

## Light, Science and Society: The importance of plants for global CO<sub>2</sub> reduction and wellbeing

Graça Carvalho – [graca@ie.uminho.pt](mailto:graca@ie.uminho.pt)  
 Fernando Guimarães – [fernandoquimaraes@ie.uminho.pt](mailto:fernandoquimaraes@ie.uminho.pt)

University of Minho  
 Institute of Education  
 Portugal

Πανεπιστήμιο του Μίνχο  
 Ινστιτούτο Εκπαίδευσης  
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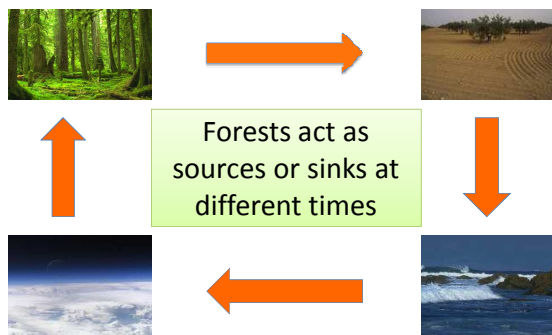
### What are carbon sinks and carbon sources?

Discussion with your colleagues

- Give a definition
- Give some examples
- Specify if they act as sources or sinks at different times

Write down your description and return it to us

### What are carbon sinks and carbon sources?



Not all stores of carbon are naturally cursed with fluctuations however

The most important carbon stores are fossil fuel deposits as they have the unique benefit of being buried deep inside the earth, naturally separated from the carbon cycling in the atmosphere.



### What is the carbon cycle?

### What is the carbon cycle?

Discussion with your colleagues

- Give a definition
- Thinking in terms of:
  - . Process
  - . Place
  - . Organisms
  - . Sources *versus* Sinks

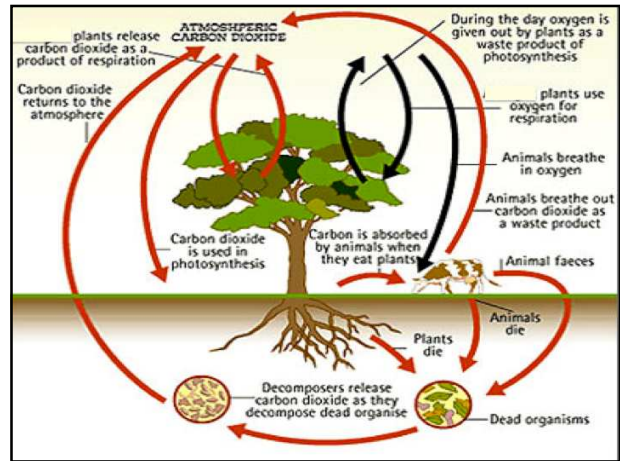
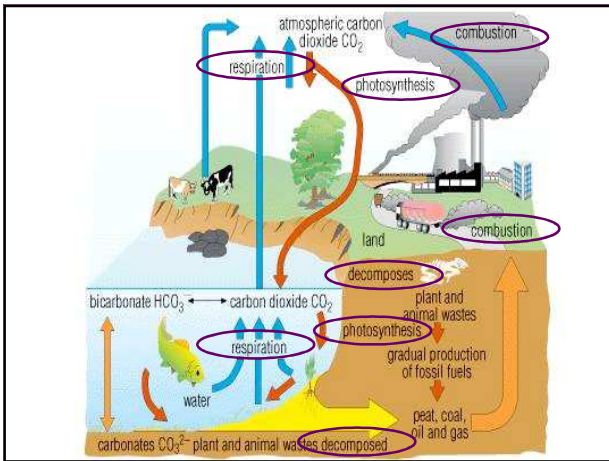
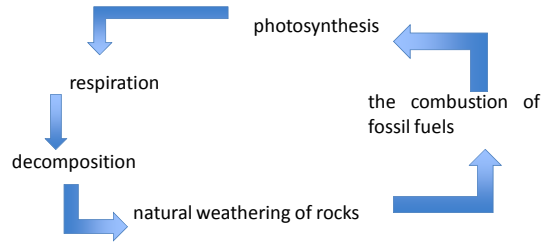
Write down your description and return it to us

The carbon cycle is the process in which carbon atoms are recycled over and over again on Earth. Carbon recycling takes place within Earth's biosphere and between living things and the nonliving environment.

