ECMWF Copernicus Procurement

Invitation to Tender

Copernicus Climate Change Service

Downscaling of CMIP6 Climate Projections using Machine Learning Tools to fill the Gaps of the Worldwide CORDEX RCM Simulations

Volume II: Specification of Requirements

ITT Ref: C3S2_384
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1   Introduction

Copernicus is the European Union's flagship Earth-observation programme created to achieve operational monitoring of the atmosphere, oceans, and continental surfaces. It aims to provide reliable, validated information services for a range of environmental and security applications. The Copernicus Climate Change Service (C3S, https://climate.copernicus.eu) responds to environmental and societal challenges associated with climate change. The service gives access to information for monitoring and predicting climate change and thus helps support adaptation and mitigation. C3S produces and brokers a wide range of data and products describing the past, present and future of the climate system. This includes global and regional reanalyses, Essential Climate Variables (ECVs), near-term climate predictions, climate projections and a variety of sectoral climate information. The data are offered to users through the C3S Climate Data Store (CDS, https://cds.climate.copernicus.eu).

2   Context

The CDS is the C3S infrastructure underpinning user access to its wide range of climate data. The CDS catalogue includes a large set of climate projection datasets including global climate projections (CMIP5 and CMIP6) and regional climate projections (CORDEX). Additionally, climate projections are available in the CDS in the datasets underpinning the IPCC Interactive Atlas (IPCC-IA) and the Copernicus Interactive Climate Atlas (C3S Atlas).

The present Regional Climate Model (RCM) datasets offered in the CDS are based on the CORDEX downscaling of the CMIP5 Global Climate Models (GCMs). Documentation of these CORDEX data is available at https://confluence.ecmwf.int/display/CKB/CORDEX%3A+Regional+climate+projections. A new effort (in the C3S2_382 contract) is ongoing to ingest new CORDEX datasets downscaling the CMIP6 GCMs (referred to as CORDEX-CMIP6 hereafter) into the CDS. It is anticipated that those data will be published as a new CDS catalogue entry towards the end of 2026.

ECMWF as the Entrusted Entity for the Copernicus Climate Change Service (C3S) invites Tenders for **providing new high resolution regional climate data using Machine Learning (ML) procedures which downscale CMIP6 GCMs**. This new dataset would complement the CORDEX-CMIP6 datasets which will be published in parallel, and the two sets of data together will form an enhanced set of regional climate datasets, with improved coverage of the climate projection uncertainty space (an enhanced matrix of GCM-RCM pairs available across scenarios and regions).

3   Contract Summary

The main objective of the present Invitation to Tender (ITT) is to create new regional climate data based on ML technology, hereafter referred to as CORDEX-CMIP6-ML (this acronym is used solely for the sake of simplicity and does not assume endorsement of the expected ML datasets by the CMIP6 and CORDEX communities). The new data shall complement existing (and planned) CORDEX-CMIP6 RCM simulations, forming a coherent dataset where traditional dynamical RCM and ML-based data can be used together.

The available CORDEX-CMIP6 simulations relevant to C3S users and services will be published in the CDS by the end of 2026. It is already known that these planned CORDEX-CMIP6 RCM simulations will not be sufficient to provide an optimal sample of scenario-GCM-RCM combinations for all 14 CORDEX domains (https://cordex.org/domains/) for climate services (and related applications such as the C3S Atlas for instance). The present ITT aims to create new regional climate data generated by ML algorithms to fill gaps

identified in the dynamical CORDEX-CMIP6 matrix[1]. Consequently, the ML-derived regional climate data (RCM-ML) should be fully compatible with their RCM counterparts, with any assumptions and limitations well documented.

The work required should start with a 'gap analysis'. This would involve creating an inventory of the available (and planned) CORDEX-CMIP6 simulations for each of the 14 CORDEX domains and identifying the climate service relevant gaps in the resulting CORDEX-CMIP6 matrix which could be filled via ML-based data. It is expected that the ML methods will be trained on appropriate RCM-GCM datasets. Any limitations in the available training data which could restrict the 'gap filling' exercise should be assessed and well documented, keeping in mind that the present ITT is not directly calling for new climate model (RCM) simulations.

