

Aside from fossil fuels, the only element of reporting of national emission reduction goals in the NDCs is that arising from changes in land use associated with agriculture, forestry and other land uses (AFOLU). The mechanisms for implementing AFOLU are well established and are set out in the 2006 IPCC Guidelines as modified by the 2019 Refinement for National GHG Inventories. For a better interaction with the policy sector and an effective use of EO satellite data to support the Paris Agreement and its Global Stocktake (GST) process CEOS is developing a dedicated AFOLU Roadmap. A first expected outcome is the support of countries in the uptake of satellite-based information in their reporting and the integration of global data sets in the first GST in 2023.

40+ years EO Satellites Monitoring on Land

EO satellites have been acquiring global data on the state and dynamics of the Earth system for over 40 years and their role has been increasingly recognised. Towards CEOS space agencies' contributions to the GST for the Land sector, ensuring accurate and comprehensive representation of CEOS agency capabilities is a key. A clear and expert overview of these capabilities is needed in relation to Agriculture, Forests (cover and biomass) and Other Land Uses. EO satellite sensors operating in different modes (primarily optical, radar, thermal and lidar) either singularly or in combination provide information on agriculture, forests and vegetation biomass as shown in Fig 1 and an indicative overview of datasets that are available to support the GST is provided in Fig 2.

