Orbiting Carbon Observatories (OCOs)

Source: IE

Why in News?

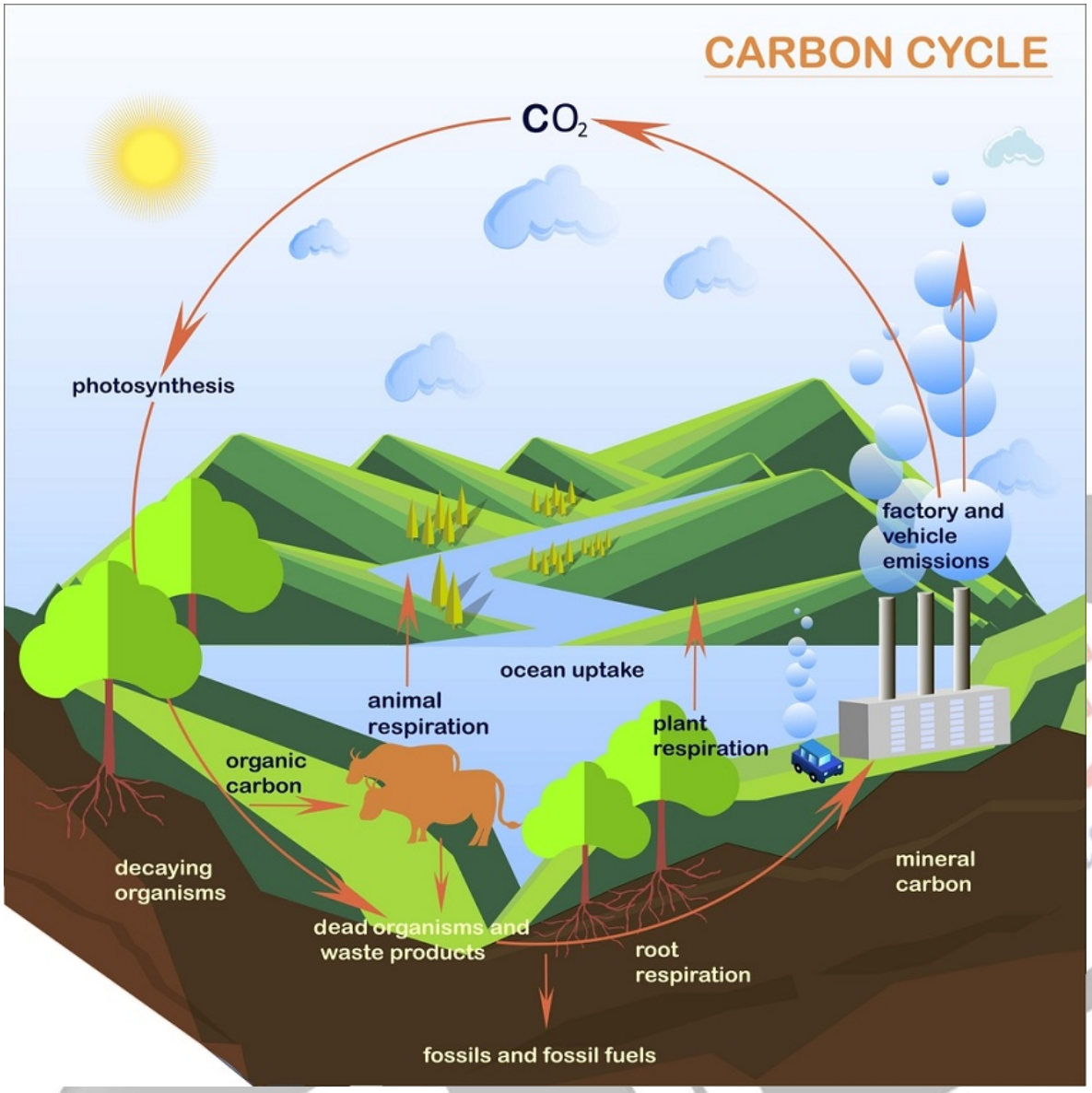
The **US** has directed **NASA** to prepare for the **early termination** of two critical satellites-**OCO-2** and **OCO-3**, which track **atmospheric carbon dioxide (CO_2)** and monitor **crop health**.

What is Orbiting Carbon Observatories (OCOs)?

- **About:** The **OCOs** are a series of **NASA**'s Earth observation satellites designed to provide crucial data for **tracking CO2 sources and sinks,** and their impact on **global climate systems.**
    - The **first mission, OCO (2009)**, failed due to a launch vehicle fairing issue.
    - However, **the subsequent mission**, **OCO-2 (2014),** was successfully launched, measuring atmospheric **CO_2**, identifying its sources and sinks, and tracking crop health through the 'glow' of **plant photosynthesis**.
        - It operates in a **sun-synchronous polar orbit** to observe any location at the **same time of day**.
    - **OCO-3 (2019)**, installed in the **ISS**, **orbits Earth every 90 minutes**, allowing **observations of the same location at multiple times** of day and providing complementary data to OCO-2.
- **Significance:** OCO satellites provide **global, high-resolution CO2 data**, tracking **seasonal and regional variations.**
    - For decades, **tropical rainforests** were considered the **planet's lungs**, clearing vast amounts of **CO_2**. However, OCO-2 data revealed that **boreal forests (taiga)**, **the coniferous forests in higher latitudes**, play a significant role in **CO_2** absorption.
    - Additionally, OCO data showed that natural **carbon sinks** can transform into carbon sources during events like droughts or **deforestation.**
    - By detecting light from **photosynthesis**, OCOs **map global plant growth,** aiding **climate mitigation** and **policy formulation for emission reduction**.

About CO_2 & Global Carbon Cycle

- **About: CO2** is a major **greenhouse gas**, trapping heat that would otherwise escape into space, and is essential for life and **maintaining Earth's atmospheric balance.**
- **Sources of CO2: Fossil fuel combustion, respiration, deforestation**, and **organic decay**.
- **Sinks of CO2: Vegetation, forests, and oceans**, which absorb roughly **half of human-produced CO2**.
- **Global Carbon Cycle:** The **global carbon cycle** is the **exchange of carbon** between the **atmosphere, oceans, land, and fossil fuels**, occurring over **seconds** (photosynthesis) to **millennia** (fossil fuel formation).



UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q1. In the context of mitigating the impending global warming due to anthropogenic emissions of carbon dioxide, which of the following can be the potential sites for carbon sequestration? (2017)

1. Abandoned and uneconomic coal seams
2. Depleted oil and gas reservoirs
3. Subterranean deep saline formations

Select the correct answer using the code given below:

(a) 1 and 2 only

(b) 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (d)

Q2. What is/are the advantage/advantages of zero tillage in agriculture? (2020)

1. Sowing of wheat is possible without burning the residue of previous crop.
2. Without the need for nursery of rice saplings, direct planting of paddy seeds in the wet soil is possible.
3. Carbon sequestration in the soil is possible.

Select the correct answer using the code given below:

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) 1, 2 and 3

Ans: (d)