CARBON MODELLING

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Carbon is the principal building block for the organic and inorganic compounds that make up life. Carbon dioxide plays a significant role in trapping heat in Earth's atmosphere. The gas is released by exertion and exhaustion of fuels and the concentration of carbon dioxide moves and changes through the seasons. A carbon footprint is a total amount of greenhouse gases (CO_2 and CH_4) that are generated by our actions. Limestone, occurring as calcium carbonate is one of the carbon forms that is abundantly found on the earth. It is dissolved in fresh water and is present in the atmosphere as carbon dioxide. It is the second most greenhouse gas which is present on the planet leading to the environmental threat of climate change.

The flow of carbon throughout the biosphere, atmosphere, hydrosphere, and geosphere is one of the most complex, interesting, and important of the global cycles. Using the tools of information from biology, chemistry, oceanography, and geology the flow of carbon through various spheres can be studied and a global carbon cycle can be interpreted.

Importance of carbon in Ecology

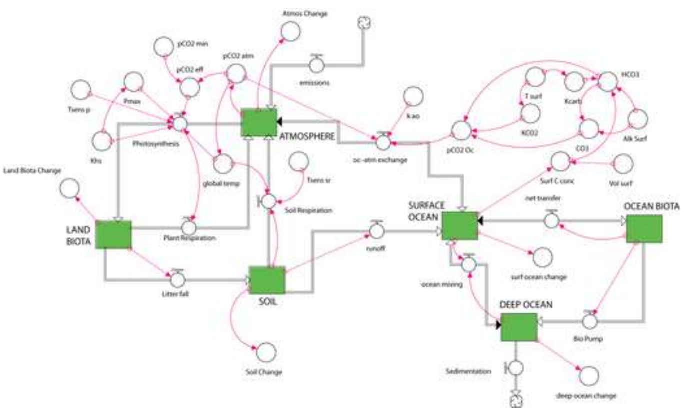
- It is the chemical backbone of life on Earth
- To regulate the Earth's temperature
- make up the food that sustains human life.
- provide energy that fuels our global economy

The Nobel Prize-winning Swedish chemist, Svante Arrhenius, 1896 studied the potential effects of human activities on the carbon cycle and the implications for climate change. He realized that CO_2 in the atmosphere was an important greenhouse gas and that it was a by-product of burning fossil fuels (coal, gas, oil). Using the global 3-D climate models of supercomputers he calculated the doubling of CO_2 in the atmosphere that would lead to a temperature rise of 4-5°C

A carbon model shows the quantity of each material used in a project and multiplies that by that materials emission factor to calculate a carbon footprint. Scientists can use models to understand and predict the fluctuations in the concentration of carbon dioxide activity. Carbon modelling is the future of the industrial revolution in building robust and efficient production cycles. Potential pitfalls that can arise will be avoided with the effective integration of the right data combinations.

The carbon model is used to simulate and sequester the fate of the carbon in the atmosphere. It is the tool used to interpret and evaluate the carbon addition to the atmosphere after fossil fuel burning and tract records of heat and Ph generated. It is also used to evaluate how permafrost melting amplifies warming under the different emission scenarios.

STELLA model is one of the Global carbon cycle models that is being used for carbon interpretation. This model incorporates the processes of carbon transfer in the terrestrial and oceanic realms. It also includes the history dating from 1880 to 2010 of human impacts on the carbon cycle in the form of emissions from burning fossil fuels, burning forests, and disrupting the soil. The reservoir controls and maintains the flow of the fuel with a valve system. The atmosphere reservoir is connected to a converter called pCO2 atm — this is the concentration of CO2 in the atmosphere and the units are in parts per million or ppm, the same units that CO2 concentrations are typically given in.