An evaluation of relevant ML methodologies and tools is required to indicate whether there are ready-to-use emulators available to provide the RCM-ML data. RCM emulators here mean ML-based methods which can provide a similar set of dynamically consistent climate variables as provided by the traditional dynamical RCMs. Ideally, the best available and tractable RCM emulator techniques would be used to provide the CORDEX-CMIP6-ML data for the community. It is emphasised that the present ITT is not intended to have a significant R&D component, however some limited development work to test and adapt existing methodologies can be accommodated in the first year of the project.

The main objective is to provide the same variables and time slices in the same data format (quality controlled "CMORised"[2] NetCDF files published to ESGF data nodes) for all the 14 CORDEX domains. However, discussion of any foreseen limitations can be part of the response to this ITT. The data provided by the present activity will be published in the CDS in a similar manner to the CORDEX-CMIP5 and the new CORDEX-CMIP6 dataset. This publication process needs to be fully facilitated in this work including data quality control (ideally performed before upload to ESGF). User guidance and documentation needs to be written to fully inform C3S users on these new data, and how they can be used alongside other available RCM datasets.

4   Technical Specifications

Climate models play a pivotal role in the understanding of the climate system and climate projections provide future estimates of the evolution of the climate. C3S in its CDS provides various climate projection information to its users. They are outputs of GCMs and RCMs. The GCMs available from the CDS are CMIP5 and CMIP6 and the RCMs are the outputs of the CORDEX experiments (CORDEX-CMIP5) for 14 domains, creating a 'mosaic' of data with global coverage (see also https://doi.org/10.1175/BAMS-D-22-0111.1). Additionally, the datasets underpinning the IPCC Interactive Atlas (IPCC-IA; https://interactive-atlas.ipcc.ch/) and the Copernicus Interactive Climate Atlas (C3S Atlas; https://atlas.climate.copernicus.eu/atlas) are also available.

These climate projection datasets are available from the following links in the CDS:

CMIP5:

- https://cds.climate.copernicus.eu/datasets/projections-cmip5-monthly-single-levels
- https://cds.climate.copernicus.eu/datasets/projections-cmip5-monthly-pressure-levels
- https://cds.climate.copernicus.eu/datasets/projections-cmip5-daily-single-levels
- https://cds.climate.copernicus.eu/datasets/projections-cmip5-daily-single-levels

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[1] Here we mean the 'matrix' of available datasets from traditional RCM downscaling of GCM simulations (GCM-RCM pairs), which varies by domain and scenario.

[2] "CMORised" data refers to data written in conformance with the CF-conventions and all relevant CMIP/WCRP standards, which would also require the definition of new metadata standards to be used for ML-based climate projections in this work.

CMIP6: https://cds.climate.copernicus.eu/datasets/projections-cmip6

CORDEX-CMIP5: https://cds.climate.copernicus.eu/datasets/projections-cordex-domains-single-levels

IPCC-IA: https://cds.climate.copernicus.eu/datasets/projections-climate-atlas

C3S Atlas: https://cds.climate.copernicus.eu/datasets/multi-origin-c3s-atlas

The CORDEX-CMIP5 data are the downscaling of CMIP5 GCMs using various RCMs, resulting in a scenario-GCM-RCM matrix of available data (see GCM-RCM-scenario matrices for all CORDEX domains at https://confluence.ecmwf.int/display/CKB/CORDEX%3A+Regional+climate+projections#CORDEX:Regionalclimateprojections-DrivingGlobalClimateModelsandRegionalClimateModels). Simulations using CMIP6 GCMs as lateral boundary conditions (CORDEX-CMIP6), prepared as part of CORDEX, are ongoing and will be published in the CDS before the end of 2026. The preparation of the publication of such data in the CDS is performed by another C3S contract (C3S2_382).

It is important to stress that all these climate projection data are available in a dedicated space on ESGF nodes for C3S, and all the data comply with ESGF requirements in terms of data format and content, as well as additional C3S specific selection criteria and quality control. The CDS climate projection infrastructure relies on the use of those dedicated nodes (at IPSL and DKRZ) to serve the data to the C3S users.

