Earth Observation Roadmap for Ecosystem Services Accounting in the EU

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Ecosystem extent

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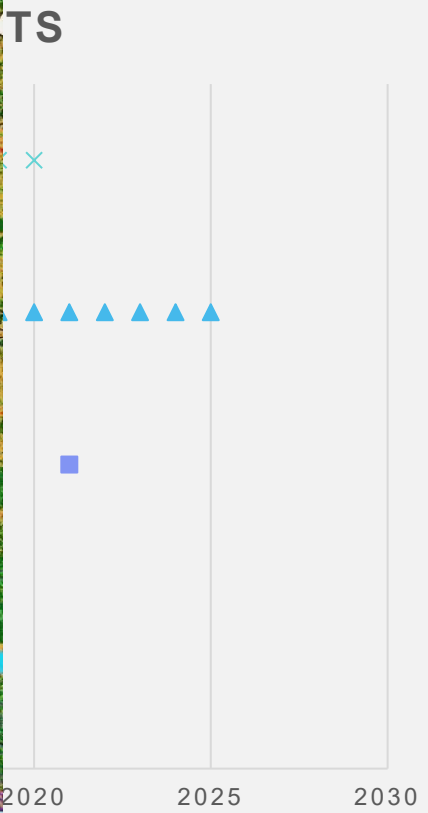
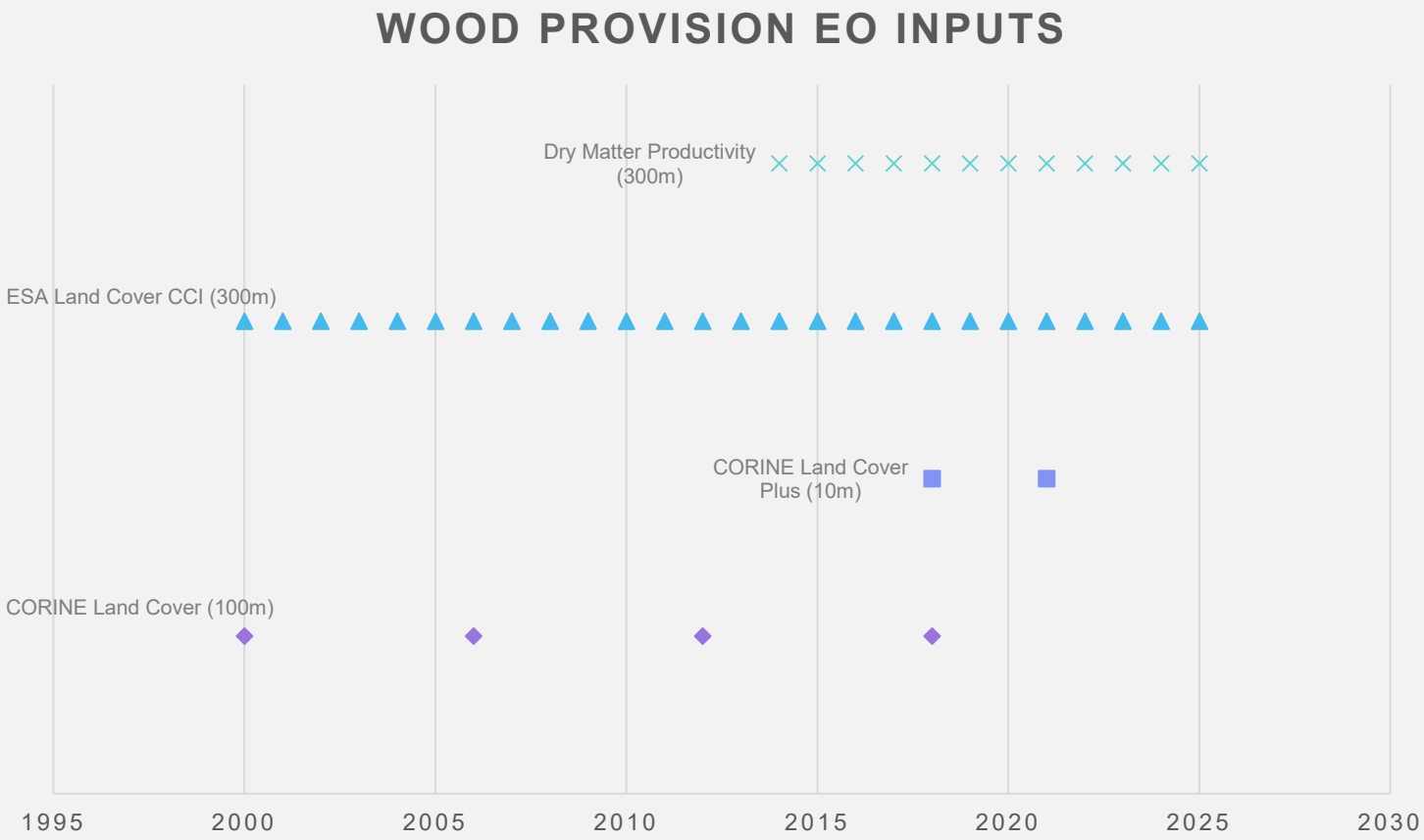