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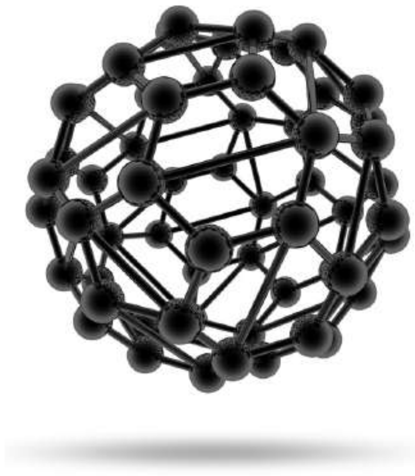
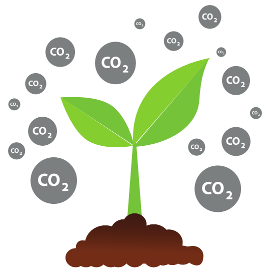


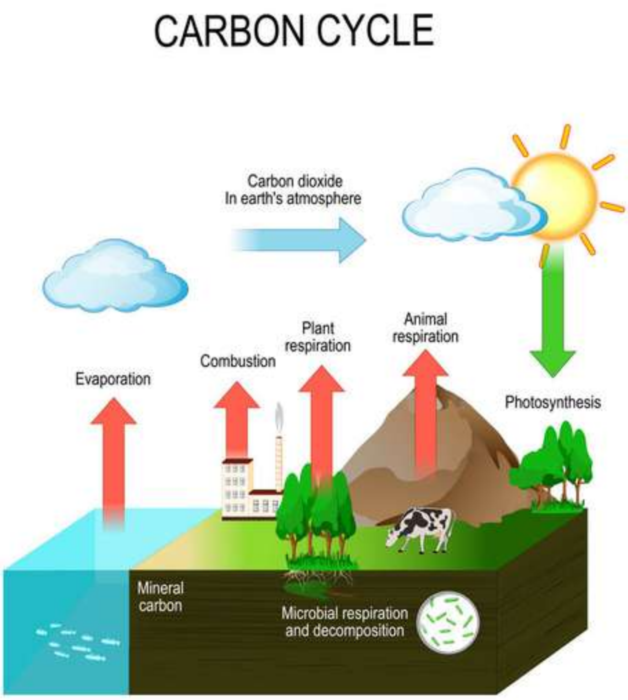


In this model, the initial amount of carbon in the atmosphere gives a pCO2 value of 280 ppm (and by now, it is just over 400 ppm). The pCO2 atm converter is in turn connected to the same climate model here it determines the strength of the greenhouse effect. The climate model calculates the temperature at each moment in time and then passes that information back to the carbon cycle model in the form of a converter called global temp change, which is the change in global temperature relative to the starting temperature is like a temperature anomaly.

The global temp change converter is connected to a couple of other converters that attach to the photosynthesis and soil respiration flow. Both flows are intuitive to temperature and the temperature combines with something called temperature sensitivity. The Tsens sr records the temperature sensitivity for soil respiration. Both photosynthesis and soil respiration are sensitive to temperature as they increase with temperature.

Global temp change is also connected to the surface temperature of the oceans (T surf) via a "ghosted" version of the converter — a dashed line version that helps eliminate so many long connecting arrows running all over the diagram. These converters assess the parameters like temperature, atmospheric CO2, and PH acidity. At the very top right of the model, there is a converter called Observed Atm CO2 that contains the observed history of atmospheric CO2 concentration from 1880.

The efficiency of the model is continuously monitored. If our carbon cycle model is efficient, then it should calculate a pCO2 that closely matches the observed record. The model includes the historical records of carbon emissions from burning fossil fuels and a history of land use changes that impact the carbon cycle. These land use changes are segmented into burning that accompanies deforestation and soil disruption related to farming in addition to the flow of carbon from the land biota and soil back into the atmosphere. These human alterations effeminate the carbon cycle and are shown in the model by clicking on the graph icons and land use changes on the right side of the model.



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It is often difficult to be precise, but consideration of the materials, labour, fuel and other resources required can produce reasonably indicative estimates. Having built a carbon model for one product, draw insights, and integrate all the other products' carbon footprint with its parameters and process boundaries. This can be used for enabling the identification of carbon 'hotspots' across programmes, and for continuous improvement and is an important aspect of any model

The carbon model can be established by system boundaries for both capital and operational model.The necessary trackable parameters can be set accordingly. Once the parameters are set, the next step would be to identify the materials and products the system operation will use. Suppliers can help with the carbon spent for each material and the process controls. Validate the raw data provided to the system standards. Other carbon data is available from the government and industrial sources. Perform your emissions calculations as required, based on your knowledge of the quantities required and the building's likely energy consumption.