

# Einstein Telescope

Progress Report 4  
Period 2023-Q4

**Authorisation**

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<sup>1</sup> Guido Derks announced to leave as pathfinder-director after the setup of the project office organisation.

<sup>2</sup> The Project Office Directorate requested the Province of Limburg to make a proposal to fill in this position.

<sup>3</sup> In the current phase of feasibility studies, Project Control also includes Contract Management.

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# 1 Introduction

This Progress Report 4 provides an overview of the progress in the fourth quarter of 2023.

## **The Einstein Telescope opportunity**

The objective of the Einstein Telescope is to build a large-scale research infrastructure that will be the next generation gravitational wave detector for further scientific research of the cosmos. The Einstein Telescope is adopted in the 2021 European roadmap for research Infrastructures (ESFRI). This confirms the excellent science case and the plans to construct the Einstein Telescope in Europe and the following steps towards a site selection.

The starting conditions of the Euregion Meuse-Rhine to host the Einstein Telescope are favourable. This region offers strong research institutes and high-tech industry. And the infrastructure and international living and business climate are attractive. The Einstein Telescope offers the Euregion Meuse-Rhine an unique opportunity to take a global leadership position in a new pioneering area of science: gravitational wave research. Housing the Einstein Telescope in this region will boost a positive impact on science, economy and society.

## **ET-EMR Taskforce and Project Office**

At the ET Ministerial Conference 26 September 2023 in Brussels, delegates from Belgium, the Netherlands and the German Federal State of North Rhine-Westphalia agreed to make preparations towards a bidbook and joint consortium to establish the Einstein Telescope in the Euregio Meuse-Rhine. The ET-EMR Taskforce has several tasks, including the preparations for the bidbook and the host consortium. The ET-EMR Project Office has the responsibility to deliver all the feasibility studies (civil engineering, geology, environmental planning and cost) to realise the Einstein Telescope in the Meuse-Rhine Euregion. The ET-EMR Project Office has started preparations in January 2023.

## **Feasibility studies and progress reports**

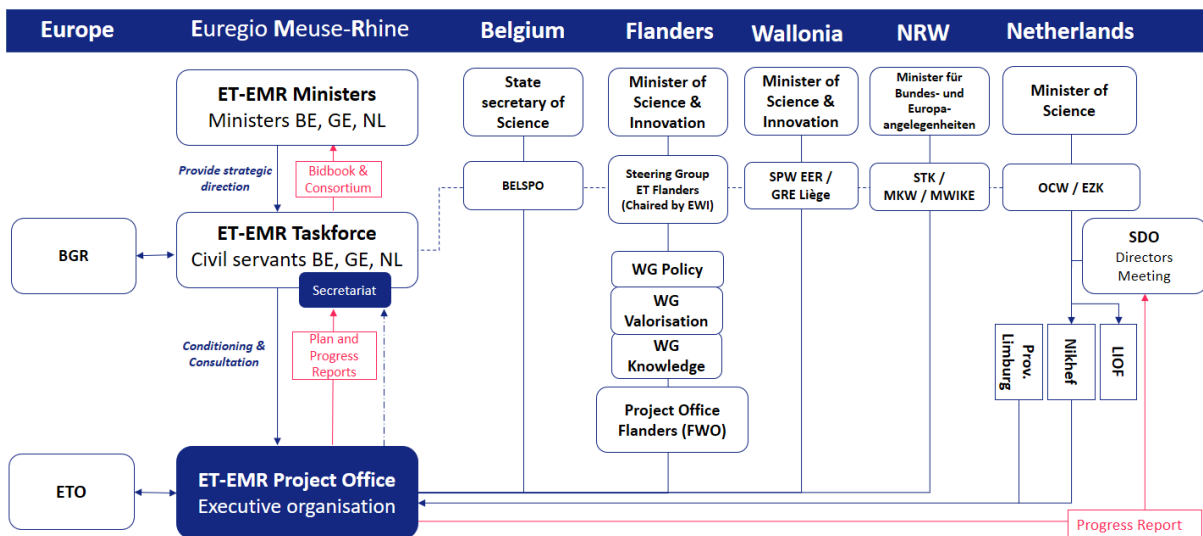
It is clear that a feasible plan to construct and operate the Einstein Telescope strongly relies on necessary governmental conditions, both financial and legal. The Project Office therefore relies on the ET-EMR Taskforce to provide these conditions in the process of preparing a bidbook and the forming of a host consortium. To ensure a clear understanding of each other's expectations, a close cooperation and open communication between the Project Office and the Taskforce is of crucial importance. In that respect, the Project Office provides the secretariat to the Taskforce. There is a monthly meeting with the Taskforce Steering Group. And the Taskforce also receives all quarterly progress reports.

## 2 Project management

### 2.1 General

In the first quarter of 2023, the Project Office Directorate decided to structure the project according to the IPM (integrated project management) model. In the second quarter implementation of the IPM-model started. In coordination with the EMR partners, the IPM model will be further developed.

