

SUSTAINABLE DEVELOPMENT

2. ECOSYSTEMS

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SOME QUESTIONS...

What do you understand by “system” or “ecosystem”?

Can you put examples of ecosystems?

What type of relationships we can find inside ecosystems?

Can different ecosystems be linked?

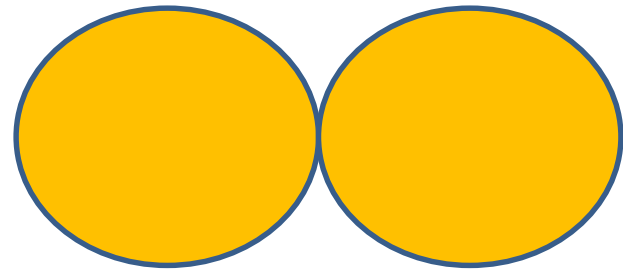
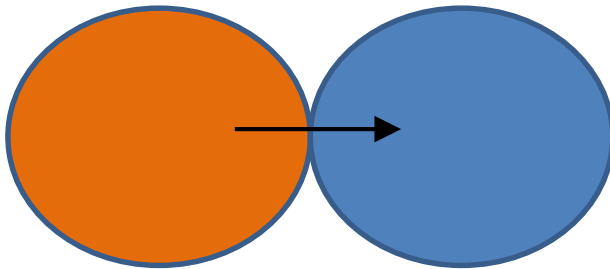


1. THERMODYNAMICS

ZERO LAW

When two bodies with different temperature get in contact, they tend to balance.

The body with the highest temperature gives to the other one until balance





1. THERMODYNAMICS

FIRST LAW

If work is produced or heat exchange is produced over a system , the system will change.