Since a continual supply of carbon is essential for all living organisms, the carbon cycle is the name given to the different processes that move carbon from one to another.

The complete cycle is made up of "sources" that put carbon back into the environment and "sinks" that absorb and store carbon.

If a diagram were drawn showing the different processes that move carbon from one form to another, what could it be its main processes?



**Cellular respiration**

Plants, algae, many bacteria (Autotrophs) produce oxygen and food. Breathing / Respiration

$$6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O + \text{ATP}$$

Oxygen + Sugar → Carbon dioxide + Water

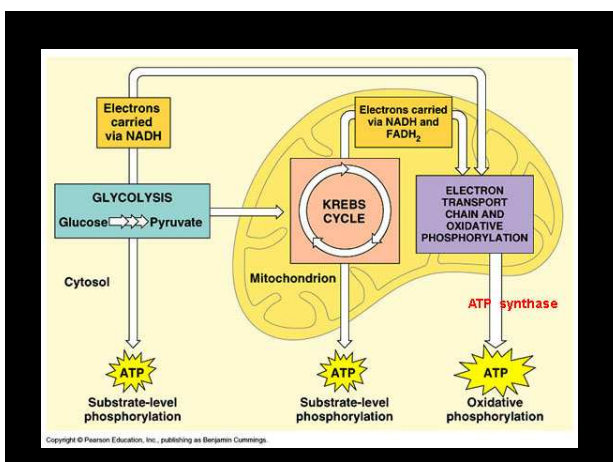
**Glycolysis**

**Cytoplasm:** Glucose is broken down into pyruvate. This process produces 2 ATP and 2 NAD<sup>+</sup> from 4P and 4ATP. Substrate Level Phosphorylation is involved.

**Mitochondrion:** Pyruvate enters the mitochondrion and is converted to acetyl-CoA. This process releases carbon dioxide and water. The Krebs Citric Acid Cycle produces NADH and FADH<sub>2</sub>. The inner membrane is involved in the production of 32 ATP from Electron Transport Phosphorylation.

Inputs: ← C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> (Food) and ← O<sub>2</sub> (Breathing)

Outputs: H<sub>2</sub>O and CO<sub>2</sub>



**6CO<sub>2</sub> + 6H<sub>2</sub>O  $\xrightarrow{\text{Light}}$  C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6O<sub>2</sub> + ATP**  
 Carbon dioxide + Water → Sugar + Oxygen

**Photosynthesis**

Plants, algae, and sea beds (autotrophs)

Law

Carbon dioxide, Water, Oxygen, Food

Breathing / Respiration

**6O<sub>2</sub> + C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> → 6CO<sub>2</sub> + 6H<sub>2</sub>O + ATP**  
 Oxygen + Sugar → Carbon dioxide + Water

**Cellular respiration**

Animals, fungi, many bacteria (heterotrophs)

**6CO<sub>2</sub> + 6H<sub>2</sub>O  $\xrightarrow{\text{Light}}$  C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6O<sub>2</sub> + ATP**  
 Carbon dioxide + Water → Sugar + Oxygen

