

INTERNATIONAL EFFORTS USING SPACE FOR CLIMATE ACTION

A strategic mapping exercise on existing international efforts using space technologies and applications to support climate adaptation, mitigation, monitoring and resilience



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**UNITED NATIONS
OFFICE FOR OUTER SPACE AFFAIRS**

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UNITED NATIONS
Vienna, 2022

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EXECUTIVE SUMMARY

Climate change is a complex crisis with effects felt globally at all levels. Therefore, it is widely agreed that we must mobilize every effort to mitigate emissions and to prepare for and adapt to the realities and consequences of climate change. Space-derived information is the backbone of climate science, hence, it is fundamental to develop the right programmes and activities and to guide policy development.

As space-derived information plays this key role in the joint efforts to monitor and observe climate change but also to mitigate, build resilience and prepare for the impacts of climate change, the increasing number of actors as well as a variety of “climate services” or “climate actions” can be noticed at the global, regional and local level. Mapping key intergovernmental coordination bodies which use space technology to support climate action at global level fundamentally has its roots in the understanding that a multilateral collaborative environment is paramount to addressing climate change.

The development of a map depicting coordination and collaboration in the various

areas where space technology for climate action is applied, aims to provide an overview of the existing policy, and technical and coordination mechanisms. The goal is to support stakeholders in their strategic decision-making, enable identification of collaboration opportunities, and define potentially existing niche areas as well as domains for development and evolution.

The applied approach in this exercise was to focus on the roles of the different intergovernmental bodies which have been key constituencies in the global efforts to combat climate change and to provide a comprehensive collection of the different actors as well as their relationship to each other. This report offers an additional piece to grasp the fast changing and evolving landscape of space for climate action.

Any entity that engages in climate action is ultimately guided and supported by the goals of the United Nations Framework Convention on Climate Change. For the purpose of the mapping of the main roles of entities, based on the Framework Convention, the following broad roles have been applied for categorization:

- Policy coordination (to support climate change mitigation and adaptation)
- Scientific assessment (to support climate change mitigation and adaptation)
- Systematic observation (to support climate change monitoring)
- Climate services (to support climate change monitoring, mitigation, adaptation and resilience)

The European landscape has been added to show how various regional efforts do not have to duplicate or replace and compete with existing global efforts but how they can complement these ambitions. The regional example contributes to a more complete understanding of the various efforts that currently exist and has improved the content of the mapping exercise as it can facilitate the formulation of geographically specific strategies and further foster policy coherence.

INTRODUCTION

BACKGROUND

The United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change. To tackle climate change and its negative impacts, world leaders at the 2015 United Nations Climate Change Conference (COP21) reached a breakthrough with the Paris Agreement, which sets long-term goals to guide all nations:

- To substantially reduce global greenhouse gas emissions to limit the global temperature increase in this century to 2 degrees Celsius while pursuing efforts to limit the increase even further to 1.5 degrees
- To review the commitment of countries every five years
- To provide financing to developing countries to mitigate climate change, strengthen resilience and enhance abilities to adapt to climate impacts

The Agreement, which has been signed by 192 countries plus the European Union, includes commitments from all countries to reduce their emissions and work together to adapt to the impacts of climate change, and calls on countries to strengthen their commitments over time. The agreement provides a pathway for developed nations to assist developing nations in their climate mitigation and adaptation efforts while creating a framework for the transparent monitoring and reporting of countries' climate goals. Every five years, each country submits an updated national climate action plan known as its nationally determined

contribution – within which countries communicate actions they will take to reduce their greenhouse gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in the nationally determined contributions actions they will take to build resilience to adapt to the impacts of rising temperatures.

www.un.org/en/climatechange/paris-agreement



Implementation of the Paris Agreement has also been recognized as essential for the achievement of the Sustainable Development Goals and the Sendai Framework.

In 2015, the same year as the Paris Agreement, all Member States adopted the 2030 Agenda for Sustainable Development which sets out a 15-year plan to achieve the 17 Sustainable Development Goals. It has been well understood that action on climate change will drive sustainable development and that sustainable development cannot be achieved without climate action. Conversely, many of the Sustainable Development Goals address the core drivers of climate change.

www.un.org/sustainabledevelopment/development-agenda



“Climate Action” is Sustainable Development Goal 13, that is, taking “urgent action to combat climate change and its impacts” and is associated with the following main targets:

- 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
- 13.2 Integrate climate change measures into national policies, strategies and planning
- 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

www.un.org/sustainabledevelopment/climate-change/


In 2015, the General Assembly also endorsed the Sendai Framework for Disaster Risk Reduction 2015–2030, which aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years. The Sendai Framework highlights the role that climate change plays as a key driver of disaster risk, as well as the ability of adaptation and resilience-building to reduce disaster risk and achieve sustainable development. Since then, findings from the recent sixth Intergovernmental Panel on Climate Change Assessment Report point to an urgent need to accelerate action to avert climate-related disaster risks, through the fast-tracked implementation of the Sendai Framework. All national adaptation plans developed under the Paris Agreement on climate list disaster risk reduction as a top priority.

<https://unfccc.int/news/as-climate-impacts-increase-un-agencies-step-up-cooperation-on-disaster-risk-reduction>


According to the United Nations Environment Programme climate action “means stepped-up efforts to reduce greenhouse gas emissions and strengthen resilience and adaptive capacity to climate-induced impacts, including: climate-related hazards in all countries; integrating climate change measures into national policies, strategies and planning; and improving education, awareness-raising and human and institutional capacity with respect to climate change mitigation, adaptation, impact reduction and early warning.”

For the purposes of this mapping exercise, climate action includes disaster risk reduction and is categorized as aiming to achieve one or a combination of the following objectives: climate change mitigation, adaptation, resilience or monitoring the latter in recognition of the need to measure and report national and global progress.

<https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/climate-action-0>


OBJECTIVES OF THIS MAPPING EXERCISE

The scientific community and the United Nations system have recognized that space-based technologies and applications are essential components in climate change research, monitoring and policy enactment. In addressing climate change, space infrastructure can support each of the above categories of climate action.

This exercise aims at mapping the key intergovernmental coordination bodies who have been using space technology to support climate action at the global level, including those in the United Nations system as well as non-United Nations groups, partnerships, etc.

It aims at reviewing their existing mandates and programmes that are using space technologies (i.e., space-based Earth observation, navigation/positioning, or satellite telecommunications) to support climate change mitigation, adaptation, resilience or monitoring.

By considering the range and capabilities of existing entities, this report can be used by policymakers, international or regional organizations, industry, academia, experts and civil society to inform their own strategy development or research to gain a more complete understanding of the technical and policy coordination efforts that currently exist.

As the purpose of this exercise is to map coordination of action, it does not include entities focused on carrying out scientific research, even though their role in this global challenge is not to be downplayed.

APPROACH

The approach followed was to map out the roles of those international bodies who are working in areas of both space and climate. While there is a clear lead with intergovernmental negotiations led by the United Nations Framework Convention on Climate Change, the mapping was to also identify the growing number of actors using space to monitor, assess and take action regarding climate change. This report looks at those various bodies, the constituents of their membership, their focus on or use of space technologies in achieving their climate action objectives, and their institutional relationships with each other. The information presented in this mapping exercise is drawn from a desk and online research combined with data and inputs collected through a written survey and selected interviews.

Europe has been used as an example of a regional approach in this exercise to show how regional intergovernmental bodies can work within the existing global framework, and even add to its overall objectives, while bringing particular benefits to their citizens. By examining the geographic coverage and different mandates/priorities of the entities described in the map, and their alignment to the overall goals of the United Nations Framework Convention on Climate Change and the Paris Agreement, it will be possible to identify possible gaps and potential opportunities for future collaboration.

If appropriate resources are available, this mapping exercise, which was issued for the first time in 2022, is planned to be updated annually. Please reach out to UNOOSA for any updates or if there is another entity to be considered for the next version of the mapping exercise.



An aerial photograph of a river delta, showing a complex network of water channels and land. The image is overlaid with a blue-to-yellow gradient. A yellow rectangular box is positioned on the left side, containing the text 'PART I.'. A larger blue rectangular box is positioned in the center, containing the main title.

PART I.

**MANDATE/PROGRAMMES OF
INTERGOVERNMENTAL BODIES USING SPACE
TECHNOLOGIES IN SUPPORT OF CLIMATE ACTION**

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SELECTED ENTITIES

The following intergovernmental coordination bodies have been selected for inclusion in this mapping exercise:

Committee on Earth Observation Satellites

Established in 1984 and set up under the aegis of the G7 Economic Summit of Industrial Nations Working Group on Growth, Technology and Employment, the Committee on Earth Observation Satellites (CEOS) is the primary forum for international coordination of civil space-based Earth observation programmes, through which its members informally coordinate their current and planned systems for Earth observation from space.

Its current 34 members are national or international governmental organizations in nature and are responsible for a civil space-based Earth observation programme currently operating, or at least in phase B of system development. Its 29 associates are other governmental organizations that are international or national in nature and currently have either a civil space-segment activity in the (pre-)phase of system development or a significant ground-segment activity that supports the objectives of the Committee, or existing satellite coordination groups and scientific or governmental bodies that are international in nature and currently have a significant programmatic activity that supports the objectives of the Committee.

In addition to ensuring international coordination, the mission of the Committee is to promote exchange of data to optimize societal benefit and inform decision-making to secure a prosperous and sustainable future for humankind. It focuses on validated requirements levied by external organizations and works closely with other satellite coordinating bodies.

The Committee is an organization that depends on the “best efforts” of its active members and associates (collectively known as “CEOS Agencies”) to implement CEOS recommendations in their respective Earth observation programmes. CEOS Agencies work together to accomplish specific goals relevant to their own agency and mission priorities and benefit from CEOS participation as they take part in collaborative missions/data systems and global initiatives to benefit society. The 63 CEOS Agencies, operating 201 satellites, have been working together to launch multi-agency collaborative missions, which have highly benefited users all around the world.

The Committee has three primary objectives:

- To optimize the benefits of space-based Earth observation through cooperation of the CEOS Agencies in mission planning and in the development of compatible data products, formats, services, applications and policies
- To aid both the CEOS Agencies and the international user community by, among other things, serving as the focal point for international coordination of space-based Earth observation activities, including the Group on Earth Observations (GEO) and entities related to global change
- To exchange policy and technical information to encourage complementarity and compatibility among space-based Earth observation systems currently in service or development, and the data received from them, as well as address issues of common interest across the spectrum of Earth observation satellite missions

CEOS Working Groups are one of two permanent, working-level mechanisms that coordinate CEOS Agency assets. They address topics such as calibration/validation, data portals, capacity-building, disaster management, climate and common data processing standards shared across a wide range of Earth observation domains. [website](#)

Coordination Group for Meteorological Satellites

The Coordination Group for Meteorological Satellites (CGMS), created in 1972, currently has 15 members, which include operational and research and design space agencies developing and operating meteorological and climate application satellites and missions. The World Meteorological Organization (WMO) is a member as it has a unique role as a representative of the world meteorological data user community. The European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) is the permanent secretariat.

CGMS globally coordinates meteorological satellite systems, including protection of in-orbit assets, contingency planning, improvement of quality of data, support to users, facilitation of shared data access and development of the use of satellite products in key application areas. The coordination is pursued from an end-to-end perspective, through development of multilateral coordination and cooperation across all meteorological satellite operators in close coordination with the user community. Specifically, the group provides an international forum for the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems and coordinates space-based Earth observation activities in accordance with the requirements of the World

Meteorological Organization Integrated Global Observing System (WIGOS) and the Vision for WIGOS in 2040.

The main goals of the activities of CGMS are to support operational weather monitoring and forecasting as well as climate monitoring, in response to requirements formulated by WMO, its programmes and other programmes jointly supported by WMO and other international agencies.

[website](#)

Committee on Earth Observation Satellites and Coordination Group for Meteorological Satellites Working Group on Climate

The Committee on Earth Observation Satellites and the Coordination Group for Meteorological Satellites Working Group on Climate (CEOS-CGMS Working Group on Climate), established in 2010, coordinates collaborative activities among the major space agencies of the world, as represented in CEOS and CGMS, in the area of climate monitoring. In this capacity, it serves as the space arm of the Group on Earth Observations (GEO). Its mission is to improve the systematic availability of climate data records through the implementation of a global architecture for climate monitoring from space. It collaborates closely with the Global Climate Observing System (GCOS) by facilitating the development, production and use of climate data records responsive to the GCOS Essential Climate Variables as detailed in the GCOS implementation plans. Through its comprehensive Essential Climate Variables Inventory of climate data records, the Working Group on Climate links GCOS requirements to agency climate data record products

to current and planned satellite missions. Inventory gap analyses identify needs and risks in current and future international space constellations and ground architectures. To help address the specific needs of the Paris Agreement and related global stocktakes, the CEOS/CGMS Working Group on Climate maintains a greenhouse gas task team. It alone has responsibility for reporting the climate activities of CEOS and CGMS to the United Nations Framework Convention on Climate Change Subsidiary Body for Scientific and Technological Advice (SBSTA) at the annual Conference of the Parties. [website](#)

Food and Agriculture Organization of the United Nations

The Food and Agriculture Organization of the United Nations (FAO) is a specialized agency of the United Nations that leads international efforts to defeat hunger. With 195 members (194 countries and the European Union), it works in over 130 countries worldwide. Its goal is to achieve food security for all and to make sure that people have regular access to enough high-quality food to lead active, healthy lives. [website](#)

Global Climate Observing System

The Global Climate Observing System (GCOS) was formally established in 1992 by a memorandum of understanding (updated in 1998) as an international, inter-agency, interdisciplinary framework for ensuring that the observations and information needed to address climate-related issues are obtained and made available to all potential users. It is co-sponsored by WMO, the Intergovernmental Oceanographic

Commission of UNESCO (IOC-UNESCO), the United Nations Environment Programme, and the International Science Council (ISC). Since 2020, the work of the GCOS secretariat has been partially supported by the European Union, which recognizes the links between the work of GCOS and the Copernicus Programme.

GCOS includes surface-based, airborne and space-based networks and encompasses the climate components of WMO as well as other observational elements and systems contributing to climate observations.


The GCOS Steering Committee provides guidance, coordination and oversight to the programme. Major operational and research observing programmes contributing to GCOS are represented, as well as an appropriate mix of disciplines in atmospheric, oceanic, hydrological, cryospheric and biospheric sciences. Three scientific panels, reporting to the Steering Committee, are in place to define the observations needed in each of the main global domains (atmosphere, oceans and land) to generate inputs from these fields to the climate observing community, to prepare specific programme elements and to make recommendations for implementation. The GCOS Secretariat, located at WMO headquarters in Geneva, Switzerland, supports the activities of the Steering Committee, the GCOS panels and the GCOS programme as a whole.

The GCOS Cooperation Mechanism was established to identify and make the most effective use of resources available for improving climate observing systems in developing countries, particularly to enable them to collect, exchange and utilize data on a continuing basis in pursuance of the United Nations Framework Convention on Climate Change.

[website](#)

Global Framework for Climate Services

The Heads of State and Government, Ministers and Heads of Delegations of over 150 countries and 70 organizations present in Geneva at the third World Climate Conference in 2009, decided unanimously through the Conference declaration, to establish the Global Framework for Climate Services (GFCS), a United Nations-led initiative spearheaded by WMO. GFCS is a worldwide partnership of Governments and organizations that produce and use climate information and services for managing and adapting to climate risks.


This United Nations-wide initiative, in which the members of WMO and inter- and non-governmental, regional, national and local stakeholders work in partnership to develop targeted work to advance the application of climate services.  [website](#)

Group on Earth Observations

The Group on Earth Observations (GEO) is a partnership of more than 100 Governments and currently 140 participating organizations that envisions a future where decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations. Membership of GEO is open to all Member States of the United Nations upon formal endorsement of the 2016–2025 Strategic Plan. Participating organizations are international bodies with a mandate in and/or use of Earth observation.

The mission of GEO is to connect the demand for sound and timely environmental information with the supply of data and information about

the Earth. This includes space-based and ground-based (or in situ) data. GEO convenes expertise from across different disciplines to coordinate their activities and promote broad and open data policies. Coordinated and open Earth observation data enable decision makers around the world to better understand the issues they face, in order to shape more effective policies. The GEO community focuses on three global priority engagement areas: the 2030 Agenda for Sustainable Development, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction.


In addition to over 70 work programme activities and initiatives that address global needs, and coordination and knowledge gaps, a central part of the mission of GEO is to build a Global Earth Observation System of Systems (GEOSS) to better integrate observing systems and share data by connecting existing infrastructure using common standards. GEOSS is a set of coordinated, independent Earth observation, information and processing systems that interact and provide access to diverse information for a broad range of users in both public and private sectors. GEOSS links these systems to strengthen the monitoring of the state of the Earth. It facilitates the sharing of environmental data and information collected from the large array of observing systems contributed by countries and organizations within GEO. The “GEOSS Portal” offers a single access point for users seeking data, imagery and analytical software packages relevant to all parts of the globe. There are already more than 400 million open data and information resources in GEOSS from over 150 national and regional providers, international organizations and the private sector. www.geoportal.org 

The GEO Plenary establishes working groups to address aspects of GEOSS implementation and provides a mechanism for members of the GEO community to engage fully in its work. The GEO Work Programme

provides a framework for countries, international organizations, the private sector, researchers and others to work together to harness the power of Earth observation to address environmental and societal challenges. Four working groups have been established as part of the GEO 2020–2022 Work Programme. They focus on the key issues related to capacity development, climate change, disaster risk reduction and data.

 [website](#)

Intergovernmental Panel on Climate Change

Created by WMO and the United Nations Environment Programme in 1988 and hosted by WMO, the Intergovernmental Panel on Climate Change (IPCC) is an intergovernmental body of members of the United Nations and WMO. IPCC currently has 195 members as well as 30 observer organizations among United Nations entities and organizations acting as participating organizations. IPCC is the United Nations body for assessing the science related to climate change.  [website](#)

Space for Climate Observatory

Space for Climate Observatory (SCO) was created by a declaration signed on 17 June 2019 and formalized through the Charter on the establishment of the Space for Climate Observatory (entered into effect on 1 September 2022), to address the need to step up international coordination to enable accurate assessment and monitoring of the consequences of climate change based on space and in situ observations as well as numerical models.

SCO supports global climate action enabled through space technology to facilitate collaborative activities at local, national, regional and international levels and improve the understanding of processed space data and derived information for climate action on local, national, regional and international levels. SCO develops capacities to study, monitor, mitigate and adapt to the impacts of climate change at local, national, regional and international levels by using satellite-based tools in combination with field data and models, through so-called “SCO Projects” that satisfy a certain set of criteria to provide operational applications designed with end users to tackle local climate conditions.

SCO is structured as an international consortium, and not an intergovernmental body per se, without legal personality, with national/regional versions, depending on the goodwill and capabilities of SCO partners and local actors. Participants in SCO can be seen as a network of agencies, international organizations as well as public and private entities involved in the Earth observation sector and its use for climate action.

 [website](#)

United Nations Development Programme

As the United Nations lead agency on international development, the United Nations Development Programme (UNDP), established in 1966 by the General Assembly, works in 170 countries and territories to eradicate poverty and reduce inequality. The Programme helps countries to develop policies, leadership skills, partnering abilities and institutional capabilities, and to build resilience to achieve the Sustainable Development Goals. The work of UNDP is concentrated on the three

focus areas of sustainable development, democratic governance and peacebuilding, and climate and disaster resilience.

The United Nations Development Programme Climate Promise, which provides support to help countries take action to reduce their emissions, increase their resilience to climate impacts and support sustainable development priorities to underpin contributions of UNDP to the Nationally Determined Contribution Partnership. [website](#)

United Nations Educational, Scientific and Cultural Organization

On 4 November 1946 the constitution of the United Nations Educational, Scientific and Cultural Organization (UNESCO) came into force. The Organization seeks to build peace through international cooperation in education, sciences and culture. It has 193 members and 12 associate members, and works across 53 field offices. The programme of UNESCO contributes to the achievement of the Sustainable Development Goals defined in the 2030 Agenda, with six domains of expertise: education, natural sciences, ocean sciences, social and human sciences, culture, communication and information. [website](#)

United Nations Environment Programme

Since its inception in 1972, the United Nations Environment Programme (UNEP) has been the global authority that sets the environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves

as an authoritative advocate for the global environment. UNEP works with Governments, the private sector, civil society and with other United Nations entities and international organizations across the world. It works closely with its 193 Member States and representatives from civil society, businesses, and other major groups and stakeholders to address environmental challenges through the United Nations Environment Assembly, the highest-level decision-making body in the world on the environment. Headquartered in Nairobi, UNEP works through its divisions as well as regional, liaison and out-posted offices and a growing network of collaborating centres of excellence.

The Programme supports Member States to ensure that environmental sustainability is reflected in development and investment planning and provides countries with the necessary tools and technologies to protect and restore the environment. [website](#)

United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change has near universal membership (197 Parties) and is the parent treaty of the 2015 Paris Agreement as well as the 1997 Kyoto Protocol. The Secretariat of UNFCCC, a United Nations entity (“United Nations Climate Change”) was established in 1992 when countries adopted the Convention. Since 1995, the Secretariat has been located in Bonn, Germany. The Conference of the Parties is the supreme decision-making body of UNFCCC. Meeting every year, all States that are Parties to the Convention are represented at the Conference of the Parties, at which they review the implementation of the Convention and any other legal

instruments that the Conference of the Parties adopts and take decisions necessary to promote the effective implementation of the Convention, including any institutional arrangements such as the Paris Agreement. A key task for the Conference of the Parties is to review the national communications and emission inventories submitted by Parties. Based on this information, the Conference of the Parties assesses the effects of the measures taken by Parties and the progress made in achieving the objective of the Convention. [website](#)

United Nations Institute for Training and Research/ United Nations Satellite Centre

The United Nations Institute for Training and Research (UNITAR), created in 1963, provides innovative learning solutions to individuals, organizations and institutions to enhance global decision-making and support country-level action for shaping a better future. With a strategy fully focused on achieving the Sustainable Development Goals, it supports Governments in implementing the 2030 Agenda.

UNITAR works to develop individual, institutional and organizational capacities of countries and other United Nations stakeholders through providing learning solutions and related knowledge products and services to enhance decision-making and to support country-level action for overcoming global challenges. [website](#)

United Nations Office for Disaster Risk Reduction

The United Nations Office for Disaster Risk Reduction (UNDRR) is the United Nations focal point for disaster risk reduction. The Office oversees the implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030, supporting countries in its implementation, monitoring and sharing of what works in reducing existing risk and preventing the creation of new risk. Its mission is to provide leadership and support to accelerate global efforts in disaster risk reduction to achieve inclusive sustainable development and the goal of the Sendai Framework.

United Nations agencies report to the Office through the Plan of Action on topics related to disaster risk reduction. [website](#)

United Nations Office for Outer Space Affairs

The United Nations Office for Outer Space Affairs (UNOOSA) works to help all countries, especially developing countries, access and leverage the benefits of space to accelerate sustainable development.

The Office provides Secretariat services to the Committee on the Peaceful Uses of Outer Space (COPUOS) and its two Subcommittees.

COPUOS was set up by the General Assembly in 1959. Members are States and its continual expansion (currently 100) makes COPUOS one of the fastest growing Committees in the United Nations. In addition to States, a number of international organizations, including both intergovernmental and non-governmental, have observer status with COPUOS and its Subcommittees.

The Office also has the mandate to implement the United Nations Programme on Space Applications.

To target disaster risk management, the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) was established under the United Nations Office for Outer Space Affairs (UNOOSA) in 2006, to help countries use space data and technologies, such as satellite imagery, to prevent and manage disasters. [website](#)

United Nations University

The United Nations University (UNU) is a global think tank and postgraduate teaching organization headquartered in Japan. The mission of UNU is to contribute, through collaborative research and education, to efforts to resolve the pressing global problems of human survival, development and welfare. Through postgraduate teaching activities, it contributes to capacity-building, particularly in developing countries.

[website](#)

World Meteorological Organization

The World Meteorological Organization (WMO) is an intergovernmental organization with a membership of 187 member States and the Secretariat, headquartered in Geneva, is headed by the Secretary-General. Established by the ratification of the World Meteorological Organization Convention in 1950, the Organization became the specialized agency of the United

Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences a year later.

The mandates of WMO focus on international cooperation at a global scale to implement an Earth-system approach for the development of meteorology, climatology, operational hydrology and related environmental services, as well as to reap the benefits from their application. WMO provides the framework for such international cooperation. [website](#)

World Bank Group

With 189 member countries, and offices in over 130 locations, the World Bank Group is a unique global partnership. A specialized agency of the United Nations, it works in every major area of development providing a wide array of financial products and technical assistance, and helps countries share and apply innovative knowledge and solutions to the challenges they face. The World Bank Group is the biggest multilateral funder of climate investments in developing countries.

[website](#)

European Centre for Medium-Range Weather Forecasts

The European Centre for Medium-Range Weather Forecasts is an independent intergovernmental organization, established in 1975, and supported by 23 member States and 12 cooperating States. It is both a research institute and a 24/7 operational service, producing and disseminating numerical weather predictions. [website](#)

European Commission

The European Union is a unique economic and political union between 27 European countries. It is both an intergovernmental and supranational body which represents the common interests of the European Union and is the main executive body. The European Commission plays an active role in designing and implementing European Union policies. The Commission is organized into policy departments, known as Directorates-General, which are responsible for different policy areas such as the Directorate-General for Climate Action (DG CLIMA) which leads the European Commission's efforts to fight climate change at European Union and international level or the Directorate-General for Defence Industry and Space (DEFIS), which leads the activities of the European Commission in the defence industry and space sector. [website](#)

European Organization for the Exploitation of Meteorological Satellites

Established in 1986, the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) is an intergovernmental organization based in Darmstadt, Germany, currently with 30 member States. The Organization is the European operational satellite agency for monitoring weather, climate and the environment from space. The user-governed operational organization serves the needs of its member States, who have full access to data and services and are represented in the supreme decision-making body of the organization, the Council. The vision of EUMETSAT is to be the leading user-driven operational agency in Europe for Earth observation satellite programmes that fulfil the objectives of its convention. It further aims to be a trusted global partner for those outside Europe who share these objectives. [website](#)

European Space Agency

Established in 1975, the European Space Agency (ESA) is an intergovernmental organization with 22 Member States, three Associate members and three European Cooperating States and additional three countries which have signed cooperation agreements. The Agency is an entirely independent organization from that of the European Union, with which it maintains close ties through the ESA/European Commission Framework Agreement. They share a joint European strategy for space and have together developed European space policy.

The mission of the European Space Agency is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. [website](#)

European Union Agency for the Space Programme

In 2021, in line with the new European Union Space Regulation and the growing role of space in supporting European Union priorities in terms of growth, competitiveness, sustainability and security, the European Union decided to expand the scope of the former European Global Navigation Satellite System Agency to include new responsibilities. This resulted in the creation of European Union Agency for the Space Programme (EUSPA) as the user-oriented operational Agency for the European Union Space Programme. This Programme and the services and applications that it supports help to advance the objectives of the European Union and to achieve its key policy goals and priorities. The mission of EUSPA, defined by the European Union Space Programme Regulation, is for the operational Agency to contribute to sustainable growth, security and the safety of the European Union. [website](#)

SPACE AND CLIMATE BACKGROUND OF SELECTED ENTITIES

Committee on Earth Observation Satellites

➤ Goals/objectives related to climate change

On climate, the Committee on Earth Observation Satellites (CEOS) works together with the Coordination Group for Meteorological Satellites (CGMS), with whom they have jointly established the CEOS/CGMS Working Group on Climate.

The CEOS/CGMS Working Group on Climate is the centrepiece of the contribution of CEOS to climate change monitoring. This joint group, including the CEOS Agencies and CGMS, coordinates and encourages collaborative activities between the major space agencies of the world in climate monitoring with the overarching goal of improving the systematic availability of climate data records through the coordinated implementation and further development of a global architecture for climate monitoring from space. The group facilitates the implementation and exploitation of the essential climate variables time series through the coordination of existing activities undertaken by CEOS Agencies and via strong collaboration with other CEOS working groups and virtual constellations. These include specific expertise on a number of essential climate variables to ensure a coherent and consistent approach to the provision of climate data records across their various topical areas. It builds on the work of the CEOS Working Group on Calibration and Validation, the Global

Space-based Inter-Calibration System (GSICS) and the Quality Assurance Framework for Earth Observations initiative to support the calibration and validation underpinning the production of climate data records.

The CEOS/CGMS Working Group on Climate also provides guidance to CEOS regarding climate-related tasks in the GEO workplan.

In response to the Carbon Observation Strategy of the Group on Earth Observations (GEO), the CEOS Carbon Strategy for Carbon Observations from Space details the adequacy of past, present and planned satellite measurements of carbon in the land, oceans and inland waters, and atmosphere domains to support GEO. Specifically, it identifies actions that CEOS and its Agencies must take to better coordinate existing and future capabilities, as well as challenges that require additional resources and/or mandates beyond the present capacity of CEOS and its member Agencies.

The CEOS Plenary has endorsed the creation of the Working Group on Disasters. This Working Group has two dozen regular members representing organizations involved in the use of satellite imagery for disaster risk reduction, response and recovery.

Its objectives include:

- Supporting the efforts of disaster risk management authorities in protecting lives and safeguarding property by means of satellite-based Earth observation and science-based analysis
- Fostering increased use of Earth observation in support of disaster risk management
- Supporting the implementation of the United Nations Office for Disaster Risk Reduction (UNDRR) Sendai Framework for Disaster Risk Reduction, and in particular, contributing to its priority one, “Understanding Risk”
- Raising the awareness of politicians, decision makers and major stakeholders of the benefits of using satellite Earth observation in all phases of disaster risk management

✚ Use of space technology

CEOS represents the “space arm” of the Group on Earth Observations (GEO), and space technology is the key topic of its work.

✚ Institutional working relations

CEOS also provides an established means of communicating with external organizations, enabling it to understand and act upon the Earth observation needs and requirements of these organizations. CEOS supports the priorities of GEO and focuses its coordination efforts on satellite data.

Through the major investments made by CEOS Agencies in developing the space segment of the Global Earth Observation System of Systems (GEOSS), it continues to provide space-based Earth observations in support of GEOSS implementation.

Coordination Group for Meteorological Satellites

👉 Goals/objectives related to climate change

Governed by its Charter, the Coordination Group for Meteorological Satellites (CGMS) specifies that in relation to climate monitoring, the Group coordinates long-term and sustainable satellite systems relevant to weather and climate to which both operational and research and development space agencies contribute. This refers to the technical and operational coordination of a global network of satellites, owned and operated by a plethora of national and international agencies, that constitute a major portion of the space-based component, which provides observations on the physical state of the atmosphere and the ocean surface. The coordinated services include data access, direct broadcast, data collection and validated geophysical products. These data are used for the preparation of weather analysis, forecasts, advisories and warnings, and increasingly to support the monitoring of climate change.

In its most recently published “Four-year High-Level Priority Plan” (2021–2025), one of the seven priorities of CGMS is focused on advancing the architecture for the space-based monitoring of climate, including greenhouse gas monitoring through the CEOS/CGMS Working Group on Climate. From a climate monitoring perspective, a fundamental building block for the provision of climate services is the architecture for climate monitoring from space, and its associated repository of climate data records. Members of CGMS, with their extensive archive of satellite observations (from which climate data

records are derived) and their long-term programmatic perspective, are uniquely placed to make a substantial contribution to this architecture. To ensure that the maximum benefit is taken from these observations for decision-making, a coordinated approach is required to ensure their compliance with GCOS requirements, as well as their systematic cataloguing, exposure and, where appropriate, reprocessing.

👉 Use of space technology

Space technology is the key topic of the work of CGMS.

👉 Institutional working relations

The high-level priority of CGMS is to task the CEOS/CGMS Working Group on Climate to do the following:

- Update the Essential Climate Variables Inventory of Climate Data Records, Gap Analysis and Coordinated Action Plan of the Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) and report on the status of the implementation of the Coordinated Action Plan

- Report to and interact with the United Nations Framework Convention on Climate Change Subsidiary Body for Scientific and Technological Advice Research and Systematic Observation (SBSTA-RSO) to foster usage of satellite data in the context of the Paris Agreement, in particular results from the operational greenhouse gas monitoring system
- Respond to the GCOS Implementation Plan and provide support to GCOS for its status report
- Work of a CEOS/CGMS Working Group on Climate Task Team on greenhouse gas monitoring to coordinate the specific CGMS contributions to the operational greenhouse gas constellation
- Foster the implementation of the architecture for climate monitoring from space by strengthening the analysis of use cases for climate data records to increase usage in climate services and science and have the CEOS/CGMS Working Group on Climate publish updated definitions for the fundamental, thematic and interim climate data records

The Secretariat of CGMS also represents CGMS members in several international bodies such as the Committee on Earth Observation Satellites (CEOS), the Group on Earth Observations (GEO), and the Space Frequency Coordination Group.

Committee on Earth Observation Satellites and Coordination Group for Meteorological Satellites Working Group on Climate

➤ Goals/objectives related to climate change

The overarching goal of the Committee on Earth Observation Satellites and Coordination Group for Meteorological Satellites Working Group on Climate (CEOS-CGMS Working Group on Climate) is improving the systematic availability of climate data records through the coordinated implementation and further development of the architecture for monitoring climate from space. More specifically, it has been assigned three main objectives:

- Provide a comprehensive and accessible view of existing and planned climate data records that are currently available from satellite missions of CEOS and CGMS members or their combination
- Deliver further climate data records, including multi-mission, through best use of available data to fulfil GCOS requirements
- Optimize the planning of future satellite missions and constellations to expand existing and planned climate data records, and to address possible gaps with respect to GCOS requirements

The first of these objectives relates to an inventory of climate data records addressing the GCOS Essential Climate Variables (ECV Inventory). The second and third objectives are addressed by a gap analysis based on the ECV Inventory and resulting in a coordinated action plan of CEOS and CGMS.

➤ Use of space technology

Space technology is the key topic of the work of the CEOS-CGMS Working Group on Climate.

➤ Institutional working relations

The CEOS/CGMS Working Group on Climate delivers a coordinated response of all member space agencies to the needs of the United Nations Framework Convention on Climate Change and the Global Climate Observing System (GCOS) for systematic observations, as called for in the Paris Agreement.

More specifically, in the context of the United Nations Framework Convention on Climate Change and other international coordination mechanisms, it will:

- Ensure that a plan is put in place for the development of a joint CEOS/CGMS response, which has broad consultation across the community, and provides the basis for future planning and priority setting by space agencies in response to climate information needs
- Support the work of GCOS in defining and delivering the essential climate variables required by the United Nations Framework Convention on Climate Change

- Provide guidance to CEOS and CGMS on climate-related tasks involving international coordination mechanisms (such as GEO and GFCS) and produce relevant reports on behalf of the CEOS and CGMS Plenaries
- Support and advise on the overall relation of CEOS and CGMS to the United Nations Framework Convention on Climate Change and its subsidiary bodies, to the Intergovernmental Panel on Climate Change (IPCC) and other international coordination mechanisms such as the Global Framework for Climate Services (GFCS)

Considering the specific importance of greenhouse gas monitoring as stated in the Paris Agreement, it will coordinate activities of CEOS and CGMS, defining and implementing an integrated global carbon observing system. This includes a targeted observing system for monitoring the column concentrations of CO₂, CH₄ and other greenhouse gases from space as well as ensuring that these activities are integrated into a broader approach on greenhouse gas monitoring and the work of overseeing the implementation of the CEOS carbon strategy.

Food and Agriculture Organization of the United Nations

👉 Goals/objectives related to climate change

The Food and Agriculture Organization of the United Nations (FAO) considers climate change a top-line corporate priority. Its strategy on climate change translates its core mandate into strategic choices and action priorities at global, regional, national and local levels with the central goal of supporting its members in achieving their commitments regarding climate change.

The Organization supports countries in both mitigating and adapting to the effects of climate change through a wide range of research-based and practical programmes and projects, as an integral part of the 2030 Agenda and the Sustainable Development Goals. Its strategy focuses on adaptation and mitigation in the agriculture sector and advocates for better management of synergies and trade-offs between the two. FAO supports its member countries in these efforts by offering technical guidance, data and tools for improved decision-making and the implementation of adaptive measures. It has also embedded these tools and approaches in broader frameworks such as climate-smart agriculture and in the promotion of disaster risk reduction policy and action. In the field of adaptation, the response to the adverse effects of climate and the preparation for future impacts, FAO works with member nations, their farmers, academia, civil society and the private sector to improve ways of adapting to the effects of climate change in the agriculture sector. The FAO Mitigation of Climate Change in Agriculture programme works on the ground and with partners to monitor and assess greenhouse gas emissions and the mitigation

potential in agriculture and to develop the capacity of stakeholders working on national greenhouse gas inventories and farmers using climate-smart agricultural practices.

According to an analysis by FAO, around 90 per cent of the nationally determined contributions, as referenced in the Paris Agreement refer to the agriculture sector. FAO has therefore prioritized providing support to countries on nationally determined contributions implementation and formulation within its climate change strategy. FAO provides guidance on integrating climate considerations into policies, strategies and projects in a way that is coherent with national priorities through activities such as the Forest and Landscape Restoration Mechanism, the Blue Growth Initiative and policy support in the livestock sector. The latter includes supporting improved livestock management in emergency situations, disease control, actions to reduce methane emissions from enteric fermentation, and effective management of manure and pastures. From 2009 to 2017, more than 300 programmes and projects addressed the problems caused by climate variability and extremes in the agriculture sectors.