The present ITT anticipates the following main tasks:

1. In cooperation with the C3S2_382 contract and the CORDEX community, create an inventory of available and planned CORDEX-CMIP6 RCM simulations.
2. Analysis of the climate services-relevant gaps in the CORDEX-CMIP6 simulations, and in the available training data. This analysis should include all the 14 CORDEX domains and consider the required experiments (historical and scenario), time slices and data resolution.
3. Literature review of available ML methods and tools which can serve as RCM emulators to provide similar data to the traditional RCMs (CORDEX-CMIP6), to fill the identified gaps. There should also be a feasibility assessment to decide which solutions can be realistically used within the constraints of the contract.
4. Specification of the ML tool and framework to be used to generate the RCM-ML data (CORDEX-CMIP6-ML). Attention needs to be paid to the limitations of the available GCM and RCM training datasets and whether any additional RCM simulations would help to provide more reliable and extensive CORDEX-CMIP6-ML data.
5. Design of the evaluation methodology including minimum scientific quality requirements for the new CORDEX-CMIP6-ML dataset.
6. Implementation of ML procedures to derive CORDEX-CMIP6-ML datasets, including the implementation of the related training.
7. Thorough evaluation of the CORDEX-CMIP6-ML dataset (using the methodology developed in point 5 above) including strengths and weaknesses and compatibility with the traditional CORDEX-CMIP6 RCM data.
8. Creation of the final CORDEX-CMIP6-ML dataset with ESGF-compatible format and content, including publishing the data to one of the established ESGF nodes.
9. Preparation of the dataset for publication in the CDS, including running the relevant quality control on the data (if not done prior to publication at ESGF). This also involves the handover of the practical details of the dataset including the list of files, NetCDF metadata details, dataset overview and confluence documentation to the relevant C3S climate projection infrastructure contract (C3S2_380) and ECMWF.

To organise these tasks, three main areas of work are required; the gap analysis to identify targets and training datasets for RCM emulation, the design and development of the RCM emulator, and the production and preparation of the final datasets and documentation. Special emphasis during the development and production should be put on the compatibility between the existing CORDEX-CMIP6 data and this new CORDEX-CMIP6-ML dataset, and documenting this for the users. These tasks and areas of work also described further in the description of the recommended work packages.

4.1 Specification of Work

The following work packages are recommended to implement the tasks described above. This list should be considered as a guideline and not as a strict formal requirement. The cost of the administrative reporting (quarterly and annual reports, implementation plans etc.) shall be limited to a maximum of 10% of that of the total human resources.

4.1.1 Work package 1: Gap analysis on missing CORDEX-CMIP6 RCM simulations

The first main task would be to gain a complete understanding of the available CORDEX-CMIP6 data including the simulations planned in the coming years. This requires communication with the CORDEX community to understand their plans and with the relevant C3S sibling contract (C3S2_382). Once the available GCM-RCM-scenario matrix is confirmed across all domains then an analysis is needed to assess what gaps relevant to climate services in the available data provided by the traditional RCMs. These gaps need to be identified in terms of domains, GCM-RCM-scenario combinations, and model resolution.

The gap analysis should be also complemented by an analysis, which identifies the priorities, i.e. which gaps, are more important to provide the relevant uncertainty information for the entire climate services modelling chain. This will be essential decide which RCM-ML data can be produced realistically within the framework of the present project. This work could consider similar analysis performed in the past on the CORDEX-CMIP5 data, which led to additional RCM simulations. See some details available from the references at https://confluence.ecmwf.int/display/CKB/CORDEX%3A+Regional+climate+projections#heading-Backgrounddocumentsanduserguides.

Indicative list of required deliverables:

- Full description of the available (and planned) GCM-RCM-scenario data for all CORDEX domains including model resolution.
- Scientific gap analysis of the GCM-RCM-scenario matrix with a plan for which gaps need to be filled by new RCM-ML data (including priority information on this gap filling exercise).
- Analysis of the available RCM data in terms of required training datasets for the RCM-ML emulators, potentially including the identification of required RCM simulations to enrich the training data for the ML methods.