**Photosynthesis**

Plants make their own food  
**Autotrophs**

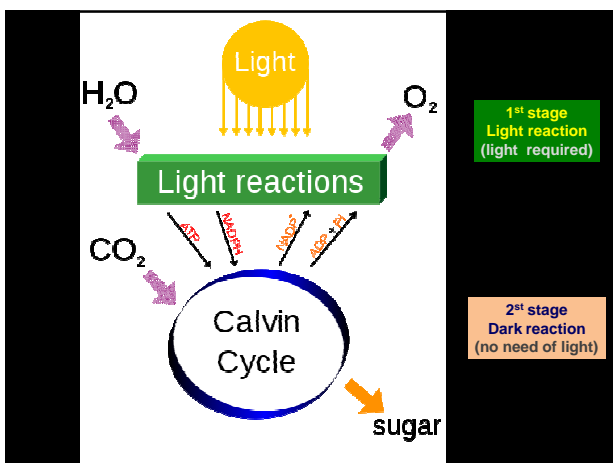
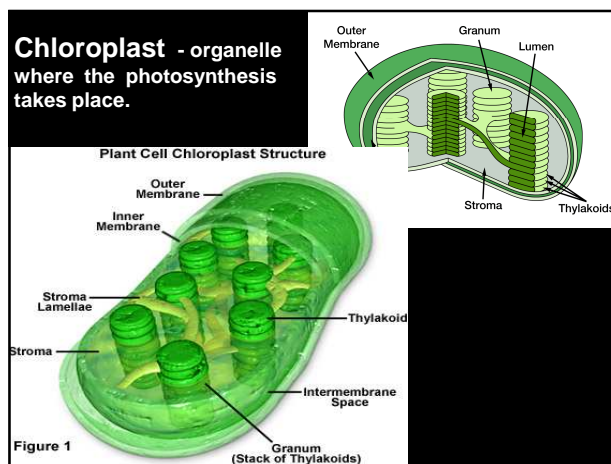
They need:  
 water + Minerals from the soil + free CO<sub>2</sub> + Light

Plants, algae, and sea beds (autotrophs)

