



Invitation to Tender

Destination Earth Programme

Destination Earth Impact Sector Pilot Services
and Machine-Learning Demonstrators

Volume II: Specification of Requirements

ITT Ref: DE_374
ISSUED BY: ECMWF Administration Department Procurement Section
Date: 3 July 2024
Version: Final

Table of Contents

1.	Introduction	3
1.1.	Definitions	3
2.	Background	4
2.1.	DestinE structure and implementation	4
2.2.	DestinE DT capabilities	5
2.3.	Related activities and projects	6
2.4.	Reference resources	7
3.	Summary of contracts to be placed.....	7
4.	Technical specification.....	9
4.1.	User requirements and Service definition	11
4.2.	Pilot Service implementation	12
4.3.	Service operations, maintenance and user support	13
4.4.	User scenario and demonstrator definition	14
4.5.	Demonstrator development, including implementation and training.....	14
4.6.	User engagement and communication	15
4.7.	Deliverables and milestones	16
5.	General requirements.....	16
5.1.	Implementation schedule	16
5.2.	Meetings.....	17
5.2.1.	Physical / face-to-face meetings	17
5.2.2.	Regular meetings by web-conference.....	17
5.3.	Documents and reports.....	17
5.4.	Graphical material and content for communication.....	17
5.5.	Data and IPR	17
6.	Tender format and content	18
6.1.	Page limits	18
6.2.	Specific additional instructions for the Tender	18
6.2.1.	Executive summary	18
6.2.2.	Track record.....	19
6.2.3.	Quality of resources to be deployed	19
6.2.4.	Technical solution proposed	19
6.2.5.	Management and implementation plan	20
6.2.6.	Key performance indicators	21
6.2.7.	Requirements compliance table.....	22
6.2.8.	Diversity and inclusion	25

1. Introduction

Destination Earth (DestinE) is an initiative of the European Commission under the EU Digital Europe programme [RD1]. By pushing the limits of computing, weather and climate sciences, DestinE is a cornerstone of the European Commission's efforts to boost Europe's digital capabilities and the Green Deal actions on climate change and to prevent environmental degradation. It aims at supporting climate change adaptation policies and decision-making for reducing the impacts of climate change and extreme events.

DestinE will deploy several highly accurate thematic digital replicas (digital twins) of the Earth system to simulate natural and human activities as well as their interactions, to develop and test scenarios that would enable more sustainable developments and support European policy making. DestinE is intended to unlock the potential of both physics-based and data-driven models and the capacity of leading European supercomputers of the EuroHPC Joint Undertaking to achieve a breakthrough in the resolution and realism of the simulation of Earth-system components.

The European Centre for Medium-Range Weather Forecast (ECMWF) implements two high-priority digital twins for DestinE – one on climate change adaptation and one on weather-induced extremes. These are developing enhanced simulation systems, informed by observations, based on a new generation of Earth system models. These enhanced systems aim at representing the Earth system more realistically, but will also produce information at precisely those scales where many of the impact of climate change and extremes are felt and where key processes are observed. This allows users from impact-sectors to access and exploit such information for their specific application.

Rooted in both the European Commission's Green Deal and the Digital Strategies, DestinE will contribute to solving a range of societal challenges in Europe and globally. Sectors anticipated to benefit from DestinE data, information and tools are those where timely and spatially detailed weather and climate data and information can support decision-making, including management or planning in agricultural, forestry, renewable energy, water, air quality, urban development, maritime or air transport, biodiversity, disaster risk mitigation, and others.

The confluence of high-quality, well-structured data and computing resources characterising DestinE also makes it an attractive resource and hub for developing machine-learning approaches for simulations and decision-support in the sectors benefitting from DestinE.

A prerequisite for the success of DestinE will be the effective guidance of its orientation, development and implementation by the needs and requirements of user groups in impact sectors that stand to benefit from the advanced capabilities provided by DestinE, and in particular the digital twins. To this end ECMWF has adopted a co-design approach for developing the DestinE digital twins and has been implementing a set of use cases already in the early development phase of DestinE¹. This Invitation to Tender (ITT) aims at (1) establishing a set of Pilot Services for users in selected impact sectors by building on the novel digital twin data and capabilities, (2) demonstrating the added-value of applying Artificial Intelligence/Machine Learning (AI/ML) based approaches for producing user-relevant impact sector information. This aims at exploiting the recent breakthroughs in AI/ML and the digital twin data to enhance user-relevant information for key impact sectors.

1.1. Definitions

General definitions can be found in Volume I. Definitions specific for this Invitation to Tender (ITT) are given below. For a general DestinE glossary please refer to the Destination Earth Glossary [RD2].

Application: An action, information product, or service (including consultancy), which makes use of one or

¹ <https://destine.ecmwf.int/destine-uses/>

more DestinE DT services or outputs as an input.

Demonstrator: An explorative implementation of an Application to test and/or showcase its viability for future further development or implementation.

Digital Twin (DT): Highly accurate replicas of the Earth-system that simulate the system's behaviour, allowing to monitor and predict environmental change, test scientific hypotheses and adaptation scenarios. DestinE's DTs combine several cutting-edge Earth-system models and Earth observations as well as advanced data analytics and integration and interoperability with impact sector applications. They are DestinE system components, interfacing with the Digital Twin Engine, offering a seamless production service of actionable knowledge for users that results from the fusion of observational and simulated data of the physical Earth system and of impact-sector relevant information..

Impact Sector: Domain in which the outputs of the DT are expected to enhance the ability to predict the effects of different policy/management scenarios and thus support decision-making. Possible impact sectors include, for example, water management, agriculture and forestry, renewable energy management, air quality management, urban development, maritime or air transport, biodiversity protection, disaster risk mitigation, and climate impact assessments.

Pilot Service: Service-like provision of information or tools that demonstrates the Service for a limited duration of time. Pilot Services supports the qualification of their products, engage users in co-designing potential future Services, and may not reach the service levels expected from Services, notably with respect to timeliness and throughput.

Service: Regular provision of technological capabilities, resources, data, information or tools to meet user needs, including their management across a variety of digital infrastructures. Services in DestinE handle complex workflows related to Earth system information generation and delivery, facilitate the management of complex monitoring, prediction and projection systems, and make components available for use in different digital contexts to enable rich interaction in the wider digital environment.

Users: Institutions or individuals interacting with the DestinE core Service Platform (DESP), Data Lake (DEDL) and/or a DT, thus exploiting DestinE capabilities, output products or Services to achieve their objectives. These may include researchers, agencies implementing policies, companies, or civil society. DestinE Users may ingest DestinE output data for further processing in their own applications. These are typically expert users, e.g. in research, national hydro-meteorological services or environment agencies.

2. Background

2.1. DestinE structure and implementation

DestinE is funded by the European Union's Digital Europe programme and is implemented by ECMWF, the European Space Agency (ESA), and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). The objective of this initiative is to develop – on a global scale – a highly accurate digital replica of the Earth to enhance the abilities to respond and adapt to the environmental challenges posed by climate change and extreme events. In doing so, DestinE supports the European Union in achieving sustainable development objectives and contributes to the European Green Deal and Digital Strategies.

The main building blocks of the infrastructure of the DestinE System are:

- The DestinE core Service Platform (DESP; responsibility ESA) A platform that provides a large number of users with tools, applications and services, based on an open, flexible, scalable and evolvable secure cloud-based architecture. DESP federates access to users' platforms, European cloud and HPC infrastructures and integrates access to Digital Twins. It allows users to customise the platform, integrate their own data and develop their own applications.