4.1.2 Work package 2: Design and development of ML-based RCM emulators

This work package would first perform the literature and technological review of the currently available tools to be used as RCM emulators. This review would give guidance on what methods can be realistically used as a starting point and implemented in the present contract. Limited development work might be included in the plans, provided it is necessary. Any developments need to be justified, described, and planned, considering the time scale necessary to provide the required datasets for the CDS within the term of this contract.

The aim of the emulators would be to fill the gaps found in WP1 taking into account the priorities identified, but also the available training data. This gap filling could include "domain-transfer", when GCM-RCMs pairs are missing for a given scenario and domain, "GCM-transfer", where the RCM is available for a given domain (and scenario) but not driven by the desired GCM, or "scenario-transfer", when some scenarios are missing for a given domain-GCM-RCM combination. The development and implementation plan should consider all these possible options and needs to be agreed with ECMWF. The training data to be used for this can be any pre-existing climate projection datasets, particularly CMIP6 and CORDEX-CMIP6 data, but also including the CMIP5 and CORDEX-CMIP5 data (provided useful information can be extracted). Ultimately, this work package would select and design the ML-method(s) to provide CORDEX-CMIP6-ML data. This would also include any uncertainty information inherited from the ML methodology and any limitations due to lack of sufficient training data.

Indicative list of required deliverables:

- Literature review of available methods for providing downscaled regional climate data emulating RCMs.
- Design and description (including development and implementation plan) of the proposed ML method to be used for creating the CORDEX-CMIP6-ML data to fill the gaps identified in WP1.
- Description of required input and output variables with details on ensuring dynamical consistency among the output variables.
- Description of training methods and datasets for providing the CORDEX-CMIP6-ML data. This would include a summary of how better (more) training data would provide better (more comprehensive) ML results.
- Description of any uncertainty information to be provided with the CORDEX-CMIP6-ML data.
- Full technical description of the final RCM emulator and ML methodology.
- General outlook on the use of RCM emulators in the future for complementing dynamics-based RCM data.

4.1.3   Work package 3: Evaluation methodology and dataset evaluation

A key element of the development work is to ensure that the output CORDEX-CMIP6-ML datasets meet C3S scientific quality requirements, i.e. they have comparable quality to the available CORDEX-CMIP6 RCM products in general and provide additional value to the climate services community. To achieve this an evaluation methodology needs to be proposed and agreed detailing the minimum quality requirements that the new data needs to meet. A thorough evaluation methodology should be built to compare the CORDEX-CMIP6 and CORDEX-CMIP6-ML data. This needs to be discussed and agreed prior to any training and production work. Methodology should be proposed to measure accuracy, statistical calibration (if uncertainty estimates are provided), spatial and temporal consistency. The quality assessment results need to be reflected in the user guidance materials (see Work package 5).

Indicative list of required deliverables:

- Minimum quantitative quality requirements for the ML-generated datasets.
- Detailed description of the evaluation methodology and underlying reference datasets used.
- Report on the quality of the produced RCM-ML data using the agreed evaluation methodology.
- Report on the combined use of CORDEX-CMIP6 and CORDEX-CMIP6-ML datasets.

4.1.4   Work package 4: Training of the RCM emulators and production of the dataset

This work package would perform the training of the RCM emulator, the production of the CORDEX-CMIP6-ML datasets, and associated monitoring. The production would include the final output NetCDF files, which will be published at an ESGF node by WP5.

Indicative list of required deliverables:

- Technical description of the CORDEX-CMIP6-ML production details, including training data, and output datasets.
- Description of the monitoring of the production suites and output data in terms of technical and quality assurance details.

4.1.5   Work package 5: Data publication including user guidance and support

The data produced needs to be published to ESGF. Before this is done quality control procedures adopted from related work in C3S2_382 should be run to confirm adherence to relevant CMIP/WCRP data encoding standards, as well as additional C3S quality requirements. This will require liaison with the relevant communities to define metadata encoding standards to include ML-specific attributes such as the ML algorithm, training datasets, etc. The data then needs to be published on an ESGF node (preferably IPSL or DKRZ, if possible).