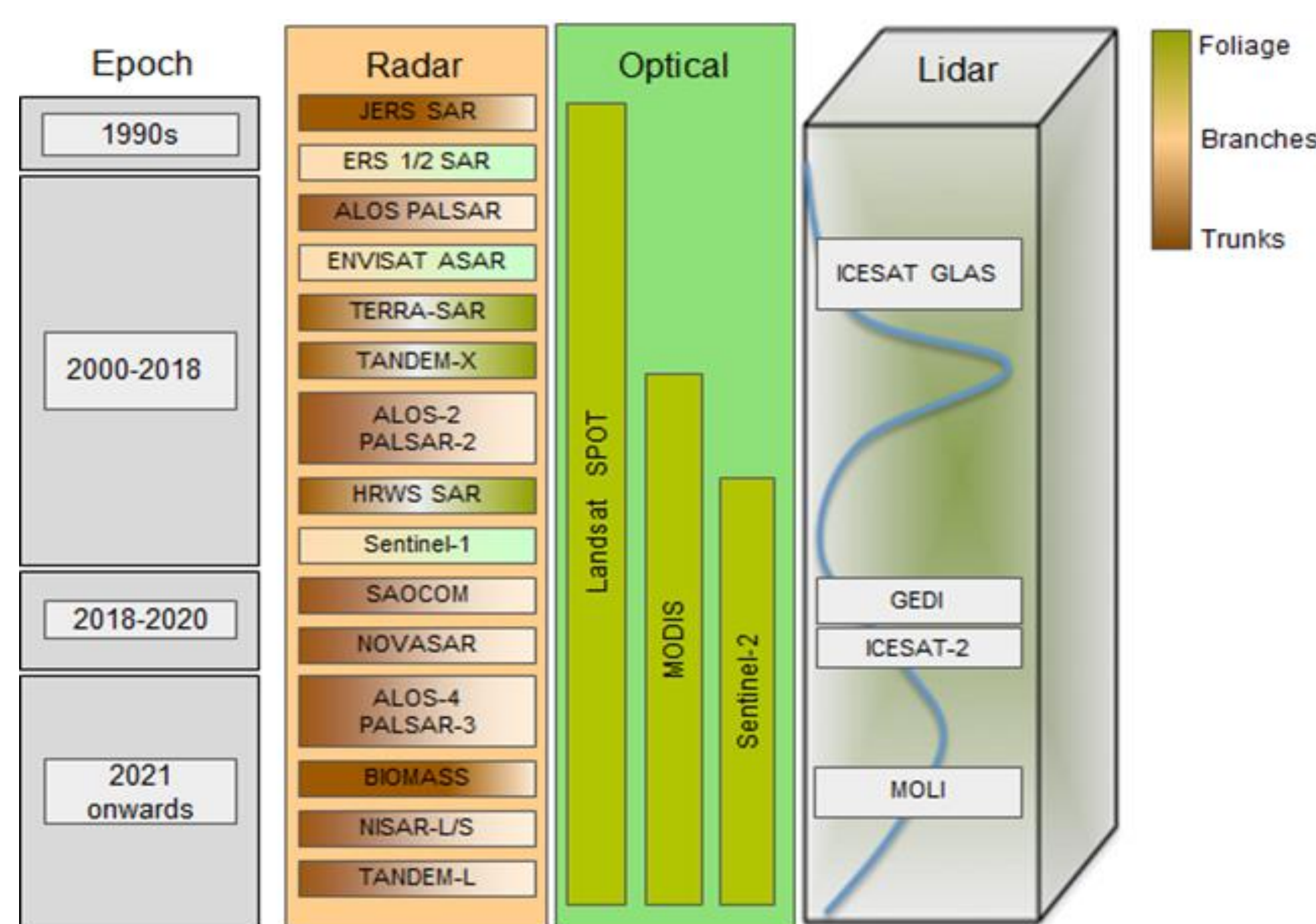


Fig 1. EO satellite sensor types supporting AFOLU information needs

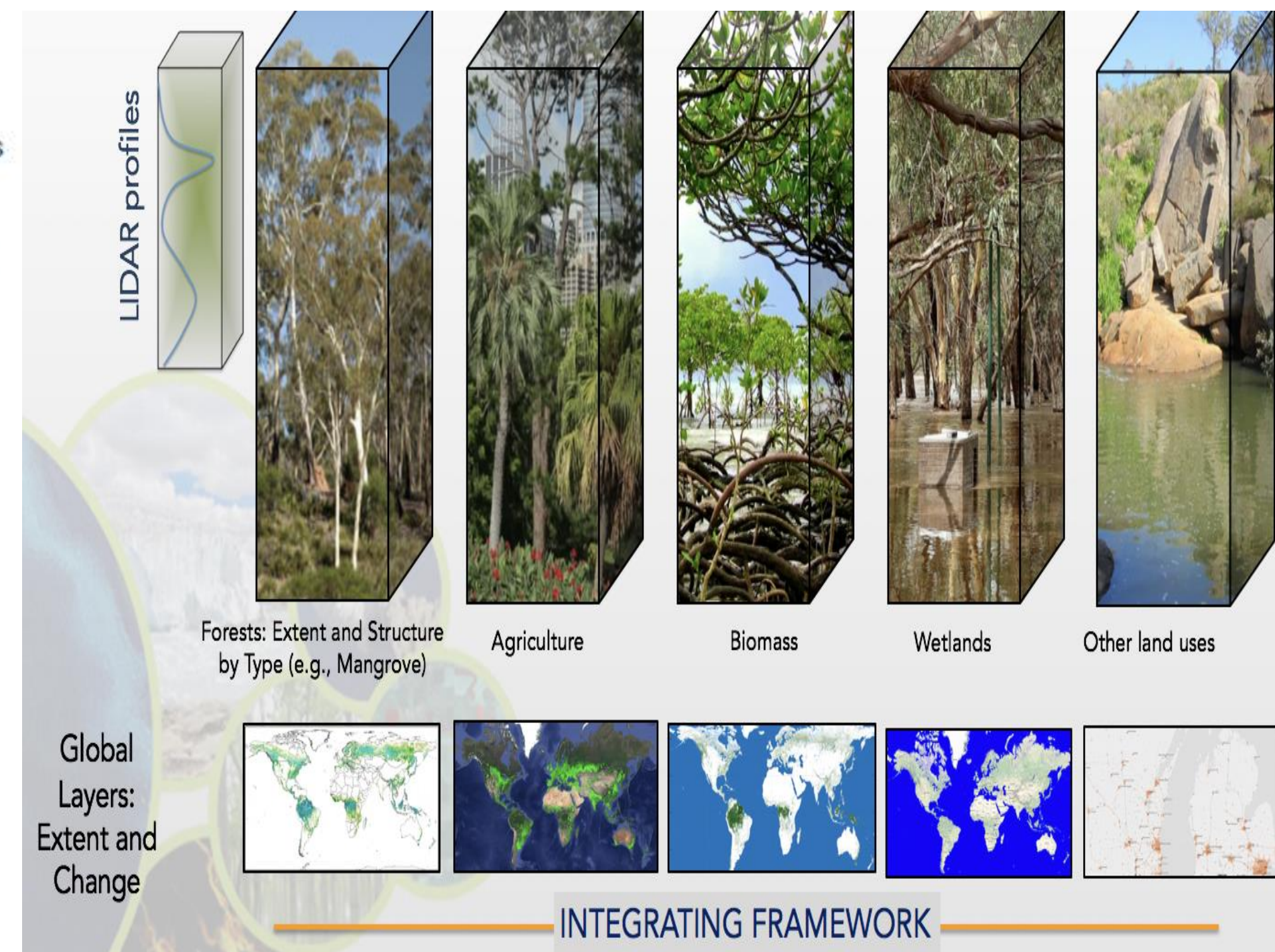


Fig 2. Broad overview of global datasets generated from EO that can support the GST

Agriculture

ESA's WorldCereal project is developing the first open-source and cloud agnostic systematic approach to create global seasonal cropland extent and crop type maps (Fig 3). This will be used to produce maps at the end of a season per agro-ecological zone, that include 10 m crop extent, as well as maize and wheat crop type maps based on Copernicus Sentinel data. The system is supported by a global reference data set which is continues to grow and will be managed by the GEOGLAM community post project. The system produces multi-temporal / seasonal datasets. The system implementation post project is still pending.