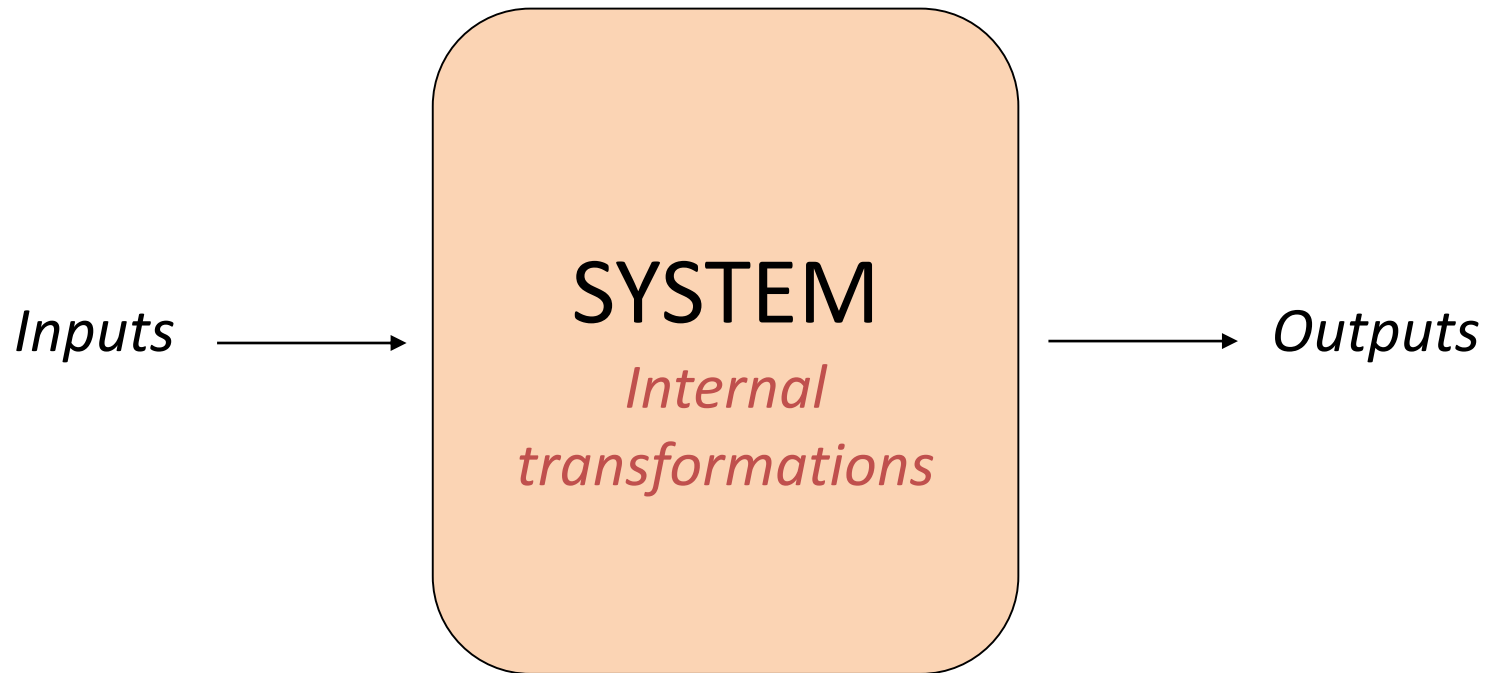
Principle of Energy Conservation

$$E_{\text{in}} - E_{\text{out}} = \Delta E_{\text{system}}$$



1. THERMODYNAMICS

DEFINITION OF A SYSTEM



Not self-sufficient systems

Internal transformations always tend to organise

Always happen with an external support

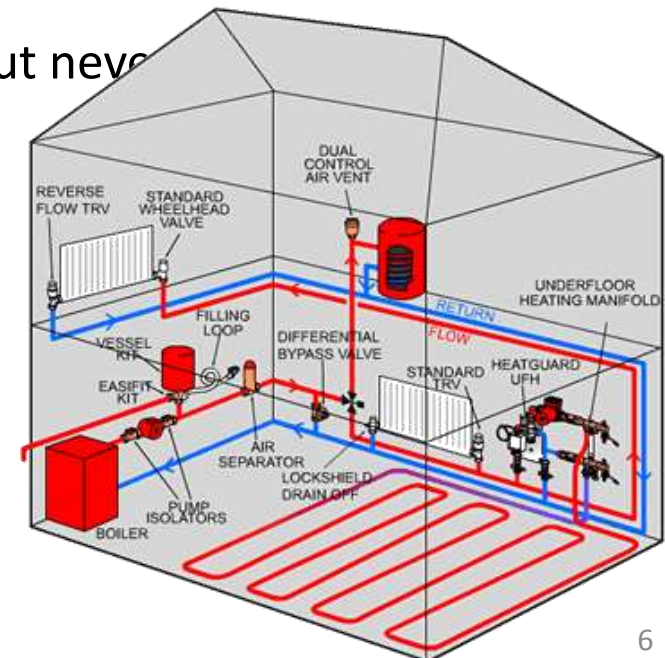
1. THERMODYNAMICS

SECOND LAW: ENTROPY

It is not possible to do the opposite way. We cannot heat an object from a cooler one.

Besides, in this process there will always be losses (Efficiency of a system)

An efficient system tends towards zero, but never





1. THERMODYNAMICS

THIRD LAW

An efficient system tends towards zero, but never gets it.

Impossibility of absolute zero temperature (0°K)





1. THERMODYNAMICS

EXISTING SYSTEMS

Open systems

Interchange of mass and energy (e.g. a car)