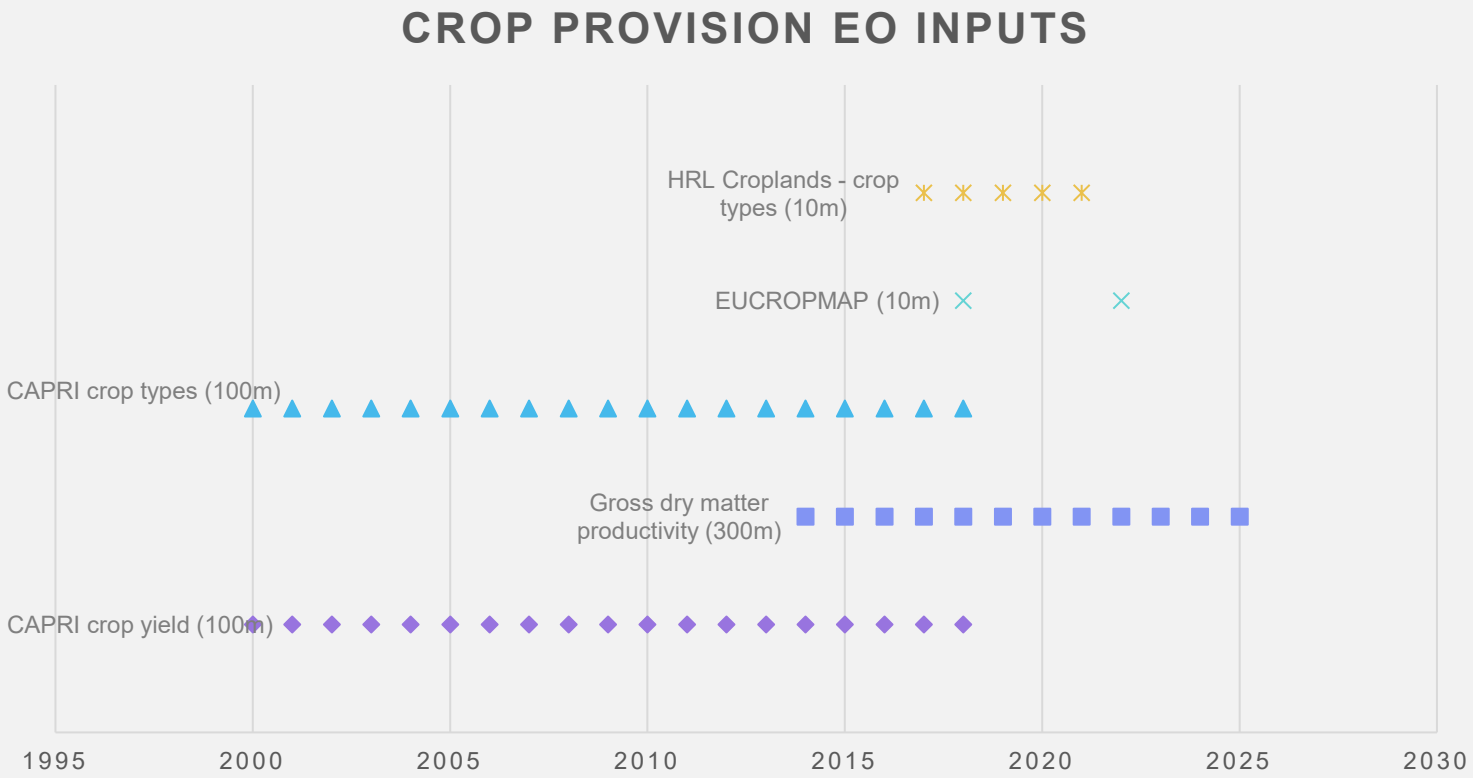
Wood provision



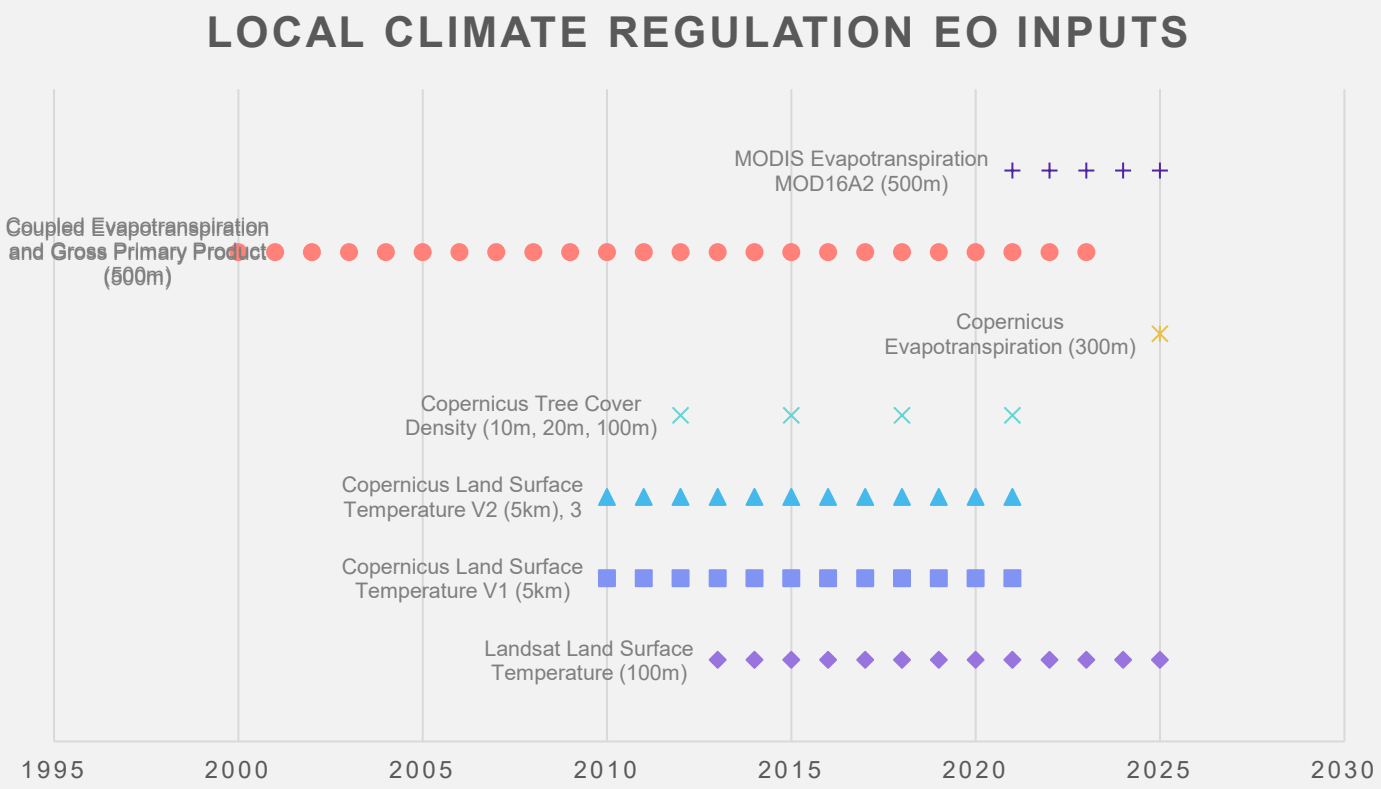
- Is the **ecosystem contributions to the growth of trees and other woody biomass**.
- Uses the **net annual increment (NAI), that is subsequently spatially allocated utilising a land cover/land use map specifically tailored to the forest** ecosystem type.
- The allocation is **weighted dry matter productivity**, in order to provide a more nuanced and accurate representation of the ecosystem's characteristics.

Crop provision

- Is the **ecosystem contributions to plant growth as approximated by the amount of harvested crops** for different uses.
- This includes food and fibre production, fodder and energy, and grazed biomass.
- The model of crop provision **is based on a statistical input that uses spatial proxies for its distribution** to make it spatially explicit.
- For this service an important input is crop yield, however, there is no EO product that covers the EU for this purpose hence currently there are no other alternatives than the CAPRI model which has the limitation that goes up to 2018.