FAO has joined forces with UNDP and UNEP within the Reducing Emissions from Deforestation and Forest Degradation (REDD) Programme. The Organization also supports developing countries in their REDD+ processes and in turning their political commitments, as represented in their nationally determined contributions, into action on the ground. REDD+ is a United Nations collaborative initiative, a knowledge and advisory partnership on forests and climate, launched

in 2008, that focuses on Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries. The objective is to generate financial value from the carbon stored in forests, offering incentives for developing countries to reduce the rate of deforestation and forest degradation and invest in low-carbon paths to sustainable development. REDD, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks (REDD+), is a climate change mitigation solution developed by Parties to the United Nations Framework Convention on Climate Change, recognized in article 5 of the Paris Agreement. As the largest international provider of REDD+ assistance, UN-REDD supports nationally led REDD+ processes and helps them to advance the implementation of the Paris Agreement, in order to reduce deforestation, promote sustainable land use, advance international cooperative approaches to climate mitigation and mobilize climate finance to turn the tide on tropical deforestation.

With regard to reporting on emissions, UN-REDD advises countries to follow the guidance from the United Nations Framework Convention on Climate Change and the methods and approaches laid out in the IPCC guidelines. Countries planning on engaging in REDD+ activities are requested to develop national forest monitoring systems as a way to measure progress in their commitments to forest and climate action. It has been internationally recognized that such monitoring systems can oversee REDD+ activities and contribute to the process of measurement, reporting and verification. UN-REDD provides technical assistance and capacity development related to all aspects of national forest monitoring, including the development of technical and functional capacities for establishing a national forest monitoring system, forest reference emission levels or forest reference levels,

satellite land monitoring systems, national forest inventories and greenhouse gas inventories. National forest monitoring systems are a foundation for national decision-making, monitoring the implementation and effects of forest policy actions, sustainable forest management, REDD+ and the enhanced transparency framework for action and support of the Paris Agreement under the United Nations Framework Convention on Climate Change, through the provision of transparent, reliable, relevant, accessible and sustainable forest data. The Food and Agriculture Organization Forestry Department has been supporting over 70 countries as they develop forest monitoring capacities to promote sustainable forest management and measurement, reporting and verification systems in order to receive results-based payments for reducing emissions from deforestation and forest degradation (REDD+).

👉 Use of space technology

To help practitioners to put national forest monitoring systems in place, FAO has developed a range of supporting materials, including the voluntary guidelines for national forest monitoring and various free, open-source software tools and platforms, such as Open Foris and System for Earth Observation Data Access, Processing and Analysis for Land Monitoring (SEPAL), which uses satellite imagery for natural resource management. SEPAL was developed by FAO to help countries monitor and report on forest and land use. SEPAL offers users access to satellite data, an easy-to-use interface, and is powered by cloud-based super computers, thus paving the way for improved climate change mitigation plans and data-driven land-use policies. SEPAL serves and empowers users, including government

agencies, research organizations, non-governmental organizations, companies and academia in over 180 countries around the world to gain a better understanding of land cover dynamics using the data, processing capacity and analytical possibilities it offers. SEPAL users can process and analyse satellite imagery from Planet, Landsat, Sentinel and Advanced Land Observing Satellites (ALOS), taking advantage of the high temporal and spatial resolution of Planet imagery, the historical archive of Landsat imagery, the frequency of Sentinel-2 imagery and the cloud-penetrating abilities of Sentinel-1 and ALOS.

The platform allows users to produce robust results spanning a range of applications from mosaic-style renderings of land cover, forest disturbances, fires and pest infestation to dynamic flood maps and initiatives geared to peatland conservation and restoration. It includes tools for near-real-time alert systems and degradation assessments and complements other Open Foris open-source technologies that FAO has developed for forest monitoring and reporting. Collect Earth is a Google Earth plugin developed by FAO for forest sampling analysis in sync with Google Earth Engine and Open Foris Collect. This free open-source software for land monitoring facilitates access to multiple freely available archives of satellite imagery, including archives with very high spatial resolution imagery and those with very high temporal resolution imagery. Collectively, these archives offer free access to a large amount of information on current and past land dynamics for any location in the world. Collect Earth draws upon these archives and the synergies of imagery of multiple resolutions to power an innovative method for land monitoring known as augmented visual interpretation.

www.fao.org



<https://openforis.org/tools/collect-earth/>



Through the monitoring, analysis and early warning activities of FAO, the Global Information and Early Warning System on Food and Agriculture (GIEWS) provides a further significant contribution to three of the strategic objectives of the organization using Earth observation for crop monitoring. GIEWS continuously monitors food supply and demand and other key indicators for assessing the overall food security situation in all the countries of the world. It issues regular analytical and objective reports on prevailing conditions and early warnings of impending food crises at country or regional level. At the request of national authorities, GIEWS supports countries in gathering evidence for policy decisions, or planning by development partners, through its Crop and Food Security Assessment Missions, fielded jointly with the World Food Programme (WFP). In the country-level application of tools for Earth observation and price monitoring, GIEWS also strengthens national capacities in managing food security-related information. To support the analysis and supplement ground-based information, GIEWS utilizes remote sensing data that can provide valuable insights on water availability and vegetation health during the cropping seasons. In addition to rainfall estimates and the Normalized Difference Vegetation Index, GIEWS and the Office of Climate Change, Biodiversity and Environment of FAO have developed the Agricultural Stress Index, a quick-look indicator for the early identification of agricultural areas likely to be affected by dry spells, or drought in extreme cases. All Agricultural Stress Index System (ASIS) raster data sets are accessible through the Geospatial Portal and the Web Map Service provided by FAO.

👉 Institutional working relations

In collaboration with the European Space Agency (ESA), FAO helps countries to use satellite data to guide their food and agriculture policies. A new memorandum of understanding between FAO and ESA was signed in April 2021 to pave the way for exchanging relevant expertise and developing applications in which Earth observation images can be used to better monitor agrifood systems. It covers areas such as identifying and understanding the requirements and challenges for using satellite data in the field of food and agriculture, sharing data sets and surveys, supporting access to Earth observation data sets and developing innovative Earth observation algorithms, products and applications making full use of the latest information technology capabilities, such as cloud computing. The joint work will scale up the capacity of FAO to help countries use Earth observation methods for agricultural statistics and Sustainable Development Goal monitoring. ESA already works with FAO and pilot national statistical offices through the Sen4Sat project. In addition, Thomas Pesquet (a French ESA astronaut), as a FAO Goodwill Ambassador, helps the Organization to raise awareness of the importance of transforming the world's agrifood systems, making them more resilient, inclusive, efficient and sustainable to overcome the challenges of persisting and growing hunger, while preserving the planet's environment and biodiversity.

Global Climate Observing System

👉 Goals/objectives related to climate change

The Global Climate Observing System (GCOS) programme stimulates, encourages, coordinates and facilitates the taking of needed climate observations by national or international organizations to support their own requirements as well as common goals. It provides an operational framework for integrating and enhancing the observational systems of participating countries and organizations into a comprehensive system focused on meeting the full range of national and international requirements for climate issues. It regularly assesses the status of global climate observations of the atmosphere, land and ocean and produces guidance for its improvement. The GCOS programme does not directly make observations nor generate data products.

The GCOS expert panels maintain definitions of Essential Climate Variables, the observations required to meet the need to systematically observe the changing climate of the Earth. They identify gaps by comparing the existing climate observation system with these essential climate variables. The expert panels regularly develop plans on how to sustain, coordinate and improve climate observations as well as physical, chemical and biological observations. The observations supported by GCOS contribute to solving challenges in climate research and also underpin climate services and adaptation measures.

👉 Use of space technology

The need for observations is formally addressed through the United Nations Framework Convention on Climate Change, which has charged GCOS with the responsibility for defining requirements for observations relevant to climate change, both in situ and space based. GCOS works with partners to establish requirements and to ensure the sustained provision of reliable climate physical, chemical and biological observations and data records, building on relevant observing systems.

The GCOS programme provides the overall foundation through the assessment and formulation of requirements for climate monitoring from space. Those are captured in GCOS reference documents and reports, including the GCOS implementation plan, that comprises actions targeted at the satellite community.

👉 Institutional working relations

Since no single country or agency can fulfil the full range of demanding requirements established by the GCOS for space-based observations, the overall framework for this international endeavour, called the “Global Architecture for Climate Monitoring from Space”, was defined in 2013, following an initiative of WMO, CEOS and CGMS, and is being further developed and implemented by the CEOS/CGMS Working Group on Climate.

The GCOS Cooperation Mechanism was established to identify and make the most effective use of resources available for improving climate observing systems in developing countries, particularly to enable them to collect, exchange and utilize data on a continuing basis in pursuance of the United Nations Framework Convention on Climate Change. This mechanism provides independence from other intergovernmental processes, including those related to the United Nations Framework Convention on Climate Change, while assisting in achieving the objectives of both UNFCCC and GCOS.

Global Framework for Climate Services

👉 Goals/objectives related to climate change

The Global Framework for Climate Services (GFCS) accelerates and coordinates the technically and scientifically sound implementation of measures to improve climate-related outcomes at national, regional and global levels. GFCS enables the development and application of climate services to assist decision-making at all levels in support of addressing climate-related risks. The vision of GFCS is to enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scale.

GFCS uses National Frameworks for Climate Services (NFCS), multi-stakeholder user interface platforms, as a key mechanism for enabling the development and delivery of climate services at country level. NFCS focus on improving co-production, tailoring, delivery and use of science-based climate predictions and services focused on the five GFCS priority areas which are agriculture and food security, disaster risk reduction, energy, health and water. NFCS support the Paris Agreement by helping Parties to the Agreement prepare, maintain and communicate their nationally determined contributions. By providing climate services that help assess climate vulnerabilities, identify adaptation options, improve the understanding of climate and its impacts and enhance the adaptation planning and

implementing capacity of climate-sensitive sectors, NFCSs complement national adaptation plans.

GFCS integrates the collective efforts to promote cooperation in scientific, technological, technical, socioeconomic and other research, systematic observation and development of data archives related to the climate system for the implementation of adaptation programmes under the United Nations Framework Convention on Climate Change. It fits well within the adaptation and technology building blocks of a future climate change deal to strengthen actions on vulnerability assessments, national adaptation plans, enabling policy environments, arrangements for sharing knowledge and tools for risk reduction and sharing. The GFCS implementation plan guides the development of the information resources that are needed for building climate resilience and preparing adaptation plans.

The Climate Coordination Panel (CCP) is the oversight and implementation mechanism for GFCS.

GFCS is user-need driven as a process, and its implementation is organized in five functional pillars:

- Observation and monitoring
- Climate research, modelling and prediction
- A climate services information system
- A climate user interface programme
- Capacity-building

The first two pillars provide the foundation for the framework for delivering observations, data and model outputs from which the research community and service providers can extract an extensive set of climate products and information. The “climate services information system” routinely generates and exchanges climate data, products and information. The user interface layer transforms them into tailored information required by specific adaptation projects, while promoting the development of new services in response to user needs. The capacity-building pillar aims at upgrading the climate service capacities of developing countries in support of their adaptation strategies.

↘ Use of space technology

The Global Architecture for Climate Monitoring from Space, defined in 2013 following an initiative of WMO, CEOS and CGMS, constitutes the space component of the “Observation and Monitoring” pillar of GFCS, fulfilling GCOS requirements. It has been recognized that no single country or agency can fulfil the full range of demanding requirements established by GCOS for space-based observations. International cooperation is required across all operational and research space agencies to coordinate existing assets, promote their optimized combined use for climate monitoring and plan for future systems aimed at expanding the time and scope of climate data records and bridging identified gaps against GCOS requirements. Thus, the Architecture provides the overall framework for this international endeavour.

↘ Institutional working relations

The governance structure of GFCS includes the Partner Advisory Committee (PAC), which is the stakeholder engagement mechanism of GFCS. Its general mandate includes:

- Supporting the Technical Coordination Committee in the coordination of the delivery of the climate-related strategic plan goals and objectives of WMO
- Overseeing the implementation of the Global Framework for Climate Services (GFCS), in close cooperation with PAC
- Coordinating WMO contributions to GFCS, guided by the country-focused results-based framework for WMO contributions to GFCS
- Facilitating a full value chain country-level delivery of climate services to priority climate-sensitive sectors and documentation of associated socioeconomic benefits, in cooperation with development partner organizations
- Coordinating WMO contributions to the provision of services in support of high-level, climate-related United Nations policy processes and joint action
- Aligning and coordinating contributions of constituent programmes of the World Climate Research Programme (WCRP), in particular the co-sponsored Global Climate Observing System (GCOS) and Global Framework for Climate Services (GFCS)

Group on Earth Observations

👉 Goals/objectives related to climate change

The Climate Change Working Group (CC-WG) is convened to develop and implement the Group on Earth Observations (GEO) climate change action strategy to advance the use of Earth observation in support of climate adaptation and mitigation. This includes actions related to the pillars of the Paris Agreement on climate change. In this way, the Working Group will support the translation of the Canberra Declaration into concrete actions within the GEO Work Programme, and ultimately drive actions to promote GEO climate engagement priority.

CC-WG is composed of almost 100 members covering a wide range of countries, as well as government, academia, United Nations agencies and intergovernmental organizations, non-governmental organizations and the private sector.

Duties involve improving coordination and uptake of the GEO Work Programme activities relevant to climate change, supporting the action of countries within the United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change (IPCC), and strengthening the collaboration with partners of GEO in the climate domain.

CC-WG coordinates in particular with the Disaster Risk Reduction Working Group (DRR-WG) through its established subgroup on coordination with GEO engagement priorities (climate change and

Sustainable Development Goals) and with other GEO Working Groups as appropriate.

Four subgroups of CC-WG have been established to carry out its duties:

- Coordination of climate issues across the GEO Work Programme and synergies with key partners
- Engagement with UNFCCC and IPCC
- Enhancing the use of Earth observation for mitigation
- Enhancing the use of Earth observation for adaptation and loss and damage

👉 Use of space technology

The focus of the Climate Change Working Group (CC-WG) is on enhancing coordination of climate-related activities across the GEO Work Programme to promote an effective response to the needs of key partners such as the United Nations Framework Convention on Climate Change and IPCC, and to ensure complementarity of efforts with other data providers in the Earth observation community including WMO and the Committee on Earth Observation Satellites (CEOS). This is undertaken through a mapping of relevant GEO Work Programme activities aimed at identifying existing gaps and synergies as well as through the establishment of close dialogue with partners and the facilitation of communication within the GEO Work Programme.

These efforts help ensure that national, regional and global climate action efforts are implemented in a sustainable manner for the benefit of society.

Since CEOS represents the “space arm” of GEO, this subgroup ensures that complementarity of the efforts of space-based Earth observation data providers involved in GEO climate-related activities will be addressed.

✚ Institutional working relations

GEO uses its unique convening power to connect members and key partners such as UNFCCC, IPCC, WMO, UNEP and CEOS to lead national, regional and global climate action efforts.

CEOS is a member (“space arm”) and the CEOS/CGMS Working Group on Climate is a member of the Climate Change Working Group (CC-WG).

Through the first GEO Climate Workshop in June 2018, GEO has engaged with the Secretariat of UNFCCC to identify key areas where coordinated Earth observations through GEO could support climate action including mitigation, reducing emissions from deforestation and forest degradation (REDD+), adaptation, loss and damage, technology development and transfer, capacity-building and the global stocktake. The Paris Agreement has also highlighted the need to strengthen scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making.

The IPCC Guidelines for national greenhouse gas inventories include information on the potential contributions of space-based Earth observations for comparison with greenhouse gas emission estimates. Parties to the Convention have agreed to use the IPCC Guidelines in reporting to the Convention.

Intergovernmental Panel on Climate Change

👉 Goals/objectives related to climate change

The objective of the Intergovernmental Panel on Climate Change (IPCC) is to provide Governments at all levels with scientific information that they can use to develop climate policies.

IPCC provides regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. Though IPCC does not conduct its own research, it is through its assessments of the information from worldwide climate research in peer-reviewed literature, journals, books and other sources, that it identifies the strength of scientific agreement in different areas and indicates priority needs for further research activities. IPCC reports are also a key input into international climate change negotiations.

IPCC is divided into three Working Groups and a Task Force. Working Group I deals with the physical science basis of climate change, Working Group II with climate change impacts, adaptation and vulnerability and Working Group III with mitigation of climate change. The main objective of the Task Force on National Greenhouse Gas Inventories is to develop and refine a methodology for the calculation and reporting of national greenhouse gas emissions and removals.

👉 Use of space technology

The IPCC Guidelines for National Greenhouse Gas Inventories include information on the potential contributions of space-based Earth observations for comparison with greenhouse gas emission estimates. Parties to the Convention have agreed to use the IPCC Guidelines in reporting to the Convention.

Furthermore, the recent IPCC special reports have pointed out that the expanded use of new information and communication technologies, climate services and remote sensing is critical for near-term actions for capacity-building, as well as technology transfer and deployment to strengthen adaptation and mitigation.

👉 Institutional working relations

IPCC has a well-established role in the Convention process. It communicates its assessment of scientific information to UNFCCC bodies through its regular reports to the Conference of the Parties and in particular to the Subsidiary Body for Science and Technological Advice (SBSTA).

Space for Climate Observatory

👉 Goals/objectives related to climate change

The participants of the Space for Climate Observatory (SCO) gather regularly to share experiences, toolkits and methods, to provide project accelerators, and to discuss and agree on projects and actions addressing the identified common goals. These goals are directly linked to international commitments taken by nations to tackle climate change issues and their impacts.

SCO aims at becoming an important tool for decision-making on preparedness, adaptation and resilience to the impacts of climate change at the local and regional levels.

👉 Use of space technology

SCO aims at supporting the emergence of Earth observation-based applications for climate adaptation, mitigation and monitoring at the local level, and fostering international cooperation for such projects to be shared and used in various geographic areas.

Specifically, SCO aims to:

- Support global climate action enabled through space technology to facilitate collaborative activities at local, national, regional and international levels, and improve the understanding of processed space data and derived information for climate action on local, national, regional and international levels

- Develop capacities to study, monitor, mitigate and adapt to the impacts of climate change at local, national, regional and international levels by using satellite-based tools in combination with field data and models
- Exploit the full potential of space technologies for climate change monitoring, mitigation and adaptation to meet climate objectives, and increase awareness about its benefits and to monitor and to support the implementation of activities
- Establish a forum to facilitate, enable and support exchanges on climate actions supported by space applications for sharing experiences, toolkits and methods on the application of space technology for climate action as well as to promote the use of good practices for using space technologies to meet climate objectives
- Reach a wide diversity of actors in both the space and climate change sectors to foster cooperation between space and government agencies as well as national, regional and international public organizations, institutions and agencies and academic and research institutions to be able to connect to potential end users and national and international private sector organizations and institutions

SCO aims to provide to interested users the tools and capabilities to study, monitor and adapt to the impacts of climate change, especially on local and regional geographic scales, using satellite-based Earth observation tools in combination with field data and models. There are currently 57 projects set up under SCO, targeting adaptation and/or mitigation and monitoring at the local level.

Based on fostering the use of Earth observation satellite data, complemented by local observations and socioeconomic data, SCO devises advanced methodologies to combine various types of data and provide action scenarios at local and regional scale. The SCO Initiative is not only about coordination of data and preparing pilot projects but also about the coordination of platforms (or tools) to manage these data and applications.

✦ **Institutional working relations**

SCO operates alongside and downstream of climate change programmes and initiatives supporting and accelerating work already under way within the space and scientific communities, as well as actions on the ground led by international organizations such as the United Nations and regional organizations such as ESA. It is also a participating organization in GEO.

United Nations Development Programme

👉 Goals/objectives related to climate change

The Climate Promise is the response of the United Nations Development Programme (UNDP) to the climate challenge with the commitment to ensure that any country wishing to increase the ambition of their national climate pledge is able to do so. UNDP is supporting countries to turn their nationally determined contributions targets into concrete action. Leveraging the nationally determined contributions as an umbrella, UNDP is bringing together its infrastructure networks to provide comprehensive support on nationally determined contributions implementation.

<https://climate-promise.undp.org/what-we-do>



The UNDP Strategic Plan 2022–2025 declares a structural transformation, particularly for green, inclusive and digital transitions as one of its three strategic directions. Under this umbrella, it will continue to provide support for climate change adaptation and mitigation through forestry, agriculture, water and sustainable energy as well as ecosystem and biodiversity support in over 140 countries. Building on this portfolio, UNDP is leveraging digital technology and data to achieve climate goals. It takes advantage of its field presence and strong relationships with government partners to contribute to the global creation of useful data and analytics through expertise, ground proofing, and by defining the most critical problems in order to bring data to life.

<https://digital.undp.org/>



👉 Using space technology

The UNDP Geographic Information System and Satellite Imagery Team is working with countries to provide free analysis and interpretation of the data.

<https://undp.medium.com>



In 2016, UNDP and the United Nations Satellite Centre (UNOSAT) entered into a three-year collaboration period with the purpose of developing a web-mapping interface for the monitoring and evaluation of 15 UNDP projects focused on infrastructure rehabilitation in sub-Saharan Africa. UNDP required satellite analysis to fully understand the state of specific locations before, during and after its project interventions. Several projects involved the reconstruction of essential infrastructure such as hospitals, schools and electrical substations for which satellite imagery was used to capture the evolution from damaged sites to functional facilities. From this, the “Geo-localized Maps and Satellite Imagery Analysis” interface emerged. During the project period, UNDP and UNOSAT established methodologies and systems for monitoring project sites via satellite imagery that can continue to be built upon to track progress and assess the impact for the benefit of communities involved.

<https://unitar.org>



The “Geo-localized Maps and Satellite Imagery Analysis” platform allows UNDP to monitor projects, measure impacts and communicate results in a more visual manner. The objective of this platform is the implementation of a satellite imagery

<https://undp.unosat.org/>



analysis through a Digital Map (a Geographic Information System platform) to assist in enhancing overall planning and coordination of UNDP field monitoring, communication and donor mobilization. This enhanced transparency will improve the monitoring of projects and reporting to donors and all stakeholders.

👉 **Institutional working relations**

Under a memorandum of understanding signed in December 2017 and to last for five years, the United Nations Office for Outer Space Affairs (UNOOSA) and the United Nations Development Programme have agreed to focus on cooperation in the use of geospatial and space-based technologies for the activities of UNDP, as well as coordination in activating emergency response mechanisms for the benefit of United Nations Member States. UNOOSA will work to provide UNDP, with access to satellite imagery and analysis, and leverage the UNDP global user network to deliver space-based solutions for the Sustainable Development Goals.

<https://sdgs.un.org>


United Nations Educational, Scientific and Cultural Organization

👉 Goals/objectives related to climate change

In 2017, the United Nations Educational, Scientific and Cultural Organization (UNESCO) General Conference adopted a new Strategy for Action on Climate Change which outlined a four-point strategy for UNESCO to support Member States in adapting to climate change and mitigating its effects on their citizens and territories over the period 2018–2021. This was done in line with the nationally determined contributions to the 2015 Paris Agreement and geared towards realizing the 2030 Agenda for Sustainable Development, notably Sustainable Development Goal 13.

In line with its strategy, UNESCO provides data and climate information services on water security, Earth sciences, biodiversity and the ocean.

<https://ioc.unesco.org/index.php/topics/climate>



The Organization aims to help Member States to mitigate and adapt to climate change, to educate for sustainable development in the context of climate change, to assess the risks of natural disasters due to climate change, and to monitor the effects of climate change on UNESCO-designated sites. UNESCO-designated World Heritage sites, Biosphere Reserves and Global Geoparks provide useful platforms to apply and test climate monitoring, mitigation and adaptation, raising awareness of climate change impacts on human societies, cultural diversity, biodiversity, ecosystem services, and natural and cultural heritage of the world. Over 30 UNESCO programmes in ocean and natural sciences, education, culture and

communication contribute to creating knowledge, educating and communicating about climate change, and to understanding the ethical implications for present and future generations.

World Heritage properties serve as climate change observatories to gather and share information on applied and tested monitoring, mitigation and adaptation practices. UNESCO builds capacities of States Parties and other stakeholders to manage climate change impacts on World Heritage sites effectively and sustainably. The main aim of these efforts is to increase the capacity of these properties to continue to convey their outstanding universal value and support sustainable development. In 2014, it published a practical guide to Climate Change Adaptation for Natural World Heritage Sites and continues to build the capacity of site managers to deal with climate change. Management of resilient World Heritage properties requires designing and implementing appropriate adaptation measures, complemented by activities that contribute to disaster risk management, climate change mitigation and sustainable development.

The global network of World Heritage also harbours options for society to mitigate and adapt to climate change through the ecosystem benefits, such as water and climate regulation, that they provide and the carbon that is stored in World Heritage Forest sites. Climate change is happening at many marine World Heritage sites and is the biggest management challenge in a rapidly changing ocean. A 2021 report, Ocean Science Road map for UNESCO Marine World Heritage, reveals that three

<https://whc.unesco.org/en/news/2368/>



quarters of marine World Heritage sites are unprepared for the impacts of climate change, because of a lack of scientific knowledge.

The Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) a United Nations body responsible for supporting global ocean science and services, is at the forefront of climate science and knowledge that inform and underpin meaningful actions to counteract climate change. It strives to promote intergovernmental cooperation to generate knowledge about the nature and resources of the ocean and coastal areas and to apply that knowledge to management, sustainable development, marine environment protection and decision-making processes within its Member States. It is supporting all its 150 Member States to build their scientific and institutional capacity to achieve the global goals including the United Nations Agenda 2030 and its Sustainable Development Goals, the Paris Agreement on Climate Change and the Sendai Framework on Disaster Risk Reduction. The vision of IOC-UNESCO is that strong scientific understanding and systematic observations of the changing world ocean climate and ecosystems shall underpin sustainable development and global governance for a healthy ocean, and global, regional and national management of risks and opportunities from the ocean. Two out of four high-level objectives of IOC-UNESCO address the increased resiliency to climate change and variability and enhanced safety, efficiency and effectiveness of all ocean-based activities through scientifically founded services, adaptation and mitigation strategies and effective early warning systems and preparedness for tsunamis and other ocean-related hazards.

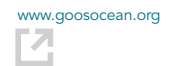
👉 Use of space technology

UNESCO applies space technologies to monitor the state of conservation of World Heritage sites at risk due to natural hazards or conflict. Monitoring cultural heritage in areas affected by conflict or natural disasters, including using satellite imagery, allows UNESCO experts to better assess needs and plan recovery and reparation measures.

UNESCO collaborates with different organizations to use space technologies:

- Collaboration with ESA to use space technologies and the data they provide to monitor natural and cultural heritage sites
- Assistance from the International Centre on Space Technologies for Natural and Cultural Heritage on the use of space technologies for natural and cultural heritage, biosphere reserves and geoparks activities
- Through a partnership with the United Nations Satellite Centre (UNOSAT) since 2015, UNESCO monitors the state of conservation of World Heritage sites at risk due to natural hazards or conflict

IOC-UNESCO leads the Global Ocean Observing System (GOOS) co-sponsored by WMO, the International Council for Science (ISC) and UNEP, a platform that integrates in situ and remote observations of the status of the world's ocean and climate and climate change. Established in 1991, GOOS is a collaborative system of ocean observations encompassing in situ networks, satellite systems, Governments, United Nations agencies and individual scientists, which provide ocean observing data and assessments to feed models for climate predictions, weather forecasting, maritime operational services and marine ecosystem health monitoring.



👉 Institutional working relations

The Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) also co-hosts (with Conservation International and the International Union for the Conservation of Nature) the Blue Carbon Initiative. This initiative is a global programme, bringing together Governments, research institutions, non-governmental organizations and communities from around the world, to mitigate climate change through the restoration and sustainable use of coastal and marine ecosystems.

United Nations Environment Programme

👉 Goals/objectives related to climate change

The mission of the United Nations Environment Programme (UNEP) is to provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of future generations. The current UNEP four-year medium-term strategy articulates its role in delivering the promises of the 2030 Agenda. UNEP works on delivering transformational change for people and nature by drilling down to the root causes of the three planetary crises of climate change, nature and biodiversity loss, and pollution and waste. It employs seven interlinked subprogrammes for action: Climate Action, Chemicals and Pollutions Action, Nature Action, Science Policy, Environmental Governance, Finance and Economic Transformations and Digital Transformations.

UNEP helped establish the Intergovernmental Panel on Climate Change (IPCC) and has concentrated on efforts to reduce greenhouse gas emissions, mainly by promoting renewable energy and improved energy efficiency. Its work cuts across the fields of science, policy, technology and finance and works with countries to pursue low-emission development and boost their capacity to adapt and be resilient to climate change through nature-based solutions.



UNEP is helping countries move towards climate resilience and low-emissions strategies through:

- Adaptation and mitigation techniques
- The UN-REDD Programme
- Nature-based solutions
- The access of countries to climate finance
- Support to the private sector to seize opportunities for climate action
- Forecasting services and early warning and disaster preparedness systems

The UNEP Copenhagen Climate Centre (UNEP-CCC) was recently established, jointly with United Nations Office for Project Services (UNOPS), to support developing and middle-income countries in their efforts to progress towards a climate-resilient, low-carbon future and to integrate climate priorities in national development planning. This centre will provide support in building national transparency systems to track and report on climate actions and their impacts; and through market development and innovative business models, it will support governments, cities and the private sector to act on climate change. UNEP-CCC will step up implementation of the UNEP climate change strategy and energy programme, and manage the production of flagship reports on climate change, the Emissions Gap Report and the Adaptation Gap Report.

👉 Use of space technology

The World Environment Situation Room is the new UNEP data, information and knowledge platform that includes georeferenced, remote-sensing and Earth observation integrated with statistics and data on the environmental dimension of sustainable development to support decision-making, policy-setting and action at the global, regional, national and local levels. This federated data system of the best openly accessible environmental data, information and knowledge targets country policymakers, top environmental policymakers, the environmental scientific community, business and interested citizens. It enables users to access, visualize, share and download the data, information and knowledge services regarding the world environment situation in near real time with adequate analytical capacity. This dynamic knowledge platform will be the primary transformational change tool for implementing the global environmental data strategy of UNEP by integrating geospatial digital libraries, data-driven assessments, foresights, global environmental monitoring, communications, citizen science, and support to United Nations country teams and related common country analysis. Designed to collect, process and share the world's best environmental science and research, as well as the mass of new data from satellites, drones and citizen science, including critical tools to review progress on delivering the environmental dimension of Agenda 2030, the World Environment Situation Room will be customized to fulfil the mandate of UNEP. It is designed to promote advocacy on the global environment, accelerate action on climate change, biodiversity and nature loss, chemicals and pollution, and bring more transparency to knowledge of the state of our environment at the global, regional and national levels.

<https://wesr.unep.org/home/aboutus>



The United Nations Biodiversity Lab 2.0 (UNBL) is a free, open-source platform that enables Governments and others to access state-of-the-art maps and data on nature, climate change and human development in new ways to generate insight for nature and sustainable development. It is freely available online to Governments and other stakeholders as a digital public good. UNBL brings together a strong coalition of partners, data providers and technological innovators to support the creation of a digital ecosystem for the planet, which allows policymakers to effectively use open data in spatial planning to deliver on the Paris Agreement and the post-2020 global biodiversity framework. Developed jointly by UNEP, the United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) and the Secretariat of the United Nations Biodiversity Convention, the Lab provides decision makers with access to over 400 spatial data layers across biodiversity, climate change and development, helping them to identify new opportunities to act in the best interest of both people and planet. The mapping dashboard, developed by the UNEP/Global Resource Information Database Geneva (GRID-Geneva), collates spatial data from UNEP-WCMC, GRID-Geneva, NASA, United Nations agencies and premier research institutions to ensure that Governments across the world have access to the data they need to make key conservation and development decisions, and offers a customizable toolkit for analysis, visualization and sharing. It is fully integrated into the World Environment Situation Room.

www.unep.org



<https://geoawesome-ness.com/united-nations-maps-mapx>



www.mapx.org



👉 Institutional working relations

A team of environmental data scientists incorporated into the big data branch of the science division of the UNEP, the Global Resource Information Database Geneva (GRID-Geneva) is a partnership between UNEP, the Swiss Federal Office for the Environment and the University of Geneva. The main role of GRID-Geneva is to transform data into information and knowledge to support the decision-making process related to environmental issues. The scientists of GRID-Geneva process satellite imagery using remote sensing software, create GIS models from geospatial data and generate interactive maps and graphs for automatic updates. GRID-Geneva is also specialized in the design and maintenance of data platforms for supporting UNEP, including the World Environment Situation Room, the Ramsar Convention and many other organizations and environmental agreements. The GRID-Geneva partnership brings a powerful science policy interface with the University of Geneva for solid science, large computation facilities and the Government of Switzerland to advise and support policies. It is also part of the One Global Partnership, which includes more than 15 centres worldwide, working together to keep the environment under review and support UNEP with data processing.

UNEP has also agreed to work together with NASA on the promotion and implementation of the Global Learning and Observations to Benefit the Environment (GLOBE) Programme of NASA and the activities of UNEP. The GLOBE Programme is an international science and education programme that provides students and the public worldwide with the opportunity to participate in data collection and the scientific process and contribute to the understanding of the

Earth system and global environment. Through this partnership, GLOBE and UNEP will cooperate on environmental education and training, citizen science, and the collection and distribution of environmental data. In particular, the partnership strengthens the sharing and interoperability of geospatial data, promoting the availability of rich information for learning and observations towards a better environment. This leverages UNEP initiatives in terms of harnessing the power of big data on the environment.

United Nations Framework Convention on Climate Change

👉 Goals/objectives related to climate change

The Secretariat of the United Nations Framework Convention on Climate Change is tasked with supporting the global response to the threat of climate change.

It provides organizational support and technical expertise to negotiations and institutions of the Convention and facilitates the flow of authoritative information on the implementation of the Convention, the Kyoto Protocol and the Paris Agreement. This includes the development and implementation of innovative approaches to mitigate climate change and drive sustainable development.

The Secretariat supports a complex architecture of bodies that serve to advance the implementation of the Convention, the Kyoto Protocol and the Paris Agreement. The Secretariat provides technical expertise and assists in the analysis and review of climate change information reported by Parties and in the implementation of the Kyoto mechanisms. It also maintains the registry of nationally determined contributions established under the Paris Agreement, a key aspect of implementation of the Paris Agreement. The Secretariat organizes and supports several negotiating sessions each year, the most important being the annual Conference of the Parties. In addition to these major conferences, the Secretariat organizes annual sessions of the subsidiary bodies as well as many meetings and workshops throughout the year.

👉 Use of space technology

Supported by the Secretariat to the Convention, the Subsidiary Body for Science and Technological Advice (SBSTA) is one of two permanent subsidiary bodies to the Convention established by the Conference of the Parties. It supports the work of the Conference of the Parties, serving as the meeting of the Parties to the Kyoto Protocol and of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement through the provision of timely information and advice on scientific and technological matters as they relate to the Convention, the Kyoto Protocol and the Paris Agreement. In addition, SBSTA cooperates with relevant international organizations on scientific, technological and methodological questions. Key areas of work for SBSTA include the impacts, vulnerability and adaptation to climate change, promoting the development and transfer of environmentally sound technologies and conducting technical work to improve the guidelines for preparing and reviewing greenhouse gas emission inventories. SBSTA carries out methodological work under the Convention and promotes collaboration in the field of research and systematic observation of the climate system.

SBSTA has been increasingly emphasizing the value of systematic observations, a term that encompasses Earth observations in the context of the Convention due to their importance for the work of IPCC.

👉 Institutional working relations

Institutional relations with external partners with respect to space-based data are reflected in the context of implementing systematic observations of the climate system, which is supported through WMO, GCOS (and the Global Ocean Observing System, GOOS), CEOS and the CEOS/CGMS Working Group on Climate and other partners and relevant organizations.

WMO supports UNFCCC through a wide range of scientific and technical inputs, including annual greenhouse gas bulletins and Statements on the State of the Global Climate, in collaboration with a wide range of United Nations partners.

GCOS provides its status reports and implementation plan to UNFCCC in five-year cycles. The GCOS Status Report identifies improvements in climate observational capabilities and highlights outstanding issues and gaps. The GCOS implementation plan responds to the findings in the Status Report and recommends actions to achieve a fit-for-purpose global climate observing system, that meets the needs of climate data and information for both science and policy.

IPCC has a well-established role in the Convention process. It provides scientific input to inform the Conference of the Parties and the Convention bodies, in particular SBSTA. It plays a key role in assessing the information from worldwide climate research and has an important function in identifying priority needs for further research activities.

United Nations Institute for Training and Research/United Nations Satellite Centre

👉 Goals/objectives related to climate change

The Climate Change Programme (CCP) represents the core activities of the United Nations Institute for Training and Research (UNITAR) in the area of climate change and the Programme approach aims at building and developing capacity both at the country and regional levels to deal with the impacts of climate change, on both adaptation and mitigation. At the regional and international level, networks are created with centres of excellence and international organizations working on climate change, to produce resource materials such as training modules and climate screening tools that are tested and disseminated for wider use. At the country level, the outputs of these regional and international networks, such as training modules and screening tools, build and develop the capacity of national experts, through training workshops and fellowships, and support country representatives to meet and address their capacity needs regarding climate change adaptation and mitigation. The CCP network is a reflection of the partners the programme works with at the country level to increase and build capacity on climate change. CCP projects reflect how the Programme builds capacity within the research centres of excellence and also at country level. The Global Climate Change Adaptation network, facilitated by the United Nations Environment Programme (UNEP) is an example of an international network of which CCP is a partner. This network proposes to mobilize the resources of relevant regional centres and ground networks to enhance key scientific, technical and most importantly institutional

capacity for adaptation in a synergic and coherent manner that will benefit developing countries.

👉 Use of space technology

The United Nations Institute for Training and Research (UNITAR) has an operational satellite applications programme, promoting evidence-based decision-making for peace, security and resilience by using geospatial information technologies. In June 2021, the United Nations Economic and Social Council adopted a resolution that recognized the programme as the United Nations Satellite Centre (UNOSAT).