- The DestinE Data Lake (DEDL; responsibility EUMETSAT) provides discovery, access, and big data processing services to the DestinE data portfolio [RD3], including required data storage. It provides seamless access to datasets via GUIs or APIs to data in accordance to the DestinE Data Portfolio, regardless of data type and location. DEDL big data processing allows near-data processing and by this conceptually supports ML/AI applications executed on the DEDL. The DEDL federates with existing data holdings as well as complementary data from diverse sources like in-situ, socio-economic, or data-space data.
- The Digital Twin Engine (DTE; responsibility ECMWF) is a software-defined environment to operate DestinE's DTs and manage their corresponding control and data flows across distributed high-performance computers (HPC) and cloud computing resources. Moreover, it creates a framework for the fusion of observations with Earth-system simulations and the integration of applications targeting specific impact-sectors via selected use cases. The engine enables the porting and optimization of codes, developing and managing the digital twin workflows, and provides the data handling and model interaction and interactivity capabilities that run on diverse HPC and cloud infrastructures including the Data Warehouse hosted on the data bridges.
- The two high-priority Digital Twins (DTs; responsibility ECMWF) for generating high-quality simulations and combining simulations and observations of the Earth system at unprecedented accuracy to serve the EU's Green Deal policy priorities:
 - Weather-induced extremes DT ("Extremes DT") for providing capabilities for the assessment and prediction of environmental extremes at very high spatial resolution and close to real-time decision-making support at continental, country, coastline, catchment and city scales in response to meteorological, hydrological and air quality extremes.
 - Climate change adaptation DT ("Climate DT") for providing capabilities to support climate adaptation policy and scenario testing at multi-decadal timescales aiming at a real breakthrough at the level of reliability at regional and national levels.

Already during the first phase of DestinE a number of use cases were realized, which demonstrated how DestinE may be used for different applications [RD4]. Examples include the applications in hydrology, renewable energy production and energy system modelling, air quality and urban heat extremes, among others.

From now on and in future phases of DestinE, a service portfolio will be developed and continue to evolve to enhance capabilities, adding further thematic foci, ingest the latest scientific developments and observational information, and make use of the emerging digital infrastructure ecosystem supported by the Digital Europe programme in Europe.

2.2. DestinE DT capabilities

During phase 1 of DestinE, ECMWF and its contractors have built the two high-priority DTs, on weather-induced extremes ("Extremes DT") and on climate change adaptation ("Climate DT"), and demonstrated their capabilities at scale.

The Extremes DT delivers a substantial evolution of existing Earth-system simulation and data assimilation systems in terms of simulation grid-spacing, observational uptake capabilities, integration of weather, hydrology and air quality models in a unified workflow relying on the Digital Twin Engine, workflow configurability and interactivity. The DT operates at weather time scales producing high-quality information for assessing and predicting weather, hydrology and air quality extremes, both routinely and on-demand.

A global component of Extremes DT produces daily simulations at a spatial resolution of 4,4 km on a timescale of 4 days ahead.

A regional configurable component that can be activated “on-demand” as extreme events unfold over Europe produces simulations at a spatial resolution of 500 to 700m, on a timescale of 2 days ahead. The first configurations of this regional component is expected to become available towards the end of 2024.

Details of the data portfolio of the Extremes DT can be found at the Data Portfolio of the DT Extremes [RD5].

The Climate DT delivers a substantial evolution of existing climate projection capabilities at multi-decadal timescales. The main breakthroughs lie in the operationalisation and the regular production of high-quality climate information, in the streaming of this information to applications from important impact-sectors like forestry, urban environments, hydrology, hydro-meteorology, and energy, and in developing further interactivity elements in particular in support of performing “what-if” scenarios. The DT provides globally consistent and co-located climate, weather and impact-sector information at much higher data output rates (5 to 10 km resolution for the different earth-system components, globally, hourly to monthly) than presently available for different emission scenarios for the next few decades (up to 2050).

At the start of phase 2 of DestinE (June 2024) prototype climate projections are available for the SSP3.70 scenario, covering the period 2020-2040 for IFS² -NEMO³ and 2020-2030 for ICON. Simulations for historical periods (starting in 1990) are also available for the two models (16 and 12 years, respectively), and control experiment (starting in 1990), which allow to assess model drift will become available in the next months.

The Climate DT provides selected model output variables characterising the evolution of the different Earth-system components. For selected time slices, the Climate DT will also generate ensemble simulations to assess extremes during phase 2 of DestinE.

Both DT already include elements of co-design with component models from impact sectors. An uncertainty quantification framework for the DT is being developed gradually throughout the DestinE phases.

Details on the Climate DT are available at the ECMWF Destination Earth webpages and the Explanation of Destination Earth Digital Twin on Climate Change Adaptation [RD6] and of the data portfolio of the Climate DT at [RD7].

Technical information on the interfaces provided by the Digital Twin Engine is available in the Documentation for the Digital Twin Engine [RD8].

2.3. Related activities and projects

The work to be contracted under this ITT benefits from other initiatives, past and present, though no formal dependencies are foreseen between the contracts concluded under this Tender and these other activities.

ECMWF has been realising a number of DestinE use cases for different impact sectors, including renewable energy, air quality, and flood risk management as well as flood risk assessment. Impact-sector applications are included in the development of the Extremes DT and Climate DT [RD6].

A collection of use cases and demonstrators has also been realised in the context of ECMWF Copernicus activities [RD9, RD10].

ESA and, EUMETSAT have also been realising a collection of use cases [RD4] and demonstrators.

The EU Mission on Adaptation to Climate Change [RD11] aims at supporting more than 175 EU regions, cities and local authorities in their efforts to build resilience against the impacts of climate change. A range of activities, including the expansion of Climate-ADAPT and projects funded under the Horizon Europe framework programme, support the implementation of this mission.

² <https://www.ecmwf.int/en/forecasts/documentation-and-support/changes-ecmwf-model>

³ <https://www.nemo-ocean.eu/>

Further developments of digital twin components or applications connecting to DestinE are funded in national and European research programmes.

2.4. Reference resources

- [RD1] Destination Earth websites of the Commission and joint DestinE website
<https://digital-strategy.ec.europa.eu/en/policies/destination-earth>
<https://www.destination-earth.eu>
- [RD2] ECMWF Destination Earth Glossary <https://destine.ecmwf.int/glossary/>
- [RD3] DestinE Data Portfolio
<https://destine-data-lake-docs.data.destination-earth.eu/en/latest/dedl-discovery-and-data-access/DestinE-Data-Portfolio/DestinE-Data-Portfolio.html?highlight=collections>
- [RD4] Overview of use case contracts implemented by ECMWF, ESA, and EUMETSAT
<https://destination-earth.eu/use-cases/>
- [RD5] Data Portfolio of the DT Extremes
<https://confluence.ecmwf.int/display/DDCZ/DestinE+ExtremesDT+Parameters>
- [RD6] ECMWF Destination Earth webpages <https://destine.ecmwf.int/>
Explanation of Destination Earth Digital Twin on Climate Change Adaptation
<https://destine.ecmwf.int/news/the-fast-development-of-destines-climate-change-adaptation-digital-twin/>
- [RD7] Data Portfolio of the DT Climate
<https://confluence.ecmwf.int/display/DDCZ/DestinE+ClimateDT+Parameters>
- [RD8] Documentation for Digital Twin Engine
<https://digital-twin-engine.readthedocs.io/en/latest/#documentation>
- [RD9] Sectoral impacts of the Copernicus Climate Change Service
<https://climate.copernicus.eu/sectoral-impacts>
- [RD10] Use cases of the Copernicus Atmosphere Monitoring Service
<https://atmosphere.copernicus.eu/use-cases>
- [RD11] EU Mission on Adaptation to Climate Change
<https://climate-adapt.eea.europa.eu/en/mission/the-mission>

3. Summary of contracts to be placed

This ITT aims to place separate contracts, implementing DestinE pilot services or ML-based demonstrators for selected impact sectors. Each contract shall either

- (Lots 1a-f) deliver a Pilot Service for a well-defined user group, which must be adequately engaged in co-designing the service; or
- (Lot 2) demonstrate a fully ML-based, interactive solution for a selected impact sector that moves beyond current capacity and has the potential to be developed into a service in the future.