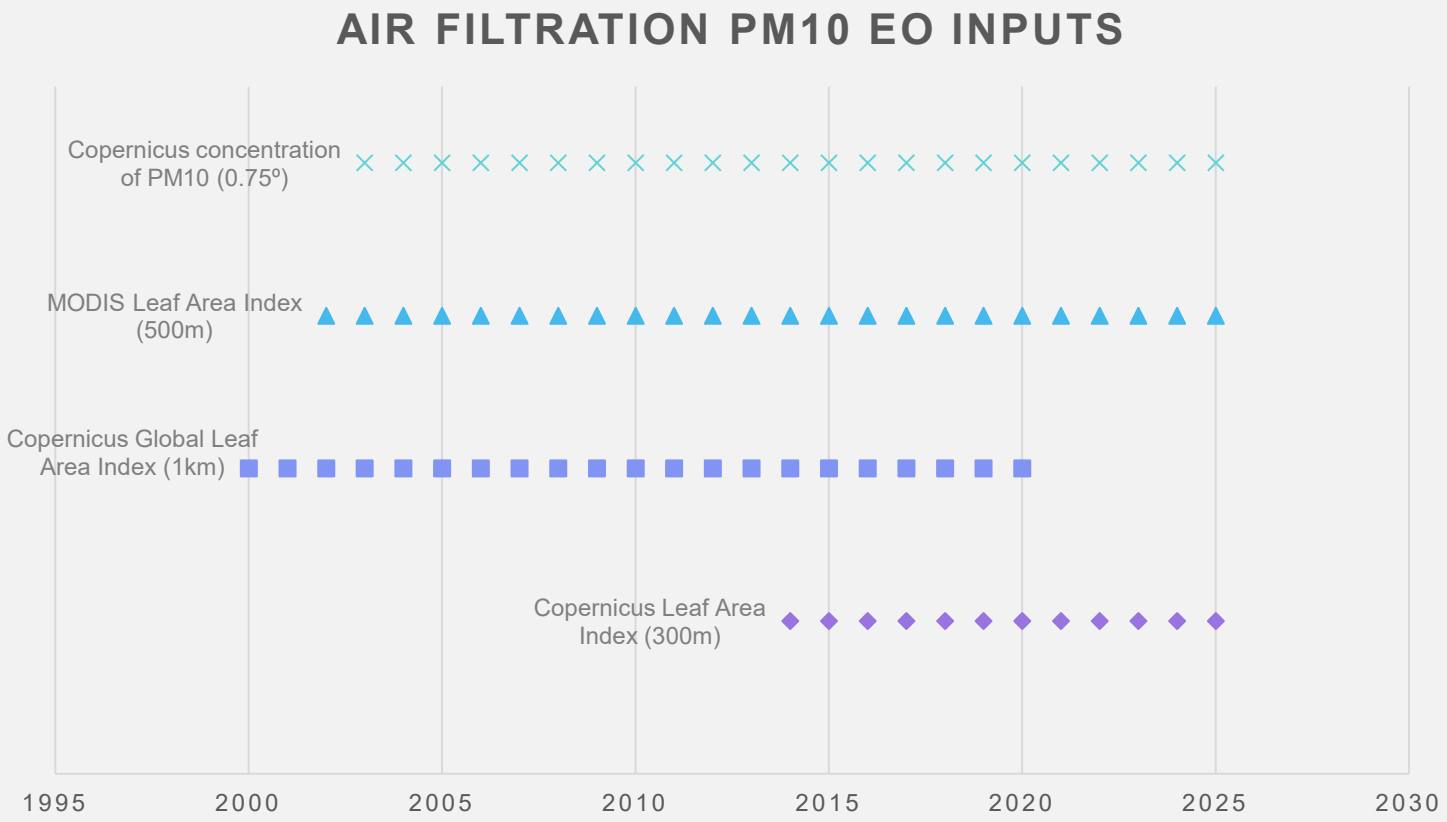
Local climate regulation



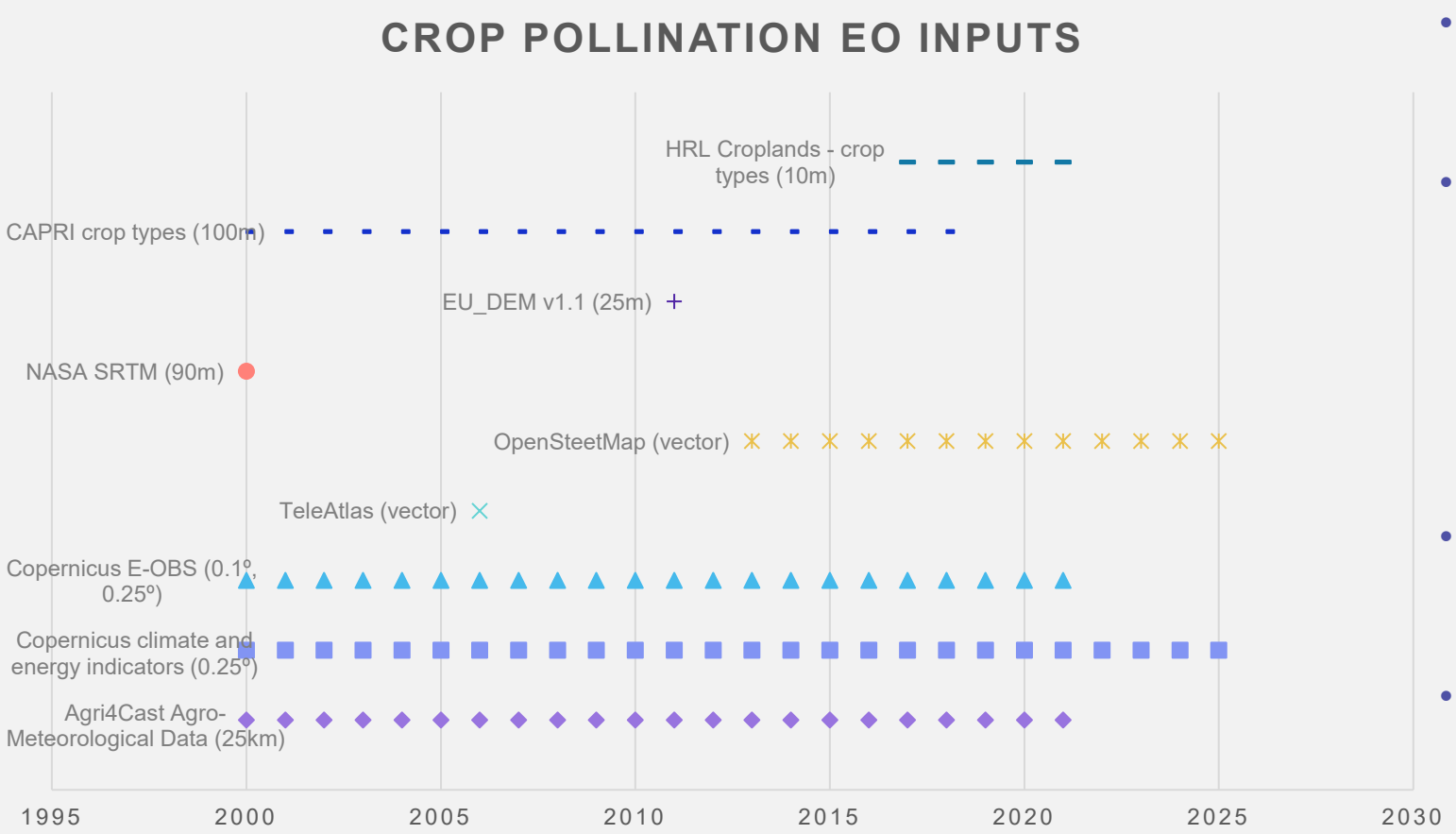
- Is the **ecosystem contribution to regulating ambient atmospheric conditions in urban areas through vegetation** that improves the living conditions of people and supports economic production.
- Estimates **how vegetation influences air temperature** using **tree cover density, evapotranspiration, and** satellite-derived **land surface temperature (LST)** as key inputs.
- The output maps **the capacity of green spaces to reduce air temperature**, highlighting their role in urban and environmental cooling.