The resolution encourages UNITAR to continue developing training programmes on the use of geospatial technologies and knowledge derived from satellite imagery in support of evidence-based decision-making, notably in the field of disaster risk reduction.

UNOSAT has the mandate to provide United Nations funds, programmes and specialized agencies with satellite analysis, training and capacity development, at their request, as well as to continue supporting Member States with satellite imagery analysis over their respective territories and to provide training and capacity development in the use of geospatial information technologies. Its mission is to promote evidence-based decision-making for peace, security and resilience using geospatial information technologies.

One of the main strategic objectives of UNOSAT is to build and develop capacities of Member States to use Earth observation and geospatial information technologies.

Operational since 2003, UNOSAT Rapid Mapping provides satellite image analysis during humanitarian emergencies, both natural disasters and conflict situations. With a 24/7 year-round availability to process requests, a team of analysts ensure timely delivery of satellite imagery derived maps, reports and data ready for direct inclusion in Geographic Information Systems (GIS) according to needs. Typical situations for which UNOSAT Rapid Mapping is activated include floods, earthquakes, storms, landslides, volcanoes, oil spills, chemical waste, refugee and internally displaced persons camp mapping, conflict damage assessment and situation analysis.

✚ Institutional working relations

Under the existing memorandum of understanding with the United Nations Office for Outer Space Affairs (UNOOSA), the entities agree to collaborate particularly on the use of space-based technology for the achievement of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals.

United Nations Office for Disaster Risk Reduction

👉 Goals/objectives related to climate change

By endorsing the Sendai Framework for Disaster Risk Reduction, the General Assembly mandated the United Nations Office for Disaster Risk Reduction (UNDRR) as the focal point for disaster risk reduction within the United Nations system, advocating and promoting coherence and synergies between disaster risk reduction, climate change and ultimately sustainable development.

Climate change has been recognized to undermine the ability to achieve both the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction. In particular, climate change can increase disaster risk in a variety of ways by altering the frequency and intensity of hazardous events, affecting vulnerability to hazards, and changing exposure patterns. Disaster risk is magnified by climate change; it can increase the hazard while at the same time decreasing the resilience of households and communities.

In its Work Programme for 2020–2021, UNDRR continued to advance Sendai Framework implementation and further integrate disaster risk reduction as an essential component of climate action and sustainable development through intergovernmental decision-making and policy-setting.

It is acknowledged that risk-informed strategies and actions need to be anchored on the best available climate and disaster risk analytics. Countries need to ensure that disaster risk reduction strategies are

informed by climate projections, and national adaptation plans are risk informed. This is the only way to have the full picture and develop actions that will help avert, minimize and address risk, losses and damages.

www.undrr.org


👉 Use of space technology

The Bonn Declaration, adopted in November 2017 at a United Nations Germany International Conference on International Cooperation towards Low-Emission, Resilient Societies, specifically called on UNOOSA and UNDRR to work with the space community and relevant partners to develop robust solutions for disaster risk reduction. Pilot programmes of CEOS and UN-SPIDER, which involve the use of applications on Earth observation, telecommunications and Global Navigation Satellite Systems that support disaster risk reduction and recovery efforts, by providing accurate and timely information for decision makers were recognized.

The Declaration also called on WMO, United Nations agencies, GEO and other relevant organizations, to facilitate the identification of relevant satellite data and information to respond to requests from stakeholders, particularly from developing countries, in order to help with implementation of the Sendai Framework, the Paris Agreement on climate and the 2030 Agenda for Sustainable Development.

www.undrr.org/news/space-technologies-key-risk-reduction


👉 Institutional working relations

UNDRR and WMO have established the International Network for Multi-Hazard Early Warning Systems (IN-MHEWS) with other international and national agencies, including UN-SPIDER. This multi-stakeholder partnership facilitates the sharing of expertise and good practice on strengthening multi-hazard early warning systems as an integral component of national strategies for disaster risk reduction, climate change adaptation and building resilience.

United Nations Office for Outer Space Affairs

👉 Goals/objectives related to climate change

The United Nations Office for Outer Space Affairs (UNOOSA) is the Secretariat of the Committee on the Peaceful Uses of Outer Space (COPUOS), which is the only committee of the General Assembly dealing exclusively with international cooperation in the peaceful uses of outer space. Its role as a forum to monitor and discuss developments related to the exploration and use of outer space has evolved alongside the technical advancements in space exploration, geopolitical changes and the evolving use of space science and technology for sustainable development. The overall mandate of the Committee and its two Subcommittees aims at strengthening the international legal regime governing outer space, resulting in improved conditions for expanding international cooperation in the peaceful uses of outer space. The mandate also specifies that the Committee should support efforts at the national, regional and global levels, including those of entities of the United Nations system and international space-related entities, to maximize the benefits of the use of space science and technology and their applications. Overall, the Committee aims to increase coherence and synergy in international cooperation in space activities at all levels.

The Office substantively supports the Committee and its subsidiary bodies in their deliberations on a wide range of issues, including, since 2009, on a dedicated item on space and climate change.

UNOOSA is also the Secretariat of UN-Space, a formal mechanism, which has served as the focal point for inter-agency coordination and cooperation in space-related activities within the United Nations system since 1975, with the aim of promoting cooperation and preventing duplication of efforts related to the use of space applications by the United Nations. UN-Space, also known as the United Nations Inter-Agency Meeting on Outer Space Activities, meets and discusses matters related to the use of space technologies by a wide range of United Nations entities in their activities. UN-Space convenes annual sessions and issues a report on its deliberations for the consideration of COPUOS. In particular, UN-Space has prepared, in cooperation with WMO and UNFCCC and with contributions from other United Nations entities, a dedicated special report on the use of space technology within the United Nations system to address climate change issues. In 2022, UN-Space produced another special report focusing on Space for climate actions. Inter-agency coordination in areas, including on the use of space for climate, is also promoted through the reports of the Secretary-General of the United Nations, which are generated by UN-Space on a biennial basis. Furthermore, UN-Space facilitates consultations of a broader range of stakeholders, such as Member States, the private sector, non-governmental institutions and academia, with United Nations entities, through its open sessions. An open session of UN-Space fully devoted to Space for Climate was held in Geneva in conjunction with the thirty-first session of UN-Space, and featured the participation of UNFCCC, WMO, ITU, UNESCO and UNECA.

Since its creation in 1971, the United Nations Programme on Space Applications has made substantial progress in furthering knowledge and experience of space applications around the world. Provision of country capacity-building, education, research and development support and technical advisory services by the Programme have all helped to reduce the gap between industrialized and developing countries. Climate change is one of the seven areas of work under the Programme, and it organizes a variety of awareness and training activities or thematic sessions with other partners, focusing on the use of satellite-based data and information in support of climate change research or to highlight the connection between climate change and vulnerability to disasters.

The United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) was established by the General Assembly through its resolution 61/110 of 14 December 2006 and is implemented through UNOOSA. The mandate of UN-SPIDER is to enable developing countries to use all types of space-based information in all phases of the disaster management cycle including prevention, preparedness, early warning, response and reconstruction. It develops solutions to address the limited access of developing countries to specialized technologies essential in the management of disasters and the reduction of disaster risks. It also facilitates cooperation between satellite data and information providers and the different groups of users of such data, such as policymakers, disaster risk managers or emergency responders. The Knowledge Portal of UN-SPIDER is a hub for pertinent information, links and resources. Through its tailor-made technical advisory support, UN-SPIDER assesses the individual potential of a country, makes

specific recommendations and carries out specialized training courses for government staff. Additionally, through its conferences, workshops and expert meetings, it brings together relevant stakeholders from both the space and the disaster communities in order to foster an exchange of innovations and experiences.

The Office works to help all countries, especially developing countries, access and leverage the benefits of space to accelerate sustainable development. It also works with space agencies and space leaders around the world to devise solutions to challenges that require an international response. In recent years, the Office has conducted a variety of outreach, awareness-raising and capacity-building activities which have included climate change as a topic. The Office helps to link space and climate experts with decision makers through workshops and symposiums organized directly by the Office or co-organized with partners.

✚ Use of space technology

Space technologies are one of the main key topics of UNOOSA, as the only United Nations office entirely dedicated to space affairs.

✚ Institutional working relations

UNOOSA works across the legal, policy, scientific and technical aspects of the peaceful uses of outer space. To enhance the impact and scale of this work, it partners with stakeholders from across the

international community, such as international organizations, national and regional space agencies and a range of other public, private, academic and civil society institutions.

The list of participating organizations of UN-SPACE include:

Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Convention on Biological Diversity (CBD), Department of Peacekeeping Operations (DPKO), Food and Agriculture Organization (FAO), International Atomic Energy Agency (IAEA), International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), International Telecommunication Union (ITU), United Nations Conference on Trade and Development (UNCTAD), United Nations Convention to Combat Desertification (UNCCD), United Nations Department of Economic and Social Affairs (UN DESA), United Nations Department on Safety and Security (UNDSS), United Nations Development Programme (UNDP), United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Economic and Social Commission for Western Asia (UNESCWA), United Nations Economic Commission for Africa (UNECA), United Nations Economic Commission for Europe (UNECE), United Nations Economic Commission for Latin America and the Caribbean (ECLAC), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Environmental Programme (UNEP), United Nations Framework Convention on Climate Change (UNFCCC), United Nations Geographical Information Working Group (UNGIWG), United Nations High Commissioner for Refugees (UNHCR), United Nations Human Settlements Programme (UN-HABITAT), United Nations Industrial Development Organization (UNIDO), United Nations Initiative on Global Geospatial Information

Management (UN-GGIM), United Nations Institute for Training and Research (UNITAR)/Operational Satellite Applications Programme (UNOSAT), United Nations Office for Project Services (UNOPS), United Nations Office for the Coordination of Humanitarian Affairs (OCHA), United Nations Office on Disaster Risk Reduction (UNDRR), World Food Programme (WFP), World Health Organization (WHO), World Intellectual Property Organization (WIPO), World Meteorological Organization (WMO), and Global Climate Observing System (GCOS)

- UN-Space efforts in coordination of space-related activities within the United Nations system for climate action led to the preparation on 30 May 2022 of the Special Report of the Inter-Agency Meeting on Outer Space Activities on this topic. The document is available under the symbol number A/AC.105/1264.
- The United Nations Office for Outer Space Affairs (UNOOSA) has joined the Space for Climate Observatory (SCO), signing the SCO Charter on 27 June 2022.
- Memorandum of understanding to cooperate in the use of geospatial and space-based technologies with United Nations Development Programme (UNDP) to coordinate in activating emergency response mechanisms for the benefit of United Nations Member States; and to jointly organize annual outreach events and activities, such as conferences, seminars and workshops.
- In March 2022, EUSPA and UNOOSA signed a memorandum of understanding to conduct joint studies and to facilitate knowledge-sharing and education on the European Union Space Programme, and foster a space economy that best supports the United Nations Sustainable Development Goals.

- Memorandum of understanding with UNOSAT to collaborate to further their common goals, particularly the use of space-based technology for the achievement of the 2030 Agenda; to support Member States with technical advisory missions, where the organizations will assess a State's risk and disaster management abilities and recommend solutions with space-based information, including training and capacity development; to coordinate on activities and policy as well as collaborate to improve access to and raise awareness of space applications and Earth observation data.
- UN-SPIDER works together with UNDRR and WMO, along with other international and national agencies, in the International Network for Multi-Hazard Early Warning Systems (IN-MHEWS). This multi-stakeholder partnership facilitates the sharing of expertise and good practice on strengthening multi-hazard early warning systems as an integral component of national strategies for disaster risk reduction, climate change adaptation and building resilience.

For activities related to disaster risk reduction:

- UN-SPIDER builds capacities in developing countries to access and use space technologies, jointly with its network of international partners
- UN-SPIDER collaborates with the UNDRR in global networks such as the International Network Multi-Hazard Early Warning System (IN-MHEWS)
- UN-SPIDER collaborates with UNOSAT on the International Charter for Space and Major Disasters, Copernicus Activations, the International Working Group on Satellite-based Emergency Mapping and joint publications and delivery of training to promote the use of space-based technologies for disaster management

United Nations University

👉 Goals/objectives related to climate change

The United Nations University (UNU) works on climate change and focuses on contributing to insurance safety nets for island communities threatened by sea level rise and extreme weather as well as on advancing strategies to reduce carbon emissions through international cooperation. Furthermore, it is helping democratize access to leading low-carbon technologies for developing countries.

👉 Use of space technology

Following a United Nations University Institute for Water, Environment and Health (UNU-INWEH) survey, which showed that a majority of flood forecasting centres in flood-prone countries lack the ability to run complex flood forecasting models, UNU-led experts have debuted a new tool that generates instant, accurate street-level resolution maps of floods worldwide since 1985. This free online World Flood Mapping Tool was created by UNU-INWEH to help inform disaster mitigation and other planning in all countries, especially those in the Global South where flood risk maps are rare and often badly out-of-date.

The flood mapping tool is the first tool released as part of the Web-based Spatial Decision Support System (WSDSS) to address flood-related information gaps in the currently available flood early warning

and risk management systems. WSDSS comprises the flood mapping tool and a flood risk prediction tool. The flood mapping tool generates inundation maps for significant floods from 1984 until the present using open Earth data. The tool applies a water classification algorithm to “stacks” of historical satellite imagery derived from Landsat to reveal inundation patterns over space and time. The flood mapping tool is a hindcast tool that allows impacts of inundation on various socioeconomic sectors to be analysed. The flood risk prediction tool to be released in 2022 will use artificial intelligence models to generate current and future flood risk maps for three climate change scenarios at the city, district and river basin levels. The artificial intelligence models will be trained using the inundation maps generated by the flood mapping tool and open data sets, including land use, land cover, precipitation, temperature, gender and age-disaggregated socioeconomic data. WSDSS will improve the spatial and temporal coverage of national and regional flood early warning and risk management systems and enhance the spatial resolution of the outputs. It will also build the capacity of flood forecasting centres in the Global South to use artificial intelligence models, big data and cloud computing to analyse the impacts of climate change. The flood mapping tool improves the accuracy of the inundation maps by using data from multiple satellite sensors (harmonized Landsat and Sentinel-2 data) and improves upon the accuracy and development time of flood risk maps by using artificial intelligence models.

👉 Institutional working relations

To understand the risks of climate change and examine how vulnerabilities can be reduced, the United Nations University (UNU) institutes in Belgium, Germany and the Netherlands launched the “UNU Climate Resilience Initiative” in February 2022. Working with partners across the main flood-affected countries in Europe, as well as other flood-prone areas of the world, the initiative aims to share knowledge, shape policy and drive action to better prepare for future extreme weather events.

World Meteorological Organization

👉 Goals/objectives related to climate change

The World Meteorological Organization (WMO) is the co-custodian of the United Nations Sustainable Development Goal 13 on climate action. The challenge facing the WMO community is to provide decision makers with the scientific facts and analysis they need to adapt to climate change impacts and build climate resilience.

The Organization is firmly committed to supporting the Paris Agreement on climate change and to help guide emission-reduction actions as per nationally determined contributions.

<https://public.wmo.int/en/resources/bulletin/integrated-global-green-house-gas-information-system-ig3is>



The Organization helps its members to monitor the climate of the Earth on a global scale so that reliable information is available to support evidence-based decision-making on how to best adapt to a changing climate and manage risks associated with climate variability and extremes.

In addition to producing annual reports on the state of the global climate and seasonal updates, global climate data sets are submitted by international domain subject matter experts and assessed for the WMO Catalogue for Climate Data. The content of the catalogue will expand quickly with regional and national climate data sets.

The Organization supports climate policymaking by providing authoritative advice and information on climate change mitigation and adaptation. It draws from available scientific expertise from the

national hydrological and meteorological services of its members, and international data centres and agencies. The Organization promotes international action and cooperation on climate change by establishing Regional Climate Centres and Regional Climate Outlook Forums. By promoting and coordinating many of the observing systems and research networks that underpin climate science, it has played a leading role in convincing Governments to address climate change. Moreover, it promotes a better understanding of the societal impacts of climate change within the United Nations system.

To fulfil its mandate in the field of climate variability and climate change, WMO supports the United Nations Framework Convention on Climate Change by:

- Reporting to the Conference of the Parties about the recent progress and future plans of observation systems and research programmes that support the implementation of article 5 of UNFCCC
- Coordinating the World Meteorological Organization Integrated Global Observing System (WIGOS)
- Operating the World Meteorological Organization Information System for managing and exchanging data and information about weather, climate and water
- Leading the United Nations Global Framework for Climate Services (GFCS), a worldwide partnership that produces and uses climate information services for managing and adapting to climate risks

- Providing annual scientific reports on greenhouse gas concentrations and global climate trends (annual greenhouse gas bulletins and Statements on the State of the Global Climate)
- Providing capacity development to assist governments to monitor and forecast climate trends
- Addressing climate information requirements for disaster risk management
- Contributing to the United Nations Alliance on Climate Change Education, Training and Public Awareness
- Co-sponsoring and hosting the Intergovernmental Panel on Climate Change (IPCC)
- Co-sponsoring and hosting the World Climate Research Programme (WCRP)
- Co-sponsoring and hosting the Global Climate Observing System (GCOS)

The World Meteorological Organization Integrated Global Observing System (WIGOS) is one of the top priorities of WMO as the new overarching framework for all its observing systems, comprising space, air, land and sea-based instruments that monitor the state of the atmosphere of the Earth, ocean and land surface and water cycle. A key component of WIGOS is the Global Observing System (GOS), whose components belong to the national meteorological and hydrological services of WMO members, to other national and international agencies such as space agencies or to private entities. In response to the demand for a significant worldwide upgrade of space- and surface-based observations and predictions caused by current global challenges, WIGOS provides a new integrated approach incorporating the most recent scientific and technical

advances. The framework promotes network integration and partnership outreach and engages the regional and national actors essential for the successful integration of these systems. These national and international WIGOS partnerships allow the members of WMO to build observing capabilities and achieve better national, regional and global coverage. This evolved integrated observing system will be a comprehensive “system of systems” interfaced with WMO co-sponsored and other observing systems, making major contributions to the Global Earth Observation System of Systems (GEOSS).

WIGOS enables members and their partners to better respond to natural hazards, improve weather, water, climate and related environmental monitoring and to adapt to climate change and human-induced environmental impacts while providing avenues for education, training and capacity development. These objectives are at the very core of the mandate of WMO and are particularly evident in the United Nations-wide Global Framework for Climate Services (GFCS), which it leads.

✦ Use of space technology

Recognizing the growing importance of data collected by space-based systems, the World Meteorological Organization (WMO) established in 2003 the WMO Space Programme. The overall goal of the Programme is to achieve maximum benefits from Earth observation satellites for WMO applications. It promotes the availability and utilization of satellite data and products for weather, climate, water and related applications of WMO members. Its scope is to coordinate satellite and other space-related activities throughout

all WMO Programmes; to give guidance to these programmes on the potential of remote-sensing techniques in meteorology, hydrology and related disciplines and applications; and to ensure effective cooperation with and among international partners and organizations dealing with satellite systems.

A major task of the WMO Space Programme is to contribute to the development of the space-based component of WIGOS, which is guided by the targets of the Vision for WIGOS in 2040 and supports all WMO-sponsored and co-sponsored programmes as a component of WIGOS. The integrated space-based observing system consists of the operational and research and development environmental satellites and ground segments. This task includes the monitoring of operational as well as the planning of future satellite missions for weather, water and climate observations serving all WMO application areas. It coordinates the activities of members related to the space-based observing system component of WIGOS to ensure sustained and interoperable satellite observations and to promote their applications. Its work is coordinated by the Space Systems and Utilization Division in the WIGOS branch of the Infrastructure Department.

The Global Space-based Inter-Calibration System (GSICS) is an international collaborative effort (currently with 18 entities) initiated in 2005 by WMO and CGMS to monitor, improve and harmonize the quality of observations from operational weather and environmental satellites. GSICS aims at ensuring consistent accuracy among space-based observations worldwide for climate monitoring, weather forecasting and environmental applications. Its results are being used for climate data records processing activities. GSICS contributes to the integration of satellite data within WIGOS and within GEO.

<https://gsics.wmo.int/en>



✦ Institutional working relations

- The space-based component relies on enhanced collaboration through partnerships with satellite operating agencies such as CGMS and CEOS
- WMO is a member (and Secretariat) of GEO
- WMO leads the Global Framework for Climate Services (GFCS)
- Co-sponsor of IPCC (and host)
- Co-sponsor of GCOS (and host)
- WMO provides a Statement on the State of the Global Climate and the Greenhouse Gas Bulletin to the Conference of the Parties

World Bank Group

👉 Goals/objectives related to climate change

The World Bank Group sees climate action as fundamental to alleviating poverty and boosting shared prosperity, a mission that is at the core of its development mandate. It published www.worldbank.org its Climate Change Action Plan to guide its interventions from 2021 to 2025. The plan broadly lays out how the Bank will support climate action through both mitigation and adaptation efforts for the government and private sector of its clients. It aims to advance the climate change aspects of the green, resilient and inclusive development of the World Bank Group approach, which pursues poverty eradication and shared prosperity with a sustainability lens. In the Action Plan, the World Bank Group will support countries and private sector clients to maximize the impact of climate finance, aiming for measurable improvements in adaptation and resilience and measurable reductions in greenhouse gas emissions. The plan also considers the vital importance of natural capital, biodiversity and ecosystem services and aims to increase support for nature-based solutions, given their importance for both mitigation and adaptation. As part of its effort to drive climate action, the World Bank Group has a long-standing record of participating in key partnerships and high-level forums aimed at enhancing global efforts to address climate change. The new action plan represents a shift from efforts to “green” projects, to greening entire economies, and from focusing on inputs, to focusing on impacts. It concentrates on integrating climate and development as well as identifying and prioritizing action on the largest mitigation and adaptation

opportunities and using those to drive its climate finance and leverage private capital in ways that deliver the most results.

The Climate Change Knowledge Portal (CCKP) is the hub for climate-related information, data and tools for the World Bank Group. Developed to service the needs of expert and non-expert users, the Portal provides global data on past climate and future climate change projections, as well as socioeconomic data to support users in their climate-resilient decision-making. The Portal provides an online platform from which a wide range of users can access and analyse comprehensive data related to climate change and development, allowing them to apply scientific information to the design of a project or policy, and also provides links to other resources and tools. The platform is built to enhance the understanding of the changing climate across different levels of detail. Using the latest climate data and scientific research available, the Portal provides development practitioners with resources to explore, evaluate, synthesize and learn about future climate scenarios, projected risks and climate-related vulnerabilities at multiple levels of detail. The Portal also contains disaster risk data sets, as well as synthesis products, such as the climate risk country profiles, which are built and packaged for specific user-focused functions in a particular country or sector.

<https://climateknowledgeportal.worldbank.org/about>



👉 Use of space technology

The World Bank Group supports client countries in creating open databases and monitoring systems that include geospatial dimensions for better, more transparent evidence and data-driven decision-making. The World Bank Group worked with the European Space Agency (ESA) on the Earth observation for Sustainable Development Climate Resilience (EO4SD-CR) cluster during its most recent upgrade of CCKP, to identify Earth Observation data that could be seamlessly integrated into the existing architecture for instant access by users, as well as gain insight about the potential of Earth observation data to support climate-resilient decision-making at regional and national levels.

www.preventionweb.net/publication/earth-observation-data-climate-change-knowledge-portal-cckp



The World Bank Group and ESA have been collaborating since 2008, within the Sustainable Development Cluster of the World Bank Group, jointly implementing technical assistance projects that have been providing specialized mapping and monitoring tools in over 20 different countries. The projects have focused on areas such as forestry management, combating illegal fishing, monitoring coastlines for changing climate and managing urban development.

Satellite information has also been increasingly included in risk mitigation and climate change adaptation programmes in a broad range of situations such as coastal lowland subsidence and flood defence. The global initiative on remote sensing for water resources management was conceived to help mainstream the use of beneficial remote sensing applications in operational projects, as well as to facilitate the adoption of remote sensing applications in its client countries. Within the Initiative, a range of innovative remote sensing applications were developed to help address specific water resources management challenges by improving monitoring and predictive capabilities and supporting better water-related operations.

www.esa.int/Applications/Observing_the_Earth/Understanding_risk_with_Earth_observation



<https://openknowledge.worldbank.org/handle/10986/29333>



The World Bank Group has been working with partners through open-source collaborations to put satellite measurements and tools in action to monitor and achieve the Sustainable Development Goals. From predicting crop yields in smallholder farms, to measuring the impacts of transportation projects in South Asia, to measuring spatial development, monitoring rural electrification and mapping land cover and land-use dynamics. These innovations have been incubated through support by the Innovations in Big Data Programme and the geospatial operations support team in the Development Economics Vice Presidency of the World Bank Group. In addition to testing and supporting innovative solutions and pilots, the World Bank Group also acknowledges and values the mainstreaming applicability of satellite Earth observation across all sectors of sustainable development. To achieve a widespread adoption of this technology and eventually foster knowledge transfer to country clients, the World Bank Group implements “Space in support of International Development Assistance”. The main aim of this partnership is to develop the wide-scale, systematic use of satellite Earth observation as best-practice source of environmental information, integrated in the working practices and finances for all phases and activities of development assistance operations. Within this framework, the World Bank Group has set up the Space Partnership Multi-Donor Trust Fund to be financed by official development assistance sources. The trust fund supports activities in the domains of capacity-building (training for the use of Earth observation-based environmental information) and skills transfer (training for the production of Earth observation-based information) in developing countries. Over the period 2020–2024, ESA will carry out the technical knowledge developments (information products,

<https://blogs.worldbank.org>



<https://eo4society.esa.int>



user-oriented analytics tools) that are required for new types of environmental information arising from development operational needs.

Satellite Earth observation has also been one of the pillars of the disaster risk management practice at the World Bank Group in the event of natural disasters. Satellite data are used to support large-scale emergency recovery programmes through a post-disaster needs assessment. The disaster risk specialists of the World Bank Group help countries around the world prepare for catastrophes such as earthquakes and extreme weather events with support from the Global Facility for Disaster Reduction and Recovery (GFDRR).

www.financialprotectionforum.org/blog/using-satellite-data-for-climate-crisis-and-disaster-risk-finance



👉 Institutional working relations

The World Bank Group signed a memorandum of intent in 2015 at the Conference of the Parties to work with the European Space Agency and other groups to integrate Earth observation into the Sustainable Development Goal framework as part of its EO4SD initiative. In 2017, the areas covered were extended to climate resilience, disaster risk reduction, fragile and conflict States, ocean resources and the marine environment. The partnership also expanded to explore on a larger scale how satellite information can be integrated and mainstreamed into projects and research of the World Bank Group to reduce poverty, monitor environmental changes and stimulate economic growth in developing countries. The two organizations are now collaborating under the new Space for International Development Assistance initiative. The Crisis and Disaster Risk Finance team of the World Bank Group has also put in place a technical assistance programme on crisis risk finance analytics which leverages innovative analytics at global, country and project levels to create an enabling environment for improved risk financing and risk management. The programme is funded by the Global Risk Financing Facility (GRiF) and is under the joint technical partnership of the World Bank Group and the European Space Agency.

www.worldbank.org



www.financialprotectionforum.org/blog/leveraging-space-technology-for-climate-risk-finance



European Centre for Medium-Range Weather Forecasts

👉 Goals/objectives related to climate change

The core mission of the European Centre for Medium-Range Weather Forecasts (ECMWF) is to produce numerical weather forecasts and monitor the Earth system and carry out scientific and technical research to improve forecast skill. The Centre works in collaboration with national meteorological and hydrological services and research institutions from many of the member and cooperating States, to develop its modelling capabilities, to design new products and to evaluate and diagnose forecast quality.

The Centre provides global forecasts, climate reanalyses and specific data sets, designed to meet different user requirements. ERA5, which provides hourly estimates of a large number of atmospheric, land and oceanic climate variables, is produced by the Copernicus Climate Change Service (C3S) at ECMWF, and is the current atmospheric reanalysis for climate monitoring.

The C3S outreach strategy aims to ensure effective and consistent communication from the service elements to the users. ECMWF aims to promote the service to relevant bodies and create public awareness of the role of the Climate Change Service by developing educational resources and organizing events to raise awareness of climate change issues.

👉 Use of space technology

The Centre operates two services from the Copernicus Earth Observation programme, the Copernicus Climate Change Service (C3S) and the Copernicus Atmosphere Monitoring Service (CAMS). It has been implementing C3S and CAMS since 2014, with the first phase completed in 2021. The second phase commenced formally in July 2021 and will run for the next seven years. The Centre also contributes to the Copernicus Emergency Management Service (CEMS) and works closely with the Copernicus Marine Environment Management Service.

To deliver these activities, the Centre provides global numerical weather forecasts, air quality analysis, atmospheric composition monitoring, climate monitoring, ocean circulation analysis, hydrological predictions and fire risk predictions.

The Centre implements C3S on behalf of the European Union. The service provides comprehensive climate information covering a wide range of components of the Earth system (atmosphere, land, ocean, sea ice and carbon) and timescales spanning decades to centuries (i.e. based on the instrumental record). It maximizes the use of past, current and future Earth observations (from in situ and satellite observing systems) in conjunction with modelling, supercomputing and networking capabilities. C3S combines observations of the climate system with the latest science to develop authoritative,

quality-assured information about the past, current and future states of the climate in Europe and worldwide.

The portfolio of service products includes:

- Consistent estimates of multiple essential climate variables
- Global and regional reanalyses (covering a comprehensive Earth system domain: atmosphere, ocean, land, carbon)
- Products based on observations alone (gridded; homogenized station series; reprocessed climate data records)
- A near-real-time climate monitoring facility
- Multi-model seasonal forecasts
- Climate projections at global and regional scales

This wealth of climate information is the basis for generating a wide variety of climate indicators aimed at supporting adaptation and mitigation policies in Europe in a number of sectors.

The Centre also implements the Copernicus Atmosphere Monitoring Service (CAMS). The increasing concentration of greenhouse gas and the cooling effect of aerosols are prominent drivers of a changing climate, but the extent of their impact is often still uncertain. To address these environmental concerns there is a need for data and processed information. CAMS has been developed to meet these needs, to support policymakers, business and citizens with enhanced atmospheric environmental information.

CAMS delivers the following operational services:

- Daily production of near-real-time analyses and forecasts of global atmospheric composition
- Reanalyses providing consistent multiannual global data sets of atmospheric composition with a frozen model/assimilation system
- Daily production of near-real-time European air quality analyses and forecasts with a multi-model ensemble system
- Reanalyses providing consistent annual data sets of European air quality with a frozen model/assimilation system, supporting in particular policy applications
- Products to support policy users, adding value to “raw” data products in order to deliver information products in a form adapted to policy applications and policy-relevant work
- Solar and radiation products supporting the planning, monitoring and efficiency improvements of solar energy production and providing quantitative information on irradiance for downstream applications related to health and ecosystems
- Climate forcing from aerosols and long-lived (CO₂, CH₄) and shorter-lived (stratospheric/tropospheric ozone) agents
- Anthropogenic emissions for the global and European domains and global emissions from wildfires and biomass burning

ECMWF also contributes to the Copernicus Emergency Management Service (CEMS). The latter provides information for emergency response in relation to different types of disasters, including meteorological hazards, geophysical hazards, deliberate and accidental man-made disasters and other humanitarian disasters as well as prevention, preparedness, response and recovery activities.

ECMWF contributes to early warning systems for flood awareness and forest fire information.

ECMWF runs the computational centre for the European Flood Awareness System (EFAS), with responsibility for running the forecasts, post-processing, and hosting the EFAS information system platform. The Centre also runs and manages the Global Flood Awareness System (GloFAS), which became a fully operational 24/7 service in 2018.

ECMWF is also the computational centre for the Copernicus Emergency Management Service Fire. It provides fire danger calculations from high-resolution and ensemble forecasts, as well as temperature and precipitation anomalies. The data feed into the European Forest Fire Information System, which was established to support the national authorities responsible for the management of forest fires in the European Union and neighbouring countries, as well as to provide the European Commission and the European Parliament with reliable information on trends associated with these incidents.

👉 Institutional working relations

For the Copernicus Climate Change Service (C3S), ECMWF has a multiannual agreement with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) for its satellite data records.

C3S builds upon and complements capabilities existing at national level and being developed through several climate-change research initiatives. It has become a major contribution from the European Union to the World Meteorological Organization (WMO), the Global Framework for Climate Services (GFCS) and its Climate Monitoring Architecture.

ECMWF also provides advanced training to scientific staff in member and cooperating States and assists WMO with its programmes.

It participates in a four-party arrangement with EUMETSAT, Mercator Ocean International and the European Environment Agency to cooperate on the Copernicus data and information access service platform.

European Commission

👉 Goals/objectives related to climate change

One of the six priorities that the European Commission identified for its current mandate (2019–2024) is delivering a European Green Deal to transform the European Union into a modern, resource-efficient and competitive economy, while preserving the natural environment of Europe, tackling climate change and making Europe carbon-neutral and resource-efficient by 2050.

The Directorate-General for Climate Action (CLIMA) leads the efforts of the European Commission to fight climate change at European Union and international level. Its key mission is to formulate and implement European Union climate policies and strategies, so that the European Union can turn into the first climate-neutral and climate-resilient continent by 2050. CLIMA promotes innovative decarbonization technologies to tackle global warming. It aims at ensuring prosperity and well-being, instilling a new climate culture in Europe, changing behaviours across our society. It maintains a global leadership in climate action, protecting the ozone layer, enhancing the international and domestic carbon market. Furthermore, it contributes to greening finance, ensuring the mainstreaming of climate action into the European Union budget, and into European Union and Member States policies. The European Commission has put forward a series of legislative proposals to make its policies fit for delivering the updated 2030 greenhouse gas emissions net reduction target of 55 per cent below 1990 levels, as set out in the 2030 Climate Target Plan and written into the European Climate Law.

👉 Use of space technology

In support of the European Green Deal, the space policy of the European Union actively contributes to fighting climate change, stimulates technological advances and innovation, and provides socioeconomic benefits to citizens.

The Directorate-General for the Defence Industry and Space (DEFIS) leads the activities of the European Commission in the defence industry and space sector. In the area of Space, DEFIS is in charge of implementing the European Union Space programme, which enables solutions to tackle global challenges such as sustainability and climate change, safety and security, and emergencies and mobility. It bolsters the European Union Space policy in the fields of Earth observation, satellite navigation, connectivity, space research and innovation, and supports investments in critical infrastructure and disruptive technologies.

The European Union Space Programme delivers European space-based services such as the Earth observation system, Copernicus, which supports environmental management and helps to mitigate the effects of climate change and ensures safety and civil security across Europe. The global satellite navigation and positioning system, Galileo, provides accurate positioning and timing information. The Galileo and Copernicus programmes continuously and accurately gather data that contribute to the production of essential climate variables monitoring the state of the climate. The Copernicus

Programme provides real-time and forecast information products, as well as informed mapping products, that empower citizens, entrepreneurs, researchers and public authorities, to find data-driven innovative solutions and take responsible action for a more sustainable future. In addition, Galileo provides high accuracy positioning and navigation signals that are essential for monitoring and mapping applications.

The Copernicus Programme is the Earth observation system of the European Union, composed of Sentinel satellites and contributing missions as well as in situ data. Free, full and open access satellite data are used to provide services, which aim to ensure the operational monitoring of the atmosphere, oceans and continental surfaces to provide reliable, validated information services for a range of environmental and security applications in six areas of land monitoring, marine environment monitoring, atmosphere monitoring, climate change, emergency management and security. The Copernicus Climate Change Service (C3S) routinely monitors the climate and evolution of the Earth and provides information about the past, present and future climate in Europe and the rest of the world. The monthly Climate Bulletin of the Climate Data Store presents the current condition of the climate using key climate change indicators. It also provides an analysis of the maps included and information on how they are produced, as well as comparisons with the past. The C3S service gives key indicators on a number of essential variables such as temperature, sea ice and CO₂.

Destination Earth (DestinE) is another initiative of the European Commission through its Directorate-General for Communications Networks, Content and Technology (CONNECT). DestinE is an

ambitious initiative to develop a very high precision digital model of the planet (a “digital twin”) that can monitor, analyse, predict and safeguard various terrestrial aspects including climate dynamics, natural disasters, food and water security, ocean circulation and biodiversity. Constantly fed with Earth observation data, combined with in situ measurements and artificial intelligence, the digital twins aim to provide a highly accurate representation of the past, present and future changes of the Earth.

✚ Institutional working relations

The European Union Space Programme is implemented in close cooperation with European Union Member States, the European Union Agency for the Space Programme (EUSPA), the European Space Agency (ESA), the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and many other stakeholders.

The European Commission manages the Copernicus Programme, which is implemented in partnership with Member States, ESA, EUMETSAT, ECMWF, European Union agencies and Mercator Ocean International.

ESA is responsible for the development of the space-segment component and operates the Sentinel-1, Sentinel-2 and Sentinel-5P satellites. ESA also delivers the land mission from Sentinel-3.

EUMETSAT is responsible for operating the Sentinel-3 satellites and delivering the marine mission and will also operate and deliver

products from the Sentinel-4 and -5 instruments, and the Sentinel-6 satellites.

ESA and EUMETSAT will coordinate the delivery of data from 30+ satellites that form the contributing missions. The ground segment, which is spread geographically, relies on existing infrastructure that is also provided by national public and private facilities.

The Copernicus Climate Change Service (C3S) is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF).