It is essential that C3S users are well informed on the new type of data to be provided by this contract. For this we need detailed documentation covering how the data was computed, and what are the strengths and weaknesses of the products with respect to the dynamical RCM data. This requires documentation describing how the CORDEX-CMIP6 and CORDEX-CMIP6-ML data can be used together in climate services. This work would also include specific information related to the new CDS catalogue entry like the overview text, variable definitions and documentation pages (the standard set of information used for every CDS entry in C3S), as well as the inventory of files at ESGF to handover to the relevant C3S climate projection infrastructure contract (C3S2_380) and ECMWF.

Indicative list of required deliverables:

- Technical description of the output data availability at ESGF, formats and their compatibility with the ESGF and C3S quality requirements.
- User guidance documents on CORDEX-CMIP6-ML data, with special emphasis on compatibility of the new dataset with respect to the original dynamics-based RCMs (strengths and weaknesses).
- CDS overview and documentation for the new CORDEX-CMIP6-ML CDS catalogue entry.

4.1.6   Work package 0: Management and coordination

This work package includes overall responsibility for day-to-day service management and coordination.

The following management aspects shall be briefly described in the technical proposal:

Meetings:

- Kick-off meeting
- ECMWF will organise regular progress review meetings (by videoconference).
- ECMWF organises annual C3S General Assemblies. The Contractor (1-3 team members) is expected to attend these meetings and contribute to discussions related to the topic of this ITT.
- Tenderers can propose additional project internal meetings, as they deem needed, as part of their response.

Quality assurance and control: The timely delivery as well as final quality check of the deliverables shall be ensured by the prime contractor (in terms of content, use of ECMWF reporting templates for deliverables and reports (Microsoft Word), format, deliverable numbering and naming, spelling and typos…); all reports and deliverables in this project shall be submitted in English. Unless otherwise specified the specific contract Deliverables shall be made available to ECMWF in electronic format, via the relevant deliverable repository system.

Communication management (incl. external and internal communication). Any external communication activity must be agreed with the ECMWF Copernicus Communication team in advance. This includes, but not exhaustively, communication planning, branding and visual style, media outreach, website and social media activity, externally facing text and graphical content and events. Such agreed activity would also need to be evaluated and reported on once complete so that success measures and KPIs could be provided to the European Commission (cf. Clause 2.4.6 of the Framework Agreement).

Set of Key Performance Indicators (KPIs) suitable for monitoring various aspects of contract and service performance. The proposed KPIs shall be SMART (specific, measurable, actionable, realistic and time bound). All KPIs shall be regularly reviewed and updated together with ECMWF, during the contract. The Contractor shall report to ECMWF on these KPIs as part of the quarterly progress review meetings, as well as part of the Quarterly and Annual Implementation Reports. The template to be used by the Tenderers to describe the KPIs is included in Volume IIIB of the ITT "Template for Tenderers".

Risk Management: The proposal shall include a risk register that describes identified risks for each work package, along with a mitigation strategy for each of the identified risks. This mitigation strategy shall be composed by both preventive and corrective measures. The risk register shall be updated regularly by the

Contractor, and any update (related to new risks, likelihood or impact) shall be reported during the progress review meeting, as well as part of the quarterly and annual implementation reports.

Resources planning and tracking using the appropriate tools.

Subcontractor management, including conflict resolution, e.g. the prime contractor is responsible for settling disagreements, although advice/approval from ECMWF may be sought on the subject. A list of subcontractors describing their contribution and key personnel shall be provided, as well as backup names for all key positions in the contract. Tenderers shall describe how the Framework Agreement, in particular Clause 2.9 on Sub-contracting, has been flowed down to all their subcontractors.

Management of personal data and how this meets the requirements of Clause 2.8 on Personal Data Protection and Annex 6 of the Framework Agreement.