Air filtration (PM_{10})

- Is the **ecosystem contribution to filtering air-borne pollutants** through the deposition, uptake, fixing and storage of pollutants by ecosystem components (particularly trees). This mitigates the harmful effects of the pollutants.
- The main drivers are the **concentration of pollution and the deposition velocity by vegetation which is calculated based on the Leaf Area Index (LAI)**, which in turn is the proxy for ecosystem contribution.
- The **seasonality** should be considered in the model since **LAI and pollution vary greatly** even within a month.



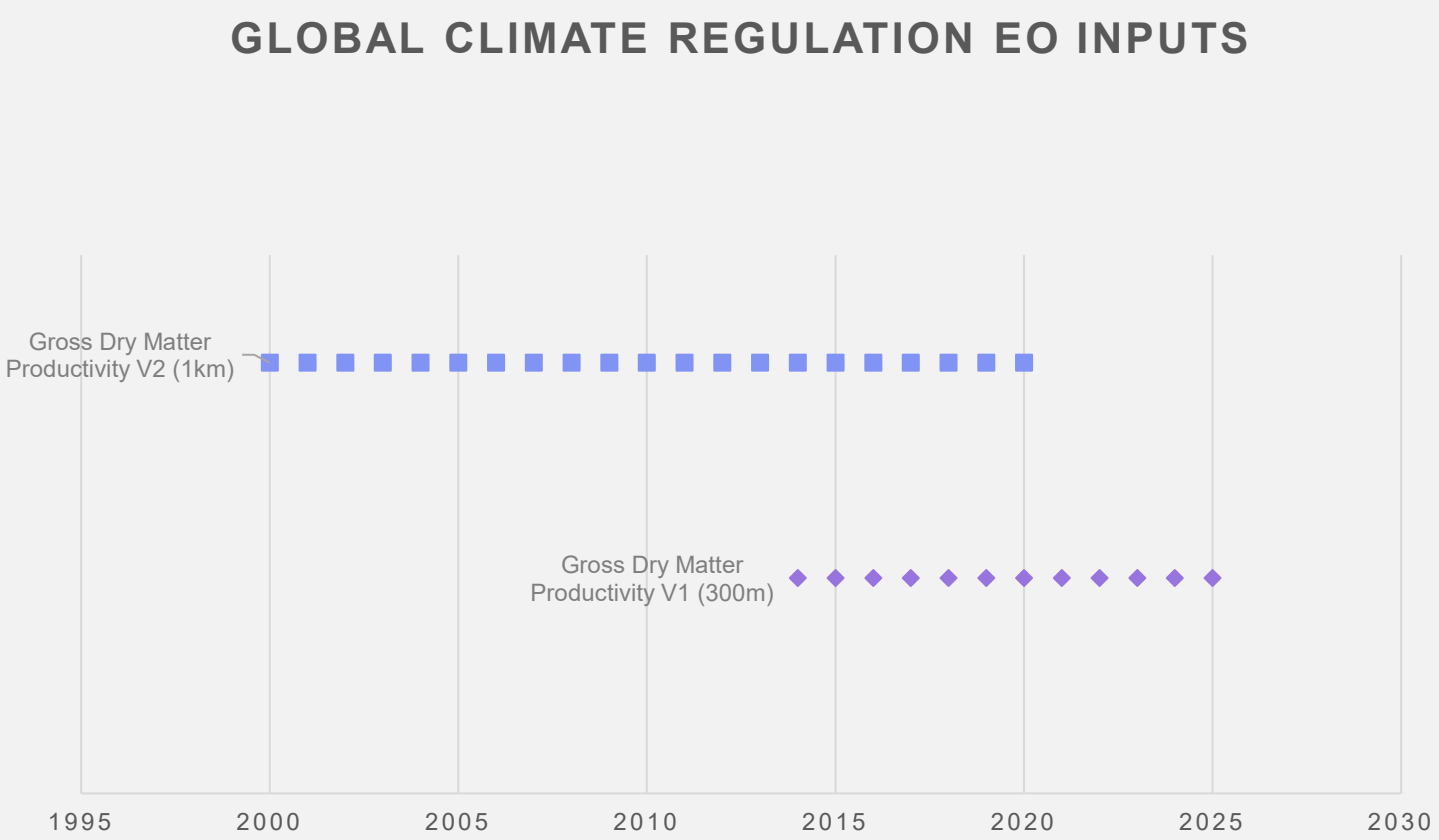
Crop pollination



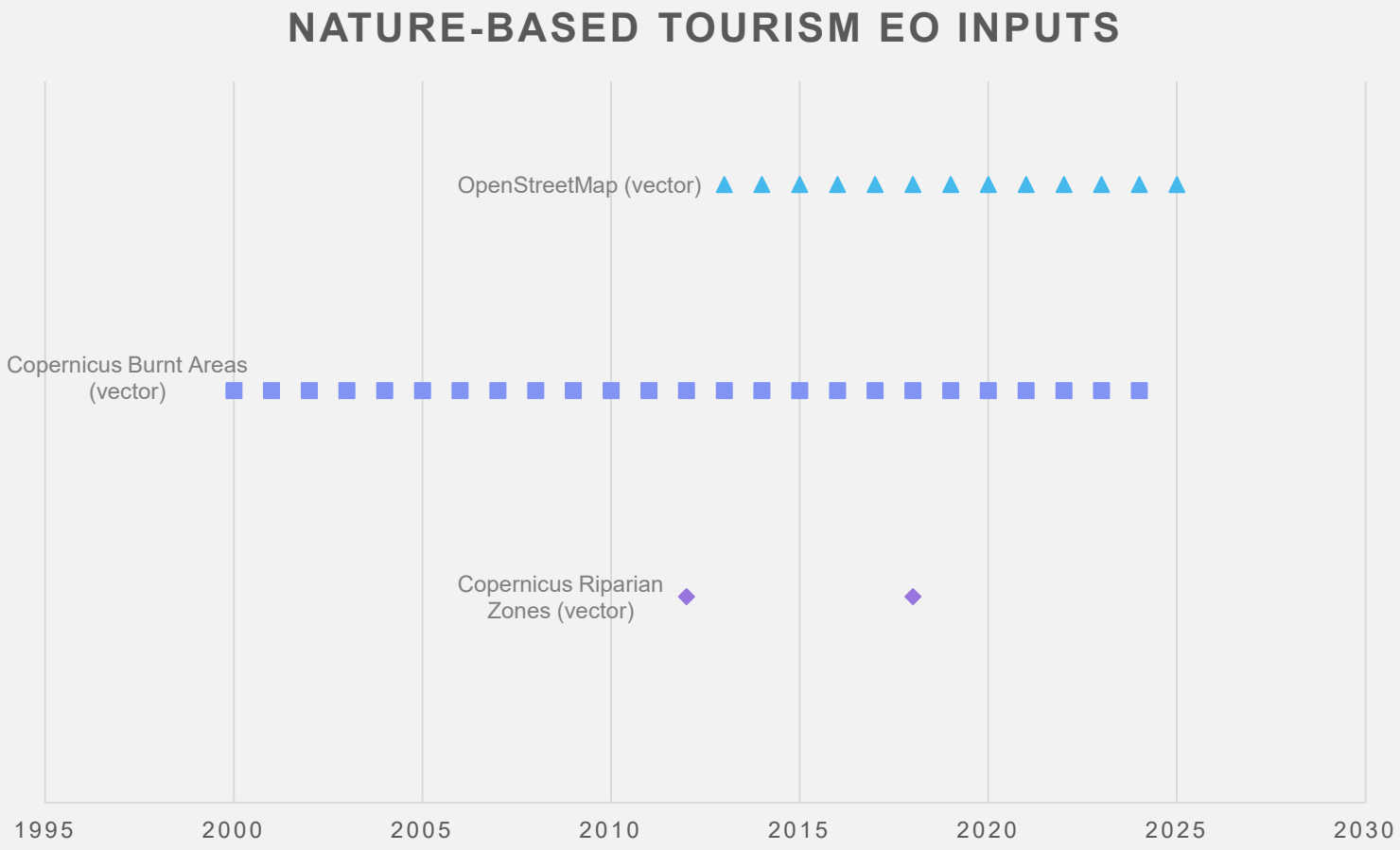
- Is the **the ecosystem contribution by wild pollinators to the production of crops**.
- This service utilizes EO data, including climatic variables such as temperature and **precipitation, radiation levels, crop delineation and ecosystem extent** information, **to assess the suitability of areas for pollinators** and the potential pollination services they provide.
- Digital elevation maps are a one snap in time due to slow changes in this kind of product.
- **Copernicus climate and energy indicators are presented as an alternative** for the continuation of the production of the accounts **when the previous input was Agri4Cast.**

Global climate regulation

- Is maintained through ecosystem processes such as **carbon sequestration and carbon stock**, the service is split into carbon sequestration (**uptake**) and carbon retention (**storage**).
- Carbon sequestration and stock **are calculated from greenhouse gas emissions**.
- **Carbon sequestration removes** greenhouse gases from the atmosphere.
- **Carbon stock stores carbon in ecosystems** like forests and wetlands, mitigating the effects of climate change.
- The global climate regulation service model is based on the **Land Use, Land-Use Change and Forestry (LULUCF)** Regulation which uses as a spatial proxy Gross Dry Matter Productivity.