The recent Copernicus 2.0 agreement (signed December 2021) also includes:

- A four-party arrangement between EUMETSAT, ECMWF, Mercator Ocean International and the European Environment Agency to continue to cooperate on the federated cloud-based Copernicus data and information access service platform, WEkEO, from 2022 to 2028
- The implementation arrangement for cooperation between EUMETSAT and ESA on the CO2M mission: EUMETSAT will operate the CO2M satellites and receive, process and disseminate their data

For Destination Earth (DestinE): ECMWF, ESA and EUMETSAT are the three organizations entrusted by the European Union to deliver the first phase, building the digital twin engine and the development of the first two digital twins on weather-induced extremes and climate change adaptation by 2024 and to implement the programme over the next 7–10 years. Specifically, EUMETSAT is responsible for the Destination Earth (DestinE) Data Lake, ESA for the Destination Earth (DestinE) Core Service Platform and ECMWF for the two initial digital twins on extreme weather and climate adaptation.

European Organization for the Exploitation of Meteorological Satellites

👉 Goals/objectives related to climate change (and use of space technology)

The European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) is an operational organization that gathers accurate and reliable satellite data on weather, climate and the environment around the clock, and delivers them to its Member States, to international partners and to users worldwide.

The first priority of EUMETSAT is to fulfil the essential requirements of its Member States in terms of observations, data and support services for operational weather as well as Earth system monitoring and forecasting for climate services, through its own satellite programmes.

Included among its nine strategic objectives are:

- Consolidating the contribution of the organization to the realization of the Vision for WIGOS in 2040 and planning future satellite systems
- As a partner of the Space Strategy for Europe, delivering Copernicus ocean and atmospheric composition monitoring missions and contributing to collaborative research and innovation projects for the common benefit of EUMETSAT and European Union Member States

- Cooperating with other satellite operators and contributing to global partnerships for monitoring the weather, climate and greenhouse gases from space to meet additional needs of Member States.

For climate monitoring, EUMETSAT provides scientific data from space needed to understand climate variability and change.

The data and products from EUMETSAT long-term, multi-satellite programmes provide an increasing portfolio of observations that are key contributions to climate monitoring and make a significant contribution to the monitoring of climate change. EUMETSAT processes these satellite observations to develop climate data records, which are a time series of satellite measurements of sufficient length and consistency to determine climate variability and change. EUMETSAT responds to requirements expressed by the Global Climate Observing System (GCOS) and generates climate data records from long series of satellite observations.

The climate monitoring activities of EUMETSAT rely on the archiving and data processing infrastructure available at its central facilities in Darmstadt and the network of Satellite Application Facilities (SAF) distributed across its Member States, with a leading role assigned to the Climate Monitoring Space Application Facilities (CM SAF).

EUMETSAT delivers climate data and information available to its Member States, the Copernicus Climate Change Service, and users worldwide, including the global scientific community.

Climate monitoring is addressed across all EUMETSAT activities, from operations to the planning of future satellite systems, and involves specific scientific and technical efforts for the recalibration of historical data and the extraction of climate records. In practice, EUMETSAT implements its climate monitoring mission through the following activities:

- Delivering advanced multi-satellite programmes providing the operational perspective and long-term commitment required for climate monitoring
- Maintaining a unique archive of decades of space-based observations of the atmosphere, ocean and land surfaces
- Producing consistent climate data records through recalibration of space-based observations and reprocessing of the long series of physical and geophysical products thereof
- Cooperating with the scientific community to validate climate data records and stimulate their use within the Global Framework for Climate Services (GFCS)
- Ensuring easy access to a broad range of well-documented climate data records
- Supporting the European Union in the definition and implementation of its Copernicus Climate Change Service (C3S)
- Supporting climate-related capacity-building initiatives, especially in Africa

The overall framework for the climate engagement of EUMETSAT is the Climate Monitoring Implementation Plan approved by its Council. This plan prioritizes climate-related efforts, provides an overview of

committed and planned activities and identifies relevant frameworks and opportunities for international cooperation.

In 1996, the EUMETSAT Council decided to nominate the “Deutscher Wetterdienst” as host for the EUMETSAT Satellite Application Facility dedicated to climate monitoring. The Climate Monitoring Satellite Application Facilities (CM SAF) is in continuous development and operations phase, which is approved in five-yearly segments by the EUMETSAT Council. A central goal of the continuous development and operations phase (2017–2022) is to further improve all the CM SAF data records to a quality level that allows more accurate studies at longer timescales.

CM SAF is an integral part of the distributed EUMETSAT Application Ground Segment.

CM SAF develops, generates, archives and distributes high-quality satellite-derived products of the global energy and water cycle in support of monitoring, understanding and adapting to climate variability and climate change. Specifically, it provides satellite-derived geophysical parameter data records suitable for climate monitoring. It provides climate data records for essential climate variables, as required by the Global Climate Observing System (GCOS) implementation plan in support of the United Nations Framework Convention on Climate Change. CM SAF products are derived from observations of several instruments on board operational satellites in geostationary and polar orbit, which are provided by EUMETSAT, the National Oceanic and Atmospheric Administration and the Japan Meteorological Agency.

The role of CM SAF in climate monitoring and research is via its contribution to:

- The observational part by contributing relevant data records
- Understanding by supporting process studies, climate trend and variability analysis
- Improving (climate) models by providing data records for validation and by provision of satellite simulators

👉 Institutional working relations

All EUMETSAT climate activities are embedded in international cooperation frameworks.

EUMETSAT supports the Global Climate Observing System (GCOS) in the assessment process, as well as the related efforts of the WMO space programme. The objective is to facilitate access to EUMETSAT data, products and services and make the best use of available and planned satellite services in order to help individual countries and regions to meet their respective needs.

Cooperative projects are ongoing to cross calibrate data from missions of the Committee on Earth Observation Satellites (CEOS) and the agencies of the Coordination Group for Meteorological Satellites (CGMS) and develop the sustained generation of new improved climate data records. In this area, EUMETSAT has been supporting the WMO Global Space-based Inter-Calibration System (GSICS) since its initiation in 2005, and both hosts the Secretariat of the Sustained and Coordinated Processing of Environmental satellite

data for Climate Monitoring (SCOPE-CM) initiative and is involved in several SCOPE-CM projects, through its central facilities and its Satellite Application Facilities (SAF) network.

EUMETSAT also serves as the Secretariat of CGMS.

EUMETSAT provides data, products and support services to the Copernicus information services and user communities, with a focus on marine, atmosphere and climate. This involves delivering Earth observation data services to Copernicus from the Sentinel satellites, from its own Metop and Meteosat missions, from the ocean-monitoring Sentinel-3 satellites and Jason-3, and from missions of its international partners. EUMETSAT is responsible for operating the Sentinel-3 and Sentinel-6 satellites and will also operate and deliver products from the Sentinel-4 and Sentinel-5 instruments on board Meteosat Third Generation and Metop Second Generation satellites, respectively. In addition, upon request of the European Commission, EUMETSAT is also responsible for delivering data and products from Sentinel missions to third parties around the world.

In December 2021, EUMETSAT, announced a series of new agreements, contracts and data exchange arrangements through the signing of the Copernicus 2.0 agreement with the European Union, which includes:

- A four-party arrangement between EUMETSAT, ECMWF, Mercator Ocean International and the European Environment Agency to continue to cooperate on the Copernicus data and information access service platform, WEkEO, from 2022 to 2028

- The implementation arrangement for cooperation between EUMETSAT and ESA on the Copernicus CO2M mission. EUMETSAT will operate the satellites and receive, process and disseminate their data
- An extension of the multiannual agreement for EUMETSAT to provide satellite data records to ECMWF, for the Copernicus Climate Change Service (C3S)

The role of EUMETSAT in Destination Earth is to provide the end-to-end data lake service based on its expertise in developing and managing multichannel data services, which provide access to weather and climate-related data and information. The focus is on bringing users to the data to allow distributed online processing, as opposed to having to download data. The data lake will, as one core service, incorporate a large diversity of different data spaces. This will also include data from EUMETSAT Earth observation satellite systems, as well as from the European Copernicus Sentinel missions, ESA missions and ECMWF.

European Space Agency

👉 Goals/objectives related to climate change

In its Agenda 2025, the European Space Agency (ESA) announced it would appoint a Senior Climate and Sustainability Adviser to the Director General to ensure that ESA and European space programmes can support the implementation of the Paris Agreement and the European Green Deal to the fullest extent.

👉 Use of space technology

ESA has been offering data from Earth observation satellites in near-real time to decision makers and scientists since 1992 in order to manage natural resources, respond to natural disasters and better understand climate change. Earth observation is one of the eight major ESA programmes.

The Earth Observation Programme is a main player in the international landscape supporting climate science and monitoring. ESA satellites provide the global view, enabling the science community to detect signs of change, identify significant trends and constrain models to predict the future. Addressing and tackling climate change is central to the work of this programme to predict future change, support effective policymaking, enabling communities to build a more sustainable and resilient future, and tackle the consequences of a changing world. Through its role as a major provider of systematic and global climate observations, ESA interacts

with a number of international organizations that are working towards strengthening the scientific understanding and projection of climate and addressing the consequences of future change.

Climate-relevant observations are provided by a large number of satellites developed and operated by ESA. For instance, the Earth Explorers satellite missions provide answers to urgent questions and help strengthen scientific knowledge of Earth system processes and their interactions. For example, CryoSat, Soil Moisture and Ocean Salinity and Aeolus offer new insights on the behaviour of the cryosphere, soil moisture, ocean salinity and atmospheric circulation.

Working with the European Union, ESA developed the Copernicus Sentinels family of satellites specifically for the operational needs of the Copernicus Programme. The Space Component is managed by ESA and serves users with satellite data available through the Sentinels and the Copernicus Contributing Missions at national, European and international levels. ESA is developing six new Copernicus Sentinel Expansion missions on behalf of the European Union, beginning with the Copernicus Anthropogenic Carbon Dioxide Monitoring (CO2M) mission.

In response to the requirements of UNFCCC for systematic monitoring of the climate system, ESA launched its Climate Change Initiative programme in 2008. The Climate Change Initiative (CCI) merges the archived Earth observation data, in addition to data from international partners collected over five decades, to create a suite of long-term,

global data records for the key aspects of the climate system. These empirical observations provide the evidence to advance scientific understanding and support UNFCCC and IPCC.

The objective of CCI is to realize the full potential of the long-term global Earth observation archives of ESA, together with its Member States, by undertaking the activities necessary to provide a significant and timely contribution to the GCOS-defined Essential Climate Variables databases required by UNFCCC. Expert science teams drawn from ESA Member States undertake research to generate the CCI essential climate variables that track changes across the oceans, atmosphere and land. The Initiative comprises 26 parallel projects geared to essential climate variables data production, plus a dedicated climate modelling user project for assessment of the products, a portal providing all products under one roof, a toolbox to facilitate the combining and analysis of the products, and a visualization tool supporting outreach. A growing body of essential climate variables records is now freely available via the CCI Open Data Portal. These climate-quality data sets are a major contribution to the evidence base used to understand climate change, which drives international action.

In addition to the CCI research programme, the Climate Office oversees four additional research projects that address climate systems to which several essential climate variables contribute, including closing the global and regional sea-level and carbon budgets and support to global climate modelling efforts. The Climate Office has established the Climate Modelling User Group as a dedicated forum to link the climate modelling community with their

climate system perspective to satellite Earth observation experts, thereby fostering collaboration across the CCI programme.

Other initiatives related to sustainable development under the Earth observation programme are managed from the ESA Centre for Earth Observation. Since 2008, ESA has worked closely with international financial institutions and their client countries to harness the benefits of Earth observation in their operations and resources management. Earth Observation for Sustainable Development (EO4SD) is a new ESA initiative which aims at increasing the uptake of Earth observation-based data in regular development operations at national and international level. The ESA EO4SD Climate Resilience Cluster project aims to provide insight about the potential of Earth observation to support climate-resilient decision-making at the regional and national scale. In collaboration with several international financial institutions, the project will develop an Earth observation-based integrated climate screening and risk management service to help manage climate-related risks and capitalize on the opportunities that climate resilience can create. The solution will provide a quick, easy assessment of climate anomalies and a rapid calculation of climate risk indicators, their historical evolution and associated extreme events. The project will also build capacity in client States of international financial institutions allowing stakeholders to autonomously use Earth observation-based information for climate resilience decision-making.

ESA also launched its Global Development Assistance Programme (GDAP), which aims to foster impact through the systematic integration of Earth observation data in development projects.

Under this programme, ESA will carry out the technical knowledge development (information products, user-oriented analytics tools) over 2020–2024 that are required for new types of environmental information arising from development operational needs. Initial sectors to be addressed include climate resilience, disaster resilience, States subject to fragility, conflict and violence, and urban sustainability. In the disaster resilience domain, the main focus of GDAP is on hazard, exposure and vulnerability mapping in order to better meet the information requirements of international financial institutions. To achieve this, ESA engages a European consortium of specialized Earth observation providers to partner with the World Bank Group and the Asia Development Bank (ADB), aiming to strengthen developing countries' disaster resilience. Specifically, developments are planned to enhance Earth observation products concerning both hydrometeorological hazards, geohazards and related risks. These activities are part of the new, joint Space for International Development Assistance Initiative set up by ESA in partnership with international financial institutions, namely the World Bank Group and ADB.

<https://eo4society.esa.int>


👉 Institutional working relations:

The Climate Office works closely with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and operational climate services, in particular the Copernicus Climate Change Service (C3S), to ensure coordination and complementarity. The processing systems and algorithms for 13 of the 23 essential climate variables projects developed by Climate Change Initiative (CCI) have been transferred to C3S for operational data provision,

and the Office has partnered with C3S for joint data standards for essential climate variables.

ESA has also recently concluded the Copernicus 2.0 implementation arrangements for cooperation with EUMETSAT on the CO2M mission.

The CCI programme supports over 450 scientists working in 178 institutions across ESA Member States to carry out the research and development required by the projects. CCI projects have resulted in the publication of over 640 peer-reviewed research papers, which support the work of IPCC, as cited multiple times in its recent assessment reports.

The ESA Climate Office also represents the Agency at international level climate meetings as an observer for IPCC, as a member of the CEOS/CGMS Working Group on Climate, on the GEO Working Group on Climate, and the WCRP Data Advisory Council. It works closely with the Global Climate Observing System (GCOS) in the implementation plan for essential climate variables.

The team has strong strategic links with space agencies and a partnership agreement with the global research network Future Earth to support the ESA Climate Office and foster the expanding use of CCI data across research projects.

The Earth Observation for Sustainable Development (EO4SD) Climate Resilience Cluster will provide the following international financial institutions and multilateral development banks with tailored Earth observation that will inform their climate resilience decision-making: World Bank Group, Asia Development Bank (ADB), International Fund

for Agricultural Development (IFAD), African Development Bank (AfDB), International Finance Corporation (IFC) and Inter-American Development Bank (IDB).

ESA Member States approved a “Contribution Agreement”, which paves the way for the Agency to cooperate with the European Commission (as well as EUMETSAT and ECMWF) on the Destination Earth (DestinE) initiative, officially launched in March 2022. This ambitious project, led by the European Commission, involves creating a digital replica of Earth to allow its users to explore the effects of climate change on the different components of the Earth system, together with possible adaptation and mitigation strategies. ESA will be responsible for the Destination Earth (DestinE) Open Core Service Platform, a user-friendly platform that will rely on the most comprehensive and sophisticated space-based observation data, including data from the Earth Explorers, the Copernicus Sentinel series, data from the European Centre for Medium-Range Weather Forecasts (ECMWF) and, over time, other major data holdings in Europe.

European Union Agency for the Space Programme

👉 Goals/objectives related to climate change

The European Union Agency for the Space Programme (EUSPA) supports the development of downstream and integrated applications based on Galileo, European Geostationary Navigation Overlay Service and Copernicus. A key part is market development and promotion of Copernicus, to promote user uptake of the data and services with a view to maximizing their socioeconomic benefits. As a European Union agency, one of its priorities is to support the objectives of the European Green Deal.

👉 Use of space technology

The Agency is currently working on developing market segments for Copernicus and Galileo, one of which is the environment, biodiversity, and climate market. It is looking at how these space technologies, and in particular their data and services, can support industry carrying out their green transformation.

EUSPA supports industry programmes which aim to increase commercial user uptake of downstream services in support of climate action through various funding programmes: Horizon Europe, the Cassini Programme (for start-ups), and open procurement related to the environment.

EUSPA is also studying the market segment and value proposition related to early warning and emergency management services.

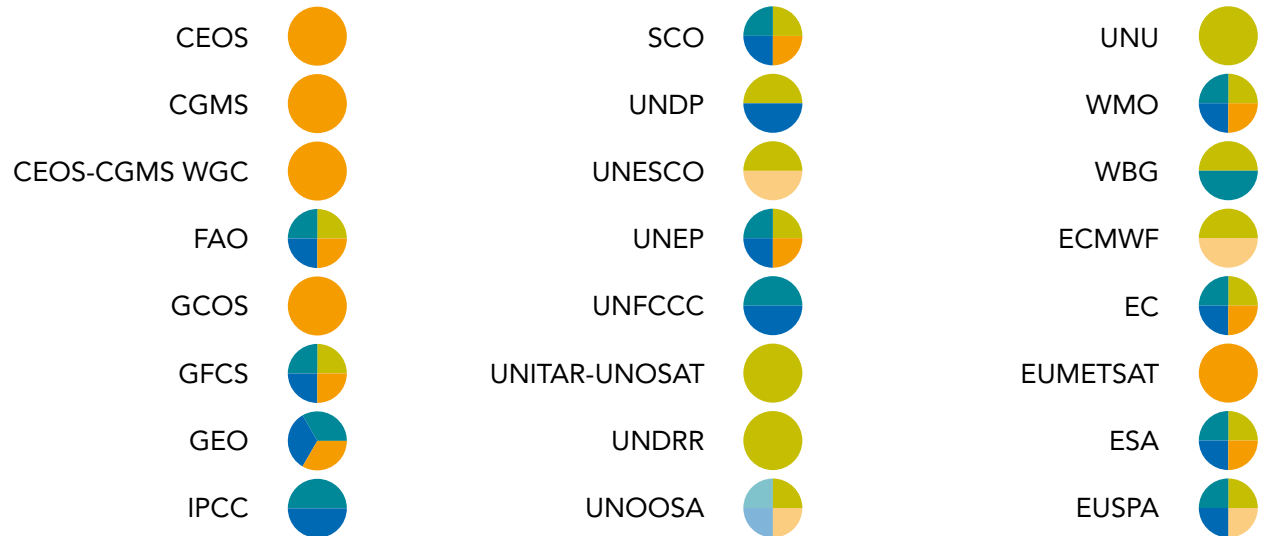
👉 Institutional working relations

As the European Union agency for the European Union Space Programme, EUSPA works closely with the European Commission, the European Space Agency (ESA), Copernicus entrusted entities and funding partners such as the European Investment Bank.

In March 2022, EUSPA and UNOOSA signed a memorandum of understanding to conduct joint studies and to facilitate knowledge-sharing and education on the European Union Space Programme, and foster a space economy that best supports the United Nations Sustainable Development Goals.

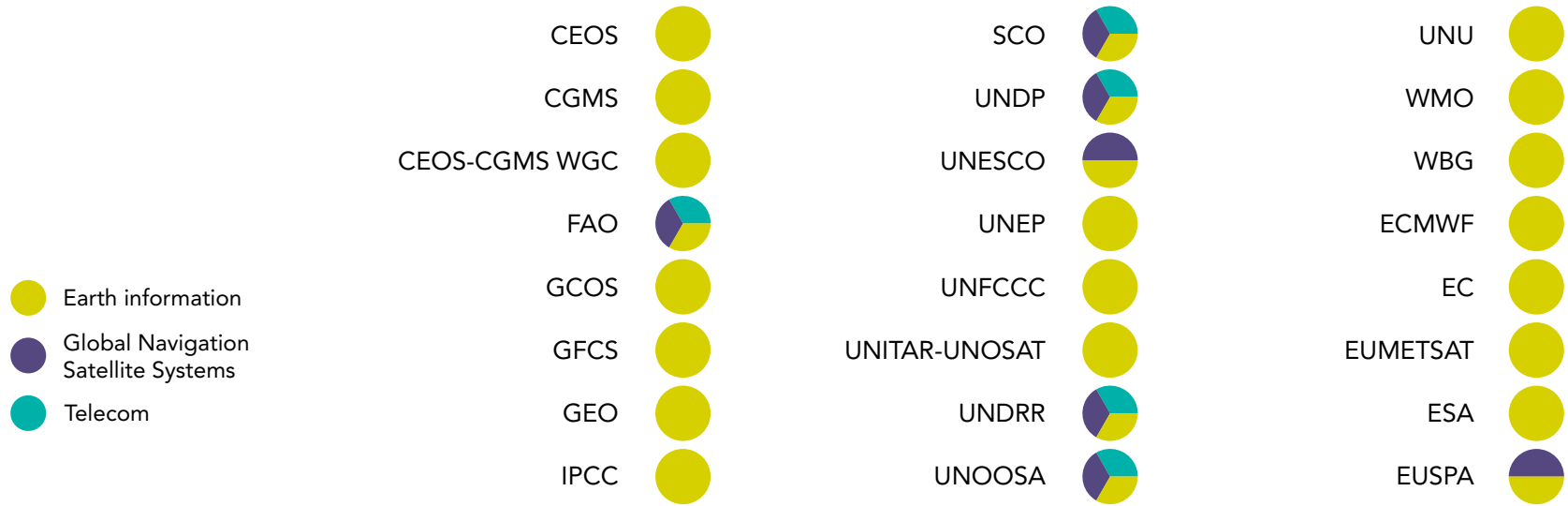
BREAKDOWN OF SELECTED ENTITIES

Main type(s) of climate action targeted by use of space technology



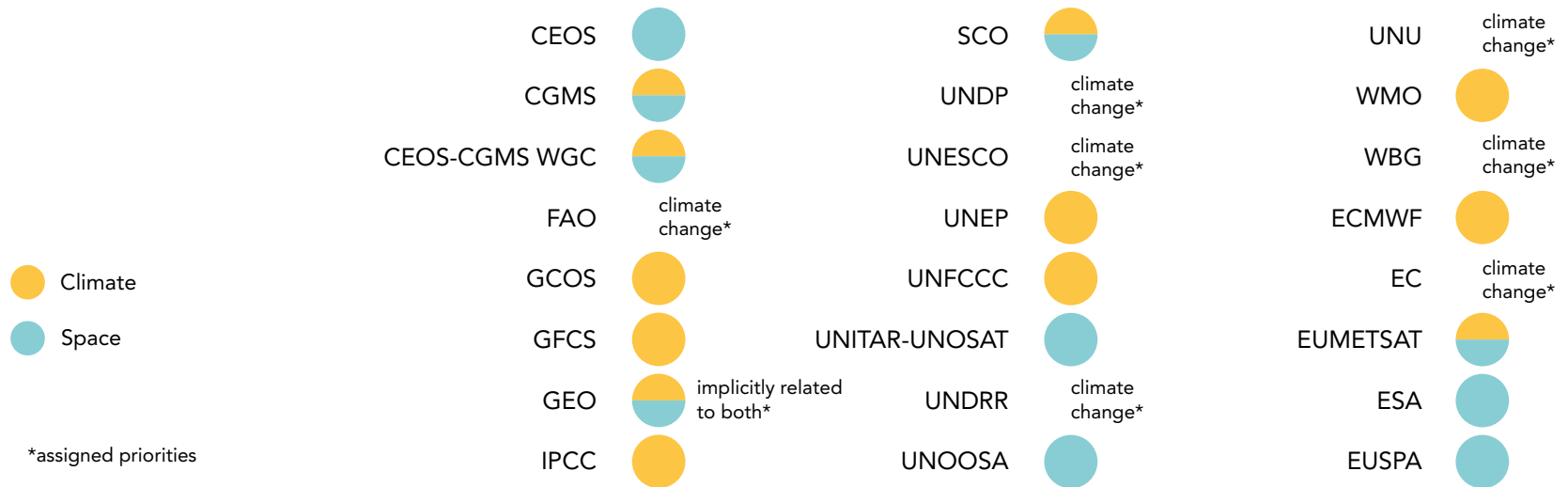
BREAKDOWN OF SELECTED ENTITIES

👉 Type(s) of space technology used/targeted to support climate action



BREAKDOWN OF SELECTED ENTITIES

👉 Mandate/mission of entity related to space versus climate



BREAKDOWN OF SELECTED ENTITIES

Country representation within each coordination body (members)

	CEOS-			UNITAR-																				
	CEOS	CGMS	CGMS WGC	FAO	GCOS	GFCS	GEO	IPCC	SCO	UNDP	UNESCO	UNEP	UNFCCC	UNOSAT	UNDRR	UNOOSA	UNU	WMO	WBG	ECMWF	EC	EUMETSAT	ESA	EUSPA
Afghanistan				●	●	●		●		●	●	●	●	●	●		●	●	●					
Albania				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Algeria				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Andorra				●	●	●		●		●	●	●	●	●	●		●	●						
Angola				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Antigua and Barbuda				●	●	●		●		●	●	●	●	●	●		●	●	●					
Argentina	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Armenia				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Australia	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Austria				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Azerbaijan				●	●	●		●	●	●	●	●	●	●	●	●	●	●	●					
Bahamas				●	●	●	●	●		●	●	●	●	●	●		●	●	●					
Bahrain				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Bangladesh				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Barbados				●	●	●		●		●	●	●	●	●	●		●	●	●					
Belarus				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Belgium	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Belize				●	●	●	●	●		●	●	●	●	●	●		●	●	●					
Benin				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Bhutan				●	●	●		●		●	●	●	●	●	●		●	●	●					
Bolivia (Plurinational State of)				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Bosnia and Herzegovina				●	●	●		●		●	●	●	●	●	●		●	●	●					
Botswana				●	●	●		●		●	●	●	●	●	●		●	●	●					
Brazil	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Brunei Darussalam				●	●	●		●		●	●	●	●	●	●		●	●	●					
Bulgaria				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●		●	●		●
Burkina Faso				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Burundi				●	●	●		●		●	●	●	●	●	●		●	●	●					
Cabo Verde				●	●	●		●		●	●	●	●	●	●		●	●	●					
Cambodia				●	●	●	●	●		●	●	●	●	●	●		●	●	●					
Cameroon				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Canada	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					

BREAKDOWN OF SELECTED ENTITIES

Country representation within each coordination body (members) (continued)

	CEOS-			FAO	GCOS	GFCS	GEO	IPCC	SCO	UNDP	UNESCO	UNEP	UNFCCC	UNITAR-			WMO	WBG	ECMWF	EC	EUMETSAT	ESA	EUSPA
	CEOS	CGMS	CGMS WGC											UNOSAT	UNDRR	UNOOSA							
Central African Republic				●	●	●	●	●		●	●	●	●	●	●	●	●						
Chad				●	●	●		●		●	●	●	●	●	●	●	●						
Chile				●	●	●	●	●		●	●	●	●	●	●	●	●						
China	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Colombia				●	●	●	●	●		●	●	●	●	●	●	●	●						
Comoros				●	●	●		●		●	●	●	●	●	●	●	●						
Congo				●	●	●	●	●		●	●	●	●	●	●	●	●						
Costa Rica				●	●	●	●	●		●	●	●	●	●	●	●	●						
Côte D'Ivoire				●	●	●	●	●		●	●	●	●	●	●	●	●						
Croatia				●	●	●	●	●		●	●	●	●	●	●	●	●			●	●	●	●
Cuba				●	●	●		●		●	●	●	●	●	●	●	●						
Cyprus				●	●	●	●	●		●	●	●	●	●	●	●	●				●	●	●
Czechia				●	●	●	●	●		●	●	●	●	●	●	●	●				●	●	●
Democratic People's Republic of Korea				●	●	●		●		●	●	●	●	●	●	●	●						
Democratic Republic of the Congo				●	●	●		●		●	●	●	●	●	●	●	●						
Denmark				●	●	●	●	●		●	●	●	●	●	●	●	●			●	●	●	●
Djibouti				●	●	●		●		●	●	●	●	●	●	●	●						
Dominica				●	●	●		●		●	●	●	●	●	●	●	●						
Dominican Republic				●	●	●	●	●		●	●	●	●	●	●	●	●						
Ecuador				●	●	●	●	●		●	●	●	●	●	●	●	●						
Egypt				●	●	●	●	●		●	●	●	●	●	●	●	●						
El Salvador				●	●	●	●	●		●	●	●	●	●	●	●	●						
Equatorial Guinea				●	●	●		●		●	●	●	●	●	●	●	●						
Eritrea				●	●	●		●		●	●	●	●	●	●	●	●						
Estonia				●	●	●	●	●		●	●	●	●	●	●	●	●			●	●	●	●
Eswatini				●	●	●		●		●	●	●	●	●	●	●	●						
Ethiopia				●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Fiji				●	●	●		●		●	●	●	●	●	●	●	●						
Finland				●	●	●	●	●		●	●	●	●	●	●	●	●			●	●	●	●
France	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●
Gabon	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Gambia (Republic of The)				●	●	●		●		●	●	●	●	●	●	●	●						

BREAKDOWN OF SELECTED ENTITIES

Country representation within each coordination body (members) (continued)

	CEOS-							UNITAR-																	
	CEOS	CGMS	CGMS WGC	FAO	GCOS	GFCS	GEO	IPCC	SCO	UNDP	UNESCO	UNEP	UNFCCC	UNOSAT	UNDRR	UNOOSA	UNU	WMO	WBG	ECMWF	EC	EUMETSAT	ESA	EUSPA	
Georgia				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Germany	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ghana				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Greece				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Grenada				●	●	●		●		●	●	●	●	●	●		●		●						
Guatemala				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Guinea				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Guinea Bissau				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Guyana				●	●	●		●		●	●	●	●	●	●		●	●	●						
Haiti				●	●	●		●		●	●	●	●	●	●		●	●	●						
Honduras				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Hungary				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
Iceland				●	●	●	●	●		●	●	●	●	●	●		●	●	●	●	●				
India	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Indonesia				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Iran (Islamic Republic of)				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Iraq				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Ireland				●	●	●	●	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●
Israel				●	●	●	●	●	●	●		●	●	●	●	●	●	●	●						
Italy	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Jamaica				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Japan	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Jordan				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Kazakhstan				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Kenya				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Kiribati				●	●	●		●		●	●	●	●	●	●		●	●	●						
Kuwait				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Kyrgyzstan				●	●	●		●		●	●	●	●	●	●		●	●	●						
Lao People's Democratic Republic				●	●	●		●		●	●	●	●	●	●		●	●	●						
Latvia				●	●	●	●	●		●	●	●	●	●	●		●	●	●		●	●		●	●
Lebanon				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Lesotho				●	●	●		●		●	●	●	●	●	●		●	●	●						

BREAKDOWN OF SELECTED ENTITIES

Country representation within each coordination body (members)

(continued)

	CEOS-				UNITAR-																				
	CEOS	CGMS	CGMS WGC	FAO	GCOS	GFCS	GEO	IPCC	SCO	UNDP	UNESCO	UNEP	UNFCCC	UNOSAT	UNDRR	UNOOSA	UNU	WMO	WBG	ECMWF	EC	EUMETSAT	ESA	EUSPA	
Liberia				●	●	●		●		●	●	●	●	●	●		●	●	●						
Libya				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Liechtenstein					●	●		●		●		●	●	●	●		●								
Lithuania				●	●	●		●		●	●	●	●	●	●		●	●	●			●	●		●
Luxembourg				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Madagascar				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Malawi				●	●	●		●		●	●	●	●	●	●		●	●	●						
Malaysia	●			●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Maldives				●	●	●		●		●	●	●	●	●	●		●	●	●						
Mali				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Malta				●	●	●	●	●	●	●	●	●	●	●	●		●	●	●			●	●		●
Marshall Islands				●	●	●		●		●	●	●	●	●	●		●		●						
Mauritania				●	●	●		●		●	●	●	●	●	●		●	●	●						
Mauritius				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Mexico	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Micronesia (Federated States of)				●	●	●		●		●	●	●	●	●	●		●	●	●						
Monaco				●	●	●		●		●	●	●	●	●	●		●	●							
Mongolia				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Montenegro				●	●	●		●		●	●	●	●	●	●		●	●	●						
Morocco				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Mozambique				●	●	●		●		●	●	●	●	●	●		●	●	●						
Myanmar				●	●	●		●		●	●	●	●	●	●		●	●	●						
Namibia				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Nauru				●	●	●		●		●	●	●	●	●	●		●	●	●						
Nepal				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Netherlands	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
New Zealand				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Nicaragua				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Niger				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Nigeria	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
North Macedonia				●	●	●		●		●	●	●	●	●	●		●	●	●						
Norway	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	

BREAKDOWN OF SELECTED ENTITIES

Country representation within each coordination body (members)

(continued)

	CEOS-				UNITAR-																				
	CEOS	CGMS	CGMS WGC	FAO	GCOS	GFCS	GEO	IPCC	SCO	UNDP	UNESCO	UNEP	UNFCCC	UNOSAT	UNDRR	UNOOSA	UNU	WMO	WBG	ECMWF	EC	EUMETSAT	ESA	EUSPA	
Oman				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Pakistan				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Palau				●	●	●		●		●	●	●	●	●	●		●		●						
Panama				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Papua New Guinea				●	●	●		●		●	●	●	●	●	●		●	●	●						
Paraguay				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Peru				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Philippines				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Poland	●			●	●	●	●	●		●	●	●	●	●	●	●	●	●	●			●	●	●	●
Portugal	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Qatar				●	●	●		●		●	●	●	●	●	●	●	●	●	●						
Republic of Korea	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Republic of Moldova				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Romania				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●
Russian Federation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Rwanda				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Saint Kitts and Nevis				●	●	●		●		●	●	●	●	●	●		●		●						
Saint Lucia				●	●	●		●		●	●	●	●	●	●		●	●	●						
Saint Vincent and the Grenadines				●	●	●		●		●	●	●	●	●	●		●		●						
Samoa				●	●	●		●		●	●	●	●	●	●		●	●	●						
San Marino				●	●	●		●		●	●	●	●	●	●		●		●						
Sao Tome and Principe				●	●	●		●		●	●	●	●	●	●		●	●	●						
Saudi Arabia				●	●	●		●	●	●	●	●	●	●	●	●	●	●	●						
Senegal				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Serbia				●	●	●	●	●		●	●	●	●	●	●		●	●	●	●	●				
Seychelles				●	●	●	●	●		●	●	●	●	●	●		●	●	●						
Sierra Leone				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●						
Singapore				●	●	●		●	●	●	●	●	●	●	●	●	●	●	●						
Slovakia				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●		●
Slovenia				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●		●
Solomon Islands				●	●	●		●		●	●	●	●	●	●		●	●	●						
Somalia				●	●	●	●	●		●	●	●	●	●	●		●	●	●						

BREAKDOWN OF SELECTED ENTITIES

Country representation within each coordination body (members)

(continued)

	CEOS-				UNITAR-																			
	CEOS	CGMS	CGMS WGC	FAO	GCOS	GFCS	GEO	IPCC	SCO	UNDP	UNESCO	UNEP	UNFCCC	UNOSAT	UNDRR	UNOOSA	UNU	WMO	WBG	ECMWF	EC	EUMETSAT	ESA	EUSPA
South Africa	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
South Sudan				●	●	●		●		●	●	●	●	●	●		●	●	●					
Spain	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sri Lanka				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Sudan				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Suriname				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Sweden	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Switzerland				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Syrian Arab Republic				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Tajikistan				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Thailand	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Timor-Leste				●	●	●		●		●	●	●	●	●	●		●	●	●					
Togo				●	●	●		●		●	●	●	●	●	●		●	●	●					
Tonga				●	●	●	●	●		●	●	●	●	●	●		●	●	●					
Trinidad and Tobago				●	●	●		●		●	●	●	●	●	●		●	●	●					
Tunisia				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Türkiye	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Turkmenistan				●	●	●		●		●	●	●	●	●	●		●	●	●					
Tuvalu				●	●	●		●		●	●	●	●	●	●		●	●	●					
Uganda				●	●	●	●	●		●	●	●	●	●	●		●	●	●					
Ukraine	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
United Arab Emirates	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
United Kingdom of Great Britain and Northern Ireland	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
United Republic of Tanzania				●	●	●		●		●	●	●	●	●	●		●	●	●					
United States of America	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Uruguay				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●					
Uzbekistan				●	●	●	●	●		●	●	●	●	●	●		●	●	●					
Vanuatu				●	●	●		●		●	●	●	●	●	●		●	●	●					
Venezuela, Bolivarian Republic of				●	●	●		●		●	●	●	●	●	●	●	●	●	●					
Viet Nam	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Yemen				●	●	●		●		●	●	●	●	●	●		●	●	●					
Zambia				●	●	●		●		●	●	●	●	●	●		●	●	●					
Zimbabwe				●	●	●	●	●		●	●	●	●	●	●		●	●	●					

An aerial photograph of a river delta, showing a complex network of channels and floodplains. The image is overlaid with a yellow rectangular area on the left and a teal rectangular area on the right, which together form a banner for the title.

PART II.