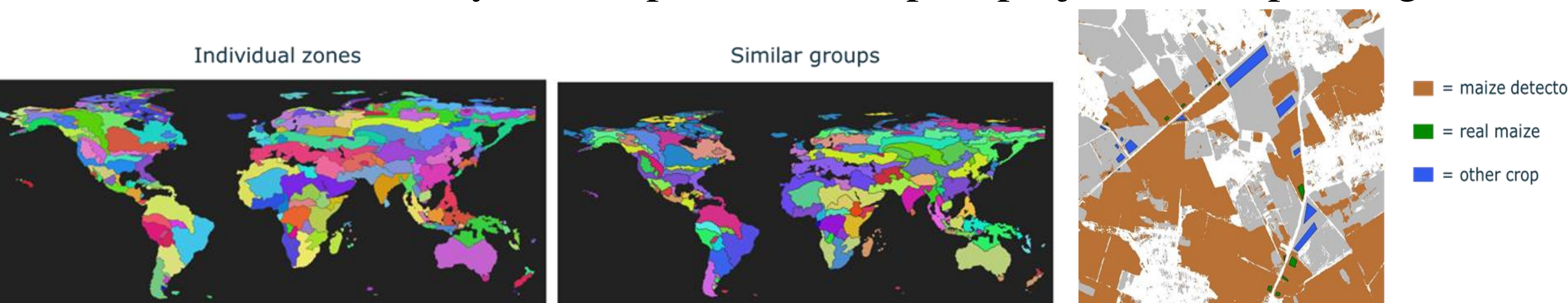


Fig 3. Global Agro-ecological zones trigger maps (left and middle) and crop type maps (right)

Land Cover

Land Cover products are being developed as part of several ongoing relevant projects and programs (e.g. Fig 4). Such information is essential for national GHG inventories, estimating activity data and to global AFOLU modelling and assessment. Specific focus is on maintaining consistency and integration of EO land change monitoring for National Greenhouse Gas Inventories; including how managed and unmanaged lands are distinguished, and the accounting of natural versus anthropogenic impacts.