Close systems

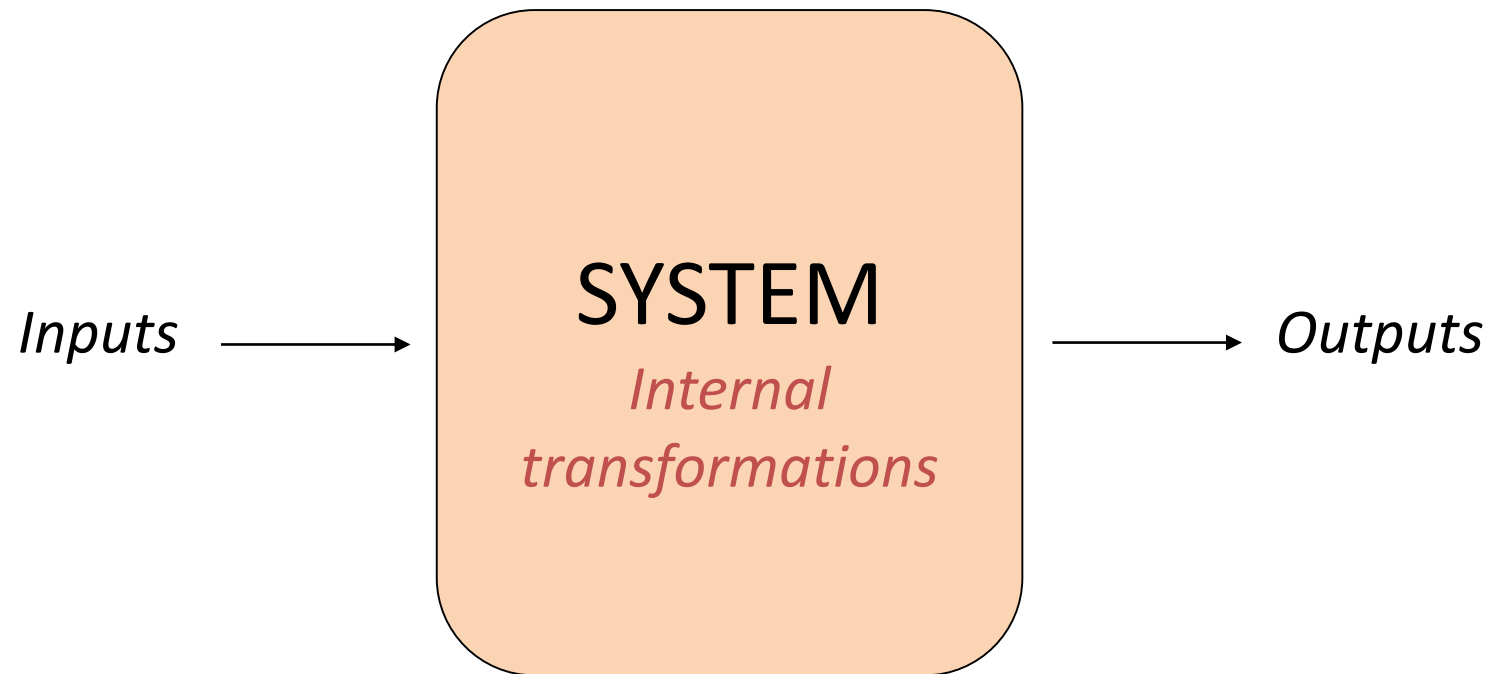
They only interchange energy (e.g. a mill)

Isolated systems

There is no interchange (they don't exist in Nature)



1. THERMODYNAMICS



Any other examples of systems?

Analyse them



EXAMPLE: BUILDINGS

What can we learn about buildings?

- Our buildings will never be self-sufficient
- They will always need external support, and there will always be losses
- We can improve efficiency, but never get to zero energy
- We can use kinder energies, materials, processes...
but we will always produce environmental impact