OVERVIEW OF AREAS OF INTERVENTION

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MAPPING OF MAIN ROLE OF ENTITIES (IN CLIMATE CHANGE FRAMEWORK)

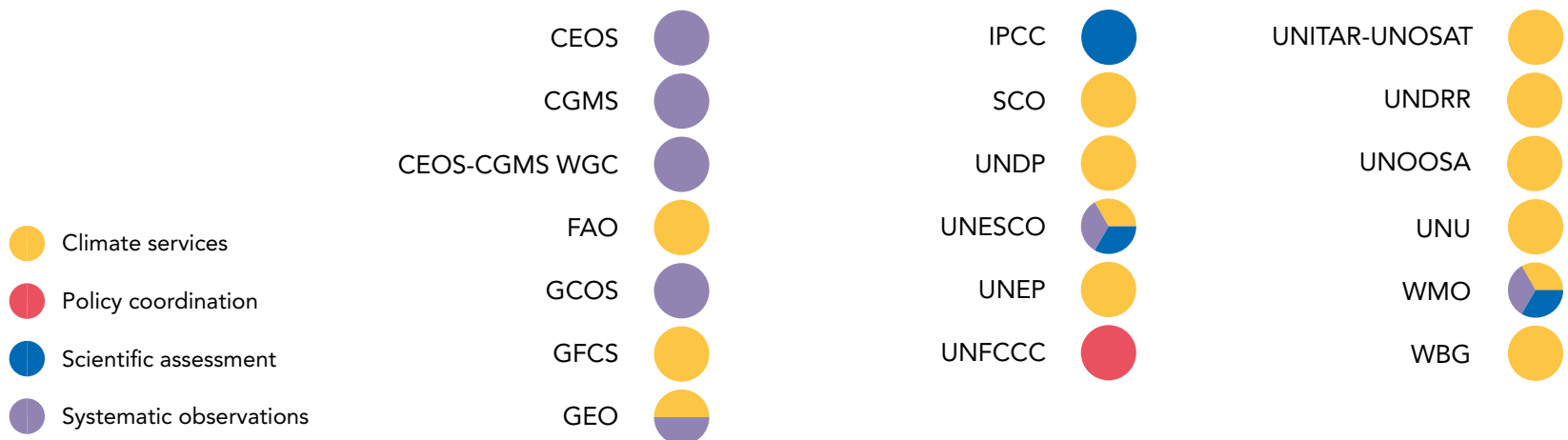
The following roles, based on the framework set out by the United Nations Framework Convention on Climate Change (UNFCCC), can be broadly applied to the entities:

- Policy coordination (to support climate change mitigation and adaptation)
- Scientific assessment (to support climate change mitigation and adaptation)

- Systematic observation (to support climate change monitoring)
- Climate services (to support climate change monitoring, mitigation, adaptation and resilience)

engages in scientific assessment, and the Group on Earth Observations (GEO) is also involved with systematic observations), their primary role within UNFCCC is emphasized in the table below:

Although each entity can potentially be associated with multiple roles (e.g. the World Meteorological Organization (WMO) also



BREAKDOWN OF ENTITIES AT GLOBAL LEVEL

Any entity engaging in climate action is ultimately guided and supported by the goals of the United Nations Framework Convention on Climate Change, the parent treaty of the Paris Agreement. The objective of all three agreements under UNFCCC is for all countries to agree on measures to both mitigate and adapt to the changing climate, i.e. by stabilizing greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development. The central aim of the Paris Agreement is to keep a global temperature rise this century to well below two degrees Celsius above pre-industrial levels, while increasing the ability of countries to deal with the impacts of climate change, and making finance flows consistent with a low greenhouse gas emissions and climate-resilient pathway.

From the data point of view, it can be generally viewed that entities carrying out systematic observation collect and process the data, and entities developing climate services provide the data to the end user. Data analysis can occur in either scientific assessment, systemic observation or climate services.

👉 Policy coordination (to support climate change mitigation and adaptation)

The United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change. All States that are Parties to UNFCCC are represented at the Conference of the Parties, the supreme decision-making body of UNFCCC, which meets yearly to review its implementation and any other legal instruments that the Conference of the Parties adopts and take decisions necessary to promote the effective implementation of UNFCCC and its institutional arrangements such as the Paris Agreement. A key task for the Conference of the Parties is to review the national communications and emission inventories submitted by the Parties. Based on this information, the Conference of the Parties assesses the effects of the measures taken by the Parties and the progress made in achieving the ultimate objective of UNFCCC.

The Convention calls on Parties to promote and cooperate in research, systematic observation and the development of data archives, including through exchange of information; supporting and developing programmes, networks and

organizations; and taking into account the needs and concerns, and building the capacity, of developing countries. In addition to recognizing the need for the best available science, the Paris Agreement identifies the need to enhance and strengthen systematic observation, climate services and knowledge-sharing.

The Secretariat of UNFCCC, which maintains the registry of nationally determined contributions under the Paris Agreement, supports the Conference of the Parties and other bodies of the Convention, including that of the Subsidiary Body for Science and Technological Advice (SBSTA), which provides information and advice regarding scientific and technological matters to the Conference of the Parties. This body carries out methodological work under UNFCCC and specifically promotes collaboration in the field of research and systematic observation of the climate system. Parties report on research and systematic observation to the Secretariat of UNFCCC via their national communications. SBSTA has mandated the Secretariat of UNFCCC to organize annual forums to exchange information to support work on both research and systematic observation. The United Nations

<https://unfccc.int>



Framework Convention on Climate Change Research Dialogue is the forum for climate change research and capacity-building, and for conveying research findings and lessons learned from activities undertaken by regional and international research programmes and organizations. Earth observation Day provides an opportunity for dialogue and the exchange of information on the state of the global climate system and developments in systematic observation.

SBSTA is the link between the policy-oriented needs of the Conference of the Parties and the scientific information provided by expert sources such as the Intergovernmental Panel on Climate Change (IPCC) and through cooperation with other relevant organizations, such as the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) and the World Climate Research Programme (WCRP), which coordinates various partners around the world active in climate-related research that underpins much of the work of IPCC.

📌 **Assessment of scientific research (to support climate change mitigation and adaptation)**

IPCC communicates its assessment of worldwide peer-reviewed scientific research regarding the basis of climate change through its regular assessment reports, as well as shorter special reports and specific technical papers, to UNFCCC bodies, in particular the Subsidiary Body for Science and Technological Advice (SBSTA), as a key input into international climate negotiations. It provides governments at all levels with scientific information, including impacts of climate change, future risks and options for adaptation and mitigation, that they can use to develop climate policies, and indicates priority needs for further research activities. Parties to the Convention have agreed to use the IPCC Guidelines in reporting to the Convention, which are now being refined to include information on the potential contributions of space-based Earth observations (e.g. the IPCC Guidelines for National Greenhouse Gas Inventories).

📌 **Systematic observation (to support climate change monitoring)**

To advise policymakers and advance scientific knowledge, UNFCCC calls on Parties to promote and cooperate in the systematic observation of the climate system and the development of data archives, including through support to existing international programmes and networks. Implementation of systematic observation is supported through cooperation, as strengthened by the decisions of the Conference of the Parties and the conclusions of SBSTA, with the CEOS/CGMS Working Group on Climate, GCOS, WMO and other relevant partners and organizations.

The United Nations Framework Convention on Climate Change has charged GCOS with the responsibility for defining requirements for observations relevant to climate change. The GCOS programme does not directly make observations nor generate data products itself. It works with partners to establish the requirements and to ensure support for the sustained provision of reliable physical, chemical and biological observations and climate data records, building on relevant observing systems. GCOS includes surface-based, airborne and space-based components

and constitutes, in aggregate, the climate observing component of the Group on Earth Observations System of Systems (GEOSS). GCOS regularly assesses the status of global climate observations of the atmosphere, land and ocean and produces guidance for improvement. However, the GCOS programme does not directly make observations nor generate data products itself. Instead, GCOS expert panels maintain the definitions of essential climate variables, the observations required to meet the need to systematically observe the changing climate of the Earth to support the working groups of IPCC and SBSTA. Taking into consideration the climate monitoring needs of UNFCCC and related institutional arrangements, the GCOS Implementation Plan describes the proposed implementation of the global observing system for climate. The GCOS programme encourages, coordinates and facilitates the taking of the needed climate observations by national or international organizations to support their own requirements as well as common goals. It provides an operational framework for integrating and enhancing the observational systems of participating countries and organizations into a comprehensive system focused on meeting the full range of national and international

requirements for climate issues. It sets out the framework for the science community to provide the data and information to implement GCOS, advance scientific research knowledge and support climate services and the development of climate indicators.

Space agencies involved in global observation coordinate their work through their membership of CEOS and CGMS. CEOS is the primary forum for international coordination of civil space-based Earth observation programmes, through which its members, referred to as the CEOS Agencies, informally coordinate their current and planned systems for Earth observation from space. In addition to ensuring international coordination, the mission of CEOS is to promote the exchange of data to optimize societal benefit and inform decision-making for securing a prosperous and sustainable future for humankind. It focuses on validated requirements levied by external organizations and works closely with other satellite coordinating bodies. CGMS is the group that globally coordinates meteorological satellite systems from an end-to-end perspective, through the development of multilateral coordination and cooperation across all meteorological satellite operators in close coordination with the user community. The

main goals of its coordination activities are to support operational weather forecasting and climate monitoring.

In general, climate data records for essential climate variables are derived from a combination of satellite and in situ observations, with satellite observations making a significant contribution for a majority of essential climate variables. The Global Climate Observing System (GCOS) Programme provides the overall foundation for climate monitoring from space, through the assessment and formulation of requirements, which are captured in GCOS reference documents and status reports, including the GCOS Implementation Plan and its satellite supplement, that are provided to UNFCCC. Since no single country or agency can fulfil the full range of demanding requirements established by GCOS for space-based observations, CEOS and CGMS joined together with WMO in 2013 to define an overall framework for this international endeavour, called the "Global Architecture for Climate Monitoring from Space". This CEOS/CGMS Working Group on Climate coordinates and encourages collaborative activities between its members, the major operational and research space agencies in the area of climate monitoring, and has the overarching goal of

improving the systematic availability of climate data records through the implementation and continued development of the Architecture. Operating on a best efforts basis, it maintains the inventory of existing and planned climate data records addressing the GCOS Essential Climate Variables (called the “ECV inventory”) that are currently available from their satellite missions and periodically performs a gap analysis that results in a Coordinated Action Plan of the Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) missions to expand the climate data records and address possible gaps with respect to the GCOS requirements. The CEOS/CGMS Working Group on Climate has also recently created a Greenhouse Gas Task Team to coordinate greenhouse gas monitoring activities of CEOS and CGMS and to develop a road map for implementing an architecture for monitoring carbon dioxide and methane from space.

https://ceos.org/observations/documents/CEOS_CGMS_GHG_Constellation_Roadmap_V2.3_cleaned.pdf



The CEOS/CGMS Working Group on Climate supports the work of GCOS in defining and delivering the Essential Climate Variables required by UNFCCC and delivers a coordinated response of all member space agencies to the

needs of UNFCCC and GCOS for systematic observations, as called for in the Paris Agreement. It also supports and advises on the overall relation of CEOS and CGMS to the Subsidiary Body for Science and Technological Advice (SBSTA), to the Intergovernmental Panel on Climate Change (IPCC) and other international coordination mechanisms such as the Global Framework for Climate Services (GFCS). The CEOS/CGMS Working Group on Climate provides guidance to both, specifically on climate-related tasks involving international coordination mechanisms (such as GEO and GFCS), and produces relevant reports on behalf of the CEOS and CGMS Plenaries.

The CEOS/CGMS Working Group on Climate reports externally to SBSTA and GCOS and reports to the space agencies through CEOS and CGMS. The joint CEOS/CGMS response, including the update of the CEOS/CGMS response to GCOS requirements, and the update of reports to SBSTA on CEOS/CGMS climate actions, provides the basis for future planning and priority setting by the space agencies in response to climate information needs. Parties provide information on systematic observations in their national communications directly to UNFCCC, which include detailed technical reports on the status

of their national systematic observations in line with the guidelines

The World Meteorological Organization (WMO) helps its members to monitor the climate on a global scale so that reliable information is available to support evidence-based decision-making on how best to adapt to a changing climate and manage risks associated with climate variability and extremes. The World Meteorological Organization Integrated Global Observing System (WIGOS) is the new overarching framework for all WMO observing systems, comprising space, air, land and sea-based instruments that monitor the state of the atmosphere, ocean and land surface, and water cycle. The framework promotes network integration and partnership outreach and engages the regional and national actors essential for successful integration of these systems. These national and international WIGOS partnerships allow members of WMO to build observing capabilities and achieve better national, regional and global coverage. This evolved integrated observing system will be a comprehensive “system of systems” interfaced with WMO co-sponsored and other non-WMO observing systems, making major contributions to the Group on Earth Observations System of Systems (GEOSS).

Portions of the surface and space-based subsystems of WIGOS will rely on WMO partner organizations. The development of the space-based component of WIGOS is guided by the Vision for WIGOS in 2040 and supports all programmes which are co-sponsored by WMO. As a component of WIGOS, it coordinates the activities of members related to the space-based observing system component of WIGOS to ensure sustained and interoperable satellite observations and to promote their applications. It includes the monitoring of operational satellite missions as well as the planning of future satellite missions for weather, water and climate observations serving all WMO application areas. Since the integrated space-based observing system consists of the operational and research and development environmental satellites and ground segments, the space-based component will rely on enhanced collaboration through partnerships with satellite operating agencies such as CGMS and CEOS.

To fulfil its mandate in the field of climate change, WMO supports UNFCCC by:

- Reporting to the Conference of the Parties about the recent progress and future plans of observation systems and research programmes that support implementation (article 5)

- Coordinating WIGOS and operating the World Meteorological Organization Information System for managing and exchanging data and information about weather, climate and water
- Providing annual scientific reports on greenhouse gas concentrations and global climate trends (annual greenhouse gas bulletins and Statements on the State of the Global Climate)
- Co-sponsoring and hosting the Global Climate Observing System (GCOS)
- Co-sponsoring and hosting the Intergovernmental Panel on Climate Change (IPCC)
- Co-sponsoring and hosting the World Climate Research Programme (WCRP)
- Leading the United Nations Global Framework for Climate Services (GFCS), a worldwide partnership that produces and uses climate information services for managing and adapting to climate risks
- Addressing climate information requirements for disaster risk management
- Providing capacity development to assist governments to monitor and forecast climate trends

- Contributing to the United Nations Alliance on Climate Change Education, Training and Public Awareness

In addition to its contribution to systematic observation of the climate system and to research networks that underpin climate science, WMO has supported climate policymaking in other roles. It provides authoritative advice and information on climate change mitigation and adaptation by drawing from the best available scientific expertise from the national hydrological and meteorological services of its members, and international data centres and agencies. It also facilitates and coordinates their contributions to assist Parties to UNFCCC to fulfil their obligations. Moreover, WMO promotes a better understanding of the societal impacts of climate change within the United Nations system. The overall goal of the Space Programme of WMO is to achieve maximum benefits from Earth observation satellites for WMO applications. It promotes the availability and utilization of satellite data and products for weather, climate, water and related applications of the members of WMO. Its Space Programme coordinates satellite and other space-related activities throughout all WMO programmes, providing guidance on the potential of remote-sensing techniques in meteorology, hydrology and related disciplines

and applications. Its World Meteorological Organization Integrated Global Observing System (WIGOS) enables members and their partners to better respond to natural hazards, improve weather, water, climate and related environmental monitoring, and to adapt to climate change and human-induced environmental impacts while providing avenues for education, training and capacity development. These objectives are at the very core of the mandate of WMO and are particularly evident in the United Nations-wide Global Framework for Climate Services (GFCS). The observations supported by the Global Climate Observing System (GCOS) are co-sponsored by WMO, contribute to solving challenges in climate research and also underpin climate services and adaptation measures.

WMO GFCS integrates these collective efforts to promote cooperation in scientific, technological, technical, socioeconomic and other research, systematic observation and development of data archives related to the climate system for the implementation of adaptation programmes under the Convention. GFCS is a global collective effort being built in collaboration with the United Nations family and the Group on Earth Observations (GEO),

space partners in CEOS and CGMS, and all relevant stakeholders.

👉 **Climate services (to support climate change monitoring, mitigation, adaptation and resilience)**

As part of their process to formulate and implement national adaptation plans, countries need to analyse current and future climate change and impact scenarios. However, many countries have reported that data and information gaps constrain this analysis. In this context, scientific information and climate services offered by global, regional and national organizations and programmes are opportunities for countries to make use of robust scientific information and data to inform their adaptation planning. “Climate services” are increasingly needed to package observation, modelling and research outputs into information that can be used to advise decision-making. They help society cope with climate variability and change through the transformation of climate-related data together with other relevant information into customized products such as projections, trends, economic analysis and services to the user communities in

<https://unfccc.int>


different sectors. Effective climate services will facilitate climate-smart decisions that will, for example, mitigate the impacts of climate-related disasters, improve food security and health outcomes, enhance water resources management, and bring better outcomes in disaster risk reduction. Given the complexity of and requirements for climate services, addressing the immense variety of user needs for climate services is beyond the capacity of any single organization, small group of organizations or a country. It calls for unprecedented collaboration among institutions across political, functional and disciplinary boundaries. At the global level, the Global Framework for Climate Services (GFCS) and the Group on Earth Observations (GEO) provide such services to equip decision makers in climate-sensitive sectors with better information to help society adapt to climate variability and change.

In addition to over 70 work programme activities and initiatives that address global needs, coordination and knowledge gaps, the GEO community is creating a Global Earth Observation System of Systems (GEOSS) that will link Earth observation resources worldwide across multiple societal benefit areas such as biodiversity and ecosystem sustainability,

disaster resilience, energy and mineral resources management, food security and sustainable agriculture, infrastructure and transportation management, public health surveillance, sustainable urban development, water resources management and make those resources available for better informed decision-making. GEOSS is a set of coordinated, independent Earth observation data and processing systems that interact and provide access to diverse resources for a broad range of users in both public and private sectors. GEOSS links these systems to strengthen the monitoring of the state of the Earth. It facilitates the sharing of environmental data and information collected from the large array of observing systems contributed by countries and organizations within GEO. GEOSS provides access to data, information and knowledge to a wide variety of users, to increase understanding of Earth processes and enhance the predictive capabilities that underpin sound decision-making. The Group on Earth Observations Climate Change Working Group (CC-WG) is currently developing a comprehensive climate change action strategy to advance the use of Earth observation specifically in support of climate adaptation and mitigation, including actions related to the pillars of the Paris Agreement on climate change. It will focus on

enhancing the coordination of climate-related activities across the GEO Work Programme to promote an effective response to the needs of key partners such as the United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change (IPCC), and to ensure complementarity of efforts with other data providers in the Earth observation community including WMO and CEOS. CC-WG includes government, academia, United Nations agencies and intergovernmental and non-governmental organizations, and the commercial sector. These efforts will help ensure that national, regional and global climate action efforts are implemented in a sustainable manner for the benefit of society.

The Global Framework for Climate Services (GFCS) is a worldwide partnership of Governments and organizations that produce and use climate information services for managing and adapting to climate risks. GFCS integrates the collective efforts to promote cooperation in scientific, technological, technical, socioeconomic and other research, systematic observation and the development of data archives related to the climate system for the implementation of adaptation programmes under UNFCCC. GFCS is conceived as an integrating set of international arrangements

which will be built upon the established global climate observation and research programmes as well as operational structures into an end-to-end product generation, service provision and application system to bridge the gap between the climate information being developed by scientists and service providers and the practical needs of end users. The vision of GFCS is to enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scale.

The GFCS implementation plan guides the development of the information resources needed for building climate resilience and preparing adaptation plans. Its services involve high-quality data from national and international databases on a selection of climate variables as well as maps, risk and vulnerability analyses, assessments, and long-term projections and scenarios. Depending on the needs of the users, these data and information products may be combined with socioeconomic variables, such as agricultural production, health trends, population distributions in high-risk areas, and

road and infrastructure maps for the delivery of goods. GFCS uses National Frameworks for Climate Services (NFCS), multi-stakeholder user interface platforms, as a key mechanism for enabling the development and delivery of climate services at country level. NFCS support the Paris Agreement, which aims to strengthen the global response to the threat of climate change, by helping Parties prepare, maintain and communicate their nationally determined contributions. By improving the co-production, tailoring, delivery and use of science-based climate predictions and services that help assess climate vulnerabilities, identify adaptation options, improve the understanding

of climate and its impacts, and enhance the adaptation planning and implementing capacity of climate-sensitive sectors, NFCS complement national adaptation plans.


This United Nations-wide initiative, in which the members of WMO and inter- and non-governmental, regional, national and local stakeholders work in partnership to develop targeted climate services, has received strong support from Governments of both developed and developing countries. With many more United Nations entities as partners, WHO, WBG, UNDP, IFRC, UNDRR, WFP, UNESCO and FAO are all directly involved in the planning and

implementation of GFCS-related activities in alignment with their mandates and priorities to advance the application of the climate services in the initial five priority areas: agriculture and food security, disaster risk reduction, energy, health and water.

A. UNITED NATIONS ENTITIES ADVANCING THE APPLICATION OF CLIMATE SERVICES

👉 Food and Agriculture Organization of the United Nations

To help practitioners to put national forest monitoring systems in place, the Food and Agriculture Organization of the United Nations (FAO) has developed various free, open-source software tools and platforms, such as Open Foris and the System for Earth Observation Data Access, Processing and Analysis for Land Monitoring (SEPAL), which uses satellite imagery for natural resource management. SEPAL was developed by FAO to help countries monitor and report on forest and land use. It offers users access to satellite data, an easy-to-use interface, powered by cloud-based super computers, paving the way for improved climate change mitigation plans and data-driven land-use policies. The platform allows users to produce robust results spanning a range of applications from land cover, forest disturbances, fires and pest infestation to dynamic flood maps and initiatives geared to peatland conservation and restoration. It includes tools for near-real-time alert systems and degradation assessments and complements other Open Foris open-source technologies that FAO has developed for forest monitoring and reporting. Collect Earth is another free open-source software application

for land monitoring developed by FAO. It facilitates access to multiple freely available archives of satellite imagery, including archives with very high spatial resolution imagery and those with very high temporal resolution imagery. Collectively, these archives offer free access to a large amount of information on current and past land dynamics for any location in the world. Collect Earth draws upon these archives and the synergies of imagery of multiple resolutions to enable an innovative method for land monitoring known as augmented visual interpretation. In addition, the www.mdpi.com  FAO Global Information and Early Warning System on Food and Agriculture (GIEWS) uses Earth observation for crop monitoring. GIEWS continuously monitors food supply and demand and other key indicators for assessing the overall food security situation in all countries of the world. Concerning the country-level application of tools for Earth observation and price monitoring, GIEWS strengthens national capacities in managing food security-related information. To support the analysis and supplement ground-based information, it utilizes remote-sensing data that can provide valuable insight into water availability and vegetation health during the cropping seasons.

All Agricultural Stress Index System (ASIS) raster data sets are accessible through the Hand-in-Hand Geospatial Portal and the Web Map Service provided by FAO.

FAO has been working with the European Space Agency (ESA) and pilot national statistical offices through the Sen4Sat project. FAO and ESA signed a new memorandum of understanding in April 2021 to pave the way for exchanging relevant expertise and developing applications in which Earth observation images can be used to better monitor agrifood systems. It covers areas such as identifying and understanding the requirements and challenges for using satellite data in the field of food and agriculture, sharing data sets and surveys, supporting access to Earth observation data sets and developing innovative Earth observation algorithms, products and applications, making full use of the latest information technology capabilities such as cloud computing. This joint work will scale up the capacity of FAO to help countries use Earth observation methods for agricultural statistics and Sustainable Development Goal monitoring.

United Nations Development Programme

The United Nations Development Programme (UNDP) collaborated with the United Nations Satellite Centre (UNOSAT) on the development of a web-mapping interface for the monitoring and evaluation of projects focused on infrastructure rehabilitation in sub-Saharan Africa. Several projects involved the reconstruction of essential infrastructures such as hospitals, schools and electrical substations for which satellite imagery was used to capture the evolution from damaged sites to functional facilities. UNDP required satellite analysis to fully understand the state of specific locations before, during and after their project interventions. UNDP and UNOSAT have established innovative methodologies and systems for monitoring project sites via satellite imagery that can continue to be built upon to track progress and assess the impact for the benefit of communities involved. To enhance the transparency of projects, results and their impact, the objective of its "Geo-localized Maps and Satellite Imagery Analysis" platform is to assist in enhancing the overall planning and coordination of UNDP field

<https://unitar.org/about/news-stories/news/using-earth-observation-and-gis-monitoring-and-evaluation-development-projects>



www.unep.org/news-and-stories/press-release/launch-un-biodiversity-lab-20-spatial-data-and-future-our-planet

monitoring, communication and donor mobilization. The implementation of this platform, which allows satellite imagery analysis through a Digital Map (a GIS platform), allows UNDP to monitor projects, measure impacts and communicate results in a more visual manner. By covering a wider area with less effort, the tool permits the remote monitoring of areas that would normally involve cumbersome travel. The enhanced transparency in project monitoring improves reporting to donors and all stakeholders. The UNDP Geoinformation and Satellite Imagery Team works with countries on their nationally determined contributions and provides free analysis and interpretation of satellite imagery data.

<https://undp.unosat.org>



<https://undp.medium.com>



Developed jointly by UNDP, the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the Secretariat of the United Nations Biodiversity Convention, the United Nations Biodiversity Lab 2.0 (UNBL) is a free, open-source platform that enables Governments and others to access state-of-the-art maps and data on nature, climate change and human development in new ways to generate insight into nature and sustainable development. It is

freely available online to Governments and other stakeholders as a digital public good. The Lab provides decision makers with access to over 400 spatial data layers across biodiversity, climate change and development, helping them to identify new opportunities to act in the best interests of both people and planet. The mapping dashboard, developed by UNEP and the Global Resource Information Database Geneva (GRID-Geneva), and fully integrated into the World Environment Situation Room collates spatial data from the www.mapx.org UNEP World Conservation Monitoring Centre, GRID-Geneva, NASA, United Nations agencies and leading research institutions to ensure that Governments across the world have access to the data they need to make key conservation and development decisions, and offers a customizable toolkit for analysis, visualization and sharing. Microsoft has committed to support the digital ecosystem of UNBL with their Planetary Computer and custom analytics as digital public goods. The Lab brings together a strong coalition of partners, data providers and technological innovators to support the creation of a digital ecosystem for the planet, which allows policymakers to use open data in spatial

www.mapx.org



<https://geoawesomeness.com/united-nations-maps-mapx>



planning effectively to deliver on the Paris Agreement and the post-2020 global biodiversity framework. It targets a wide community of users that are primarily the United Nations Environment Programme (UNEP) and partners, the Secretariats of Multilateral Environmental Agreements and other United Nations agencies mandated to collect and use geospatial data in environmental decision-making. Civil society groups, non-governmental organizations, academia and citizens complement this set of users.

✎ **United Nations Educational, Scientific and Cultural Organization**

A growing number of countries and organizations are pursuing closer relationships between heritage practitioners and space technology specialists. The United Nations Educational, Scientific and Cultural Organization (UNESCO) puts these technologies to use for monitoring the state of conservation of World Heritage sites at risk due to natural hazards or conflict. Steadily improving satellite imagery and other remote-sensing techniques allow authorities to identify potential threats to sites, such as land-use changes, ground instability, logging, the construction of illegal roads and the destruction of heritage buildings, in time to plan and implement mitigation strategies. Monitoring cultural heritage in areas affected by conflict or natural disasters, including through the use of satellite imagery, is also a critical step towards planning for recovery. This allows experts to better assess needs and plan reparation measures. The Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) leads the Global Ocean Observing System (GOOS) co-sponsored by the World Meteorological Organization (WMO), the International Council for

www.goosocean.org



Science (ISC) and UNEP. GOOS is an increasingly comprehensive platform that integrates in situ and remote observations of the status of the world's oceans, climate and climate change. GOOS is a collaborative system of ocean observations encompassing in situ networks, satellite systems, Governments, United Nations agencies and individual scientists, which provide ocean observation data and assessments to feed models for climate predictions, weather forecasting, maritime operational services and marine ecosystem health monitoring.

✎ **United Nations Environment Programme**

The World Environment Situation Room is the United Nations Environment Programme (UNEP) data, information and knowledge platform that includes georeferenced, remote-sensing and Earth observation integrated with statistics and data on the environmental dimension of sustainable development to support decision-making, policy-setting, and action at the global, regional, national and local levels. A federated data system of the best openly accessible environmental data, information and knowledge, it targets country policymakers, top environmental policymakers,

the environmental science community, business and interested citizens, by enabling users to access, visualize, share and download data, information and knowledge services related to the world environment situation in near-real time with adequate analytical capacity. This dynamic knowledge platform will be the primary transformational change tool for implementing the global environmental data strategy of UNEP by integrating geospatial digital libraries, data-driven assessments, foresights, global environmental monitoring, communications, citizen science, and support to United Nations country teams and related common country analysis. Designed to collect, process and share the world's best environmental science and research, as well as the mass of new data from satellites, drones and citizen science, including critical tools to review progress on delivering the environmental dimension of Agenda 2030, the World Environment Situation Room will be customized to fulfil the mandates of UNEP and occupy an important and unique niche in the emerging digital environments for people and the planet. It is designed to promote advocacy on the global environment, accelerate action on climate change, biodiversity and nature loss, chemicals and pollution, and bring more transparency to

<https://wesr.unep.org/home/aboutus>



knowledge of the state of our environment at the global, regional and national levels. The main role of GRID-Geneva is to transform data into information and knowledge to support the decision-making process related to environmental issues. Scientists at GRID-Geneva process satellite imagery using remote-sensing software, create GIS models from geospatial data, and generate interactive maps and graphs for automatic updates. GRID-Geneva is also specialized in the design and maintenance of data platforms for supporting UNEP, including the World Environment Situation Room, the Ramsar Convention and many other organizations and environmental conventions. The GRID-Geneva partnership is also part of the One Global Partnership, which includes more than 15 centres worldwide, working together to keep the environment under review and support UNEP with data processing.

<https://unepgrid.ch>



👉 United Nations Office for Disaster Risk Reduction

The United Nations Office for Disaster Risk Reduction coordinates and supports efforts within the United Nations system in the area of disaster preparedness and mitigation, and

advocates for appropriate measures to adapt to anticipated risks caused by climate change. Countries use data and space technology to provide evidence when reporting against the future disaster risk reduction framework and this will also provide recommended practices on how space technology can be used for resilience-building. The Committee on Earth Observation Satellites (CEOS) and the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) have collaborated on pilot programmes, which involved the use of applications on Earth observation, telecommunications and global navigation satellite systems that support disaster risk reduction and recovery efforts, by supplying decision makers with accurate and timely information.

👉 United Nations University

Through collaborative research and education, the United Nations University (UNU) contributes to efforts to resolve the pressing global problems of human survival, development and welfare that are the concern of the United Nations, its peoples and Member States. By means of postgraduate teaching

activities, UNU contributes to capacity-building, particularly in developing countries. A free online World Flood Mapping Tool was created to help inform disaster mitigation and other planning in all countries, especially those in the Global South where flood risk maps are rare and often badly out-of-date. The world flood mapping tool lets users adjust variables to help locate gaps in flood defences and responses, and to plan future development, for example, where to build or upgrade infrastructure, or develop agriculture. The flood mapping tool is the first tool released as part of the Web-based Spatial Decision Support System (WSDSS) to address flood-related information gaps in the currently available flood early warning and risk management systems. WSDSS comprises the flood mapping tool and a flood risk prediction tool. The flood mapping tool generates inundation maps for significant floods from 1984 until the present using open Earth data. The tool applies a water classification algorithm to “stacks” of historical satellite imagery derived from Landsat to reveal inundation patterns over space and time. The flood mapping tool is a hindcast tool that allows the analysis of impacts of inundation on various socioeconomic sectors. The flood risk prediction tool uses artificial intelligence models to generate current and future flood

risk maps for three climate change scenarios at the city, district and river basin levels. The artificial intelligence models will be trained using the inundation maps generated by the flood mapping tool and open data sets, including land use, land cover, precipitation, temperature, gender and age-disaggregated socioeconomic data.

👉 **United Nations Institute for Training and Research/United Nations Satellite Centre**

One of main strategic objectives of the United Nations Satellite Centre (UNOSAT) is to build and develop capacities of Member States to use Earth observation and geospatial information technologies. Through the provision of technical support, it promotes evidence-based decision-making for peace, security and resilience. In addition, UNOSAT also shares its expertise through training activities specifically targeted at disaster management authorities and decision makers. These efforts, with time, aim to strengthen national and regional capacity for disaster risk management and strengthen climate action policy. A member of the

www.unitar.org/about/news-stories/featuredarticles/developing-geospatial-capacity-enhanced-climate-resilience



International Charter Space and Major Disasters, UNOSAT Rapid Mapping provides satellite image analysis during humanitarian emergencies, both natural disasters and conflict-situations. A team of experienced analysts ensure timely delivery of satellite imagery derived maps, reports and data ready for direct inclusion in Geographic Information Systems (GIS) according to needs. Output products include maps, GIS-ready data (for example flood extents, damage assessments), statistics and reports.

👉 **United Nations Office for Outer Space Affairs**

The United Nations Office for Outer Space Affairs (UNOOSA) has the mandate to implement the United Nations Programme on Space Applications, whose mission is to enhance the understanding and subsequent use of space technology for peaceful purposes in general, and for national development, in particular, in response to expressed needs in different geographic regions of the world. The Office works to help all countries, especially developing countries, access and leverage the benefits of space to accelerate sustainable development. Climate change is one of the

seven areas of work under the Programme. In this context, UNOOSA organizes a variety of awareness and training activities or thematic sessions with other partners, focusing on the use of satellite-based data and information in support of climate change research or to highlight the connection between climate change and vulnerability to disasters. The Office helps to link space and climate experts with decision makers through workshops and symposiums organized directly by the Office or co-organized with partners. To target disaster risk management, the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) was established under UNOOSA in 2006 to help countries use space data and technologies to prevent and manage disasters. It is the mandate of UN-SPIDER to enable developing countries to use all types of space-based information in all phases of the disaster management cycle including prevention, preparedness, early warning, response and reconstruction. It develops solutions to address the limited access developing countries have to specialized technologies that can be essential in the management of disasters and the reduction of disaster risks. It aims at improving actions to reduce disaster risk or support disaster response operations through

knowledge-sharing and the strengthening of institutions in the use of space technologies. UN-SPIDER also facilitates cooperation between satellite data and information providers and the different groups of users of such data, such as policymakers, disaster risk managers or emergency responders. The objective is a better flow of information on disaster risks or disaster impacts between all stakeholders and affected populations. The Knowledge Portal of UN-SPIDER is a hub for pertinent information, links and resources. Through its tailor-made technical advisory support, it assesses the individual potential of a country, makes specific recommendations and carries out specialized training courses for government staff. Additionally, through its conferences, workshops and expert meetings, UN-SPIDER brings together relevant stakeholders from both the space and the disaster communities in order to foster an exchange of innovations and experiences. UN-SPIDER collaborates with the United Nations Office for Disaster Risk Reduction (UNDRR) and the World Meteorological Organization (WMO), along with other international and national agencies, in the International Network for Multi-Hazard Early Warning Systems (IN-MHEWS).

👉 World Bank Group

The Climate Change Knowledge Portal (CCKP) is the hub for climate-related information, data and tools for the World Bank Group. Developed to service the needs of expert and non-expert users, CCKP provides global data on past climate and future climate change projections, as well as socioeconomic data to support users in their climate-resilient decision-making. The Portal provides an online platform from which a wide range of users can access and analyse comprehensive data related to climate change and development, allowing them to apply scientific information to the design of a project or policy, and also provides intelligent links to other resources and tools. Using the latest climate data and scientific research available, it provides development practitioners with resources to explore, evaluate, synthesize and learn about future climate scenarios, projected risks and climate-related vulnerabilities at multiple levels of detail. CCKP also contains disaster risk data sets, as well as synthesis products, such as the Climate Risk Country Profiles, which are built and packaged for specific user-focused functions in a particular country or sector. Earth observation data has since been identified for seamless

<https://climate-knowledgeportal.worldbank.org/about>


integration into the existing architecture for instant access by users to support climate-resilient decision-making at regional and national levels. Satellite Earth observation has also been one of the pillars of the disaster risk management practice at the World Bank Group. Disaster risk specialists help countries around the world prepare for catastrophes such as earthquakes and extreme weather events with the support of the Global Facility for Disaster

Reduction and Recovery (GFDRR). www.worldbank.org
Developments in satellite technology, remote sensing and big data allow the World Bank Group to collect an unprecedented amount of valuable information, which can be leveraged to address emerging and complex risks. The Crisis and Disaster Risk Finance team has also put in place a technical assistance programme, under the joint technical partnership with the European

Space Agency (ESA) and funded by the Global Risk Financing Facility (GRiF), on crisis risk finance analytics which leverages innovative analytics at global, country and project levels to create an enabling environment for improved risk financing and risk management.

www.financialprotectionforum.org

B. NON-UNITED NATIONS ENTITIES ADVANCING THE APPLICATION OF CLIMATE SERVICES

Initiated under the umbrella of the One Planet Summit in 2017 and officially launched by 23 space agencies and international organizations at the instigation of the French Space Agency in 2019, the Space for Climate Observatory (SCO) is a non-binding partnership of around 40 space agencies and international organizations that aims to support the emergence of Earth observation-based applications for climate adaptation, mitigation and monitoring at the local level, and foster international cooperation for such projects to be shared and used in various geographic areas. SCO aims to provide interested users with the tools and capabilities to study, monitor and adapt to the impacts of climate change, especially at local and regional geographic scales, using satellite-based Earth-observation tools in combination with field data and models.

SCO participants gather regularly to share experiences, toolkits and methods on the application of space technology for climate action, promote the use of good practices for using space technologies to meet climate objectives, and to discuss and agree on projects and actions addressing the identified common goals, which are those directly linked to international commitments taken by nations to tackle climate change issues and their impacts. It aims to reach a wide diversity of actors in both the space and climate change sectors to foster cooperation between space and government agencies, national, regional and international public organizations, institutions and agencies, academic and research institutions, potential end users and national and international private sector organizations and institutions.