Pilot Services shall meet identified user needs and demonstrate complementarity and added value vis-à-vis currently available data or national and European services (e.g. provided by national meteorological services or Copernicus services).

Pilot Services shall be delivered for different impact sectors. To this end, contracts are intended to be placed in different Lots:

Lot 1a: Pilot Services in the energy sector

Lot 1b: Pilot Services supporting weather-related extremes resilience and impact mitigation

Lot 1c: Pilot Services in the agricultural sector and food security

Lot 1d: Pilot Services for environmental or urban planning

Lot 1e: Pilot Services for environmental migration

Lot 1f: Pilot Services in other sectors

ECMWF aims to achieve a diverse, but fair and equitable distribution of contracts among these Lots. Up to a maximum of 2 contracts will be awarded to the highest-ranking Tenders under each of these Lots that have passed the minimum threshold of 60% in the evaluation.

Each of the contracts in Lots 1a-1f shall deliver a Pilot Service from 9 months after the start of the contract until the end of the contract. A later start of Service delivery may be proposed by Tenderers but should be justified in the Tenders. From the start of the Service delivery period onwards the Pilot Service shall be available to its users according to its Service description, e.g. regular provision of data or information, maintaining an interactive Service interface. The Pilot Service shall be exposed on the DESP.

Pilot Services shall exploit the capabilities and novel data provided by the Digital Twins implemented in DestinE, i.e. the Climate DT and the Extremes DT. In addition they should rely on other data and services provided by, or available to, the user groups involved to maximize relevance of the service. Pilot Services shall be complementary to existing services, notably those implemented at national level and in the Copernicus programme.

Services may build on past and ongoing developments in DestinE, notably in Digital Twins and demonstrator use cases, and other activities contracted by ECMWF [RD6]. Where applicable, Tenders should explain how they build on previous EU-funded activities, including under Horizon Europe, DestinE or other EU-funded actions.

Criteria for selection will be the technical capacity of the Tenderer to implement the Pilot Service, the anticipated impact and improvement vis-à-vis the status quo expected due to DestinE capabilities, the credibility of the user scenario and user involvement.

ML-based demonstrators may address any of the sectors above. They should develop compelling examples of the DestinE System capabilities, notably DT data and access mechanisms, being exploited by innovative ML-based techniques to enable a step-change in terms in user benefit in any sector.

Criteria for selection will be the technical capacity of the Tenderer to implement the Demonstrator, the relevance of the Application, and potential impact and improvement vis-à-vis the status quo. Demonstrators must focus on the exploitation of ML use.

Up to a maximum of 4 contracts will be awarded to the highest-ranking Tenders, which have passed the minimum threshold of 60% in the evaluation, under

Lot 2: AI/ML-based demonstrators for the sectors listed in Lots 1a to 1e.

Each of the contracts in Lot 2 should deliver a prototype demonstrator by month 15.

The Pilot Services and ML-based demonstrators will also serve to grow the DestinE user bases and contribute to the co-design of the DestinE System components. Successful Tenderers will be expected to contribute to relevant workshops and requirement definitions, including at technical level.

Each contract must be led by one prime contractor, which may engage with one or more subcontractors. Tenderers may submit, or may participate in a subcontractor capacity in, more than one Tender for any of the Lots described in this document.

ECMWF expects each contract individually to not exceed a maximum total price of €350,000 for Tenders under Lots 1a-1f, or up to a maximum total price of €400,000 for Tenders under Lot 2. However, Tenders above these limits can be considered, if duly justified by the exceptional value and added-benefit of the Tender. ECMWF intends to use an overall budget of €2.2 Mio for contracts placed under this ITT.

4. Technical specification

This ITT addresses Tenderers that build on the DestinE DT data and capabilities to develop interactive technical solutions to support decision-making in different impact sectors:

Lot 1a: Energy

With the growing share of renewable energy sources in the energy mix, meteorological conditions are gaining an increasing impact on production and energy systems. They also impact energy consumption patterns and constrain operations of renewable energy facilities.

Tenders under this Lot may implement Pilot Services supporting energy system planning and operations, including adequacy assessment, investment planning and siting of new infrastructure, management of individual wind or hydropower facilities, or related needs. This may include large scale infrastructure developments with the potential to influence regional environmental/climatic conditions. Tenders shall explain the anticipated added-value and need for exploiting DestinE and outline a realistic future implementation. They are expected to rely on data from the Extremes DT, the Climate DT, or both.

Lot 1b: Weather-related extremes resilience and impact mitigation

Weather-related extreme events, including windstorms, floods, extreme precipitation, heat or drought are the most impactful natural disasters in terms of lives lost and damages. Accurate forecasts and climate projections can support in particular the mitigation, preparedness, and response phases of disaster risk management.

Tenders under this Lot may implement Pilot Services in any of these phases. They may include, e.g., risk-based financing or other responses, as well as information services supporting decision-makers in adaptation planning. Work proposed must fully respect the mandates for disaster risk management of entities in the countries affected, including the exclusive responsibility of Member States to maintain National Meteorological, Hydrometeorological and Hydrological Services under the 1947 UN Convention of the World Meteorological Organization (WMO) and their mission of supporting national needs, including protecting life and property of citizens in the context of high impact meteorological events.

Tenders are expected to rely on data provided by the Extremes DT or on DT Climate data for adaptation objectives.

Lot 1c: Agriculture and food security

Agriculture is dependent on meteorological and climatic conditions. Information at different timescales can support decision-making of stakeholders from farmers to policy-makers. Tenders under this Lot may implement Pilot Services linked to agricultural management, market information systems, or food security. They may address short-term decision making (e.g., water management or application of fertilizer or pesticides) or longer-term planning decisions related to

climate adaptation (e.g., suitability of certain crops for regions, diversification). Furthermore Tenders may explore the impacts of teleconnection of climatic extremes on global food systems as simulated under future climate change scenarios, such as simultaneous crop failures in different producing regions (“multi-breadbasket failures”), and related adaptation responses at national and European levels. Tenders should identify relevant links to European or global frameworks. Pilot Services are expected to rely on Climate DT or Extremes DT data streams.

Lot 1d: Environment and urban planning

The European Commission’s zero pollution action plan⁴, a deliverable under the European Green Deal, aims at substantially reducing the harm of pollution on human health and natural ecosystems. Also, climate change effects, notably heat waves or flooding, are impacting human health, stressing vulnerable groups on particular. Policy-makers and implementors from local to global levels are taking action to protect health of humans and natural environments.

Tenders under this Lot may implement Pilot Services supporting decision-makers in their tasks. This may include short-term challenges, like identifying effective measures in response to episodes of poor air quality or heat waves, or longer-term adaptation approaches, like urban greening or other adaptation measures. Pilot Services are expected to rely on Climate DT or Extremes DT data streams.

Lot 1e: Environmental migration

Climate change has emerged as a significant driver of migration, impacting communities and individuals who are vulnerable to changing environmental conditions. Rising sea levels, extreme weather events, prolonged droughts, and other climate-related phenomena, including cascading effects, can force people to leave their homes, creating complex humanitarian and policy challenges. These challenges include the displacement of populations, integration of migrants into new communities, and the development of resilient infrastructures and systems. Tenders under this Lot shall implement Pilot Services aimed at addressing the impacts of climate change on migration patterns and supporting adaptation and resilience efforts. These Services could involve monitoring and forecasting climate-induced migration trends, assessing vulnerabilities of communities at risk of displacement, or developing approaches for identifying the onset of environmental disasters with the potential to be a relevant driver for migration to support early planning and response actions. Additionally, Tenders may focus on supporting decision-makers in developing proactive measures to mitigate migration pressures, such as enhancing climate resilience in vulnerable communities. Tenderers shall explain in their Tenders how they include trans-disciplinary expertise including on climate change and the physical environment as well as societal, humanitarian and political responses. Pilot Services are expected to rely on data from the Climate DT, the Extremes DT, or both, and must respect the responsibility of countries in this domain.