Aboveground Biomass

Forest biomass products from EO - specifically derived from Lidar and SAR sensors – can be used to estimate Emission Factors (EF) for higher tier reporting and will need to meet requirements of the IPCC in order to contribute successfully to National Greenhouse Gas Inventories (IPCC, 2019). Global above ground biomass maps for 2020 are derived with different approaches. In a harmonization exercise contributions of CCI biomass, GEDI biomass, and NASA JPL biomass will be compared, validated and harmonized on a jurisdictional level to provide a unique estimate as input to the 1st GST (Fig 5). This is being conducted as an open science activity on the NASA-ESA MAAP Platform (<https://scimaap.net>) and a new web-based dashboard (<https://earthdata.nasa.gov/maap-biomass>, Fig 6) has been developed to allow exploration of the new biomass products, and sharing experience by product teams and country users (e.g. Paraguay, Peru, Wales, Japan, Solomon Islands).

Other Land Use (Wetlands/Mangroves)

Global Mangrove Watch (Fig 7) produces the most comprehensive dataset showing global mangrove distribution and change over time (Activity Data) available in the public domain. It is a time-series of global mangrove extent maps at 25 m spatial resolution, to date covering eleven annual epochs between 1996 and 2020, derived from a combination of optical Landsat data (USGS) and long wavelength (L-band) radar data from JAXA's ALOS PALSAR. Annual maps will be released from 2021 onwards.

CEOS GST Portal

A new web portal has been developed as a single point of access to all the EO AFOLU datasets and associated guidance (Fig 8). This serves as a convenient reference for Parties, and for scientific and other users to access, understand and apply the data.

