy from the Sun = Solar Capital.
materials " " earth = earth or natural Capital

Solar Capital - natural Capital.
→ air - water - Soil - wild life - minerals - habitats
  surface processes)

Sustainable:- live without depleting Resources.
using Capitals ⟹ imperilled existance.

Population increase ⟹ using up Capitals
+ increas Standard   at an ever accelerating
of living   rate.

How → Sustain population
→ what about twice the population
→ Increasing everyons standerd living

How much natural resources we have to support our lives and societies.
→ Can sustain high population with high standard level without running out the earths Capital.
→ what is the human Carrying Capacity of the earth.

This may change
over time.
(whale oil vs
Crud oil)

Resources:
Any thing from natural
environment that we use to
meet our needs or wants.

Renewable
Constantly being
replenished
inexhaustable supply
Solar and wind
energy

Potentially Renewable
- replenished on
human time scale
(less than several
decades)

trees - Crops - Surface
waters and
biodiversity (genetic, species - ecological)

⇒ Know its sustainable yeild (replinished time)
⇒ used at slower rate that if we
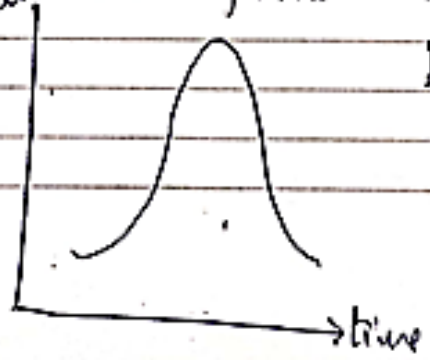dont want to deplet)

Non renewable
replinshed at
the geological
time scale
(100-1000 millions
of years)

once it used
it is gone.

we can't
wait for till
it is
replinshed
Cause we
run out

production ⇒ fossils fuds, minerals resources, soil, and
ground water.

bell shaped production history

when 80% is depleted, it is
Economically depleted and the
rest 20% become very expensive
to exploit

→ time

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extend production Curve of
Nonrenewable resources
by

1) Refuse
Don't use

(2) Reduce
use less

③ Reuse
use the same
thing over and
over again.

④ ReCycle
make new product of the material.

⊛ Refers Reserve
explaited potion go
up and down according to
marked Conditions.

Reuse and ReCycle
can't be used for
energy resources
(once burnt can't burn
again

As Arevers dowindle price will go up
making the remainging Resource
be reserved.

Pollution.

anything that is negatively impacts the air, water, soil or food. Harms Health, survival or activities of humans or other living organism

One person's pollution may be anothers resources

Pollution.

may be liquid, Solid, gas, or energy (heat and Radiation)

Pollution

~~Allways~~ usually produced as a Result of utilizing Resources.

Pollution

may be naturally occuring or anthropogenic (human produced)

Pollution

may be from an identified point Source (a smokestack) or from dispersed non point Source (fertilizer runoff

Point Source , dispersed non point Source.

⟶ it is easiear and cheaper to be controled

effect of Pollution depends on 3 factors.

1) **Toxicity:** or chemical reactivity. How harmful is the material.

2) **Concentration:** (ppm, ppb, --etc)

highly Toxic substance may be greater Concentration than a lot of something relatively benign

3) **Persistance:** (degradable or non-degradable)

Does the material breakdown to harmless substances or does remain unchanged.

How deal with pollutant ⟶ depends on the Combination of these factors

1) **Pollution Prevention:** (input Contrde)

Keep it from ever reaching the environment (protective)

Done by refuse, reduce, reuse and recycle) treat problem

2) **Pollution Clean up:** out put Contrde

get rid of pollution after it has entered the environment (reactive) treat symptom (harder and more expensive) than prevention

in U.S 99% of environmental Spending is for cleanup.

Evaluation of environmental impact. (PAT) model

1) P: Population (P):- number of people.

2) Affluence (A): standard of living or per capita use of resources.

3) (T) technollogy:- Amount of pollution produced per unit of resource used.

PAT = total environmental impact

Developed Counteries: low P, High A and T
Consumption-driven-pollution

Developing " ∴ High P, law A and T
population-driven pollution.

(Changing Human enviromental)
impact. for seach

COMPLETE THE FOLLOWING STATEMENTS

1. THE POLLUTION MAY BE ....OR ....OR ....OR
   .... SUCH AS .... AND ....

2. ....RESOURCES IS CONSTANTLY BEING REPLENSHED AND
   CAN CONSIDERED AS .... SUPPLY SUCH AS .... AND
   ....

3. IF THE POPULATION NOE ARE 6 BILLIONS WITH INCREASE 1.7 %, THIS
   NUMBER WILL BE DOUBLED APPROXIMATLY AFTER ....
   YEARS (MAKE YOUR PRIDICTION ACCORDING TO THE 70/% RULE)

4. COMPLETE THE SPACES IN THE FOLLOWING TABLE

	DEVELOPED COUNTERIES	DEVELOING COUNTERIES
NAME		
INDUSTRIALIZATION		
CAPITA		
EXAMPLES(4 EXAMPLES)		
POPULATION		
WEALTH		
USING RESOURCES		
WASTS AND POLLUTION		
POPULATION GROWING RATE		
DT		

5. THE THREE FACTORS THAT AFFET THE POLLUTION ARE ....,
   .... AND ....