Lot 1f: Other Pilot Services

Tenders under this Lot may address any sectors other than those covered under Lots 1a-e.

Lot 2: Machine-learning demonstrators

This Lot aims at the integration of Artificial Intelligence/ Machine Learning (AI/ML) into key impact sectors, utilizing the unique capabilities of the DestinE Digital Twins. Activities should explore and enhance user-relevant information, including aspects related to the interactivity and efficiency, for sectors such as agriculture, urban development, transportation, and healthcare (or any of the ones mentioned in Lot 1a to 1e) through the adoption of sophisticated machine learning techniques. Tenderers are encouraged to demonstrate innovative approaches based on AI/ML, and that make use of the DestinE DT data to address critical challenges within these sectors. The aim should be to implement ML-based pilot solutions that can in the future form the basis for a service provision.

⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0400&qid=1623311742827>

Collaborative efforts involving research institutions and commercial entities, including SMEs are encouraged. AI-driven solutions should be scalable, sustainable, and capable of delivering tangible benefits.

Pilot Service and Demonstrator delivery under any Lot must exploit the novel data, services and capabilities of the DestinE DTs and should integrate to the extent possible with DestinE System Components. They must anticipate a clear and well-explained complementarity and added-value vis-à-vis existing services, which Tenderers must highlight in their Tenders. Tenders should identify relevant links to national or international initiatives, including the UN Early Warning For All initiative, the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals, the UN Global Compact for Migration.

Pilot Services (Lots 1a-1f) are expected to be driving impact sector models with output of the Digital Twin models, either in concurrent runs (streaming data from DT models) or via extracting data from output data stored in the DEDL. They shall be exposed on DESP.

ML-based Demonstrators (Lot 2) are expected to use DT data as training data for developing the machine-learning based pilot solutions, but are envisaged to use other datasets to complement DT data.

Pilot services and Demonstrators under this ITT must include the ability for user interaction. This may be implemented at different levels, e.g. allowing users to initiate or configure impact sector model runs, support scenario planning, visualize output data fields, initiate or configure post-processing of impact sector runs, insert user-provided data into the workflow, etc.

In general users shall be enabled to investigate different “what-if” scenarios supporting their decision making. This may involve specifying adaptation choices and investigating their consequences or different storylines for selected future scenarios. Tenders shall explain what scenarios users will be enabled to define and how this will serve their decisions.

Specific key tasks for each Pilot Service (i.e., Tenders submitted to Lots 1a-1f) contract are:

1. User requirements and Service definition;
2. Pilot Service implementation, including establishing an interactive user interface and corresponding documentation;
3. Pilot Service operations, maintenance and user support;
4. Support to user engagement and communication;

These are described in detail in subsections 4.1-4.3 and 4.6.

For ML-based demonstrators the focus is more on developing novel approaches and demonstrating new capabilities for selected sectors. Correspondingly, key tasks for each ML-demonstrator contract (i.e., Tenders submitted to Lot 2) differ from those of the other Lots. In particular, these contracts’ tasks include:

1. User scenario and demonstrator definition
2. Demonstrator development, including configuration, dataset preparation and model training
3. User demonstration and evaluation
4. Support to user engagement and communication

These are described in detail in subsections 4.4-4.6.

Successful Tenderers to any Lot will also be required to support ECMWF in DestinE stakeholder engagement and communication activities for DestinE.

4.1. User requirements and Service definition

Subsections 4.1-4.3 are applicable only to Tenders submitted to Lots 1a-1f. Please refer to subsections 4.4-4.5 for the corresponding descriptions for Tenders submitted to Lot 2.

A comprehensive analysis of user needs and requirements definition shall form the basis of Pilot Service development and implementation. Successful Tenderers shall establish a core user group for the Service and

co-define how the Pilot Service will support them in their work. Members of the core user group shall be identified already in the Tender and Tenderers shall provide proof of the user group's willingness to participate in the co-design of the Service (e.g., via including them as a subcontractor in the Tender or including a letter of support). ECMWF may propose further core users to be included in the core user group during potential negotiations or the duration of any subsequent contract.

The policy/decision making needs must be clearly delineated and the opportunities for the Pilot Service to support improving on current decision-making processes should be defined. Requirements should be defined at a technical level, including data portfolio, timeliness, format, interfaces, quality, and governance.

The user interface shall optimally respond to the user needs. To the extent possible, this shall be implemented on DESP, maximizing the integration in DestinE. However, where user requirements prevent full integration with DESP, Successful Tenderers shall still expose the Pilot Service on DESP, i.e. register a service access point in the DESP service catalogue.

Successful Tenderers shall then define a Pilot Service that optimally responds to the user requirements under the applicable technical and budget constraints. The Service definition shall include the methodological approach, data and computational requirements and resources used, as well as technical and user interfaces. Particular attention shall be given to the requirements for DestinE data streams, interfaces or other capabilities needed. Where additional resources are required, these should be explained and their sources defined, including any existing access restriction.

Tenderers shall outline the intended Pilot Service, including Service portfolio (products and information produced by the Pilot Service), user groups addressed and their readiness for taking up the Service, anticipated added-value compared to existing services and capabilities at sub-national, national, or European level, technological readiness and gaps requiring development already in their Tenders. Tenders must also include a section on Tenderer's vision for the continued operation of the Pilot Service after the end of the contract (i.e., an exploitation plan, which may include commercial concepts).

Tenderers shall make relevant links to the EU Missions, notably the EU Mission on Climate Change Adaptation [RD11].

The Service definition must include a comprehensive definition of the approach to uncertainty quantification and quality control. Tenderers shall already outline this approach in their Tenders.

Successful Tenderers shall deliver a User Requirements and Service Definition document as output of this work. This shall fully describe the

- users served and their needs and mandates
- concrete user requirements
- usage scenario (who is going to use the service, when, to do what)
- Pilot Service to be implemented (portfolio, initiation, timelines, inputs and outputs including their sources, quality information provided, technical platforms, methodologies and models used, etc.)
- tests foreseen to be conducted to validate the Pilot Service.

4.2. Pilot Service implementation

Subsections 4.1-4.3 are applicable only to Tenders submitted to Lots 1a-1f. Please refer to subsections 4.4-4.5 for the corresponding descriptions for Tenders submitted to Lot 2.

Successful Tenderers shall implement a fully functional interactive Pilot Service according to the accepted User Requirements and Service Definition. To the extent possible this shall make optimal use of the capabilities available in the DestinE system components, i.e. one or both DTs, the DTE components, the DEDL and the DESP.

For any new software developments for DestinE Pilot Services open-source licences should be favoured. It should be noted that if such is proposed in the Tender, the Tenderer shall be prepared to provide more information and details on the respective open-source software licence, the benefit for EU and the DestinE from such an open-source licence, as well as confirmation that there will be no substantial risks for DestinE. The Tenderer shall warrant that the Tenderer has the full capacity and authority for such an open-source licence to be granted. If open source developments are agreed in the contract, they shall be managed as an open source project on a public repository (e.g., on GitHub, GitLab, etc.), and hosted under a dedicated domain to be identified by ECMWF. Where Tenderers propose proprietary software to be used they shall identify the corresponding software in their Tender and include any licence cost necessary for the operation of the Pilot Service in their Tender.