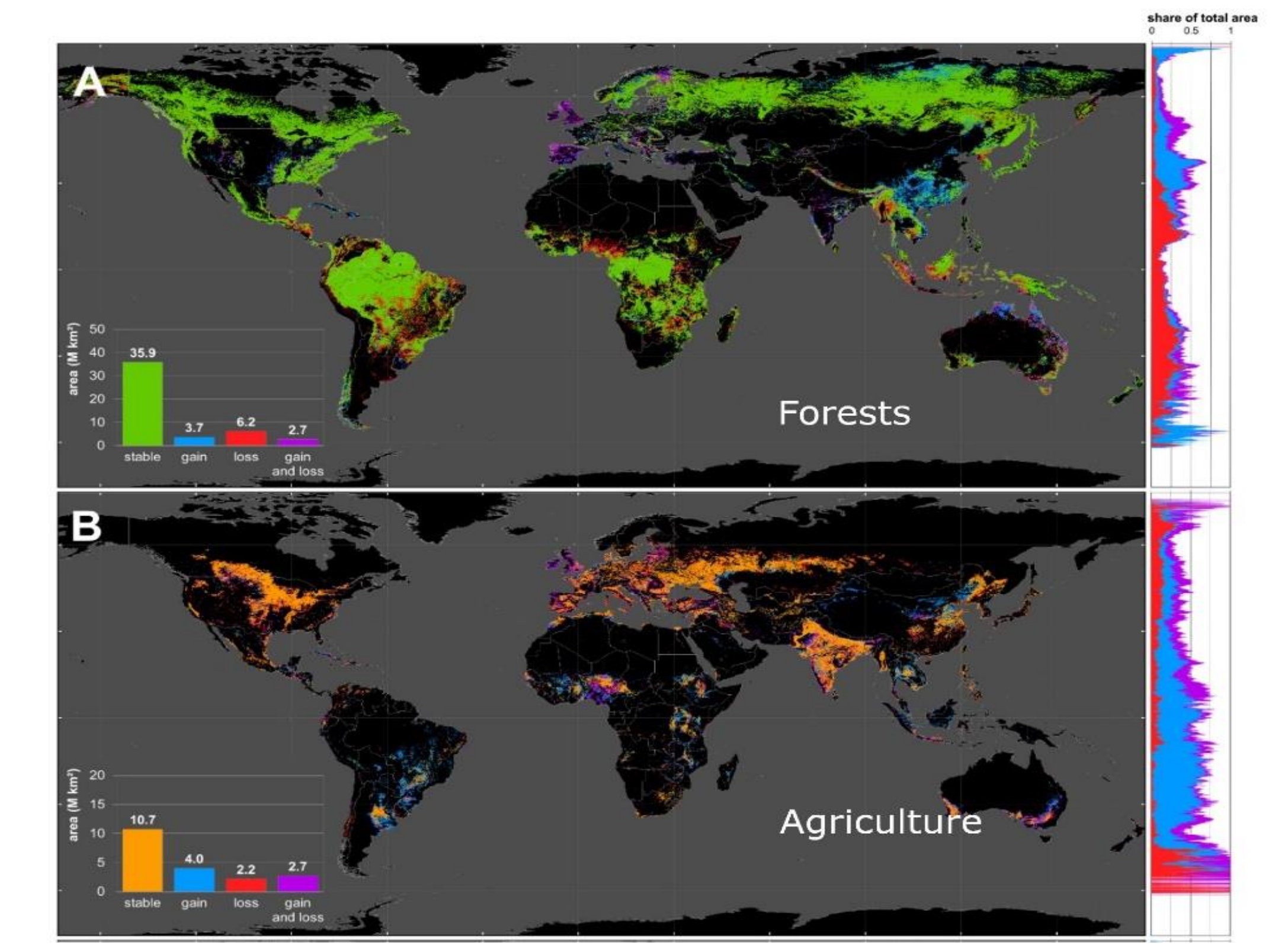


Fig 4. Global land cover change from 1960-2020 for forest and agriculture (derived from HILDA+ data, Winler et al., 2021, Nature Communications)