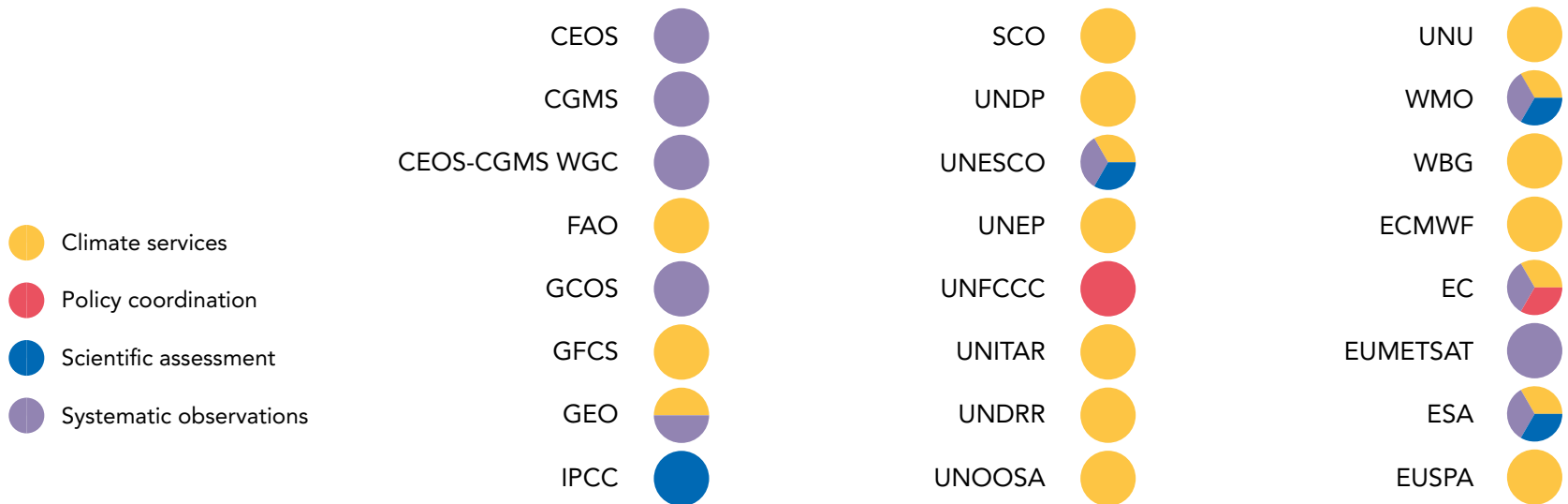
SCO endeavours to support global climate action enabled through space technology to facilitate collaborative activities at local, national, regional and international levels, and improve the understanding of processed space data and derived information for climate action on local, national, regional and international levels if possible; develop capacities to study, monitor, mitigate and adapt to the impacts of climate change at local, national, regional and international levels by using satellite-based tools in combination with field data and models; and exploit the full potential of space technologies for climate change monitoring, mitigation and adaptation to meet climate objectives, and increase awareness about its benefits and to monitor and to support the implementation of activities.

BREAKDOWN OF ENTITIES AT REGIONAL LEVEL

The above framework to map global entities can also be applied at the regional level which has been added to show how various regional efforts do not have to duplicate or replace and compete with existing global efforts but how

they can complement these ambitions. The example of adding European entities to the global landscape is described below, showing how entities can fulfil multiple roles in the regional climate change framework as well as

interact with entities at the global level, to enhance their contribution to the United Nations Framework Convention on Climate Change:



The activities of the European Commission can be broken down into policy coordination, systematic observation and climate services. As the executive body of the European Union, an intergovernmental organization of 27 Member States, the European Commission plays an active role in designing and implementing European Union policies. The policy of the European Commission for climate action is implemented by its Directorate-General for Climate Action (DG CLIMA) and called the European Green Deal, by which Europe will tackle climate change and be carbon-neutral by 2050. To support this policy objective, the European Union Space Programme, implemented by Directorate-General for Defence Industry and Space (DG DEFIS), ensures the space-based infrastructure is sufficient to meet the needs of systematic observation, that is, the Earth observation system of the European Union called Copernicus, combined with the additional benefits offered by Galileo, the Global Navigation Satellite Systems satellite constellation of the European Union. The data collected by the Copernicus Earth observation programme is not only sensed by its Sentinel satellites but in combination with other contributing missions operated by partner space agencies as well as in situ sensors. The

European Commission offers climate services through its Copernicus Climate Change Service (C3S), which processes all the relevant data, from both its satellites as well as other resources, and provides full, free and open access to archived, present and forecasted climate information. In addition to the Copernicus Climate Change Service, the European Commission provides satellite data processed via its Copernicus Emergency Management Service. The Directorate-General of Communications Networks, Content and Technology (DG CONNECT) of the European Commission is also planning a new climate service initiative, called Destination Earth (DestinE), which will use Earth observation data as input into digital twin models of the Earth that users will be able to use as a tool for supporting the development of climate adaptation and resilience plans.

The European Commission partners with the European Centre for Medium-Range Weather Forecasts (ECMWF), with expertise in modelling and forecasting, to implement C3S as well as the CAMS (Copernicus Atmosphere Monitoring Service) climate services. It also partners with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), to operate some of the Sentinel satellites to carry

out its role in systematic observation. EUMETSAT also has partnership agreements with the European Centre for Medium-Range Weather Forecasts (ECMWF) to provide the latter with data collected. The European Commission also partners with the European Space Agency (ESA) for its long-standing technical expertise in space programmes. ESA develops the space segment for Copernicus for the European Union and operates some of the Sentinel satellites as well. All three European institutions also partner with the European Commission for its Destination Earth (DestinE) Programme.

ESA also has more roles to play within this regional framework beyond its involvement in the Copernicus Programme of the European Commission. It is an entirely independent organization from the European Union, with which it maintains close ties through the ESA European Commission Framework Agreement. They share a joint European Strategy for Space and have together developed the European Space Policy. The mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. In this respect, the Senior Climate and Sustainability Adviser ensures that ESA and

the European space programmes can support the implementation of both the Paris Agreement and the European Green Deal to the fullest extent.

ESA has been offering data from Earth observation satellites in near-real time to decision makers and scientists since 1992. In response to UNFCCC requirements for systematic observation, ESA launched its Climate Change Initiative Programme in 2008. The Climate Change Initiative (CCI) merges archived Earth observation data, in addition to data from international partners collected over five decades, to create a suite of long-term, global data records for the key aspects of the climate system. These empirical observations provide the evidence to advance scientific understanding and support IPCC. The objective of CCI is to realize the full potential of the global Earth observation archives, together with its Member States, by undertaking the activities necessary to provide a significant and timely contribution to the GCOS-defined Essential Climate Variables databases required by UNFCCC. Expert science teams drawn from ESA Member States undertake research to generate the CCI Essential Climate Variables that track changes across the oceans, atmosphere and land. All CCI data products have fully characterized uncertainties and are validated using

independent, traceable, in situ measurement. CCI provides an adequate, comprehensive and timely response to the extremely challenging set of requirements for highly stable, long-term satellite-based products for climate that were addressed to space agencies. A total of 54 Essential Climate Variables have been identified by GCOS. Information derived from satellite data can contribute to more than half of them, and the CCI research programme addresses 21 of them. A growing body of essential climate variables records is now freely available via the CCI Open Data Portal. These climate-quality data sets are a major contribution to the evidence base used to understand climate change, which drives international action.

ESA is also involved in climate services. It has worked closely with international financial institutions and their client countries to harness the benefits of Earth observation in their operations and resources management. Earth Observation for Sustainable Development (EO4SD) is a new ESA initiative which aims at increasing the uptake of Earth observation-based information in regular development operations at national and international level. In particular, the EO4SD Climate Resilience Cluster project aims to provide insight about the potential of Earth observation to support

climate-resilient decision-making at the regional and national level. In collaboration with several international financial institutions, the project will develop an Earth observation-based integrated climate screening and risk management service to help manage climate-related risks and capitalize on the opportunities that climate resilience can create. Developing countries are especially prone to rapid ecosystem degradation and the loss of related regulating services that are particularly critical for climate change adaptation and disaster risk reduction. As opposed to slow-onset events, extreme weather and climate-related events have very obvious and dramatic sudden impacts. Extreme events include hazards such as heatwaves, extreme rainfall, tropical cyclones, droughts, floods and wildfires. In comparison, climate-related slow-onset events are very dangerous, but their full impact potential can take decades to manifest. The EO4SD Climate Resilience Cluster will provide the following international financial institutions and multilateral development banks with tailored Earth observation that will inform their climate resilience decision-making: World Bank Group, Asia Development Bank (ADB), International Fund for Agricultural Development (IFAD), African Development Bank (AfDB), International Finance Corporation (IFC) and Inter-American

Development Bank (IDB). ESA also recently launched its Global Development Assistance Programme (GDAP), which aims to foster impact through the systematic integration of Earth observation data in development projects. Under this programme, during the period 2020–2024 ESA will carry out the technical knowledge development (information products, user-oriented analytics tools) required for new types of environmental information arising from development operational needs. In the disaster resilience domain, the main focus is on hazard, exposure and vulnerability mapping in order to

better meet the information requirements of international financial institutions and development stakeholders. To achieve this, ESA engages a European consortium of specialized Earth observation providers to partner with the World Bank Group and the Asia Development Bank, aimed at strengthening the disaster resilience of developing countries.

Finally, ESA is also part of Space for Climate Observatory (SCO) and supports the efforts of European members in this context, while also sharing specific projects under this umbrella.

There is one more entity in the European region that belongs in the growing category of climate services. Instead of offering technical capabilities, the European Union Agency for the Space Programme (EUSPA) is focused on supporting market development downstream of traditional climate services. Rather than targeting governmental end users, the European Union Agency for the Space Programme (EUSPA), with more business-oriented expertise than policy or technical, is focused on helping European industry develop climate services for commercial end users.

An aerial photograph of a river delta, showing a complex network of channels and floodplains. The image is overlaid with a yellow rectangular area on the left and a larger red rectangular area on the right, which contains the main title text.

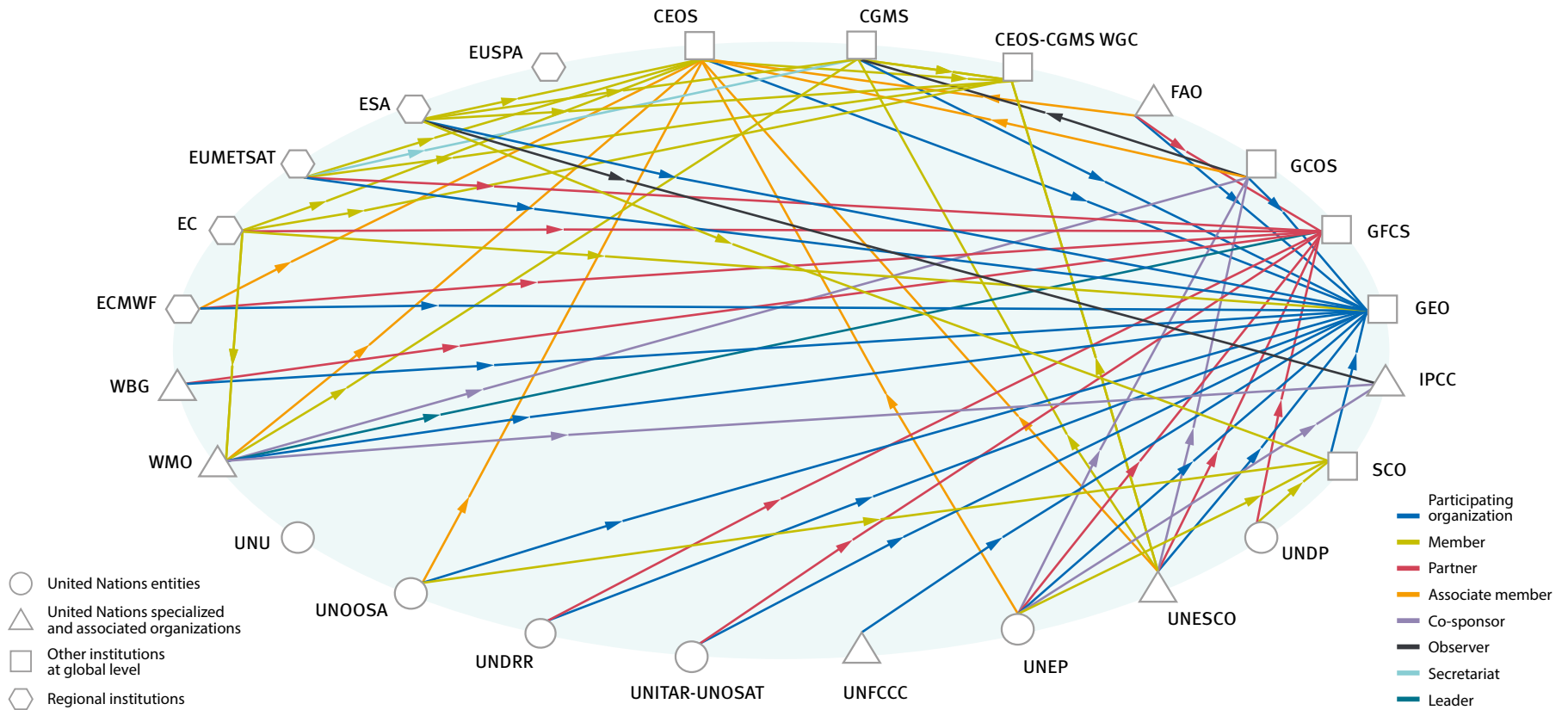
PART III.

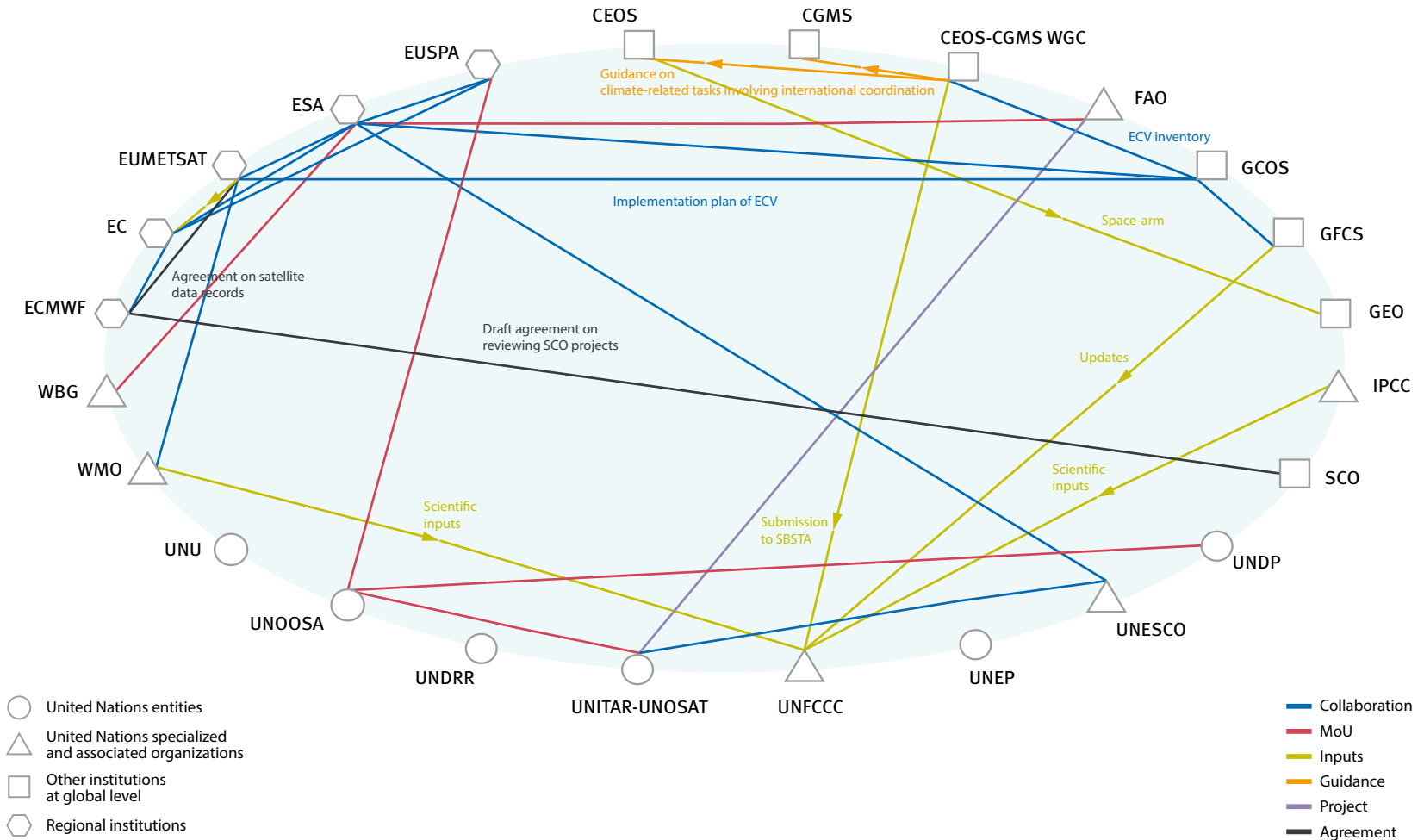
**INSTITUTIONAL RELATIONSHIPS
BETWEEN THE ENTITIES**

The following graphs have been created to provide a better and more graphic visualization of the interactions of a different nature between the international coordination bodies listed in this mapping exercise. The terminology of the

categories of the main depicted working interactions, which is rather broad, has been pulled out from publicly available information reported by the coordination bodies themselves. The list of depicted interactions is

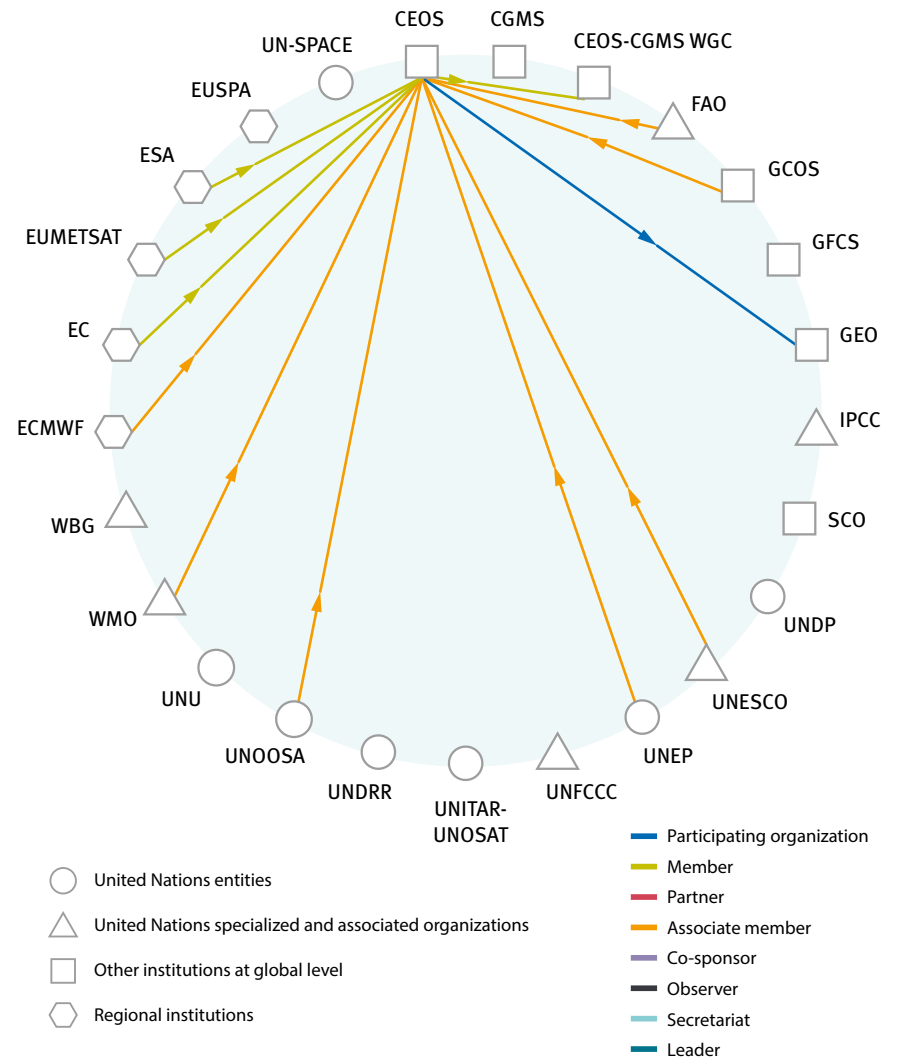
not exhaustive and is based on the information available on the websites of the bodies. The graphs depicting the different membership relations between the coordination bodies are based on the same procedure.





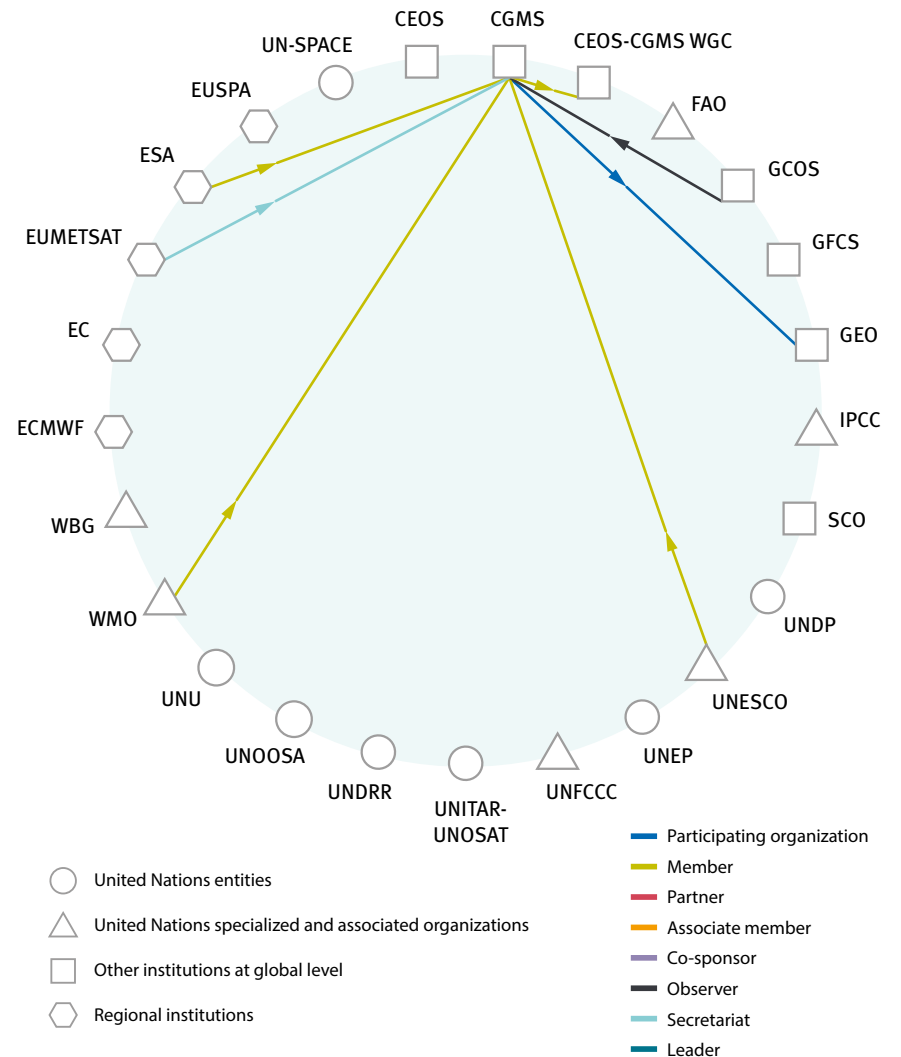
Committee on Earth Observation Satellites

- Coordinates activities of member space agencies
- Part of CEOS-CGMS WGClimate
- Participating organization ("space arm") in GEO
- Charter Partner for International Charter Space and Major Disasters
- Associate members (also "CEOS Agencies") include: WMO, UNEP, UNOOSA, FAO, UNESCO, IOC-UNESCO, ECMWF, GCOS
- ESA is a member ("CEOS Agency")
- The European Commission is a member ("CEOS Agency")
- EUMETSAT is a member ("CEOS Agency")



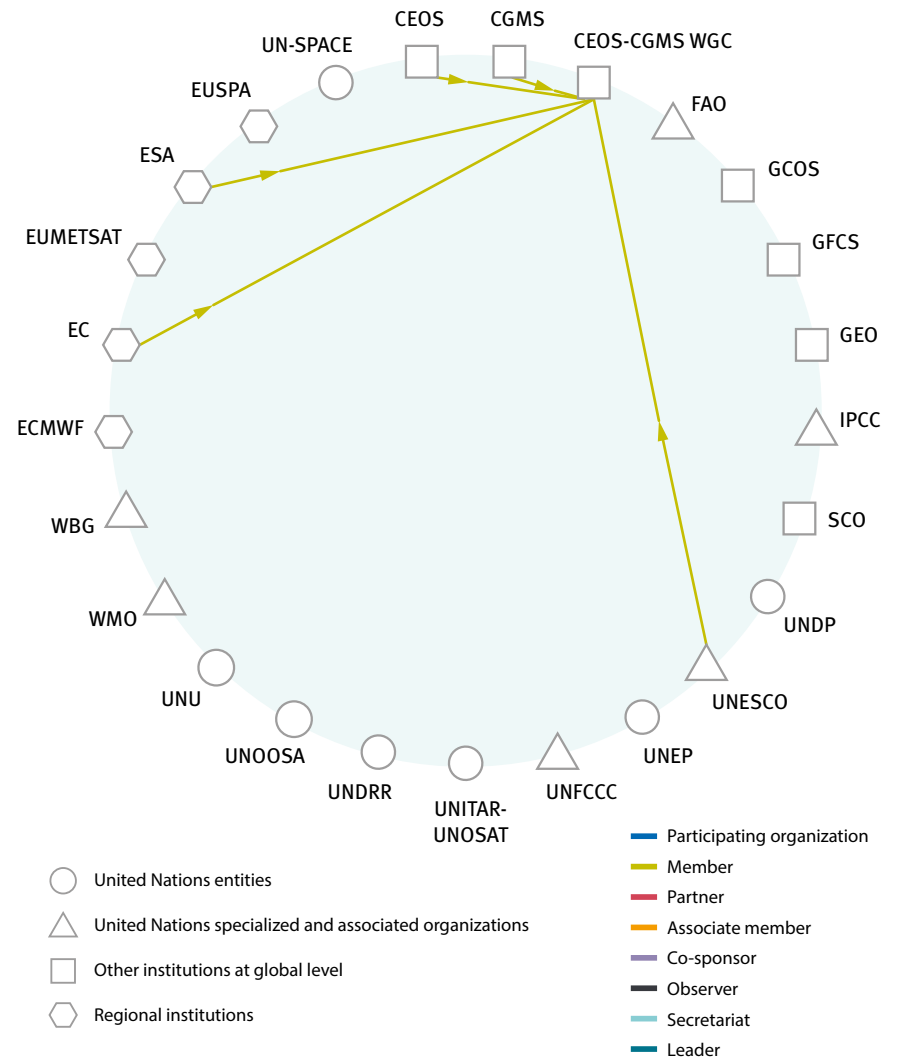
Coordination Group for Meteorological Satellites

- Coordinates activities of member space agencies (operational and research and development), represents them in international bodies
- Participating organization in GEO
- Part of WGClimate
- WMO is a member
- IOC-UNESCO is a member
- GCOS is an observer
- Interacts with some international science working groups
- ESA is a member
- EUMETSAT is a member



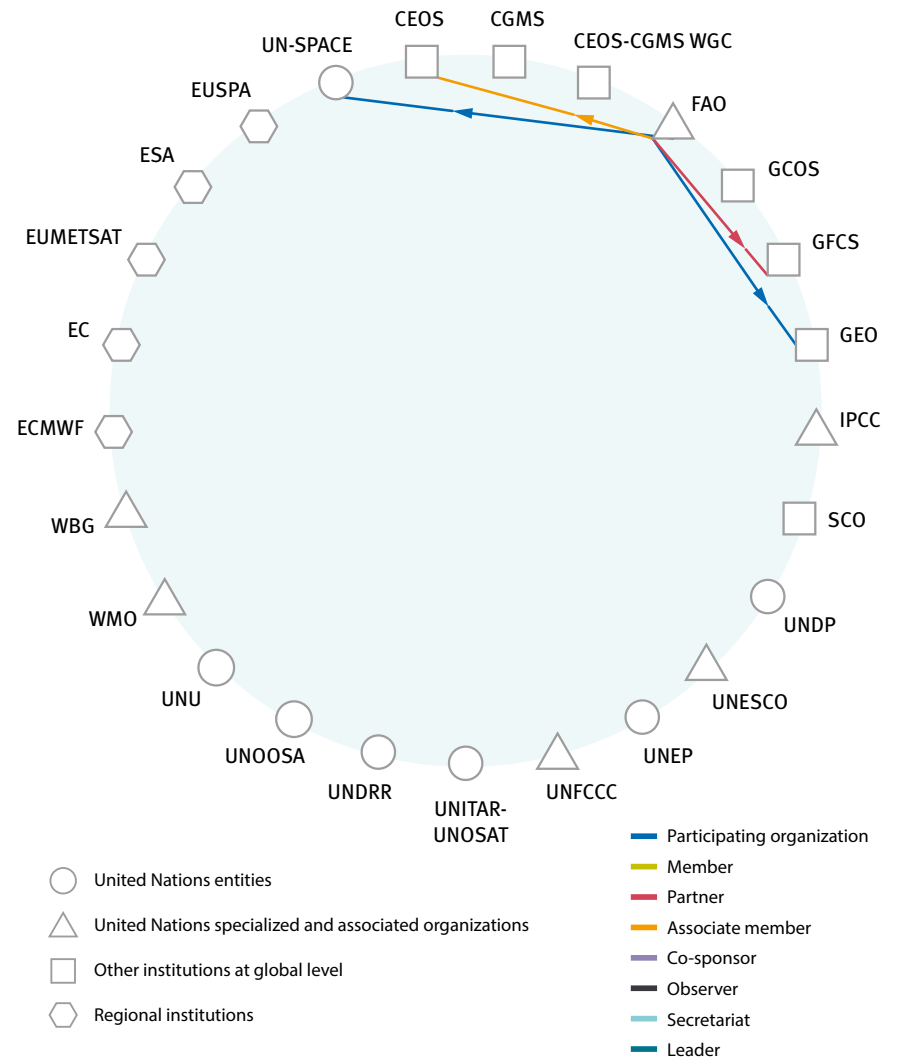
Committee on Earth Observation Satellites and Coordination Group for Meteorological Satellites Working Group on Climate

- Works with GCOS on space requirements for ECV Inventory status report (and provides joint response to GCOS Implementation Plan)
- Reports to and interacts with UNFCCC/SBSTA(-RSO)
- Submits CEOS/CGMS Joint Response to UNFCCC/SBSTA
- Comprised of CEOS and CGMS members (responsible for the Architecture for Climate Monitoring from Space)
- Provides guidance to CEOS and CGMS on climate-related tasks involving international coordination mechanisms (e.g. GEO, GFCS)
- Participates in GEO CC-WG (Climate Change Working Group)



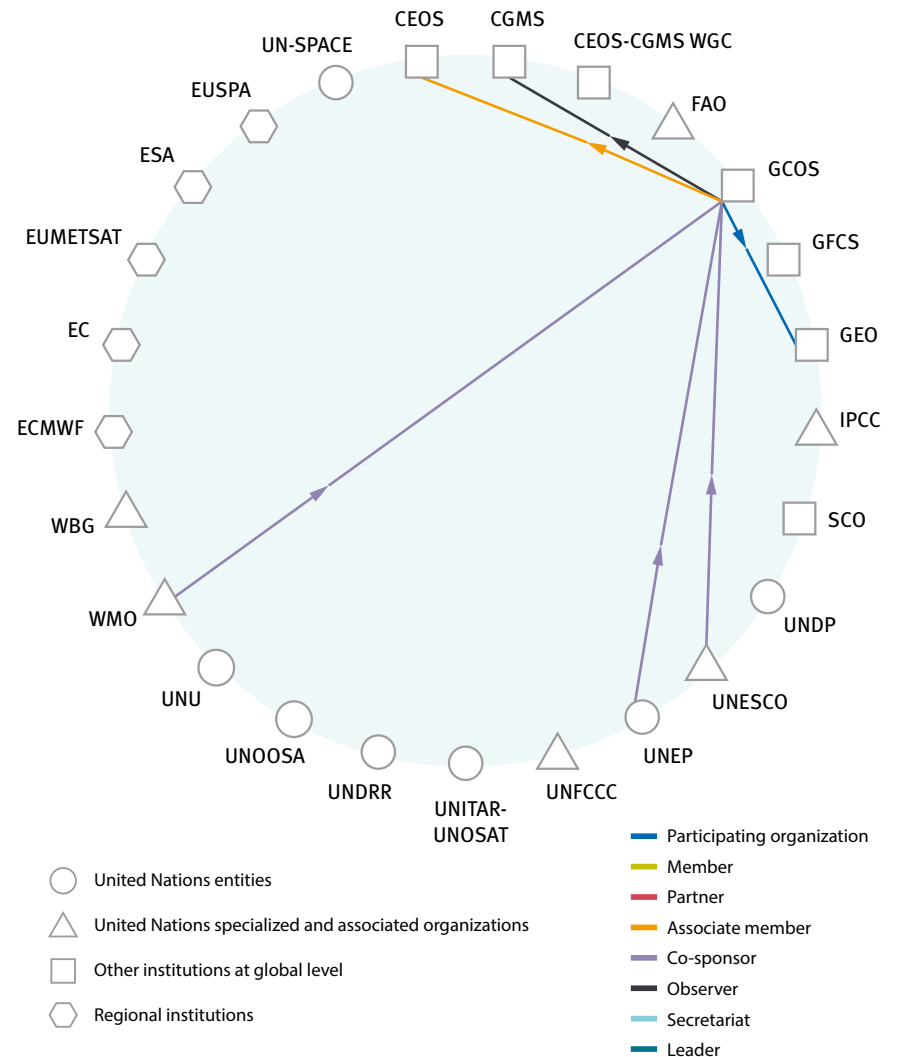
Food and Agriculture Organization of the United Nations

- Co-sponsor of UN-REDD (with UNDP, UNEP)
- Partner in GFCS
- Associate member of CEOS ("CEOS Agency")
- Participating organization in GEO
- Memorandum of understanding signed with ESA (April 2021)
- Participating organization in UN-Space



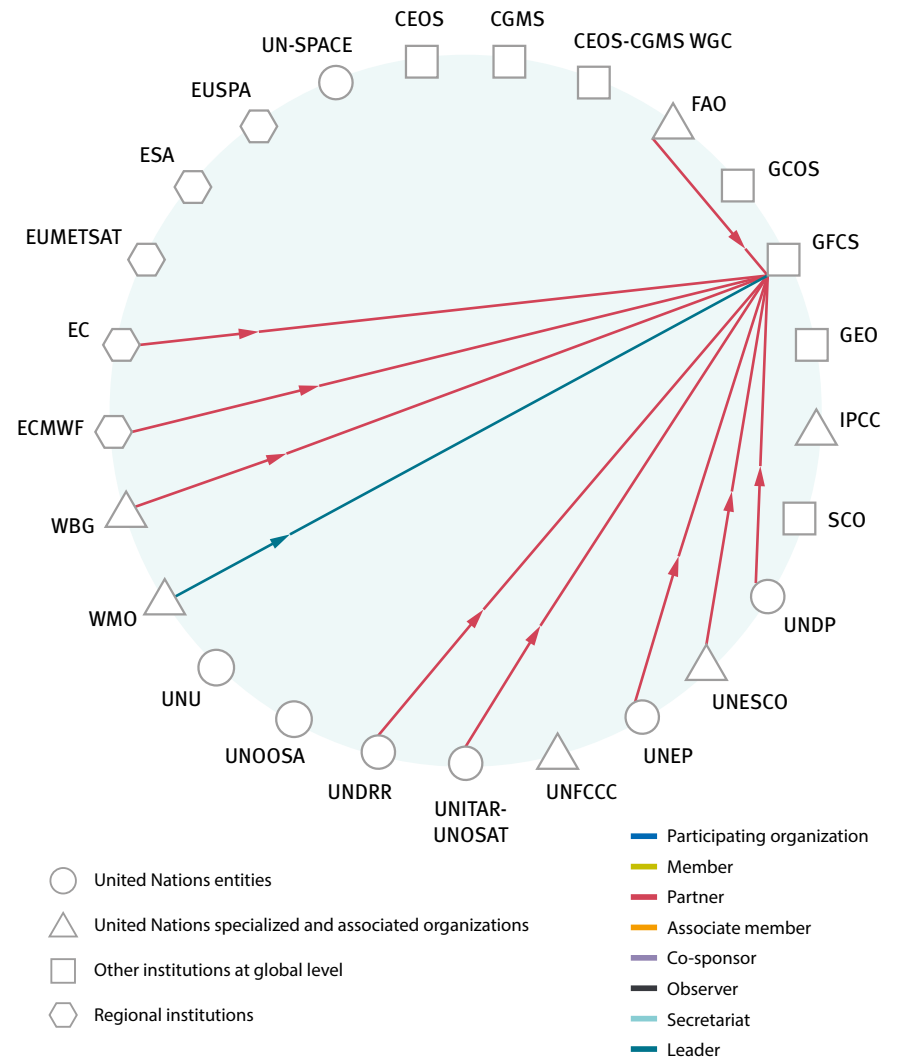
Global Climate Observing System

- Co-sponsored by WMO (host), IOC-UNESCO, UNEP, ISC, support from the European Commission
- Submits GCOS Implementation Plan and status reports to UNFCCC/SBSTA (with responses from WGClimate)
- Works with CEOS-CGMS WGClimate on space requirements for ECV Inventory
- Associate member of CEOS ("CEOS Agency")
- Observer in CGMS
- Participating organization in GEO
- Works with GFCS