The Pilot Service should be fully deployed at nine months after the Kick-Off meeting (KO+9 months). Tenderers may propose later deployment dates in their Tenders, if needed and justified. Implementation should be tested and validated with the Pilot Service core user group.

Successful Tenderers shall deliver a fully deployed Service. A Pilot Service Implementation and Test Report shall document successful implementation with appropriate reference to the user requirements and Service definition.

4.3. Service operations, maintenance and user support

Subsections 4.1-4.3 are applicable only to Tenders submitted to Lots 1a-1f. Please refer to subsections 4.4-4.5 for the corresponding descriptions for Tenders submitted to Lot 2.

After completion of the Pilot Service implementation and testing the Pilot Service shall be operated by Successful Tenderers for the duration of the contract. This includes availability of the Pilot Service for the intended user group, including any triggering, data delivery and visualization functionalities.

Tenderers shall explain in sufficient detail how they envision the Service operation to proceed, i.e. provide assumptions for user group (including expected numbers), when the impact sector model would run, if/how these will be triggered, who would have access to the interactive Service and how. Services should be as open as possible, though restrictions may be applied to meet justified user requirements or resource limitations.

Tenderers shall provide a rough estimate of resource requirements (compute, data storage, licence fees) in their Tender and identify how they propose to meet those. In particular, any resource requirements for DestinE System components (DESP, DEDL, DTE, DT) shall be identified and, if necessary, budgeted for. For estimating the cost of hosting the web application on the DESP, please refer to <https://www.ovhcloud.com/en-ie/public-cloud/prices/>

Successful Tenderers shall fix any issues identified during Pilot Service operations in a timely fashion. Acceptable downtimes of the Pilot Service depend on the specific case and shall be defined by Successful Tenderers in their Service Definition.

Successful Tenderers shall contribute to DestinE user support by providing technical support for their Services. They will be included in ECMWF's ticketing system and will be required to respond to issues raised by users or other linked services. Successful Tenderers should also contribute to user-facing and technical documentation by providing information about their Service at the request of ECMWF.

A service dashboard shall be set up by Successful Tenderers to provide an overview of the service status and operations. Quarterly Pilot Service Operation reports and a Pilot Service Operations final report shall be delivered to ECMWF, which shall include key indicators on the service delivery (uptime/availability, usage, quality indicators, timeliness, etc.).

4.4. User scenario and demonstrator definition

Subsections 4.4-4.5 are applicable only to Tenders submitted to Lot 2. Please refer to subsections 4.1-4.3 for the corresponding descriptions for Tenders submitted to Lots 1a-1f.

ML-based demonstrators shall be based on a concrete user scenario that defines the user group, which the demonstrator aims to serve, their needs, and how these groups are expected to benefit from the functional demonstrator. Successful Tenderers shall engage selected users during their work, notably to validate the definition of the demonstrator and its result. The users to be involved shall be identified already in the Tender and Tenderers shall provide proof of the user group's willingness to participate (e.g., via including them as subcontractors or including a letter of support). ECMWF may propose further core users to be included in the core user group during potential negotiations or the duration of any subsequent contract.

Successful Tenderers shall assess the anticipated improvement with respect to the current information sources available, and thus the added-value of the proposed demonstrator should be defined. The demonstrator should be defined at a technical level, including data portfolio, timeliness, format, interfaces, and expected quality.

The demonstrator definition shall include the ML-based approach, tools, training data and computational requirements and resources used, as well as technical and user interfaces. Particular attention shall be given to the requirements for DestinE data, interfaces or other capabilities needed. Where additional resources are required, including training data, these should be explained and their sources defined, including any existing restrictions on access or use.

A user interface shall be implemented on DESP, maximizing the integration in DestinE. If alternative interfaces are proposed, Tenderers shall also include exposing the ML Demonstrator as a service on DESP, i.e. register a service access point in the DESP service catalogue.

The demonstrator definition must include a description of the approach foreseen for validation. Tenderers shall already outline this approach already in their Tender.

Successful Tenderers shall deliver a User Scenario and Demonstrator Definition document as output of this work. This shall describe the

- The user groups targeted, including their needs to be addressed
- The usage scenario (what type of users would be using the service, when, to do what)
- The demonstrator to be implemented (portfolio, user interaction, inputs and outputs including their sources – for the training and inference phases, technical platform(s), ML methodologies used, etc.)
- The tests foreseen to be conducted to validate the demonstrator.

4.5. Demonstrator development, including implementation and training

Subsections 4.4-4.5 are applicable only to Tenders submitted to Lot 2. Please refer to subsections 4.1-4.3 for the corresponding descriptions for Tenders submitted to Lots 1a-1f.

Successful Tenderers shall implement a fully functional interactive demonstrator according to the Demonstrator Definition as accepted by ECMWF. To the extent possible this shall make optimal use of the capabilities available in the DestinE system components, i.e. exploit data from one or both DT, access via the DTE components, the DEDL and the DESP.

Tenderers shall provide an estimate of resource requirements (compute, data storage, licence fees) in their Tender and identify how they propose to meet those. In particular, any resource requirements for DestinE System components (DESP, DEDL, DTE, DT) shall be identified and, if necessary, budgeted for. For estimating the cost for hosting the web application on the DESP, please refer to <https://www.ovhcloud.com/en-ie/public-cloud/prices/>

For any software developed or used for DestinE Demonstrators open source solutions should be favoured, but to be noted that if such is proposed in the Tender, the Tenderer shall be prepared to provide more information and details on the respective open-source software licence, the benefit for EU and the DestinE from such an open-source licence, as well as confirmation that there will be no substantial risks for DestinE. The Tenderer shall warrant that the Tenderer has the full capacity and authority for such an open-source licence to be granted. If open source developments are agreed in the contract, they shall be managed as an open source project on a public repository (e.g., on GitHub, GitLab, etc.), and hosted under a dedicated domain to be agreed with ECMWF. Where Tenderers propose proprietary software to be used they shall identify the corresponding software in their Tender and include any licence cost necessary for the Demonstrator in their Tender.

The Demonstrator should be fully deployed at KO+15 months and should be tested and validated following the validation approach agreed in the Demonstrator Definition (see section 4.4).

A Demonstrator Implementation and Test Report shall document successful implementation with appropriate reference to the user requirements and Service definition.

4.6. User engagement and communication

DestinE aims to grow and mature its user community. The Pilot Services to be implemented following this ITT are intended to contribute to engaging user communities in the impact sectors covered.

The Tenderers are, therefore, expected to include effective user engagement as part of their work. This must include setting up a dedicated core user group for the Pilot Service and maintaining regular interactions. These activities shall be agreed upon and coordinated with ECMWF. ECMWF shall be invited to participate in core user group meetings. Tenderers shall also propose actions to reach out to further potentially interested user groups over the duration of the contract, e.g. through contributions to domain-specific conferences, meetings or exchanges, publications, dedicated webinars, etc.

Successful Tenderers are further expected to support ECMWF and the European Commission in overarching DestinE user engagement and communication activities. To this end, Successful Tenderers will be required to:

- Support workshops and other events organised by ECMWF, the Commission or other parties by presenting their work. At a minimum, Tenderers shall foresee participation in the regular DestinE User eXchange meetings (June 2025, spring 2026) and ECMWF DestinE Annual Meetings (2025 and 2026).
- Advertise the Pilot Services or ML demonstrators in relevant fora and communications (publications, websites, newsletters, social media, workshops, conferences, etc.) within the relevant sectors.
- Contribute to the ECMWF and European Commission communication work on DestinE as required.