ECOSYSTEMS

Definition

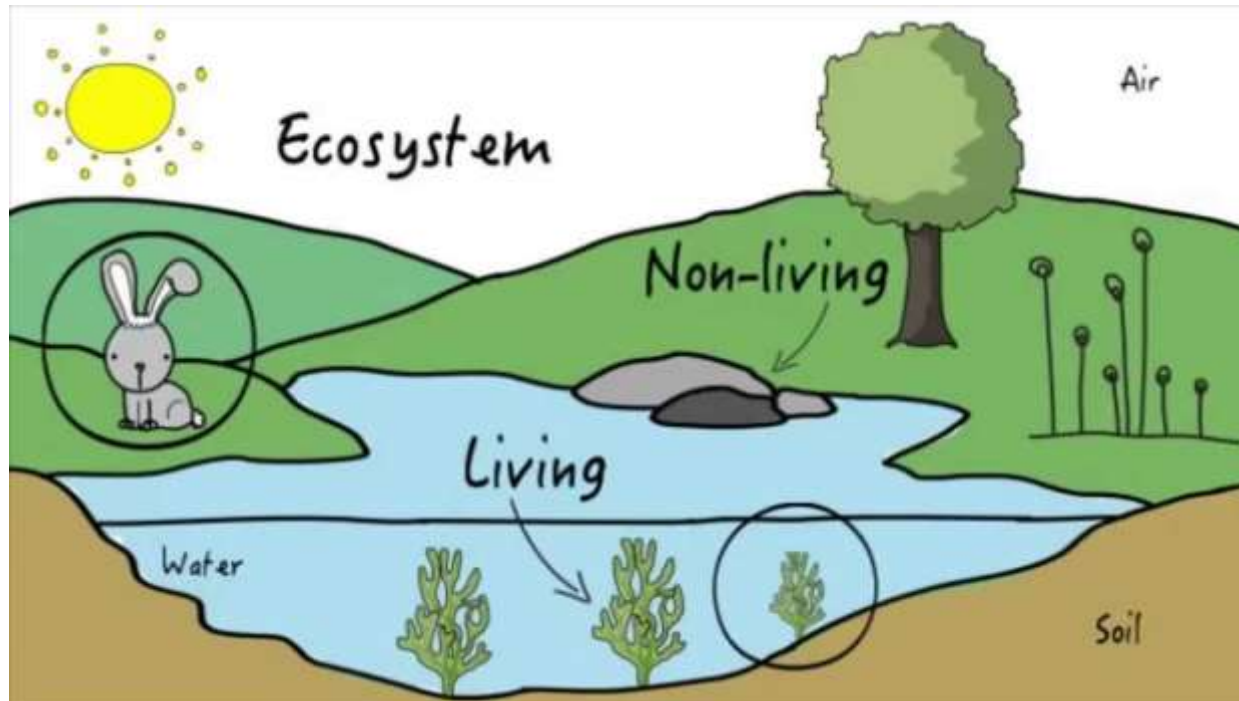
Community of living organisms in conjunction with the non-living components of their environment (things like air, water and mineral soil), interacting as a system.



ECOSYSTEMS

Analyse this ecosystem and explain:

- What living organisms are in it
- What non-living material is useful
- What internal and external factors does control it?