Carbon dioxide, Water, Oxygen, Food

Breathing / Respiration

People eat plants: directly or indirectly  
**Heterotrophs**

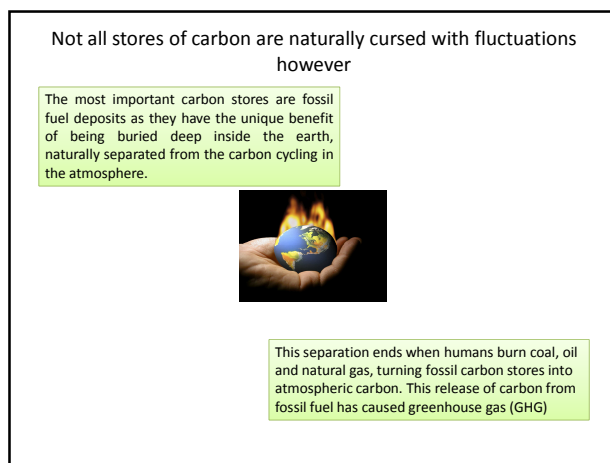
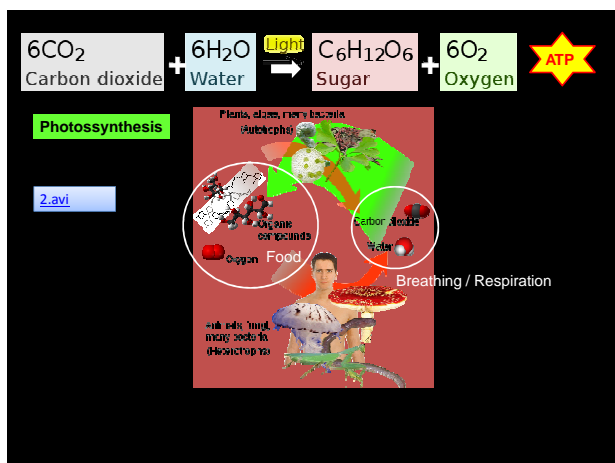
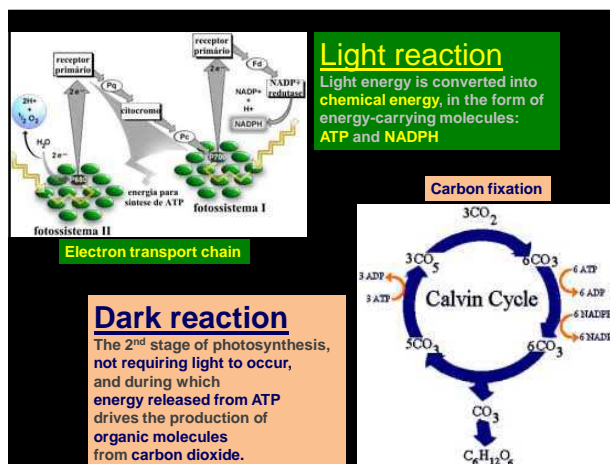
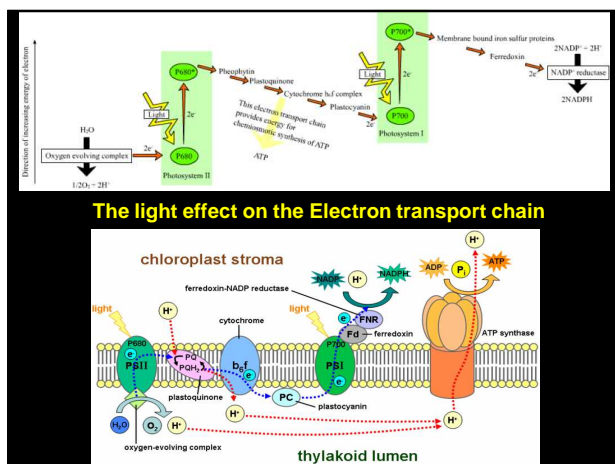
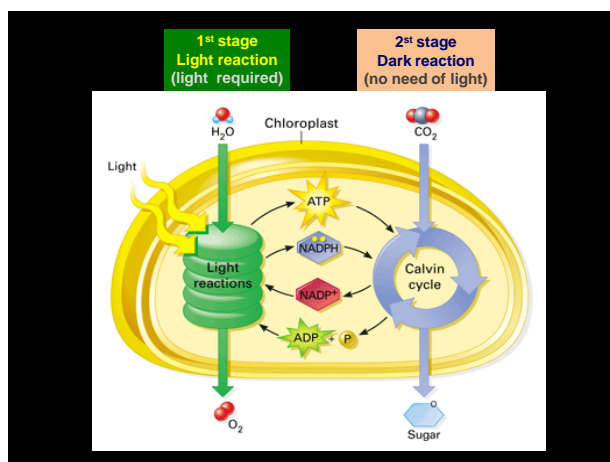
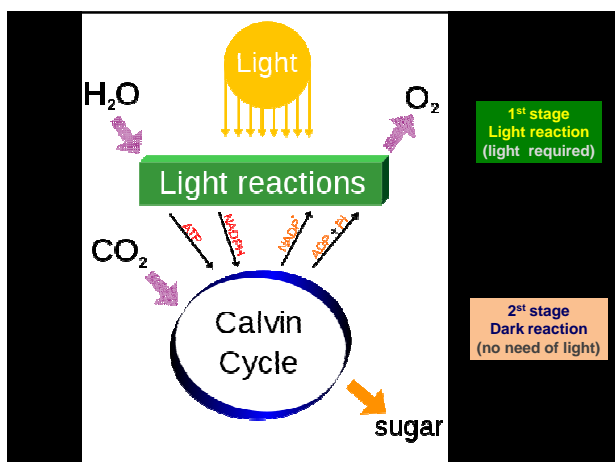