Specifically, the Successful Tenderers shall deliver at a minimum:

- A description of the Pilot Service/ML demonstrator suitable for presentation on the web to generalised audiences, including text and visuals (updated regularly);
- Presentation material on the Pilot Service and the progress of implementation to be maintained up-to-date over the duration of the contract;
- Regular posts on/for relevant social media channels within the impact sector;
- One fact sheet aimed at general public/policy audiences outlining the work of the contract
- A short video (approximately 90 seconds) presentation of the Pilot Service for inclusion on a DestinE web presence.
- Support to inter-contract communication

A plan for community engagement and communication activities carried out by the Tenderers shall be included in the Tender. An initial version will be agreed with ECMWF during negotiation and will form part of the contract. The implementation of this plan and any subsequent updates will need to be agreed upon with ECMWF regularly during the contract implementation. This includes, but does not exhaustively cover, communication planning, contributions to DestinE media outreach, websites and social media activity, externally facing written and graphical contents and events.

4.7. Deliverables and milestones

At a minimum the Successful Tenderers are expected to deliver:

Deliverable	Section reference	Format	Due	Applicable to Tenders in Lots
User Requirements and Service Definition document	4.1	Document	Kick-Off (KO) + 3 months	1a-1f
Pilot Service Implementation and Test Report	4.2	Document	KO + 9 months	1a-1f
Quarterly Pilot Service Operation reports	4.3	Document	Multiple: At the end of every quarter following KO + 9 months	1a-1f
Pilot Service Operation final report	4.3	Document	End of contract (30/09/2026)	1a-1f
User Scenario and Demonstrator Definition	4.4	Document	KO + 3 months	2
Demonstrator Implementation and Test	4.5	Document	KO + 15 months	2
Communication material to support ECMWF communication: <ul style="list-style-type: none"> – Website content – Factsheet – Presentation – Social media content – Video 	4.6	text and visuals ppt or compatible posts video	KO + 1 month (plus regular updates, as needed) As needed end of contract	all

Further deliverables should be defined by the Tenderer based on the requirements above, as needed.

Each deliverable shall have an associated resource allocation (person-months and financial budget). The total of these allocated resources shall amount to the requested budget associated with payroll as detailed in Volume IIIA of this ITT.

Milestones should be designed as markers of demonstrable progress in capability development and/or quality of capability delivery, as applicable. They should not duplicate deliverables and should not have any cost associated to them.

5. General requirements

5.1. Implementation schedule

ECMWF intends to award up to a maximum of two contracts for a duration of 21-24 months under each of the Lots 1a-1f, and up to a maximum of four contracts for a maximum duration of 18 months under Lot 2. These contracts are expected to commence in a staggered manner between December 2024 and February 2025, depending on how negotiations with preferred Tenderers progress. For the purposes of preparing responses, Tenderers should consider 1 January 2025 as the indicative start date for the contract. The actual

contract start date, as well as necessary adjustments, will be agreed with the preferred Tenderers during the negotiation phase.

The Tenderer is expected to provide a detailed schedule as part of the Tender. The proposed schedule shall address the main tasks, milestones and deliverables. Regular progress meetings will be held with ECMWF during the contract to assess contract status, risks and actions.

5.2. Meetings

5.2.1. Physical / face-to-face meetings

A kick-off (KO) meeting will be held no later than one month after contract signature.

One physical meeting should be budgeted for in Tenders submitted.

Tenderers should also foresee active participation in at least four relevant physical events over the duration of the contract in the DestinE context. This must include participation in the DestinE User eXchange meetings, which should be assumed to take place in June 2025 (Vienna) and Q2/2026 (Brussels), and annual ECMWF DestinE meetings in Q3/25 in Bologna and Q2/2026 in Bonn. Contributions to further meetings may be proposed to support user engagement and outreach objectives. Such meetings should be chosen to maximize impact and relevance in the specific impact sector communities.

5.2.2. Regular meetings by web-conference

The Successful Tenderers are expected to organize and chair monthly progress meetings with ECMWF by videoconference, prepare corresponding summary minutes of these meetings and maintain a list of agreed actions and their status.

Successful Tenderers may also be requested by ECMWF to contribute to additional technical working groups on issues relating to the requirements and evolution of DestinE. These are expected to be held generally by web-conference.

5.3. Documents and reports

All project reports shall be produced in English. Unless otherwise specified in the specific contract, deliverables shall be made available to ECMWF in electronic format (Microsoft Word/PDF/Microsoft Excel or compatible), via the DestinE Deliverables Repository portal; the details will be agreed at the negotiation stage.

Please refer to Clause 2.3 and the Annex 5 of the Volume V Agreement for details on Reporting Obligations.

5.4. Graphical material and content for communication

All content shall be produced at least in English, unless specifically agreed by ECMWF. Additional languages may be used if justified. The Successful Tenderers shall ensure that all material (text, visuals, videos, etc.) is duly licensed for use by ECMWF and the European Commission.

Outreach activities will be organised by ECMWF during the period of the contract. In such instances, the Successful Tenderers will be approached by ECMWF for support on developing and delivering contents.

Successful Tenderers shall not establish their own brand for the selected projects but rely on and use DestinE and ECMWF pre-defined wording and branding. A communications package (including guidelines, logos and templates) will be provided by ECMWF at the start of the contract.

5.5. Data and IPR

It is a condition of EU funding for DestinE that the ownership of any deliverable (as defined in Volume V Agreement) developed with DestinE funding passes from the Successful Tenderers to the European Union via ECMWF. Ownership will pass from the date of the creation of the deliverable.

All pre-existing materials (e.g. software and products) used by the Successful Tenderer to produce the DestinE deliverables and Pilot Service or ML Demonstrator will remain the property of the Successful Tenderer. The Successful Tenderers will have to provide a royalty-free, non-exclusive, worldwide, perpetual and irrevocable licence to those pre-existing materials to the European Union and ECMWF.

Developments or modifications to pre-existing materials that constitute results and are acquired or created specifically for DestinE purposes will be owned by the European Union.

Upon request, the Successful Tenderer may be granted a non-exclusive licence, at the discretion of ECMWF and subject to the approval by the European Commission, to use the deliverables which they have provided to DestinE.

6. Tender format and content

General guidelines for the Tender are described in Volume IIIB. Specific requirements to prepare the proposal for this particular Tender are described in the next sub-sections.

6.1. Page limits

As a guideline, it is expected that individual sections of the Tenderer’s response do not exceed the page limits listed below. These are advisory limits and should be followed wherever possible, to avoid excessive or wordy responses.

<i>Section</i>	<i>Page Limit</i>
<i>Executive Summary</i>	2
<i>Track Record</i>	2 (for general) and 1 (per entity)
<i>Quality of resources to be Deployed</i>	1 (excluding Table 1 in Volume IIIB and CVs with a maximum length of 2 pages each)
<i>Technical Solution Proposed</i>	10 (Table 2 in Volume IIIB, the section on references, publications, patents and any pre-existing IPR is excluded from the page limit and has no page limit)
<i>Management and Implementation</i>	4 (excluding Table 4 and Table 5 in Volume IIIB) + 2 per each Work package description (Table 3 in Volume IIIB)
<i>Pricing Table</i>	No limitation
<i>Requirements Compliance Table</i>	No limitation

Table 1: Page limits

6.2. Specific additional instructions for the Tender

The following is a guide to the minimum content expected to be included in each section of the Tender, additional to the content described in the general guidelines of Volume IIIB. This is not an exhaustive description and additional information may be necessary depending on the Tender.

6.2.1. Executive summary

The Tenderer shall provide an executive summary of the proposal, describing the objectives, team and summarising the proposed Pilot Service and its added-value, developments and operations, as well as user engagement.

6.2.2. Track record

The Tenderer shall demonstrate for themselves and for any proposed subcontractors that they have experience and knowledge relevant for the proposed solution. This includes experience in relevant projects in the public or private sector at national or international level as well as engagement with – and access to – relevant user communities in the targeted impact sector of the pilot service.