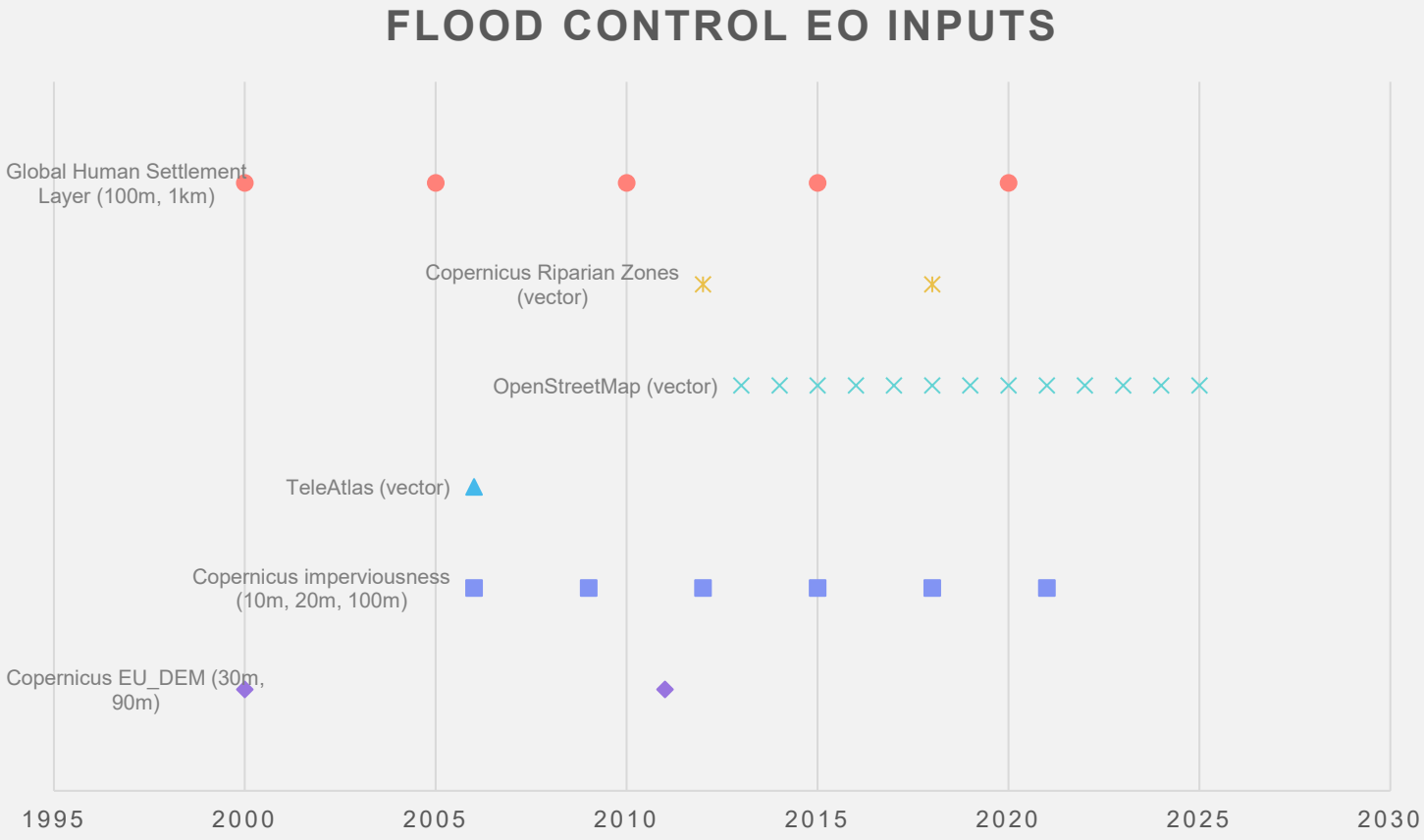
Nature-based tourism



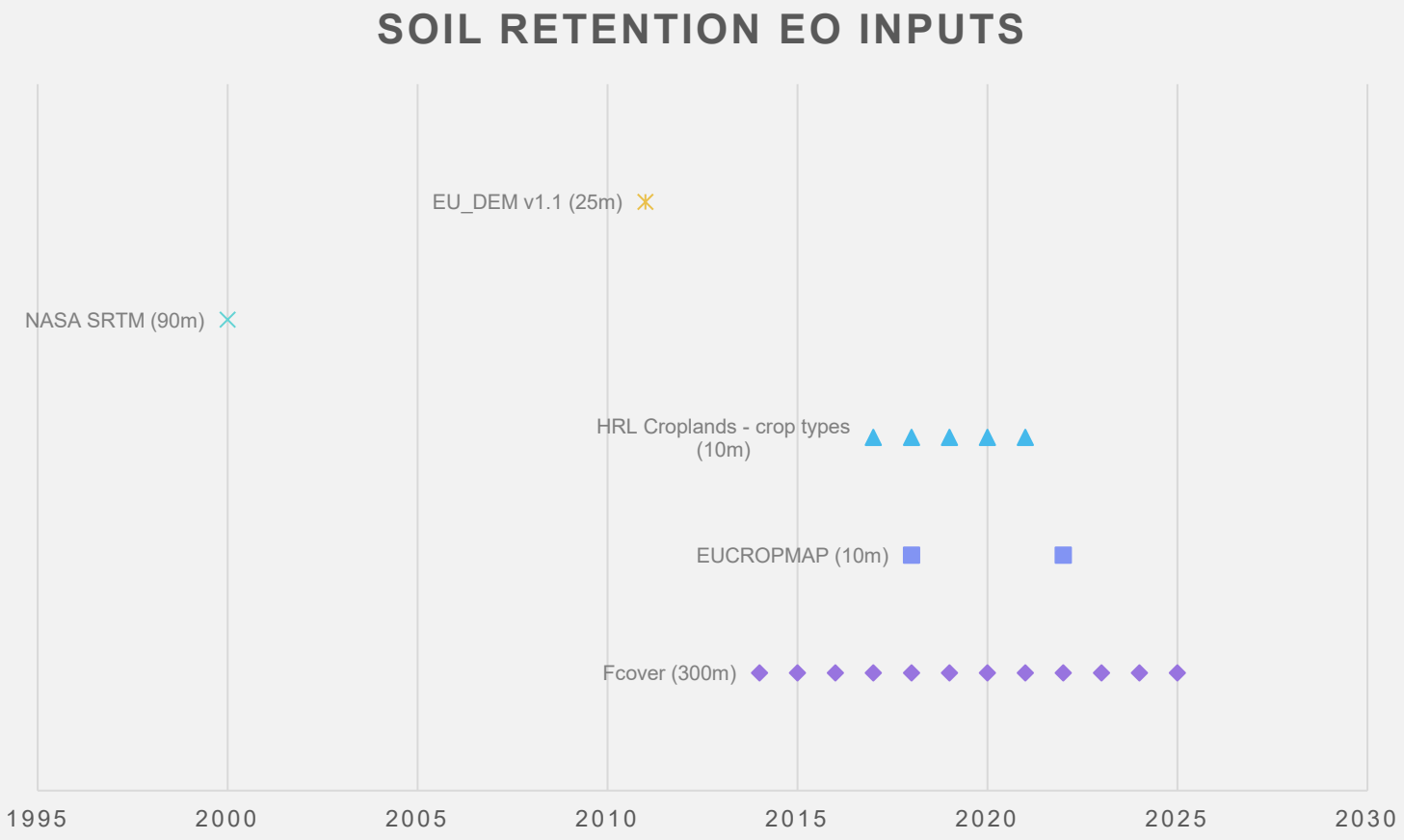
- Is the **ecosystem contribution**, in particular **through the biophysical characteristics and qualities of ecosystems that enable people to use and enjoy the environment.**
- This is modelled using a **recreation potential map**, which is calculated based on various inputs such as **ecosystem extent, distance to coast, burnt areas, and protected areas like Natura 2000 sites.**
- By quantifying the recreational value of different ecosystems, this approach **allows for a more informed distribution of tourism activities**.

Flood control

- The model for flood control **estimates the regulation of water flow by ecosystems that mitigates or prevents potential damage to economic assets** (i.e., infrastructure, agriculture) **and human lives**.
- **Is slope-dependent**.
- The **ecosystem contribution is based on a scoring system for different types of land covers and soil hydraulic properties according to their capacity to reduce runoff**, which is then adjusted by imperviousness, slope and the presence of riparian zones with natural vegetation.