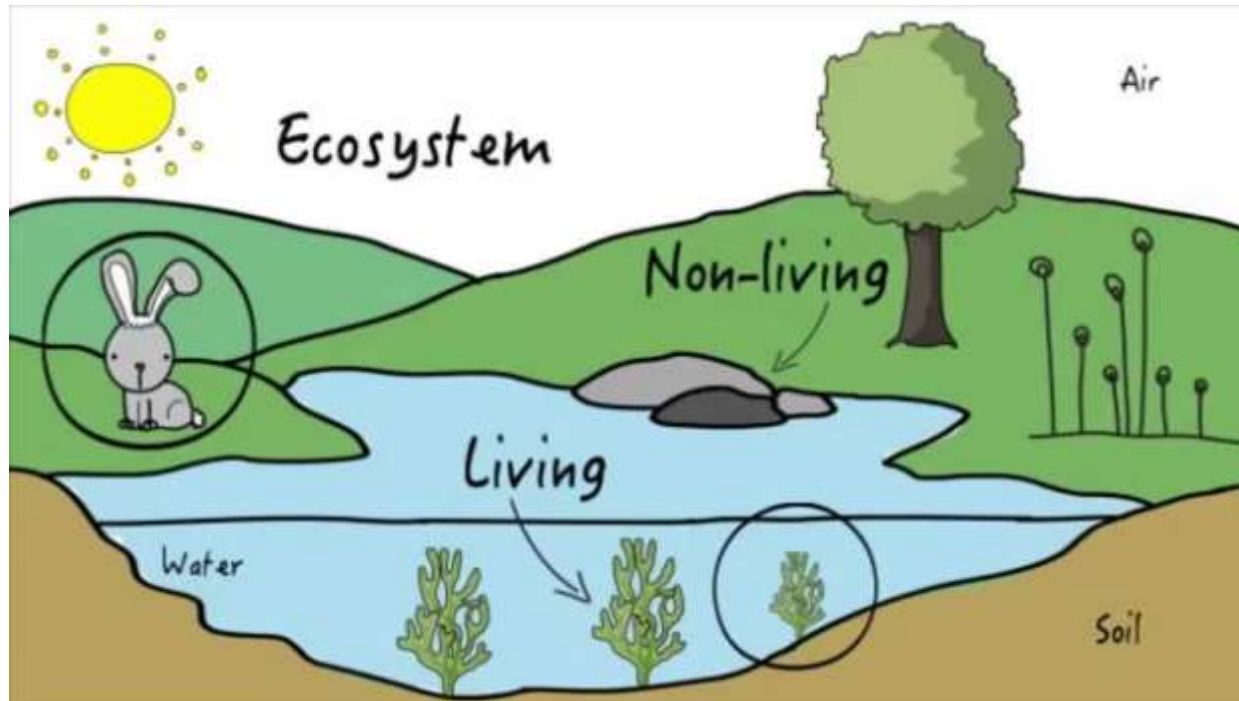




ECOSYSTEMS

How are these terms involved?

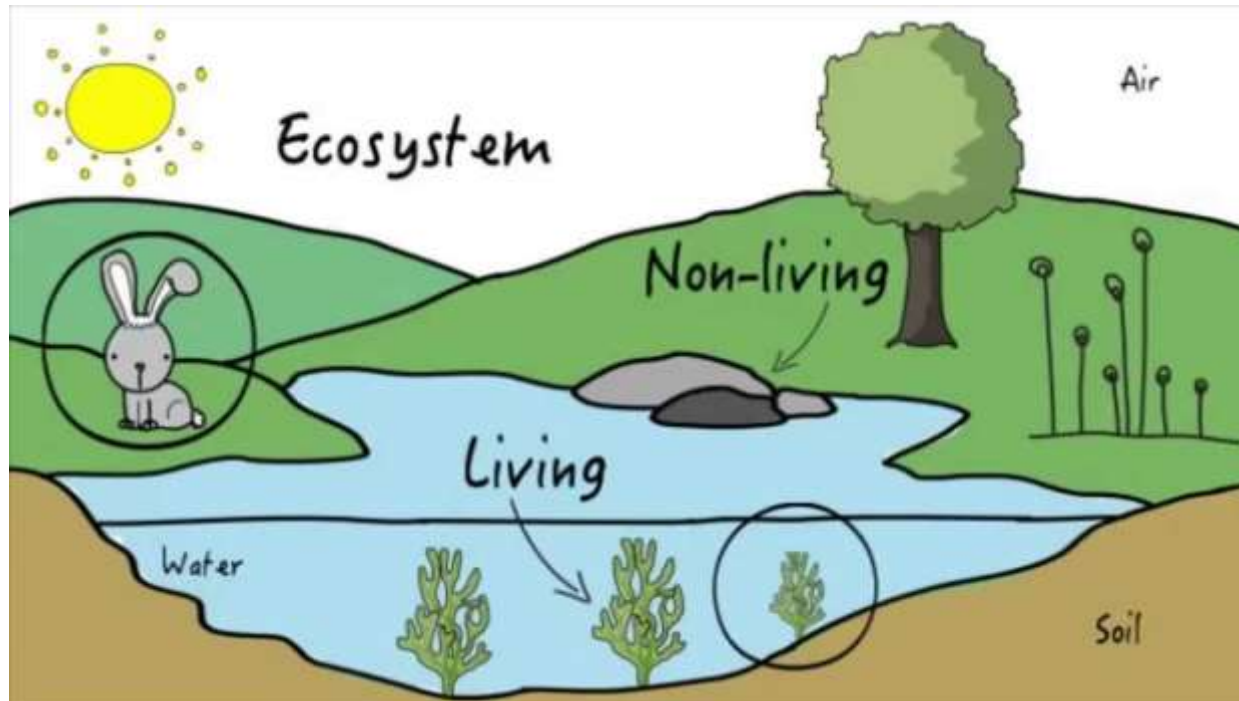
- Photosynthesis
- Biomass
- Carbon cycle
- Energy flow





