

SATELLITE OBSERVATIONS FOR CLIMATE CHANGE



KEY OFFERINGS

Data Management

- › Meta-data harvesting / cataloguing
- › Expertise with atmosphere, land and ocean-based climate data
- › Climate impact indicator provision
- › Data quality information

Systems Definition / Development

- › Visualisation tools
- › User interface development
- › Data dissemination protocols
- › Market / requirements analysis
- › Quality assurance process definition and operations
- › Machine Learning and Artificial Intelligence

Expert Managed Services

- › Service KPI's definition / compliance
- › Data processing & dashboard monitoring
- › Help desk provision
- › Training development & delivery
- › Project / Consortium management

BACKGROUND

Climate change is arguably the most difficult global challenge facing governments, business and society in the 21st century. Satellite observations have enabled major scientific advances in our understanding of climate change, with their measurements on large temporal and spatial scales key to understanding the evolution of parameters about the atmosphere, land and ocean in our Earth system.

In recent years Telespazio UK (TPZ UK) has built a European industry leadership position in the provision of satellite observations for the climate change marketplace. Mainly this has been through the European Space Agency and Copernicus Climate Change Service (C3S) Programmes, which will continue to be fundamentally important initiatives in the 2020's.

However, the UK and international business ecosystem for climate services is evolving rapidly, with the global market estimated to worth more than £27BN. The strong sector growth is driven by a number of factors: new climate change standards, the overwhelming scientific evidence of how humankind is affecting the planet, the UK Parliament-declared national climate change emergency in May 2019, and the swathe of public demand for us to live our lives with a reduced carbon footprint.

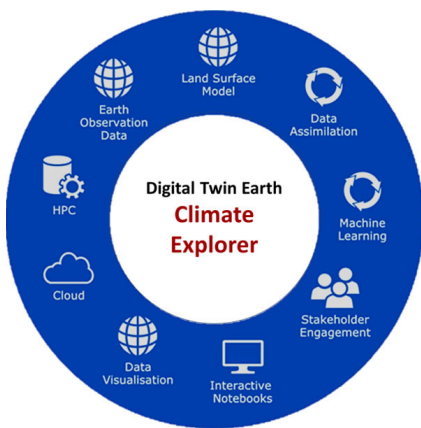
The deep capabilities and knowledge TPZ UK has built up mean we are ideally placed to support private sector stakeholders in assessing the resilience of their business to a changing climate. TPZ UK climate capabilities span all aspects of the value chain with some of our key projects shown overleaf.

MARKET / REQUIREMENTS ANALYSIS

SECTEUR (Sector Engagement for C3S, Translating European User Requirements) engaged with a wide range of stakeholders to establish existing policy needs and user requirements for potential C3S services across the following sectors: agriculture & forestry, health, coastal areas, insurance, tourism, infrastructure.

TPZ UK led the construction of a market-wide requirements database for the C3S and made recommendations (with a focus on data quality and visualisation) based on the gathered requirements.

SYSTEMS BUILD & INTEGRATION



TPZ UK is leading a **Digital Twin Earth** precursor contract to advance understanding of local impacts of global climate change. 'Digital Twin Earth' will be a high-resolution dynamic reconstruction of our planet and its complex processes. The output will provide advanced science-based decision support capabilities, including enhanced predictive and simulation capacity, at

resolutions and accuracies necessary to respond to the urgent challenges and targets addressed by the EU's Green Deal. The innovative **Climate Explorer**, developed by TPZ UK and its partners, will use advanced Earth System Models, processed using High Performance Computing infrastructure and state-of-the-art data assimilation techniques with satellite Earth Observation (EO) data. Optimised model simulation outputs will be delivered via **Machine Learning** emulation to the end user through a cloud-based Interactive Data Portal. As an example use case, this will include **soil moisture** and **drought metrics** that impact agriculture in Africa.

The Climate Data Store (CDS) is at the heart of the C3S infrastructure and provides information about the past, present and future climate in terms of Essential Climate Variables and derived climate indicators. It is designed as a distributed system, providing improved access to existing datasets through a unified web interface. Data from the CDS underpins the sector-specific applications developed as part of the C3S. TPZ UK was the prime contractor for the development of the CDS infrastructure, and led all aspects of the software / systems design & build using an Agile development approach. A highly diverse set of users (that includes policy makers, experts and scientists) can browse the catalogue, refine searches, retrieve products, view tools compatible with the data search results, and execute operations on the data using these tools. Users can also develop applications that make use of the content of the CDS using an Application Programming Interface (API).

SERVICE OPERATIONS

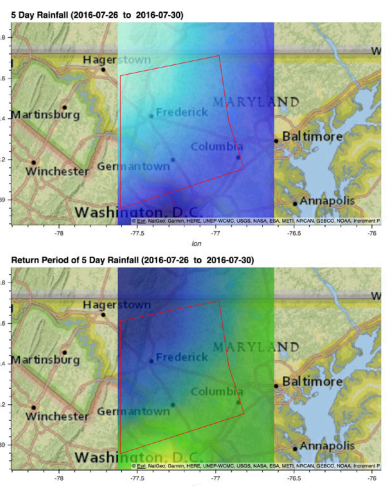
TPZ UK is the prime contractor for a cornerstone Evaluation and Quality Control (EQC) contract of the C3S, which has responsibility of evaluating the fitness-for-purpose, reliability, user relevance and quality of the downstream services.

The EQC for SIS project has three main objectives:

- › Define an EQC Framework to allow C3S users to assess whether climate services and data are fit-for-purpose
- › Ensure tools, workflows and applications / services accepted into the C3S Climate Data Store (CDS) are of good quality and uphold the required standards
- › Ensure user relevance of the C3S via user engagement, collecting and analysing user requirements (URs), and creating / maintaining the User Requirement Database (URDB).

SECTORAL APPLICATIONS

TPZ UK is part of an ESA **Earth Observation for Sustainable Development (EO4SD) Climate Resilience** initiative and has developed a Rainfall Explorer tool to help improve the understanding of flood risks associated with extreme precipitation.



This tool helps inform on climate resilience strategies to mitigate against **future flood risk**. Using this tool users may select past floods or areas of interest to obtain rainfall statistics, including the amount of rainfall (mm) recorded 5-days prior to a flood, the return period (years) of this extreme event, and the range of the rainfall return period for the selected area or flood. This information

can help understand the relationship between rainfall and resulting flood risk going forward. The World Bank and the Multilateral Investment Guarantee Agency are using the tool.

More broadly, TPZ UK also has broad experience of deriving and providing climate data indicators for a variety of sector stakeholders (including Agriculture, Insurance, Fisheries, Retail), who use the indicators for decision-making purposes.

TRAINING

The European Commission has funded a series of Info-Sessions to promote awareness of the many uses of Copernicus data and information, while providing the opportunity for hands-on demonstrations and basic training. TPZ UK is responsible for the development of the climate change adaptation and mitigation module, which has been delivered at events in Denmark (Aarhus) and Greece (Athens).

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