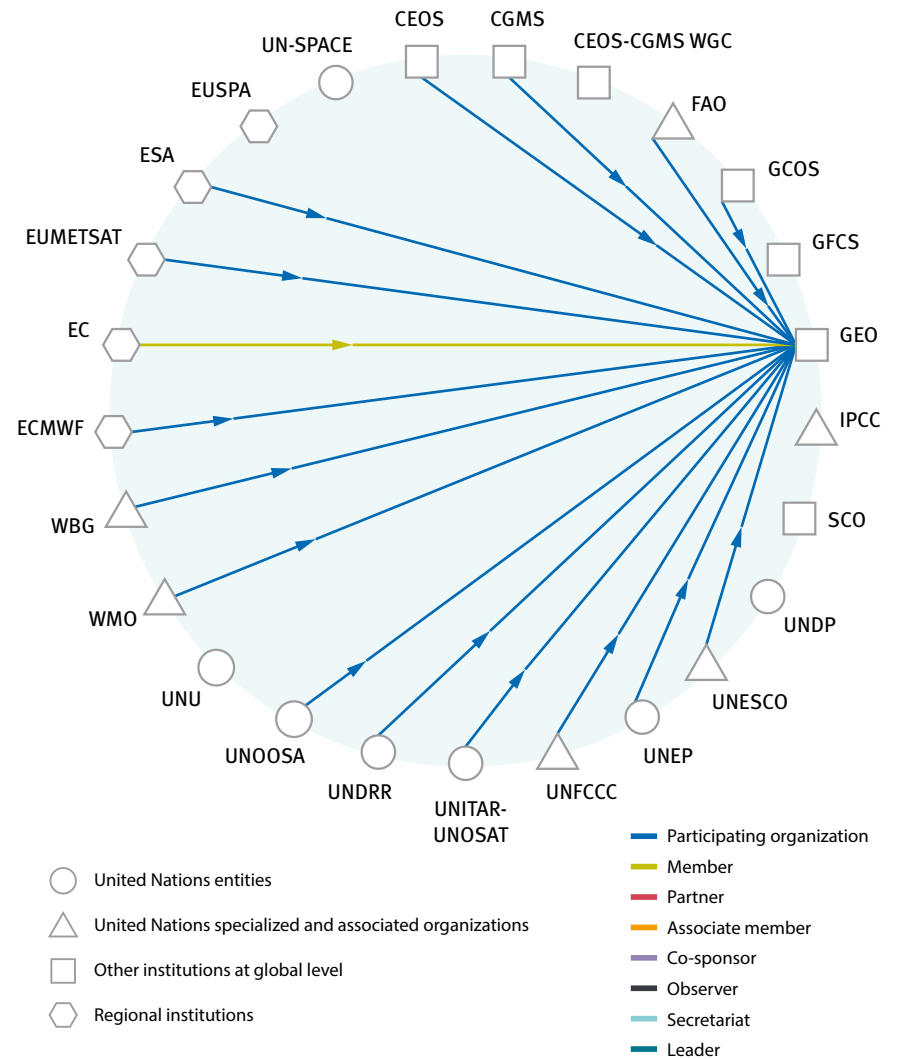
Global Framework for Climate Services

- Led by WMO
- Partners include: UNDP, UNEP, UNESCO, EUMETSAT, UNDRR, UNITAR/UNOSAT, ECMWF, FAO, WBG (and WHO, UNOPS, WFP), European Commission
- Works with GCOS
- Provides regular updates to UNFCCC/SBSTA



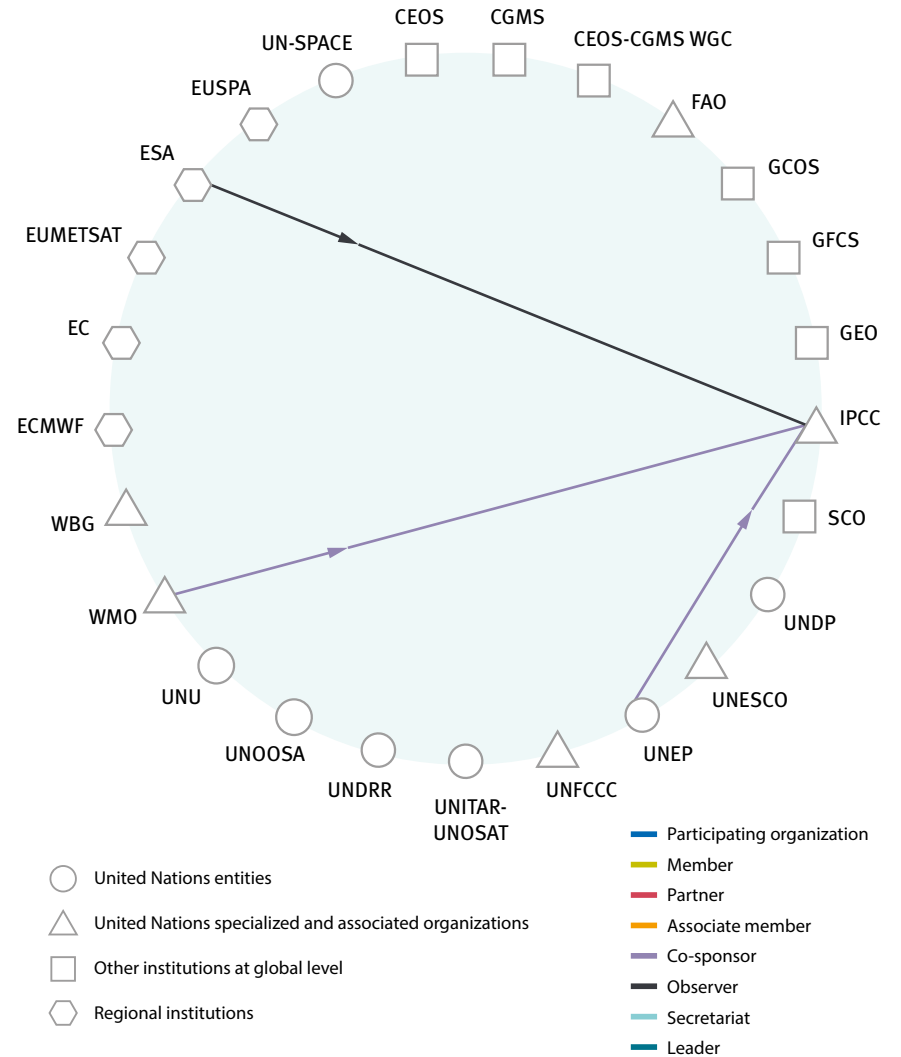
Group on Earth Observations

- CEOS-CGMS WGClimate participates in GEO CC-WG (Climate Change Working Group)
- WMO is a participating organization (Secretariat)
- CEOS is a participating organization (the "space arm")
- Other participating organizations include: CGMS, UNESCO, UNEP, WB, UNDRR, UNITAR/UNOSAT, UNOOSA, UNFCCC, FAO, GCOS, ESA, ECMWF, EUMETSAT
- Charter Partner for International Charter Space and Major Disasters



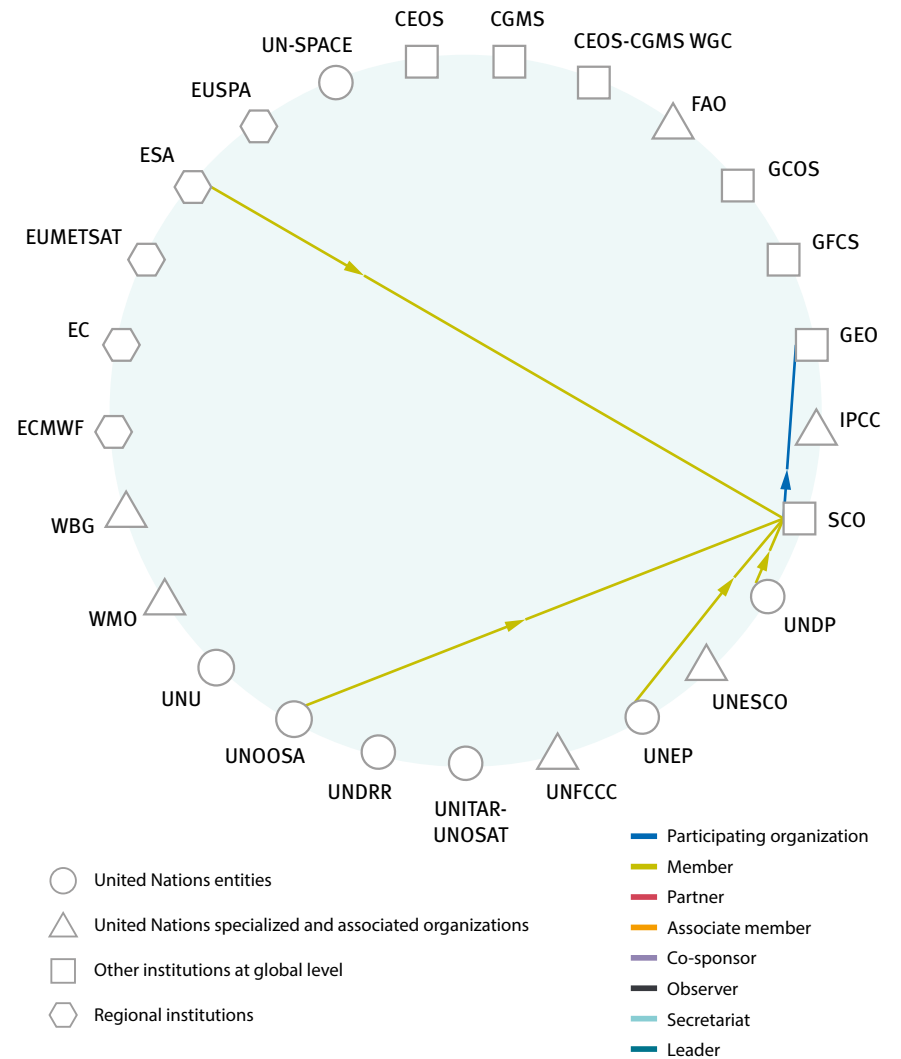
Intergovernmental Panel on Climate Change

- Provides regular assessment reports and scientific input on knowledge of climate change to UNFCCC/SBSTA
- Co-sponsored by WMO (host) and UNEP
- ESA is an observer



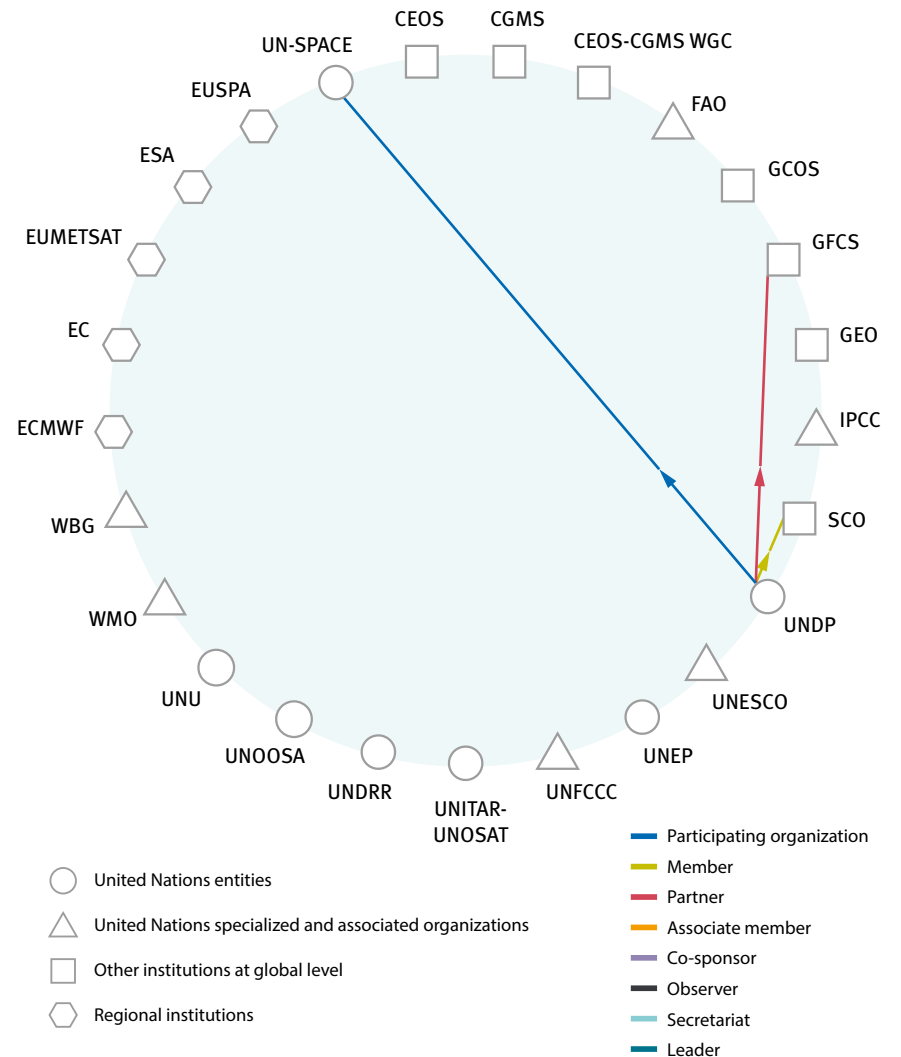
Space for Climate Observatory

- UNOOSA is a member
- ESA is a member
- Participating organization in GEO
- ECMWF is part of the reviewing committee for SCO Projects
- UNEP is a member



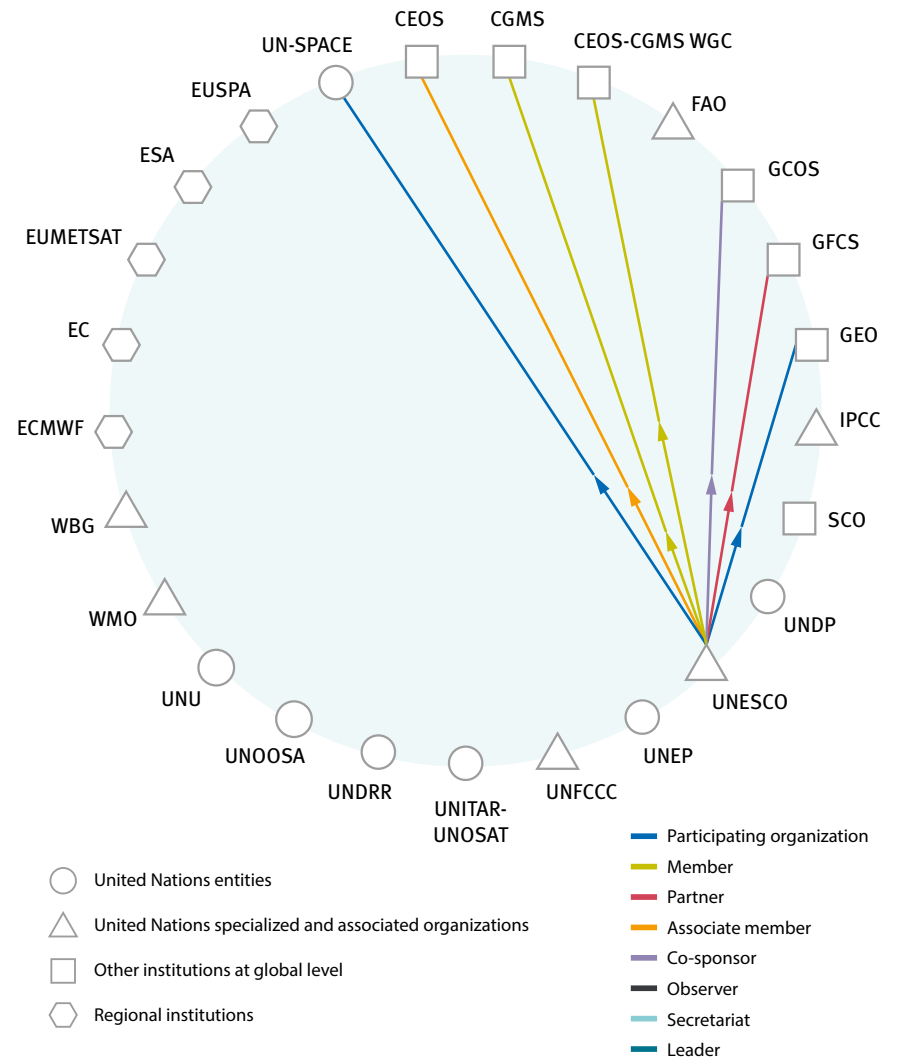
United Nations Development Programme

- Co-sponsor of UN-REDD (with FAO, UNEP)
- Partner in GFCS
- Member of SCO
- Memorandum of understanding with UNOOSA
- UNDP ensures its climate promise support brings together all UNDP projects and initiatives contributing to nationally determined contributions, work on the ground and leverages complementarities, mandates, comparative advantages and skillsets of a wide range of strategic partners, including United Nations partners, such as: UNFCCC, UNEP, FAO, ILO, UN-HABITAT, WHO
- Participating organization in UN-Space



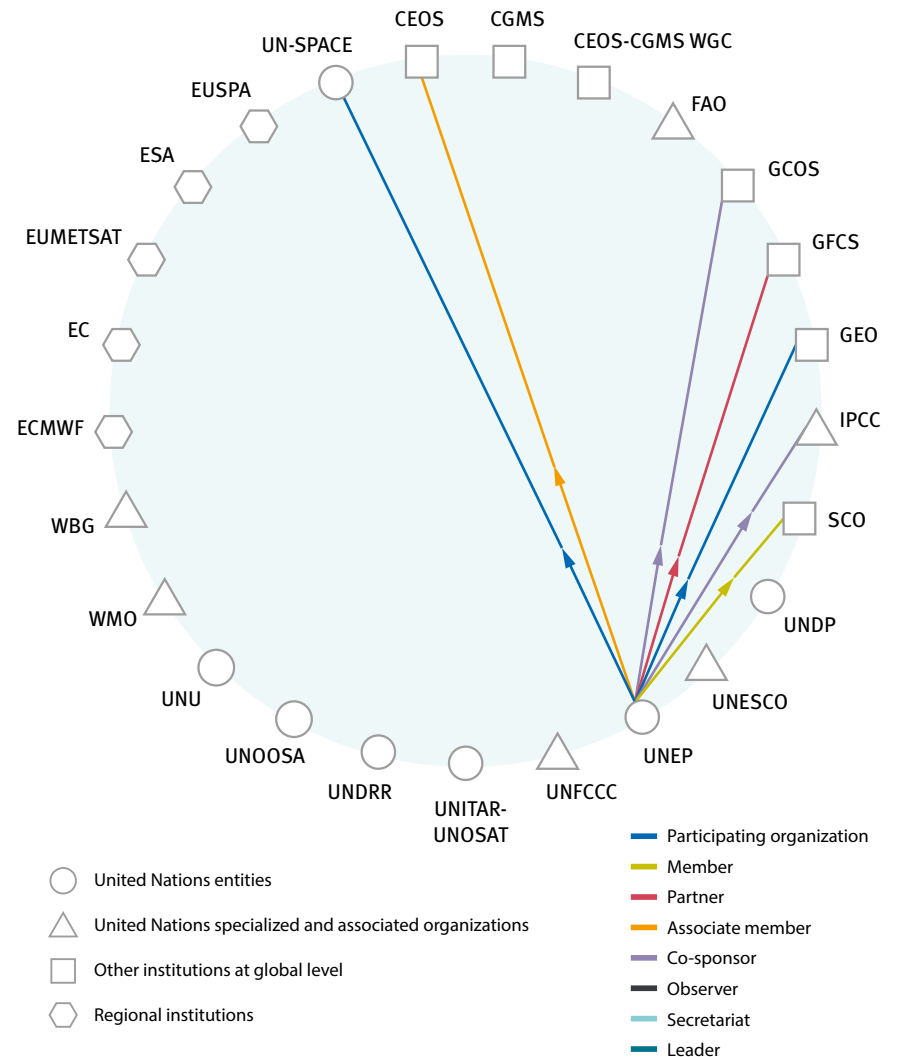
United Nations Educational, Scientific and Cultural Organization

- Participating organization in GEO
- Associate member of CEOS ("CEOS Agency")
- Partner in GFCS
- Works with ESA to use space technologies and data to monitor natural and cultural heritage sites
- Partnership with UNOSAT to monitor the state of conservation of World Heritage sites at risk due to natural hazards or conflict
- Leads the Global Ocean Observing System (GOOS) co-sponsored by WMO, UNEP, and ISC
- Co-sponsor of GCOS (with WMO, UNEP and ISC)
- Member of CGMS, CEOS-CGMS WGClimate
- Associate member of CEOS ("CEOS Agency")
- Participating organization in UN-Space



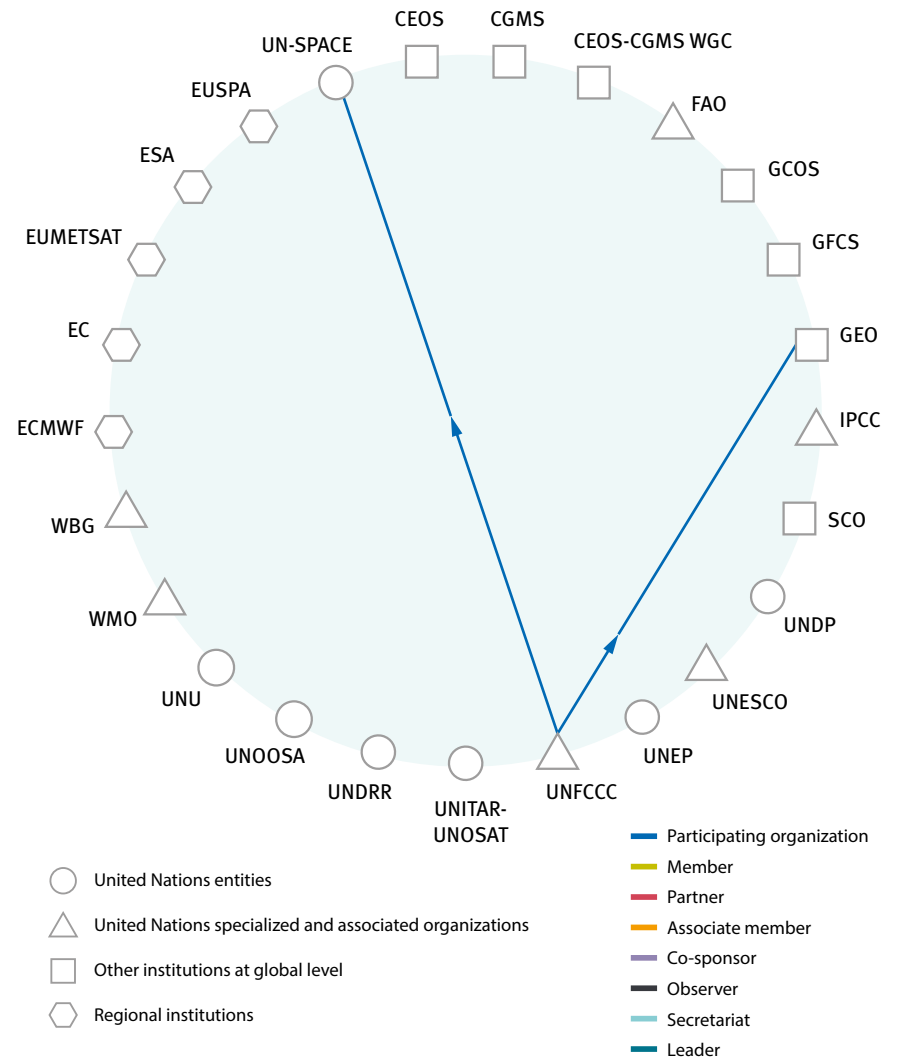
United Nations Environment Programme

- Associate member of CEOS ("CEOS Agency")
- Participating organization in GEO
- Co-sponsor of IPCC (with WMO)
- Co-sponsor of GCOS (with WMO, IOC-UNESCO)
- Co-sponsor of UN-REDD (with FAO, UNDP)
- Member of SCO
- Partner in GFCS
- "GRID-Geneva" is a partnership with the Swiss Federal Office for the Environment and University of Geneva
- Participating organization in UN-Space



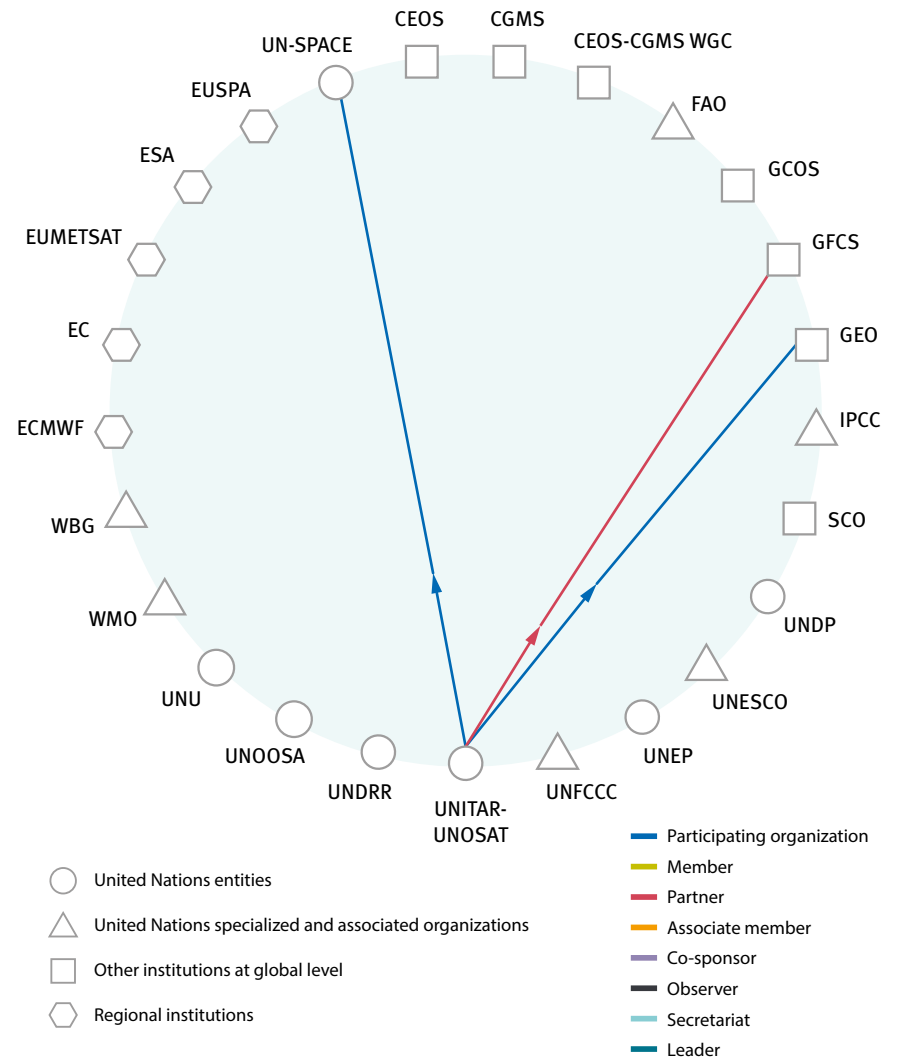
United Nations Framework Convention on Climate Change

- Works with IPCC (provides regular assessments and scientific inputs on the state of knowledge on climate change)
- GCOS provides the GCOS Implementation Plan and status reports
- CEOS-CGMS WGClimate submits joint response from CEOS/CGMS as requested
- WMO provides technical and scientific inputs (annual Statement on the State of Global Climate and Greenhouse Gas Bulletins) in coordination with a wide range of United Nations partners
- Participating organization in GEO
- GFCS provides regular updates to SBSTA
- Participating organization in UN-Space



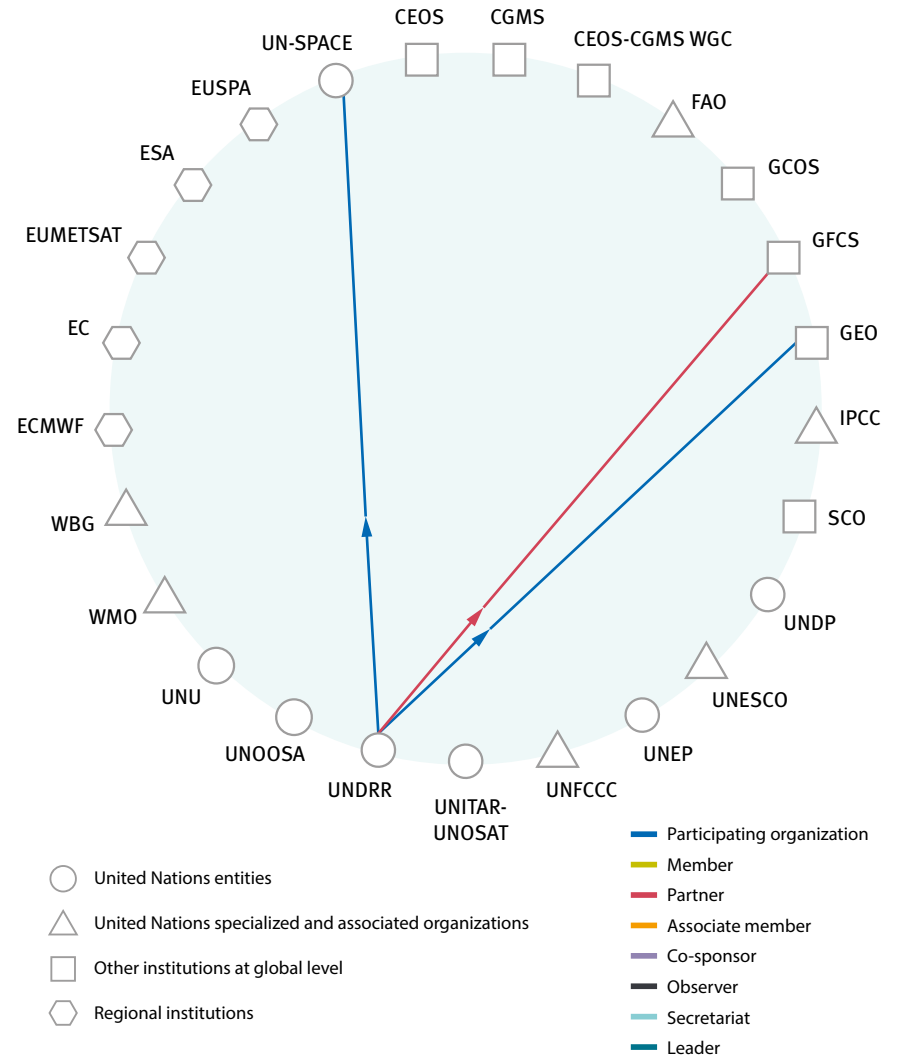
United Nations Institute for Training and Research

- Hosts the United Nations Satellite Centre
- Participating organization in GEO
- Partner in GFCS
- Memorandum of understanding with UNOOSA
- Charter Partner for International Charter Space and Major Disasters
- Rapid Map service is available to: United Nations offices and agencies, government agencies, ICRC and IFRC, international and regional organizations, humanitarian non-governmental organizations
- Participating organization in UN-Space



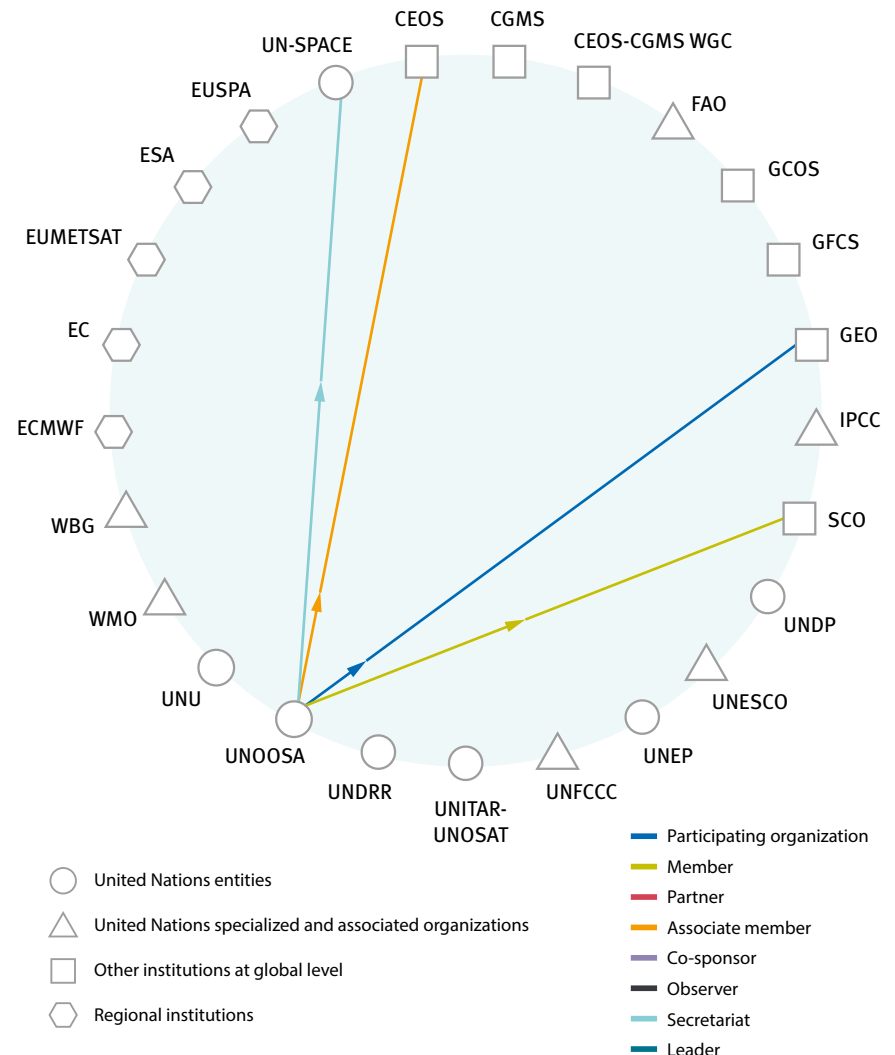
United Nations Office for Disaster Risk Reduction

- Participating organization in GEO
- Partner in GFCS
- Established the International Network for Multi-Hazard Early Warning Systems (IN-MHEWS) with WMO and other international and national agencies, including UN-SPIDER
- Participating organization in UN-Space



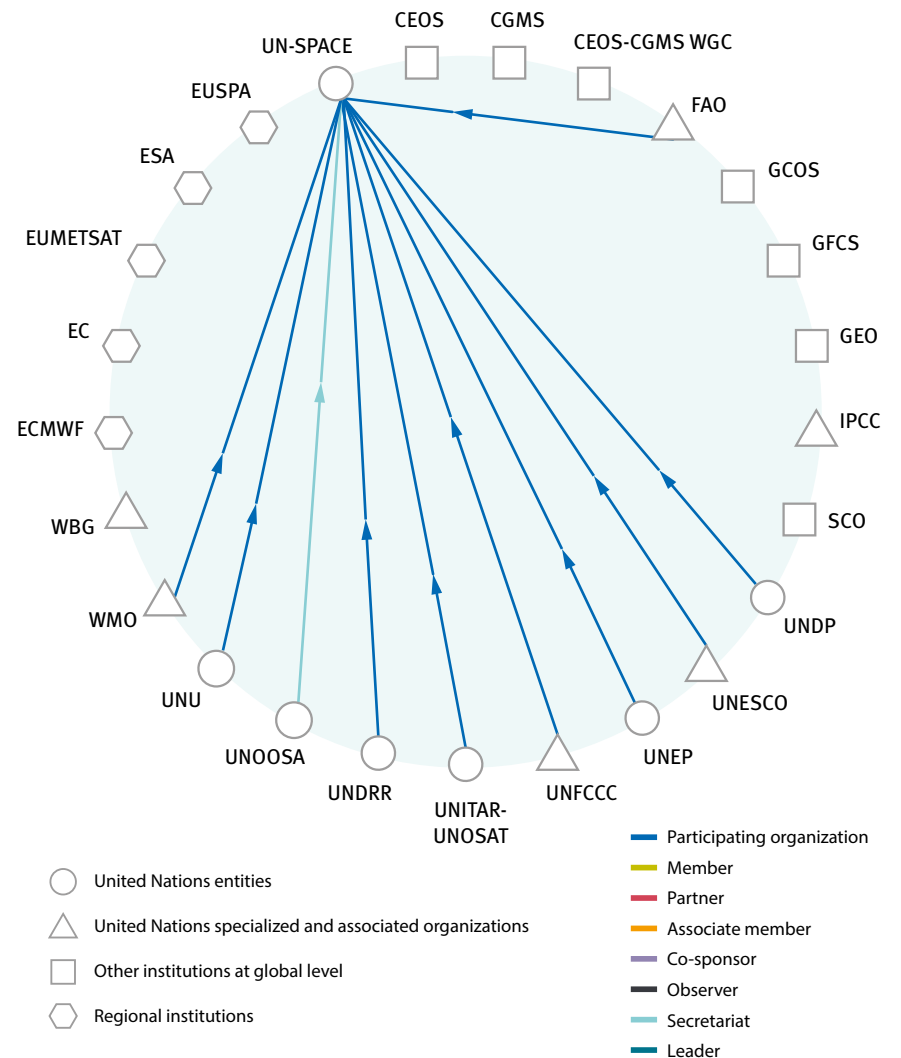
United Nations Office for Outer Space Affairs