ECOSYSTEM ECOLOGY

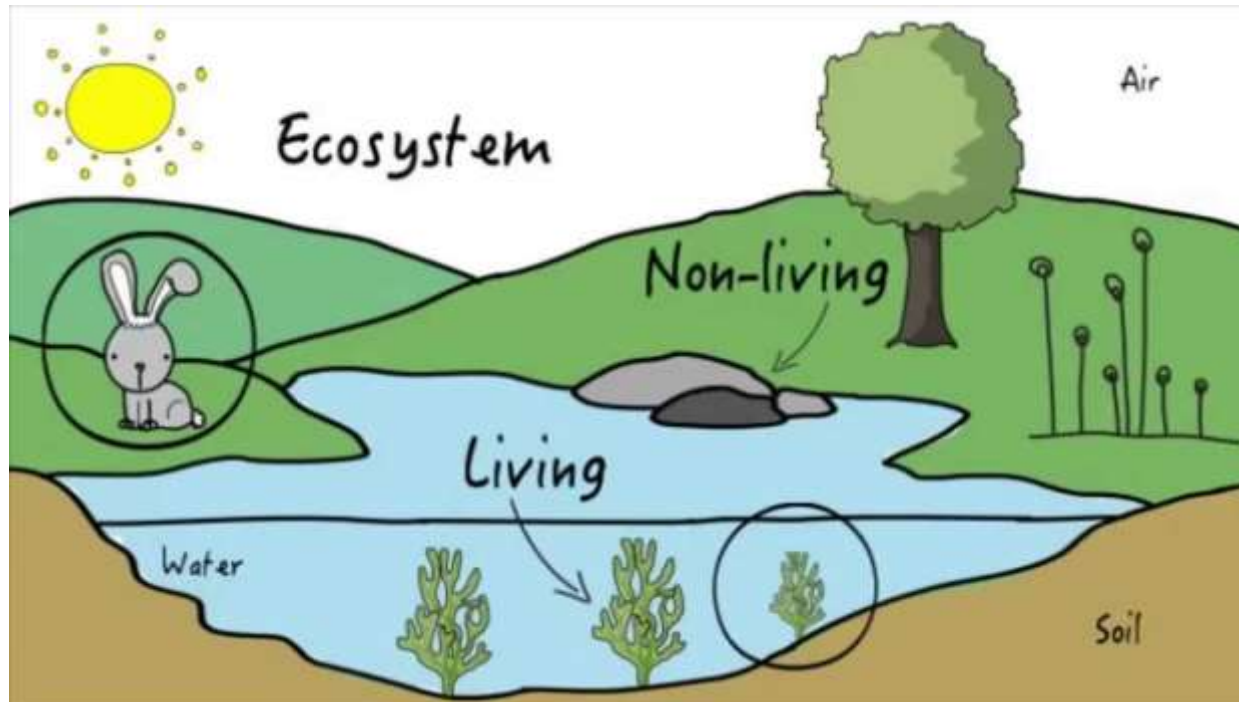
Study the processes which govern the stocks of material and energy in ecosystems, and the flow of matter and energy through them.





ECOSYSTEMS

Can this ecosystem change? How?





ECOSYSTEMS

Is this an ecosystem? How does it work? What transformations have happened?





Biodiversity

Variability among living organism from all sources

Functions:

- Provides support and provisioning to ecosystems
- Regulates the different processes happening inside and outside
- Provides cultural services

VIDEO

https://www.youtube.com/watch?v=GK_vRtHJZu4

Ecosystems diversity

VIDEO

<https://www.khanacademy.org/science/biology/biodiversity-and-conservation/levels-of-biodiversity/v/ecosystem-biodiversity>

Ecosystems goods and services

VIDEO

<https://www.youtube.com/watch?v=wMIUglBlgl>



TRANSFORMATION OF ECOSYSTEMS

Due to natural changes

- Weather conditions (rain, wind, hurricanes, etc.)
- Earthquakes
- Predation
- Introduction of new species

Due to human impact on ecosystems (anthropogenic threats)

- Farming
- Construction
- Pollution
- Growing population



ECOSYSTEM MANAGEMENT

“An integrated process to conserve and improve ecosystem health that sustains ecosystem services for human well-being”

United Nations Environment Programme - UNEP (2009)

EXERCISE

Work in groups. Read the assigned article and do the following:

1. Identify organisation of the article: introduction, aims and objectives, methodology, discussion and conclusion.
2. Discuss about the problems occurring in this ecosystem and how it can be managed properly.
3. Compare these articles and explain the relationship with ecosystem management.