If and where Tenderers plan to build on results from previous EU-funded instruments (notably under the Digital Europe or Horizon Europe Programmes), these shall be mentioned and the exploitation of results explained.

User institutions that are part of the Tender shall describe their mandates and roles, including in formal and informal impact sector fora.

Institutions proposed to be included in the core user group that are not included in the Tender as the Tenderer or subcontractors shall be requested to confirm their interest and availability to serve in that role in a letter of support to the Tender.

ECMWF may ask for evidence of performance in the form of certificates issued or countersigned by the competent authority.

6.2.3. Quality of resources to be deployed

The Tenderer shall propose a team providing the skills required for developing, demonstrating and evaluating the solutions complying with technical requirements set out in Section 4. The team shall include a dedicated Project Manager with experience in the technical management of similar-size projects. The Tenderer shall describe the experience of the Project Manager and the technical project team in performing activities related to all aspects of this Tender.

6.2.4. Technical solution proposed

6.2.4.1. Introduction

The Tenderer shall give an introduction to demonstrate their understanding of the DestinE context and the specific requirements of this Tender.

The Tenderer shall describe the objective and scope of the Pilot Service or ML demonstrator, relevant policy or decision-making context, define the user groups involved and specify their addressable needs that the pilot service/ML demonstrator is targeting.

6.2.4.2. Pilot service portfolio / ML demonstrator functionality

The Tenderer shall describe the intended Pilot Service or ML demonstrator functionality including what a user can request (i.e., on-demand elements) and what would be delivered automatically, and data and information products, including aspects of information layers/parameters, frequency, timeliness, resolution, etc.. It is understood that this may be modified based on the user interactions during the first months of the contract and will be finalized in the User Requirements and Service Definition document (Lots 1a-1f) or the User scenario and demonstrator definition document (Lot 2). Hence, Tenderers should provide their initial expectation in this sub-section.

6.2.4.3. Technical solution

This section shall describe the proposed technical solution, including applied methods and models, datasets. Information on required data and their sources should be included in a separate table, including data from the DestinE data portfolio, data that might be provided by the Extremes DT or Climate DT simulations but are not currently included in the DestinE portfolio, data from openly accessible sources, data proposed to be provided by the Tenderer, and data Tenderers propose to be provided by users of the Pilot Service.

For ML demonstrator Tenders this section shall explain the ML approach to be used, the training data and corresponding resources required for training and inference.

This section shall present an estimate of the Pilot Service resource requirements (computing, data holding, network) and how they are proposed to be met.

This section shall also include information on other third-party suppliers that are proposed for delivering the technical solution.

6.2.4.4. Added-value of the pilot services / ML demonstrators

Tenderers shall identify the qualitative and quantitative improvements expected from the Pilot Service /ML demonstrator vis-à-vis current approaches, putting forward in particular the impact of exploiting DestinE capabilities.

6.2.4.5. Complementarity to existing Services

A separate sub-section shall include a particular focus on complementarity to existing services, notably in the context of Copernicus and relevant national services. Tenderers shall also make due reference to results obtained during previous Horizon Europe or Digital Europe funded actions.

This sub-section shall also discuss how the proposed Pilot Service/ML demonstrator respects relevant institutional mandates at the level of the countries affected.

6.2.4.6. User engagement

A separate sub-section shall be included on user engagement to describe how the Tenderers will ensure effective links with relevant user communities, including the core user group and relevant communities beyond.

6.2.4.7. Exploitation plan

A sub-section shall be included to outline Tenderers view on the possible exploitation of results beyond the end of the contract. This should include a concept for continued operation and corresponding resourcing mechanisms, including commercial options.

6.2.5. Management and implementation plan

The Tenderer shall provide a detailed implementation plan of proposed activities for the duration of the contract. Deliverables should be consistent with the technical requirements specified in Section 4.

The Tenderer is requested to structure the work in four Work Packages (WP):

	Tenders under Lots 1a-1f shall include	Tenders under Lot 2 shall include
WP0	Management and implementation activities, as well as communications.	
WP1	Pilot Service definition and user and stakeholder engagement activities.	ML demonstrator definition and user exchanges.
WP2	Pilot Service development and implementation.	ML demonstrator implementation and testing.
WP3	Pilot Service operations and user support.	ML demonstrator user validation.

The number of milestones is not prescribed, but they should be designed as markers of demonstrable progress in capabilities development and/or quality of capability delivery to keep progress monitoring manageable.

Adjustments to the proposed implementation plan can be proposed by the Successful Tenderer during the contract, but they must be agreed to by ECMWF.

As part of the general project management description, the Tenderer shall consider the following elements (this is not an exhaustive list):

- Semestrial, annual and final reports shall be provided in accordance with the Volume V Agreement Clause 2.3 and Annex 5.
- An annual work plan is expected to be agreed at negotiation for 2024, if applicable. The work plan for 2025 shall be provided within 1 month of the contract start date.
- Monthly video-conferencing with ECMWF and a proposal for involvement of ECMWF in major project reviews shall be provided as part of the management plan. The contractor is responsible for the organisation of such meetings, including proposing specific topics of discussion, presenting, provision of minutes and maintaining a list of agreed actions.
- If relevant, a list of sub-contractors and details of their contribution, key technical personnel involved in the contract, legal names and addresses shall be provided. The Tenderer shall describe how the Volume V Agreement, in particular Clause 2.9, has been communicated to all their sub-contractors.
- The Tenderer shall describe in the Proposal the management of personal data and how this meets the requirements of Clause 2.8 and Annex 6 of Volume V Agreement.

The table below provides the template to be used by the Tenderer to describe the complete list of deliverables, milestones and schedules for WPO. All milestones and deliverables shall be numbered as indicated. All document deliverables shall be periodically updated and versioned as described in the table. Tenderers shall provide preliminary versions of the completed tables as part of their Tender.

Deliverables for WPO shall include the following reports:

WPO Contractual Obligations Template			
#	Nature	Title	Due
D0.y.z-YYYY	Report	Semestrial Implementation Report (January-June YYYY) YYYY being the Year n This includes a specific Financial Report	Annually on 15/07
D0.y.z-YYYY	Report	Annual Implementation Report YYYY YYYY being the Year n-1 This includes a specific Financial Report	Annually on 15/01
D0.y.z	Report	Final Implementation Report	60 days after end of contract
D0.y.z-YYYY	Report	Annual Work Plan YYYY YYYY being the Year n+1	Annually on 31/08
D0.y.z-YYYY	Other	Copy of prime contractor's general financial statements and audit report YYYY, YYYY being the Year n-1	Annually (no-cost associated)

6.2.6. Key performance indicators

The Successful Tenderers shall report to ECMWF on a set of Key Performance Indicators (KPIs) and performance targets for the activities covered by this ITT and taking the requirements described above into account. The KPIs and performance targets, to be proposed by the Tenderer in the Tender, will be agreed in contract negotiation and may be updated by mutual agreement, if necessary.