List of minimum deliverables and milestones required as part of WP0, covering the contractual and financial reporting obligations towards ECMWF in line with the Terms and Conditions of the Framework Agreement (cf. Clause 2.3 and Annex 5):

Deliverable / Milestone ID	Resp.	Nature	Deliverable / Milestone title	Due date
List of Deliverables				
WP0-QIR-YYYYQQ	Tenderer	Report	Quarterly Implementation Report YYYYQQ *YYYYQQ being here the previous quarter (e.g. 2024Q3)*	Quarterly on 15/04, 15/07 and 15/10
WP0-AIR1-YYYY	Tenderer	Report / Other	Annual Implementation Report for year YYYY – Part 1 *including both:* *- the Quarterly Implementation Report YYYYQ4 and* *- the requested preliminary financial information for year YYYY* *YYYY being here the Year n-1*	Annually on 15/01
WP0-AIR2-YYYY	Tenderer	Report	Annual Implementation Report for year YYYY – Part 2 *YYYY being here the Year n-1*	Annually on 28/02
WP0-FIR	Tenderer	Report	Final Implementation Report	Not later than 60 days after the end of contract and once all other activities duly performed
WP0-AIP-YYYY	Tenderer	Report	Annual Implementation Plan for year YYYY *YYYY being here the Year n+1*	Annually on 30/09
WP0-FIN-YYYY	Tenderer	Other	Copy of Prime Contractor's general financial statements and audit report for year YYYY *YYYY being the Year n-1*	Annually by 30/06 (no associated cost)
WP0-KOM	Tenderer	Presentation and MoM	Kick-Off Meeting	Not later than 30 days after the start of contract
WP0-PRMxx	Tenderer	Presentation and MoM	Progress Review Meeting #xx *xx being the iteration number of the PRM*	Circa every 3 months[1]
List of Milestones				
WP0-C3SGA-YYYY	Tenderer	Attendance	C3S General Assembly YYYY *YYYY being here the concerned year*	Annually, not later than on 15/12[1]

Table 1: WP0 Deliverables and Milestones

[1] These due dates are indicated to frame the corresponding deliverables and milestones schedule only, consequently the following shall be considered by the Tenderer:

- the general financial statements shall be sent by the Successful Tenderer as soon as available,
- the schedule of the Progress Review Meetings shall be aligned with the different Payment Milestones during the contract negotiation (i.e. each Payment Milestone shall have at least one corresponding Progress Review Meeting),
- depending on the year, the C3S General Assembly may take place at a different period of the year.

5 General Requirements

5.1 Implementation Schedule

ECMWF intends to award a single Framework Agreement for a period of maximum 32 months, which shall be implemented via a single Service Contract expected to commence in October 2025. The Tenderer shall provide a detailed implementation plan of the proposed activities for the full period of the contract.

5.2 Deliverables and Milestones

Deliverables should be consistent with the technical requirements specified in Section 4. A deliverable is a substantial, tangible or intangible good or service produced as a result of the contract. In other words, a deliverable is an outcome produced in response to the specific objectives of the contract. Deliverables are subject to acceptance by the technical and contract management officers at ECMWF (for deliverables quality assurance and control requirements, please see also Section 4.1.6).

Each Deliverable shall be listed in the Deliverable List tab of Volume IIIA with an associated resource allocation (in person-months) and relevant price. The total of these allocated resources shall amount to the requested budget associated with payroll (in cost and prices tab of Volume IIIA).

Milestones should be designed as markers of demonstrable progress in service development and/or quality of service delivery, as applicable. They should not duplicate deliverables, neither have associated resource allocation, contrary to the deliverables.

Tenderers shall complete the relevant table in Volume IIIA as part of their bid, including there the details, schedule and concrete delivery/completion due date of all deliverables and milestones under each work package.

5.3 Communication

The Successful Tenderer shall support ECMWF in its communication activities for the C3S services, where they are related to the activities described in this ITT. Additional activities such as C3S website news items, C3S brochures and flyers, may be discussed on a case-by-case basis during the contract implementation. For communication management requirements, please see also Section 4.1.6.

5.4 Data and IPR

It is a condition of EU funding for Copernicus that ownership of any datasets/software developed with Copernicus funding passes from the suppliers to the European Union via ECMWF. Ownership will pass from the date of creation of the datasets/software. Suppliers will be granted a non-exclusive licence to use the datasets/software which they have provided to Copernicus for any purpose.