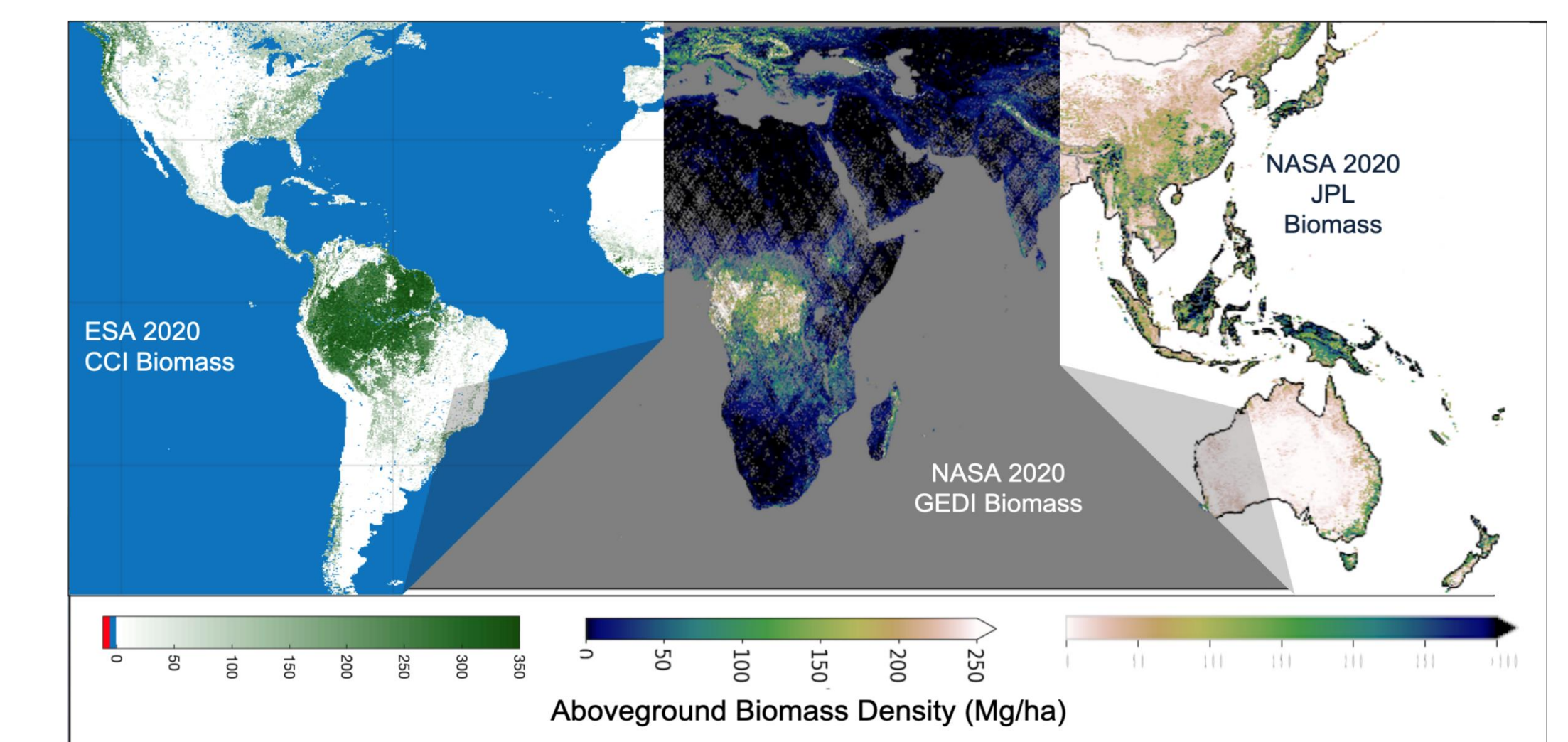


Fig 5. Intercomparison, validation and harmonization among biomass maps

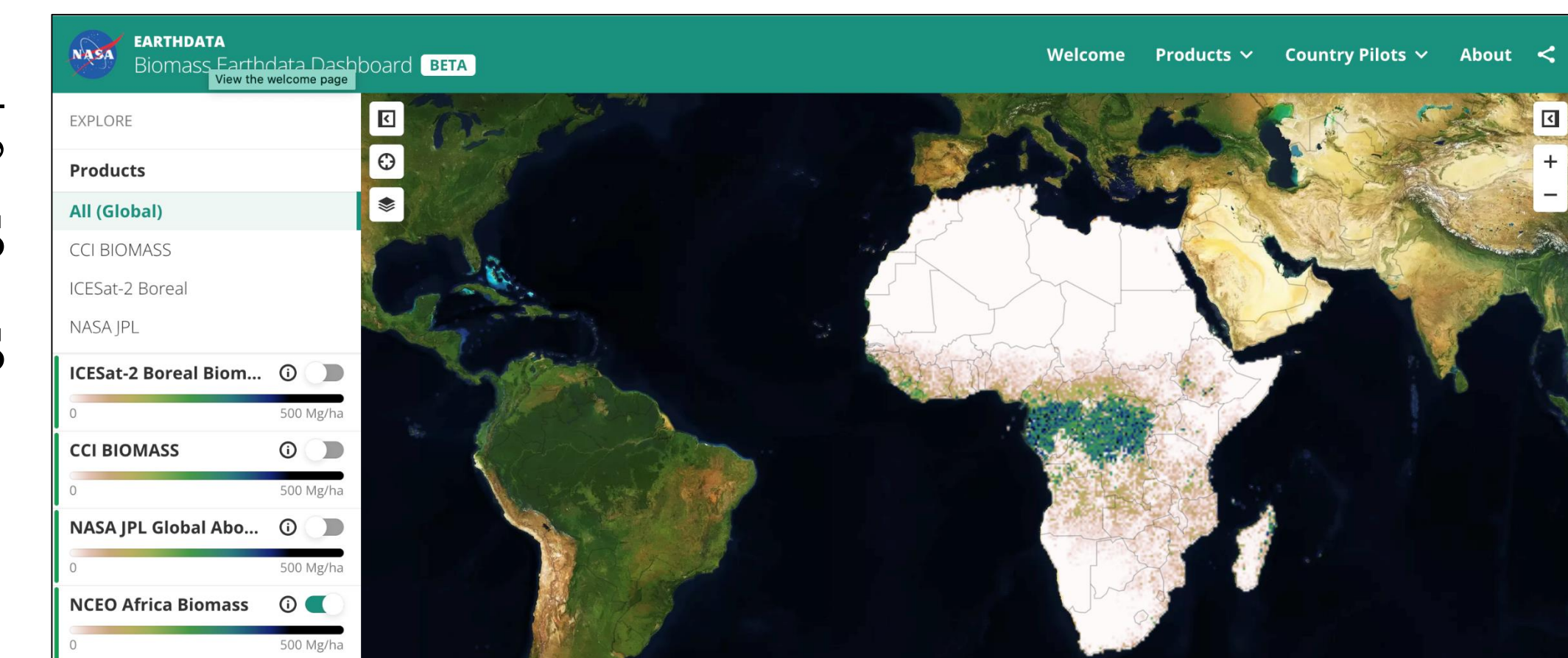