KPIs shall be measurable indicators on the key outputs of the work. These shall include as a minimum:

applicable	KPI name	Means of verification	Target	reported
Technical				
Only Lots 1a-1f	Pilot Service design meets core user	Feedback from core user group	Achieved	KO + 3

	requirements			
Only Lots 1a-1f	Pilot Service implemented	Test report	Achieved	KO + 9
Only Lots 1a-1f	Pilot Service availability	Quarterly Pilot Service reports	To be proposed by Tenderer	At the end of each quarter starting at KO + 9
All Lots	User satisfaction	User feedback collected	Positive feedback from users	End of the contract
Only Lots 1a-1f	Issue resolution	Median time for resolving issues raised on Pilot Service	To be proposed by Tenderer	At the end of each quarter starting at KO + 9

User engagement

Only Lots 1a-1f	Number of core users involved in the core user group	Meeting protocols	To be proposed by Tenderer	Every 3 months
Only Lot 2	Number of users engaged for Demonstrator definition and validation	Summary minutes of exchanges	To be proposed by Tenderer	Every 3 months
All Lots	Number of presentations at workshops, events	References	To be proposed by Tenderer	Every 3 months
Only Lots 1a-1f	Number of user requirements identified	User Requirements and Service Definition document	To be proposed by Tenderer	KO + 3; End of contract

Communication

All Lots	Number of social media posts, likes and shares	Analytics	To be proposed by Tenderer	Every 3 months
----------	--	-----------	----------------------------	----------------

Contract management

All Lots	Timely implementation of the contract	Dates of milestones and timely submission of deliverables	100% on time	monthly
----------	---------------------------------------	---	--------------	---------

Tenderers should propose additional KPIs to fully cover the focus of their Tender. These should cover aspects of Service throughput, usage, and quality.

6.2.7. Requirements compliance table

This table summarizes the requirements that the Successful Tenderer shall meet. The Successful Tenderer shall include in their Tender a Requirements Compliance Table, confirming for each of the requirements that their Tender fulfils. Any deviations shall be noted and justified.

Requirement	Description	Compliance (Y/N or "n/a" if not applicable to this Tender/Lot) Reference to Tender section and WP
Technical requirements		

<i>Scope</i>		
Req-101 (all Lots)	The Pilot Service / ML demonstrator user scenario is fully described, including in terms of data or information provided, user group, timeliness, frequency of delivery, access mechanisms, IT infrastructures and input or training data needed	
Req-102 (Lots 1a-1f)	Pilot Service includes running a sector-specific impact sector model coupled to the Digital Twin models. The mechanism of coupling is described in the Tender.	
Req-103 (Lot 2)	ML demonstrator will implement an data-driven, interactive system for impact sector users. Qualitative and quantitative added-value above currently available systems are described in the Tender.	
Req-104 (Lot 2)	The training approach for ML demonstrators is described in the Tender, including methods used. An estimate of resource requirements (compute, data storage, licence fees) is provided in the Tender, as well as how these are met. Any resource requirements for DestinE System components (DESP, DEDL, DTE, DT) are identified and budgeted.	
Req-105 (Lot 2)	The ML demonstrator will be fully implemented at 12 months after the start of the contract.	
Req-106 (all Lots)	The Tender includes an outline of the envisaged approach to uncertainty quantification and quality control.	
Req-107 (all Lots)	A protocol for generating “what-if” scenarios shall be defined.	
Req-108 (all Lots)	The Pilot Service / ML demonstrator is complementary to existing services (national, Copernicus, etc). Tenderers confirm and explain this in their Tender.	
<i>Integration with DestinE</i>		
Req-201 (all Lots)	Pilot Service / ML demonstrator exploits the novel data, Services and capabilities of the DestinE DT. The impact of this exploitation is outlined in the Tender.	
Req-202 (all Lots)	Pilot Service will be integrated with DestinE System Components (Digital Twin Engine, Data Lake, Service Platform).	
Req-203 (all Lots)	Pilot Service / ML demonstrator includes the ability for user interaction. The interaction opportunities are described in the Tender.	
Req-204 (all Lots)	Access to the Service via a front-end user interface is possible. This front-end should generally be implemented on DESP, unless otherwise justified by user requirements or technical considerations. In any case, the Service must be visible also from the DESP, i.e. a Service access point shall be registered in the DESP service catalogue.	
Req-205 (all Lots)	New software developments favour open-source licences and are managed as an open-source project on a public repository (e.g., on GitHub, GitLab, etc.) and hosted under a dedicated domain to be identified by – or agreed with – ECMWF. (More information and details may be required by the Tenderer. The Tenderer warrants that the Tenderer has the full capacity and authority for such an open-source licence to be granted).	
Req-206 (all Lots)	Any proprietary software to be used is identified in the Tender, including any licence cost necessary for the operation of the Pilot Service.	
Req-207 (all Lots)	The Tender references results obtained in previous EU-funded actions, notably including actions funded under the EU Digital Europe and Horizon Europe programmes that are exploited for the work proposed.	

<i>Pilot Service operation</i>		
Req-301 (Lots 1a-1f)	The Pilot Service will be available to its users from 9 months after the start of the contract until the end of September 2026.	
Req-302 (Lots 1a-1f)	The Tender explains how Service operation is envisioned, including assumptions for user group (including expected numbers), when the impact sector model would run, if/how these will be triggered, who would have access to the interactive service and how.	
Req-303 (Lots 1a-1f)	An estimate of resource requirements (compute, data storage, licence fees) is provided in the Tender, as well as how these are met. Any resource requirements for DestinE System components (DESP, DEDL, DTE, DT) are identified and budgeted.	
Req-304 (Lots 1a-1f)	Tenderer commits to fixing issues identified during pilot operations in a timely fashion.	
Req-305 (Lots 1a-1f)	Service implementation work includes corresponding technical support to DestinE users.	
Req-306 (Lots 1a-f)	A Service dashboard is foreseen providing an overview of the service status and operations.	
<i>User involvement</i>		
Req-401 (Lots 1a-1f)	Work includes an analysis of user needs and definition of qualitative and quantitative user requirements. This forms the basis of Pilot Service development and implementation.	
Req-402 (Lot 2)	The Tender identifies users to be engaged in defining the ML demonstrator and evaluating it. Their availability to engage with the work has been confirmed.	
Req-403 (Lots 1a-1f)	A core user group for the Pilot Service will be set up that will co-define how the Pilot Service will support them in their work. Members of the core user group are identified in the Tender. Their willingness to participate in the co-design of the Service is demonstrated, e.g. via their inclusion as subcontractors or letter of support).	
Req-404 (all Lots)	The (core) user group will test and validate the Pilot Service / demonstrator.	
Req-405 (all Lots)	Relevant links to the EU Missions, in particular the EU Mission on Climate Change Adaptation [RD11] are made and explained in the Tender.	
Management requirements, including engagement and communications		
Req-001 (all Lots)	The Management Plan provided foresees monthly video-conferencing with ECMWF and involvement of ECMWF in major project meetings.	
Req-002 (all Lots)	The Tender includes the required contributions to the overall DestinE stakeholder engagement, including the dedicated User exchanges, and training activities.	
Req-003 (all Lots)	The Tender proposes adequate key performance indicators (KPI) covering all aspects of the work proposed, including those listed the KPI in section 6.2.6 above.	
Req-004 (all Lots)	The Tender includes a realistic perspective on the exploitation of results, including a possible continued operation of the service beyond the end of the contract.	
Req-005 (all Lots)	The Tender includes contributions to DestinE communications activities, notably <ul style="list-style-type: none"> - Content for website 	

	<ul style="list-style-type: none"> - Factsheet - Presentations - Social media - Video - Support to inter-contract communication 	
--	--	--

6.2.8. Diversity and inclusion

If multiple Tenderers present equally qualified Tenders (discrepancy lower than 1%), ECMWF will take into consideration the diversity and gender balance of each Tenderer’s organisation as a tiebreaker when making the final decision. We recognise that diversity and a collaborative environment are essential for advancing scientific discovery and innovation, and we are dedicated to creating a culture that encourages and supports the contributions of individuals from all backgrounds. These varied backgrounds are particularly influential in adopting a holistic view of ethical AI and representing European values. As part of this commitment, we encourage Tenders from Tenderers who share our values and demonstrate a commitment to diversity and inclusion in their own organisations. We believe that working with suppliers who support our efforts to create a more inclusive and diverse community is key to achieving our goals and driving progress forward in all our areas of activities. Therefore, the Centre encourages all potential Tenderers to take these values into consideration when submitting proposals.