Secretariat for UN-Space, with following Participating Organizations:
 Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO);
 Convention on Biological Diversity (CBD); Department of
 Peacekeeping Operations (DPKO); Food and Agriculture Organization
 (FAO); International Atomic Energy Agency (IAEA); International Civil
 Aviation Organization (ICAO); International Maritime Organization
 (IMO); International Telecommunication Union (ITU); United Nations
 Conference on Trade and Development (UNCTAD); United Nations
 Department on Safety and Security (UNDSS); United Nations
 Development Programme (UNDP); United Nations Economic and
 Social Commission for Asia and the Pacific (ESCAP); United Nations
 Economic Commission for Africa (UNECA); United Nations Economic
 Commission for Europe (UNECE); United Nations Economic
 Commission for Latin America and the Caribbean (ECLAC); United
 Nations Educational, Scientific and Cultural Organization (UNESCO);
 United Nations Environmental Programme (UNEP); United Nations
 Framework Convention on Climate Change (UNFCCC); United
 Nations High Commissioner for Refugees (UNHCR); United Nations
 Human Settlements Programme (UN-HABITAT); United Nations
 Industrial Development Organization (UNIDO); United Nations
 Institute for Training and Research Operational Satellite Applications
 Programme (UNOSAT); United Nations Office for Project Services
 (UNOPS); United Nations Office on Disaster Risk Reduction (UNDRR);
 United Nations Convention to Combat Desertification in Countries
 Experiencing Serious Drought and/or Desertification; United Nations
 Department of Economic and Social Affairs (UN DESA); United
 Nations Economic and Social Commission for Western Asia
 (UNESCWA); United Nations Office for the Coordination of



Humanitarian Affairs (OCHA); World Food Programme (WFP); World Health Organization (WHO); World Intellectual Property Organization (WIPO); World Meteorological Organization (WMO); United Nations Geographical Information Working Group (UNGIWG); United Nations Initiative on Global Geospatial Information Management (UN-GGIM), and GCOS

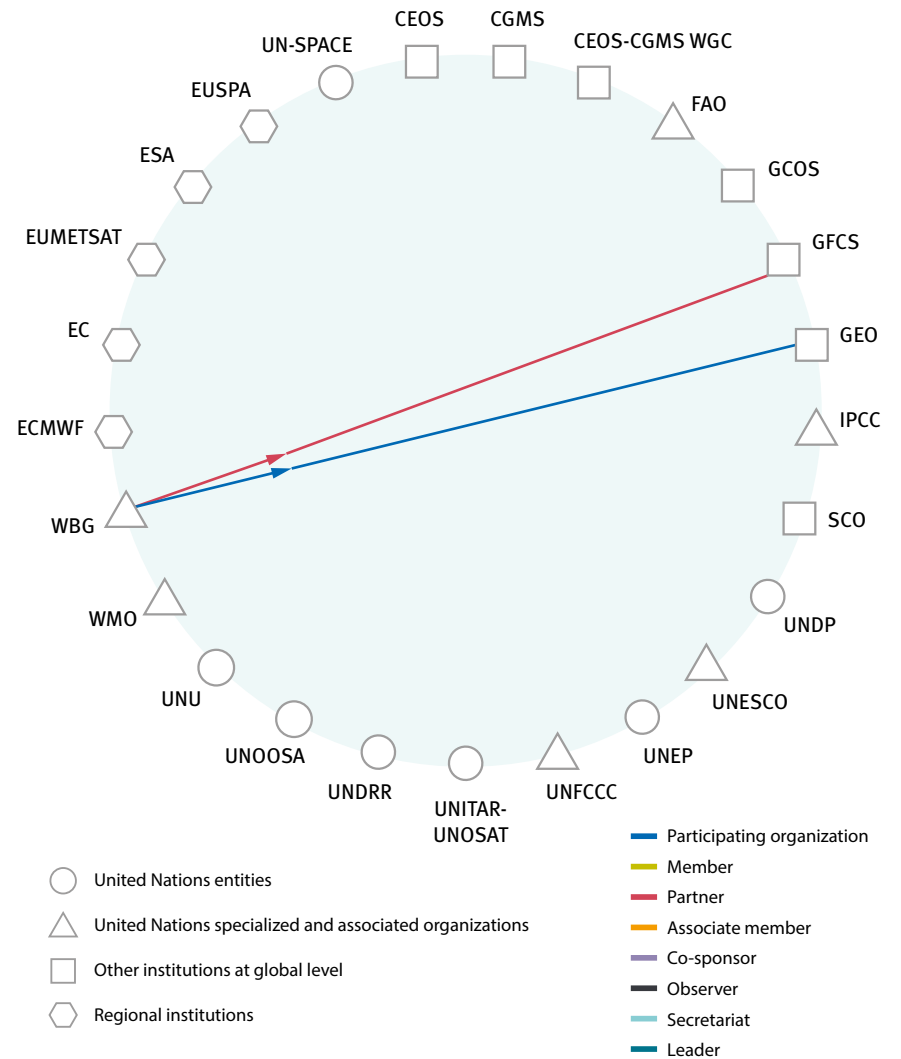
- Associate member of CEOS (“CEOS Agency”)
- Participating organization in GEO
- Member of SCO
- Charter Partner for International Charter Space and Major Disasters
- Memorandum of understanding with UNDP to cooperate in the use of geospatial and space-based technologies for UNDP activities (UNOOSA will work to provide UNDP with access to satellite imagery and analysis, and leverage the UNDP global user network to deliver space-based solutions for SDGs), to coordinate in activating emergency response mechanisms for the benefit of United Nations Member States, and to jointly organize annual outreach events and activities, such as conferences, seminars and workshops



- ✚ Memorandum of understanding with UNOSAT to collaborate to further their common goals, particularly the use of space-based technology for the achievement of the 2030 Agenda; to support Member States with technical advisory missions, where the organizations will assess a State's risk and disaster management abilities and recommend solutions with space-based information, including training and capacity development; to coordinate on activities and policy as well as collaborate to improve access to and raise awareness of space applications and Earth observation data
- ✚ UN-SPIDER collaborates with UNDRR in global networks such as the International Network Multi-Hazard Early Warning System (IN-MHEWS)
- ✚ UN-SPIDER collaborates with UNOSAT on the International Charter for Space and Major Disasters, Copernicus Activations, the International Working Group on Satellite-based Emergency Mapping, and joint publications and delivery of training to promote the use of space-based technologies for disaster management
- ✚ Memorandum of understanding with the European Union Agency for the Space Programme (EUSPA)

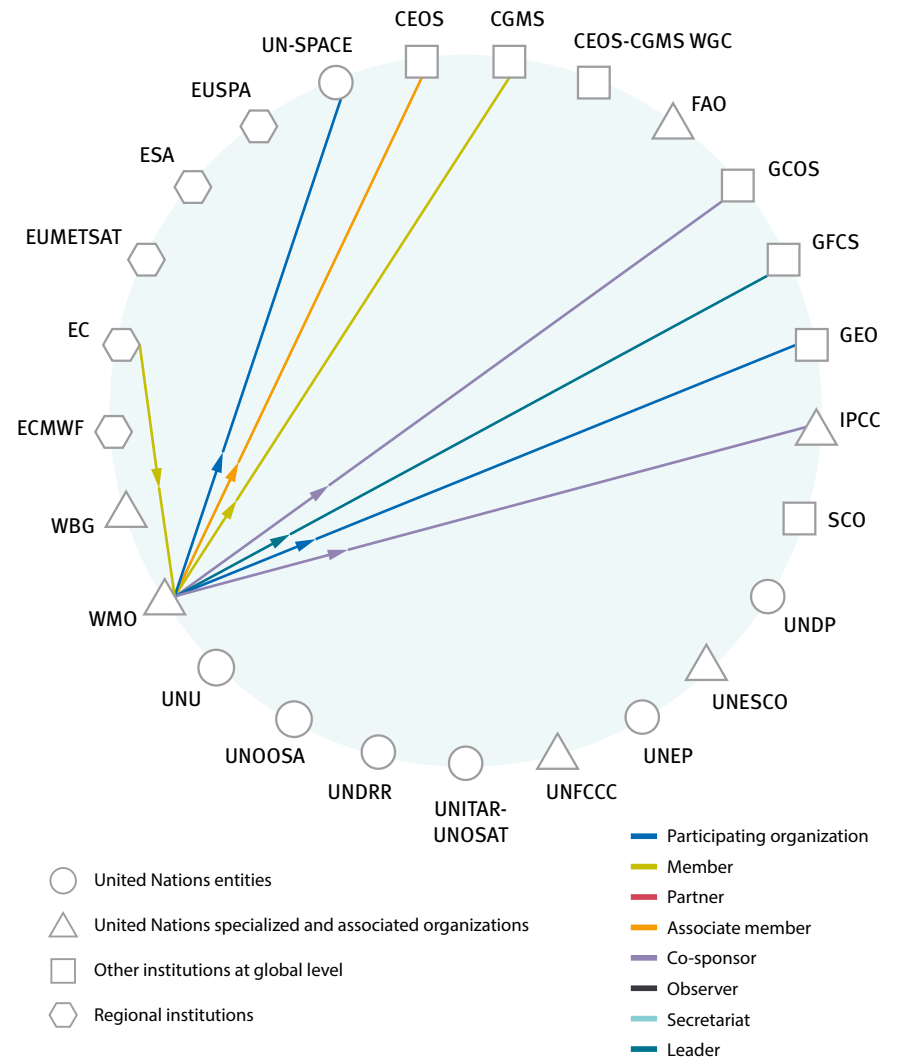
World Bank Group

- Participating organization in GEO
- World Bank Group signed a memorandum of intent with ESA in 2015 www.worldbank.org
- Partner in GFCS



World Meteorological Organization

- Reports to UNFCCC/COP on systematic observation and research programmes that support UNFCCC implementation
- Provides technical/scientific input to UNFCCC/SBSTA (Statements on the State of the Global Climate, Greenhouse Gas Bulletins)
- Co-sponsor (host) of IPCC (with UNEP)
- Co-sponsor (host) of GCOS (with UNEP, IOC-UNESCO and ISC)
- Member of CGMS
- Associate member of CEOS ("CEOS Agency")
- Member of WGClimate
- Leads GFCS
- Participating organization in GEO
- The European Commission is a member
- Participating organization in UN-Space

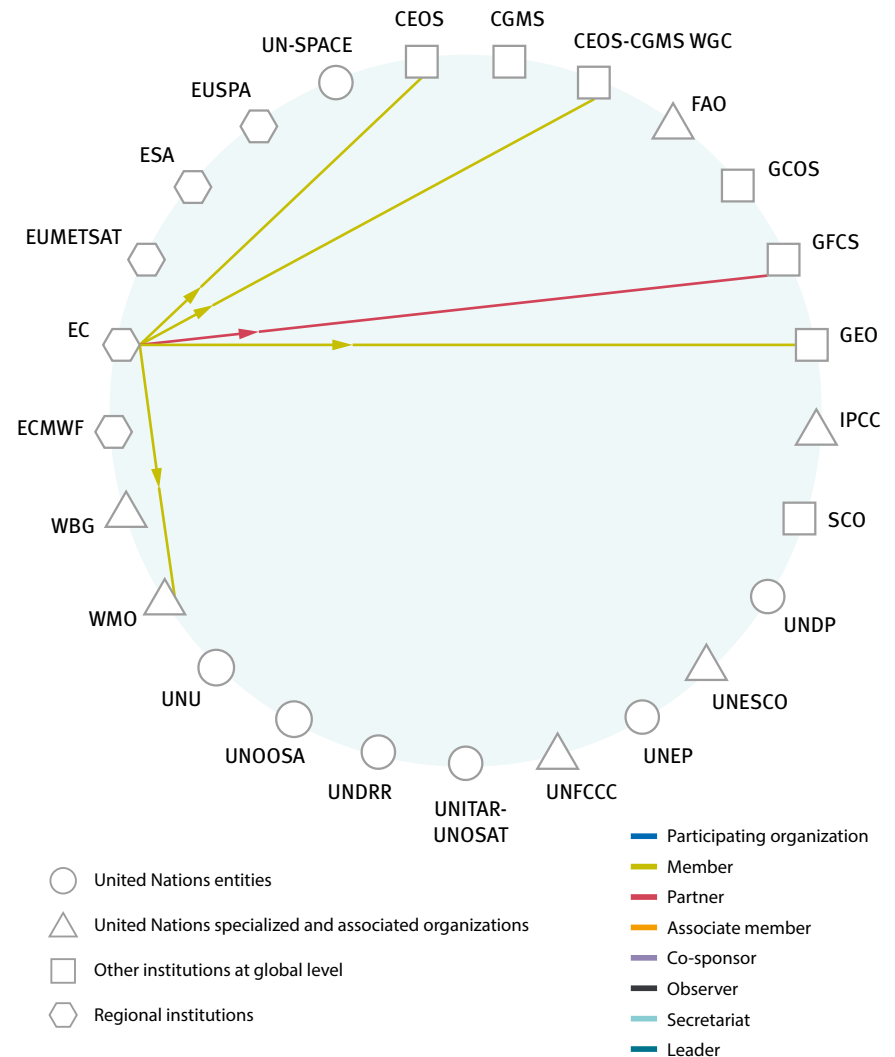


European Commission

- Partner in GFCS
- Provides support to GCOS
- Member of CEOS ("CEOS Agency")
- Member of CEOS-CGMS WGClimate
- Member of GEO

Related to Copernicus Programme:

- The European Commission manages the Programme, which is implemented in partnership with European Union Member States, ESA, EUMETSAT, ECMWF, European Union Agencies (including EUSPA) and Mercator Ocean International; ground segment relies on infrastructure provided by national public and private facilities; four-party arrangement between EUMETSAT, ECMWF, Mercator Ocean International and the European Environment Agency to cooperate on cloud-based data and the information access service platform WEKEO
- ESA is responsible for the development of the space-segment component and operates Sentinel-1, Sentinel-2 and Sentinel-5P satellites. ESA also delivers the land mission from Sentinel-3
- EUMETSAT is responsible for operating Sentinel-3 satellites and delivering the marine mission and will also operate and deliver products from Sentinel-4, and -5 instruments, and the Sentinel-6 satellite



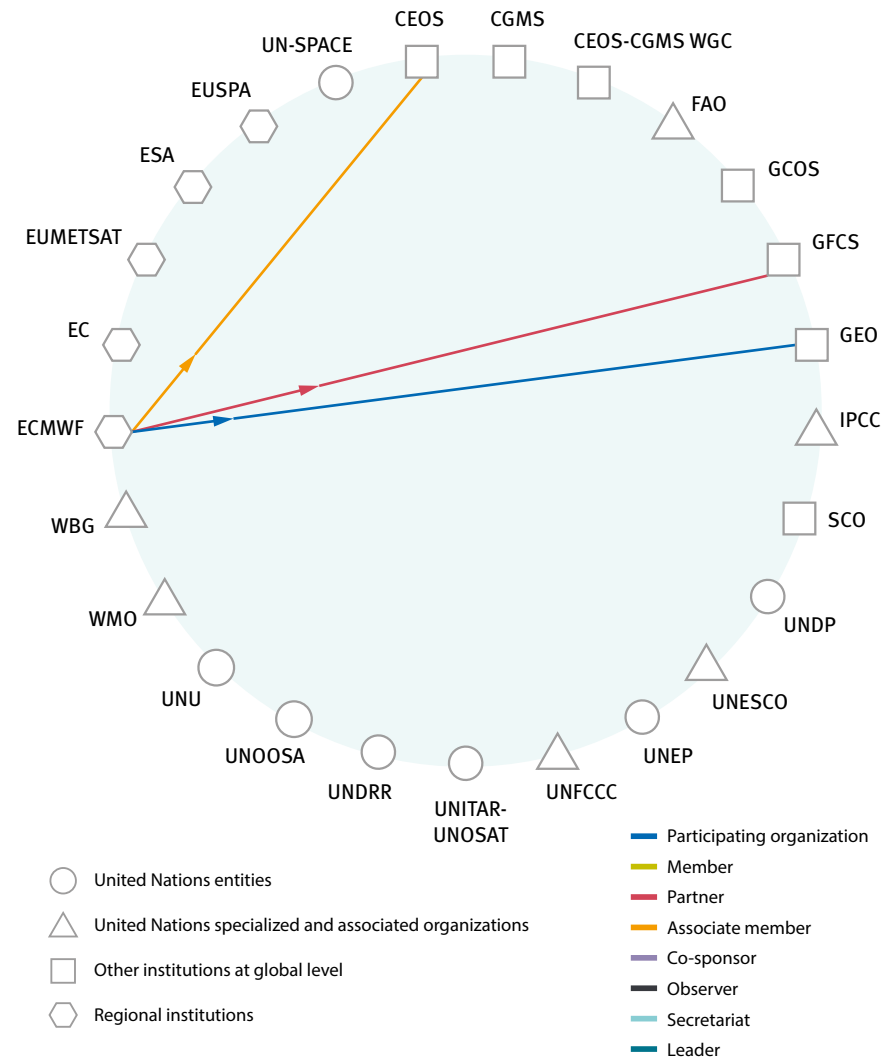
- ✚ ESA and EUMETSAT will coordinate delivery of data from 30+ satellites (Contributing Missions)
- ✚ ECMWF implements C3S (multiannual agreement for EUMETSAT to provide satellite data to ECMWF for C3S)
- ✚ Implementation arrangement for cooperation between EUMETSAT and ESA on future CO2M missions (EUMETSAT will operate the CO2M satellites and receive, process and disseminate their data)

For Destination Earth (DestinE) Programme:

- ✚ ECMWF, ESA and EUMETSAT are the entrusted entities to deliver the first phase of building the digital twin engine and the development of the first two digital twins on weather-induced extremes and climate change adaptation by 2024 and to implement the programme over the next 7–10 years. Specifically, EUMETSAT is responsible for the Destination Earth (DestinE) Data Lake, ESA is responsible for the Destination Earth (DestinE) Core Service Platform and ECMWF for the two initial digital twins on extreme weather and climate adaptation

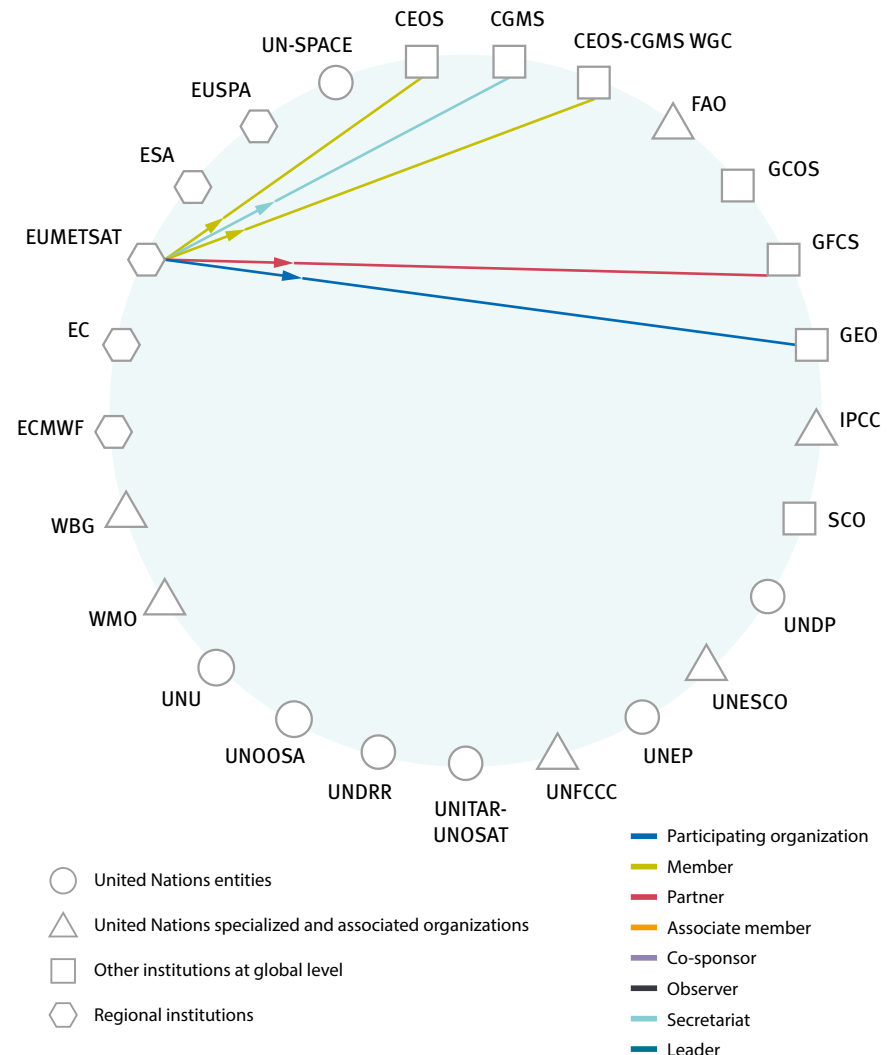
European Centre for Medium-Range Weather Forecasts

- Associate member of CEOS ("CEOS Agency")
- Participating organization in GEO
- Partner in GFCS (C3S is a major contribution to GFCS and its Climate Monitoring Architecture)
- Works with WMO (assists with its programmes)
- Works with the European Commission to implement C3S for the Copernicus Programme
- Works with EUMETSAT for C3S: multiannual agreement for its satellite data records
- Four-party arrangement with EUMETSAT, Mercator Ocean International and the European Environment Agency to cooperate on the Copernicus data and information access service platform



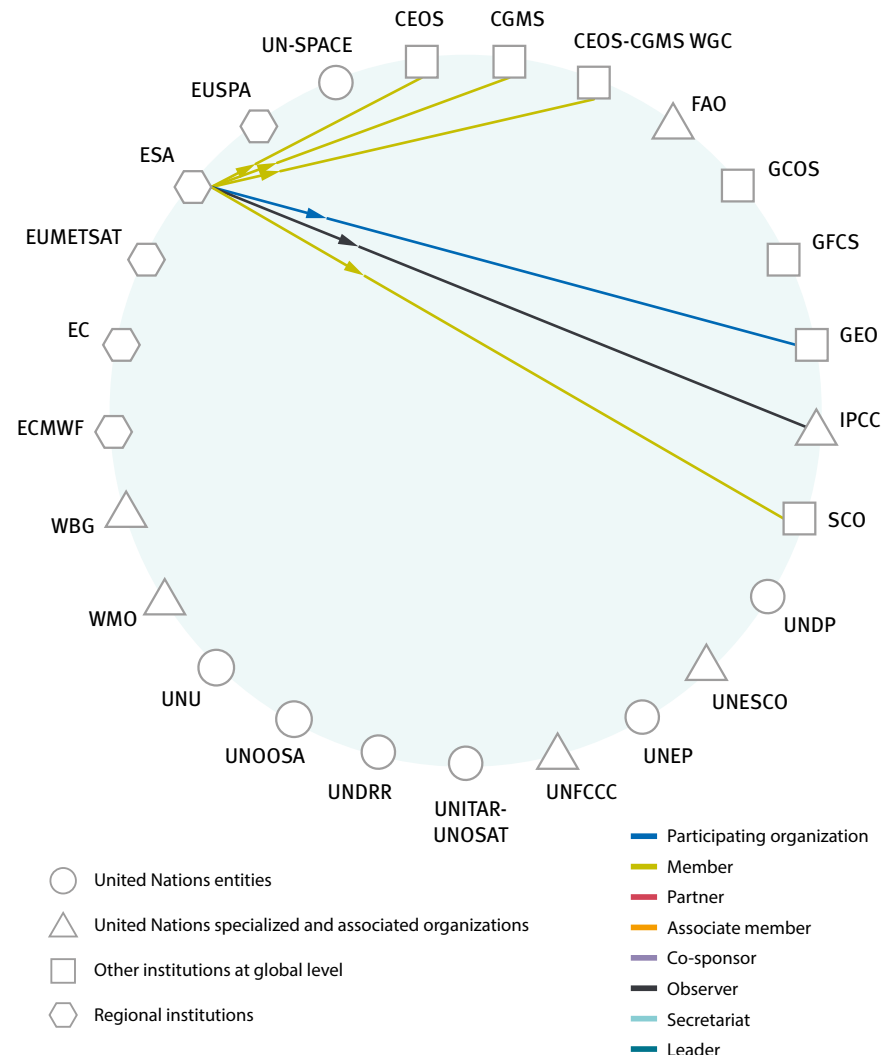
European Organization for the Exploitation of Meteorological Satellites

- Participating organization in GEO
- Member of CEOS ("CEOS Agency")
- Secretariat of the CGMS
- Member of CEOS-CGMS WGClimate
- Works with GCOS and WMO (supports GCOS in the assessment process, related efforts of the WMO space programme)
- Charter member of the International Charter Space and Major Disasters
- With the European Commission for Copernicus Programme: providing data, products and support services to the Copernicus information services and user communities, with a focus on marine, atmosphere and climate; responsible for operating the Sentinel-3 and Sentinel-6 satellites and will also operate and deliver products from the Sentinel-4, and Sentinel-5 instruments on board the Meteosat Third Generation and Metop Second Generations satellites, respectively; four-party arrangement with ECMWF, Mercator Ocean International and the European Environment Agency to cooperate on the Copernicus data and information access service platform, WEkEO; implementation arrangement for cooperation with ESA on the Copernicus CO2M mission; providing satellite data records to the ECMWF, for C3S
- With the European Commission for Destination Earth Programme: providing end-to-end responsibility for design, establishment, testing, operations and procurement of the multi-cloud Destination Earth (DestinE) Data Lake and Data Warehouse, including data from the Earth observation satellite systems of EUMETSAT, as well as from Sentinel missions, ESA missions and ECMWF



European Space Agency

- Observer for IPCC
- Member of CEOS ("CEOS Agency")
- Member of CGMS
- Member of CEOS-CGMS WGClimate
- Member of SCO
- Participating organization in GEO (member of GEO CC-WG)
- Works closely with GCOS on Implementation Plan for Essential Climate Variables
- With the European Commission for Copernicus Programme: responsible for development of the space-segment component and operates Sentinel-1, Sentinel-2 and Sentinel-5P satellites; delivers the land mission from Sentinel-3; works closely with EUMETSAT (delivery of data from Contributing Missions) and C3S to ensure coordination and complementarity
- Implementation arrangement for cooperation with EUMETSAT on CO2M missions
- Works with EUSPA (under the Cassini Programme umbrella)
- With the European Commission for Destination Earth initiative (officially launched March 2022): "Contribution Agreement" to cooperate with the European Commission (and EUMETSAT and ECMWF); will be responsible for Destination Earth (DestinE) Open Core Service Platform that will rely on the most comprehensive and sophisticated space-based observation data, including data from



Earth Explorers, the Sentinel series, data from ECMWF and, over time, other major data holdings in Europe

- ✚ Partnerships with the World Bank and the Asian Development Bank (Space for International Development Assistance Initiative)
- ✚ Memorandum of understanding with the World Bank to expand scope of activities
- ✚ Memorandum of understanding signed with FAO (April 2021): to exchange relevant expertise and develop applications in which Earth observation images can be used to better monitor agrifood systems. The joint work will scale up the capacity of FAO to help countries use Earth observation methods for agricultural statistics and SDG monitoring
- ✚ Works with UNESCO to use space technologies and data to monitor natural and cultural heritage sites
- ✚ Charter member of the International Charter Space and Major Disasters, ESA also provides rapid data access, allowing disaster management authorities to respond to floods and fires

European Union Agency for the Space Programme

- EUSPA is the operational European Union Agency for the Space Programme and works closely with Copernicus entrusted entities and funding partners such as the European Investment Bank
- Signed a memorandum of understanding with UNOOSA in March 2022

CONCLUSIONS

The mapping exercise shows that there is a wealth of ongoing and existing initiatives using space technology for climate action. When mapping the key intergovernmental coordination bodies which are using space technology to support climate action at the global level, it demonstrates that there is a well-established system with clear responsibilities and mandates in the areas of monitoring, observation and science, as well as policy development.

On the other hand, in the area of climate services or capacity-building, a comparable solid coordination and collaboration structure does not currently exist.

There are an increasing number of actors and actions in the quickly expanding field of space for climate action and climate services and there appears to be a gap for practitioners to share expertise and lessons learned in order to advance more quickly and enable a better and more targeted result on the ground.

There does not currently seem to be a collaboration architecture for climate services

that facilitates the development of clear responsibilities, aligns activities or promotes voluntary cooperation. Alongside this, there also appears to be little or no coordination among actors to ensure greater compatibility, interoperability and transparency, nor to further promote the introduction and utilization of space technology in climate action and services. Exchanges of lessons learned, sharing expertise and experience on space for climate action is another gap, including in developing countries, for the integration into existing infrastructures.

The changing and rapidly developing domain of “climate services” has seen more and more non-governmental actors entering the field, and this mapping exercise highlights the lack of a forum for exchanges and cooperation with private sector entities which could support targeted space and climate actions in the future. This means that there is also a gap in knowledge transfer and information-sharing.

The recent decision to establish a greenhouse gas monitoring system at the international level within WMO would lay the basis for an internationally coordinated approach to

network design, operation and use of observations. This initiative would expand and consolidate activities in greenhouse gas monitoring and thus incorporate already existing monitoring and data assimilation capabilities from space-based and surface-based observing systems.

The example of a regional approach also showed how regional intergovernmental bodies are adding and contributing to the existing global framework. Looking at other regional efforts to complement the entire picture can only benefit the entire mapping exercise in the future and considering other regional efforts will prove essential for presenting the big picture.

In summary it can be noted:

1 Climate observation, research and science as well as climate policy development is well-established, developed and coordinated

With the exception of some technical overlaps of different multiple observing systems, the existing mandates and programmes targeting space and climate change monitoring, science and observation are well established.

2 “Climate services” are loosely defined and different actors use different definitions

The terminologies regarding “climate services” or “climate action” are wide-ranging and the concepts not well defined. While some include the full spectrum of data collection, others describe the development of relevant space applications and technology as “climate action”. In the absence of a clear definition and commonly accepted terminology, the term “climate services” remains too broad and ambiguous to enable meaningful coordination among the various actors involved.

3 “Space climate services” and “space for climate actions” are being developed by a vast and increasing number of bodies and stakeholders

Directly related to point 2, the loose definition of “climate services” means that a growing number of new actors are describing their work as “climate services” or “climate actions”.

Furthermore, already since 2001 and through the so-called Marrakech Accords, the importance of non-governmental organizations, including private sector entities, in addressing climate change has been acknowledged and consequently these actors will play an even more important role in the future. Hence, with the increasing number of private space actors, the “climate services” domain has the potential to become even more unclearly defined. This increasing diversification of the actors could create further overlaps which could call for increased coordination and collaboration.

4 There is a lack of platforms or forums that facilitate the sharing of actions and lessons learned

The space for climate action community could benefit from platforms or forums that facilitate, enable and support the exchange of expertise, methodologies and the promotion of the use of good practices in the use of space technologies for climate action. Such networks will enable collaborative actions, improve the understanding of space applications and advance capacities to mitigate and adapt to the impacts of climate change, as well as increase awareness of the benefits of space for climate action among a broader set of actors. Furthermore, such a network of stakeholders with clearly denominated “focal points” facilitates coordination as well as the identification of entry points to jump start collaborative actions on the ground.

5 There is currently no international exchange of comprehensive and timely surface and space-based greenhouse gas observations

The establishment of the proposed integrated monitoring system by the World Meteorological Organization (WMO) on greenhouse gas carbon budget monitoring system will address a currently existing gap. This could help to improve the carbon cycle, and the data compiled, provided and exchanged could provide support in the understanding of the effectiveness of the mitigation efforts taken at the international level.

6 Limited capacity-building on “space for climate service”

Acknowledging the importance of capacity-building in the Paris Agreement, the limited number of long-term empowerment and sustainable training knowledge transfer opportunities on climate action through the application of space technology can be identified as an area which is not fully established. Also, since special reports of the Intergovernmental Panel on Climate Change (IPCC) have already pointed out that the expanded use of information and communication technologies, climate services and remote sensing is critical for near-term actions, capacity-building to strengthen adaptation and mitigation can be identified a gap. The space for climate action arena could benefit from increased efforts to improve cooperation and coordination among institutions providing capacity-building related to space applications in order to increase its use in climate action and relevant decision-making.

7 Processes and activities are not as coordinated within the United Nations system as might have been expected

Mapping the various space and climate actions and activities has revealed that international cooperation in the area of space and “climate services” or “climate actions” could be strengthened through greater coordination among all major stakeholders, and that such coordination would benefit from closer cooperation with the United Nations system through the existing United Nations system-wide inter-agency mechanism for cooperation in space-related activities.

LIST OF ABBREVIATIONS

ADB	Asia Development Bank	DEFIS	Directorate-General for Defence Industry and Space
ALOS	Advanced Land Observing Satellite	DestinE	Destination Earth
ASIS	Agricultural Stress Index System	DG CLIMA	Directorate-General for Climate Action
C3S	Copernicus Climate Change Service	DPKO	Department of Peacekeeping Operations
CAMS	Copernicus Atmosphere Monitoring Service	DRR-WG	Disaster Risk Reduction Working Group
CBD	Convention on Biological Diversity	EC	European Commission
CCI	Climate Change Initiative	ECLAC	United Nations Economic Commission for Latin America and the Caribbean
CCKP	Climate Change Knowledge Portal	ECMWF	European Centre for Medium-Range Weather Forecasts
CCP	Climate Change Programme	ECV	Essential Climate Variables
CC-WG	Climate Change Working Group of GEO	EFAS	European Flood Awareness System
CEMS	Copernicus Emergency Management Service	EO4SD	Earth Observation for Sustainable Development
CEOS	Committee on Earth Observation Satellite	EO4SD-CR	Earth Observation for Sustainable Development Climate Resilience
CEOS-CGMS WGC	Committee on Earth Observation Satellites and Coordination Group for Meteorological Satellites Working Group on Climate	ESA	European Space Agency
CGMS	Coordination Group for Meteorological Satellites	EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
CLIMA	Directorate-General for Climate Action	EUSPA	European Union Agency for the Space Programme
CM SAF	Climate Monitoring Satellite Application Facilities	FAO	Food and Agriculture Organization
CONNECT	Directorate-General for Communications Networks, Content and Technology	GCOS	Global Climate Observing System
COP	Conference of the Parties	GDAP	Global Development Assistance Programme
COPUOS	Committee on the Peaceful Uses of Outer Space	GEO	Group on Earth Observations
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization	GEOSS	Global Earth Observation System of Systems
		GFCS	Global Framework for Climate Services

GFDRR	Global Facility for Disaster Reduction and Recovery	IPCC	Intergovernmental Panel on Climate Change
GIEWS	Global Information and Early Warning System on Food and Agriculture	ISC	International Council for Science
GIS	Geographic Information Systems	ITU	International Telecommunication Union
GLOBE	Global Learning and Observations to Benefit the Environment	NFCS	National Frameworks for Climate Services
GloFAS	Global Flood Awareness System	OCHA	United Nations Office for the Coordination of Humanitarian Affairs
GOOS	Global Ocean Observing System	PAC	Partners Advisory Committee
GOS	Global Observing System	REDD +	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+)
GRID-Geneva	United Nations Environment Programme / Global Resource Information Database Geneva	SAF	Satellite Application Facilities
GRiF	Global Risk Financing Facility	SBSTA	Subsidiary Body for Scientific and Technological Advice
GSICS	Global Space-based Inter-Calibration System	SBSTA-RSO	Subsidiary Body for Scientific and Technological Advice Research and Systematic Observation
IAEA	International Atomic Energy Agency	SCO	Space for Climate Observatory
ICAO	International Civil Aviation Organization	SCOPE-CM	Sustained and Coordinated Processing of Environmental satellite data for Climate Monitoring
ICRC	International Committee of the Red Cross	SDGs	Sustainable Development Goals
IFRC	International Federation of Red Cross and Red Crescent Societies	SEPAL	System for Earth Observation Data Access, Processing and Analysis for Land Monitoring
ILO	International Labour Organization	UN DESA	United Nations Department of Economic and Social Affairs
IMO	International Maritime Organization	UNBL	United Nations Biodiversity Lab 2.0
IN-MHEWS	International Network for Multi-Hazard Early Warning Systems	UNCCD	United Nations Convention to Combat Desertification
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO	UNCTAD	United Nations Conference on Trade and Development

UNDP	United Nations Development Programme	UNITAR	United Nations Institute for Training and Research United Nations Satellite Centre
UNDRR	United Nations Office for Disaster Risk Reduction	UNOOSA	United Nations Office for Outer Space Affairs
UNDSS	United Nations Department on Safety and Security	UNOPS	United Nations Office for Project Services
UNECA	United Nations Economic Commission for Africa	UNOSAT	United Nations Satellite Centre
UNECE	United Nations Economic Commission for Europe	UN-REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
UNEP	United Nations Environment Programme	UN-SPACE	United Nations Inter-Agency Meeting on Outer Space Activities
UNEP-CCC	UNEP Copenhagen Climate Centre	UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
UNEP-WCMC	UNEP World Conservation Monitoring Centre	UNU	United Nations University
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific	WBG	World Bank Group
UNESCO	United Nations Educational, Scientific and Cultural Organization	WCRP	World Climate Research Programme
UNESCWA	United Nations Economic and Social Commission for Western Asia	WFP	World Food Programme
UNFCCC	United Nations Framework Convention on Climate Change	WHO	World Health Organization
UN-GGIM	United Nations Global Geospatial Information Management	WIGOS	World Meteorological Organization Integrated Global Observing System
UNGIWG	United Nations Geographical Information Working Group	WIPO	World Intellectual Property Organization
UN-HABITAT	United Nations Human Settlements Programme	WMO	World Meteorological Organization
UNHCR	United Nations High Commissioner for Refugees	WSDSS	Web-based Spatial Decision Support System
UNIDO	United Nations Industrial Development Organization		



**THE UNITED NATIONS OFFICE
FOR OUTER SPACE AFFAIRS (UNOOSA)**

IS RESPONSIBLE FOR ADVANCING INTERNATIONAL COOPERATION
IN THE PEACEFUL USES OF OUTER SPACE AND HELPS ALL COUNTRIES
USE SPACE SCIENCE AND TECHNOLOGY TO ACHIEVE
SUSTAINABLE DEVELOPMENT



BRINGING THE BENEFITS
OF SPACE TO HUMANKIND

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