Fig 6. New Biomass product dashboard

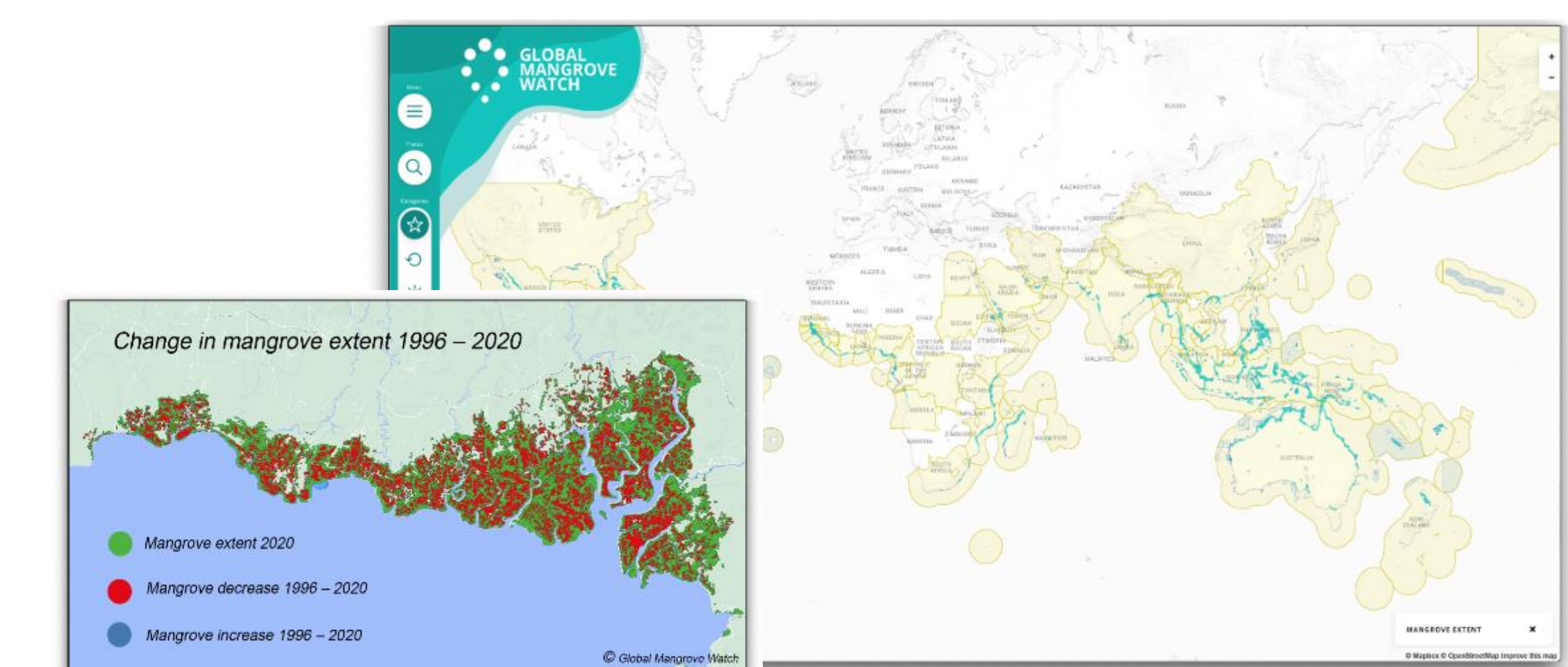


Fig 7. Global Mangrove Watch and change in Southeast Asia 1996-2020



Fig 8. CEOS GST Portal www.ceos.org/gst/