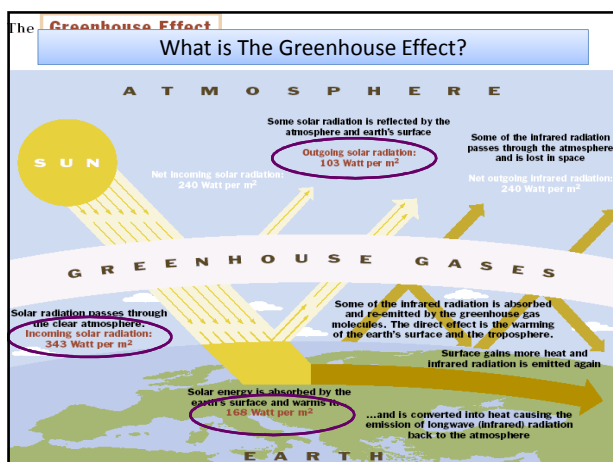
**Day and/or night**

Discussion with your colleagues

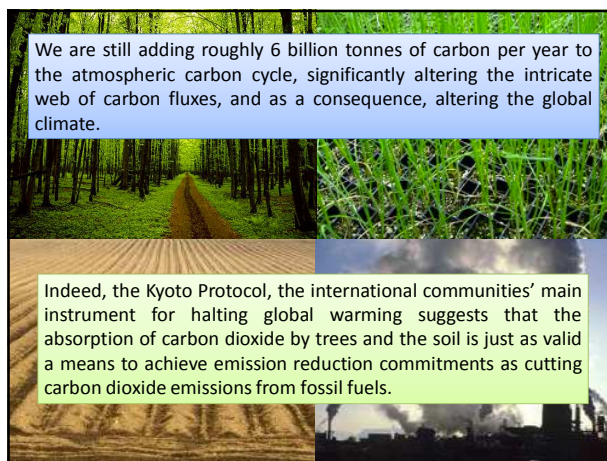
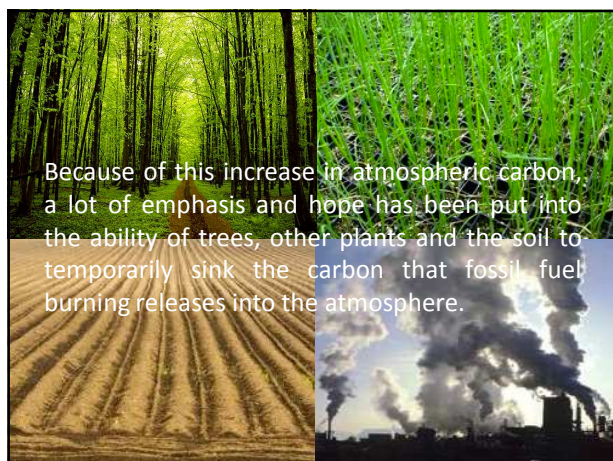
- The **photosynthesis** occurs during the day only and the **cellular respiration** in the night only
- The photosynthesis **light reaction** occurs during the day only and the **dark reaction** in the night only

Write down your description and return it to us





We are still adding roughly 6 billion tonnes of carbon per year to the atmospheric carbon cycle, significantly altering the intricate web of carbon fluxes, and as a consequence, altering the global climate.



### The fatal flaw of carbon sinks

Most of NGOs disagrees with the assumption that planting trees or reducing deforestation is just as good as reducing emissions from burning fossil fuel. Such an assumption overlooks some important facts:

- i) There is general agreement about the need to halt fossil fuel emissions, particularly in industrialised countries;
- ii) All carbon is not the same.
- iii) Afforestation - especially afforestation in northern tundra regions - may accelerate global warming.
- iv) It is not possible to accurately measure the "sink" effect of a forest

### Climate change: the forest connection

Most people are now aware that the world's hunger for energy from fossil fuel is leading to catastrophic climate change. What is becoming increasingly clear however is the effect that forests have on the climate and the climate has on forests

### Forests' effect on the climate

Forests play an important role in regulating the earth's temperature and weather patterns by storing large quantities of carbon and water.

Locally, trees provide shade, which in turn lowers summer temperatures and prevents the soil from drying out, they reduce heat loss from the ground in winter and prevent storm damage by providing shelter from wind.

Globally, forests regulate the global carbon cycle, having a profound effect on the climate.

### The climate's effect on forests

Global warming, which on a geological timescale is occurring in the equivalent of a split second, is significantly disrupting the intricate and poorly understood web of interactions that governs the very structure and composition of forest ecosystems.

This means that around a third of today's forests are likely to change their species composition. A temperature increase of 3°C by 2100 would result in forest ecosystems moving 500 km towards the poles or 500 m in elevation in order to find the same climatic conditions.

What can be done?

[3.avi](#)

Dank je wel

Go raibh maith agat

Tack

Obrigado

Thanks

Efharisto

Grazie