On-site soil retention



- Refers to the **ability of ecosystems to reduce on-site erosion rates resulting from rainfall.**
- The model **applies the Revised Universal Soil Loss Equation (RUSLE).**
- On-site soil retention by ecosystems is quantified as the **difference between the worst-case scenario** (without vegetation) **and the current situation**.
- The fraction of vegetation cover **(Fcover) is an input for the C-Factor in the RUSLE**.
- **Digital elevation maps are used for LS-Factor**.
- **Crop types are used for arable land in the calculation of C-Factor**.

Conclusions and takeaways

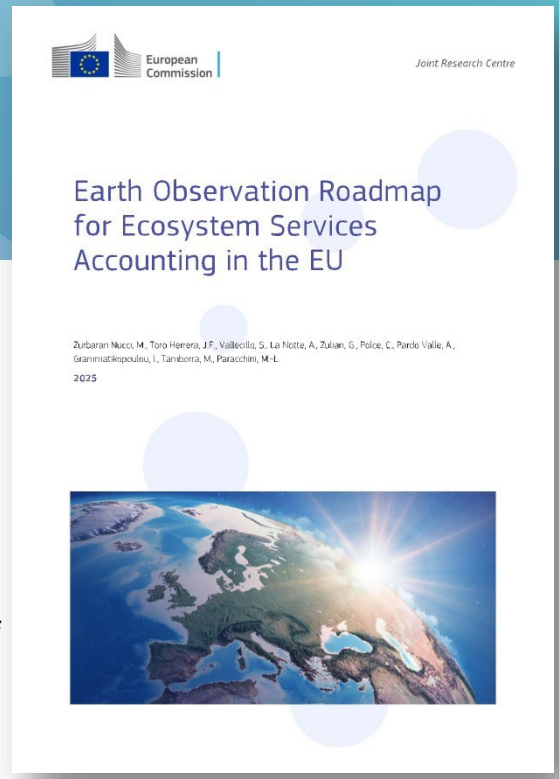
Spatial dimension is crucial in the assessment of ecosystem services

EO-derived products bridge data gaps providing proxies for data facilitating the development of ecosystem services models

The key challenge is no longer data availability, but integration with particularly statistical data and in-situ measurements

Future advancements hold promise with increased open-access to EO data, higher spatial and temporal resolution

Thank you for your attention



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