All software and products used by the Successful Tenderer to produce the Copernicus datasets/software will remain the property of the Successful Tenderer, except for those components which are acquired or created specifically for Copernicus purposes, with Copernicus funding, and which are separable and useable in isolation from the rest of the Successful Tenderers' production system. The identity and ownership of such

exceptional components will be passed to the European Union via ECMWF annually. The Successful Tenderer will be granted a non-exclusive licence to use them for any purpose.

5.5   Payment Plan

Tenderers can propose a Payment Plan in ITT Volume IIIA "Pricing and deliverables" (cf. Excel spreadsheet "Payment Plan preparation"):

The Payment Milestones should relate to the deliverables and milestones delivered during the corresponding Payment Milestone period (e.g. the payment covering the period January-June would only relate to the deliverables and milestones whose due dates are part of the same period). The recommended frequency of payments is on semestrial basis (i.e. two payments per year).

In case of request for a payment at contract signature, please note that this should be duly substantiated (e.g. in terms of necessary investment prior to implementation or during first weeks/months for ensuring the initial set up of the project). It is necessary to relate this payment to activities subject to other Payment Milestones.

6   Tender Format and Content

General guidelines for the Tender are described in Volume IIIB of this ITT. This section describes specific requirements to prepare the proposal for this particular Tender, along with guidelines for minimum content expected to be included in the proposal, 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 Tenderer's response.

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.

Section	Page Limit
Executive Summary	2
Track Record	2 (for general) and 2 (per entity)
Quality of resources to be Deployed	2 (excluding Table 1 in Volume IIIB and CVs with a maximum length of 2 pages each)
Technical Solution Proposed	2 + 3 per Work package (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)
Management and Implementation	6 (excluding Table 4 and Table 5 in Volume IIIB) + 2 per each Work package description (Table 3 in Volume IIIB)
Pricing Table	No limitation

Table 2: Page limits

6.2   Specific additional instructions for the Tenderer's response

The following is a guide to the minimum content expected to be included in each section, 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 Tenderer's response.

6.2.1   Executive Summary

The Tenderer shall provide an executive summary of the proposal, describing the objectives, team and service level.

6.2.2   Track Record

The Tenderer shall demonstrate for itself and for any proposed subcontractors that they have experience with relevant projects in the public or private sector at national or international level. 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 that meets at least the following requirements:

- A senior team member with more than 5 years of experience in managing activities related to this ITT (referred to as Principal Investigator). This person will be the point of contact on technical matters.
- A team member with experience of managing projects and contracts of this type and size (referred to as Service Manager). This person will be the main point of contact for administrative matters.
- Team members with demonstrated experience in performing activities related to the various aspects of this ITT. Particularly knowledge on the CORDEX project for running RCMs and technical know-how on the ESGF infrastructure (including data formats, quality requirements etc.) are essential.

These team members shall be involved in the activities of this ITT at a minimum level of 10% of their total working time.

6.2.4   Technical Solution Proposed

The Tenderer is expected to provide a short background to the proposed technical solution, to facilitate understanding of the solution proposed, as well as a clear and detailed description of the proposed technical solution and its organisation into work packages.

The required compute resources (for training and production) need to be included into the required budget.

6.2.5   Management and Implementation Plan

As part of the general project management description, and in addition to the guidance provided in Volume IIIB, Tenderers shall consider the elements described in Section 4.1.6 above. Note that costs associated with fulfilling WP0 requirements shall not exceed 10% of the total price of the Tender.

Furthermore, should any sub-contractors be proposed in the Tender, in order to ensure a comprehensive and realistic proposal, it is desirable for the Tenderer to actively involve all such sub-contractors in the development of the proposal. This involvement should include, but is not limited to, collaborative planning, clear communication of project timelines, and agreement on deliverables and deadlines. The Tenderer must provide documented evidence of this collaboration, demonstrating that each sub-contractor has been consulted and has agreed to their respective roles, responsibilities, and deadlines as outlined in the proposal. This requirement is instituted to promote a cohesive and feasible project plan, reflecting a true and committed partnership among all participating entities.