The figure below shows the position of the Project Office in the governance structure of ET-EMR and illustrates the international cooperation:



### 2.2 Administrative and political context

#### European context

While the ET-EMR Project Office is focused on site-specific aspects of the Einstein Telescope, there is also a wider European context in which the Einstein Telescope is designed and organized. The European ET Organisation (ETO) is setting up the organisation to prepare a plan for the Einstein Telescope: the technical design, the organisation and financial management. The ETO works together with the ET Collaboration of scientists, among other things also responsible for coordinating the detector R&D. The ETO Directorate has announced to develop a plan of action with a cost update and revised timeline. The highest decision making body at European level, the Einstein Telescope Board of Governmental Representatives, will also have to agree on the process of realizing the Einstein Telescope, including the procedure and criteria for site-selection. A proposal for the necessary ETO funding is prepared and discussed. The European timeline is ambitious and at the same time still uncertain. The Project Office Directorate is therefore in close contact with the ETO Directorate. It is expected that the BGR will present a site-selection procedure by 2024, based on the ETO plans. It has been indicated that the preparation of the above-mentioned items will take time, with submission of the bidbook planned, at least until and including 2026.

## Cooperation between Belgium, Germany, and the Netherlands

### Trilateral Task Force

At the ET Ministerial Conference 26 September 2023 in Brussels, delegates from Belgium, the Netherlands and the German Federal State of North Rhine-Westphalia agreed to start preparations for a bidbook and a joint consortium to establish the Einstein Telescope in the Euregion Meuse-Rhine. A Taskforce has been assigned to develop the proposals and present a working agenda. In the collaboration of governments the ET-Ministerial meeting acts as the highest level and a Taskforce acts at the working level. The ET-EMR Project Office is assigned to deliver the feasibility studies leading towards the bidbook. The Project Office supports the Taskforce in delivering the Secretariat. The Taskforce also receives all quarterly progress reports.

The second meeting of the EMR Taskforce took place on 30 August 2023 in Hasselt. The Taskforce adopted a Terms of Reference, following the tasks as assigned to the Taskforce in the Declaration of Intent as adopted in Brussels 26 September 2023. The Taskforce also has, with consent, taken notice of the plan for the feasibility studies and Q2-2023 progress report. Belgium and Germany were invited to provide for the additional funding, considering the budget constraints and contributions from the Netherlands. It was concluded by the Taskforce that the ET-EMR Project Office directorate and the Steering Group would discuss and present a proposal at the third Taskforce meeting, 20 November 2023 in Maastricht. In the Taskforce meeting of 20 November 2023 the Project Office Directorate has presented the plan and budget proposal 2024-2026, as addressed in a letter to the Taskforce (dated 8 November 2023). The Project Office Directorate stated that a budget decision in the coming 3-6 months would be necessary for the ET-EMR Project Office to start procurement on the additional activities in time (see 6.2 Finances).

### Commitment

The Dutch government earmarked funds (€870 million) for the bidbook and realisation in spring 2022 and also made funds (€42 million) available for preparations.

Belgium and Germany have yet to announce when they intend to decide on their commitment. The government of North Rhine-Westphalia (NRW) did announce in January 2023 its intention to co-finance the candidacy, provided federal Germany will do the same. Recently it has been announced that, on the federal level, the German Bundestag will make a budget of (€9 million) available for the feasibility studies; a final approval and the conditions for this budget need to be further cleared.

The regions, communities, and the federal government in Belgium are now consulting frequently in order to reach a common position. The Interministerial Conference on Science Policy on Einstein Telescope should be understood as a first step in this direction by the Belgian entities. The Belgian ministers have convened at 11 December 2023 to decide on further steps and support.

## 2.3 Organisation

The project roles within the Project Office were filled in Q1-2023, based on the decision to adopt the IPM model. The chart below is regularly updated with regard to the desired further internationalisation of the Project Office.

### The Project Office

#### Directorate (client)

- Director Stan Bentvelsen
- Director Arjen van Rijn
- Director Guido Derks<sup>4</sup>
- Senior Strategist (advisor) Martijn Rumpen
- Communication Manager (advisor) Henk Schroen

#### Contractors

- Project Manager Guid Bartholomée
- Contract Manager -<sup>5</sup>
- Technical Manager Wim Walk
- Environment Manager PM<sup>6</sup>
- Project Control John Kerstjens

### Internationalisation

The signing of the Declaration of Intent 26 September 2023 by the Belgian, German and Dutch ministers clears the international coordinating position of the Project Office with regards to the EMR feasibility studies. The integral plan for the feasibility studies is also an invitation to the Belgian and German governments to participate with manpower and means.

In Q4, the Project Office continued to seek international cooperation. The Project Office Directorate has monthly meetings with the Taskforce Steering Group. Nikhef and FWO have agreed to integrate their project executive capacities in the ET-EMR Project Office. A start has been made to come to an agreement with EMR institutes on available resources to execute feasibility studies within a consolidated plan and budget 2024 – 2026. There is an urgent need to attract expertise from Belgium and Germany with regard to the environmental and legal studies and in the communications team.

There is also direct and frequent contact between the Project Office and contact points of the competent environmental authorities. Periodic consultations on the fields of engineering, the environment (communication and urban planning), and project management have been and will be held with all contact persons. These contacts produce valuable information.

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<sup>5</sup> In the current phase of feasibility studies, Project Control also includes Contract Management.

<sup>6</sup> The Project Office Directorate requested the Province of Limburg to make a proposal to fill in this position.

## **2.4 Scope – Bidbook**

The Project Office is tasked to study the feasibility of the EMR region as a site for hosting the Einstein Telescope; as the foundation for a compelling bidbook by the intended host countries Belgium, Germany and the Netherlands within the anticipated European procedure for site selection.

The feasibility studies for the bidbook thus serve a dual purpose: to put the host countries in a position to put forward a responsible final candidacy and to enable the European organisations to arrive at an informed choice regarding the site selection.

The plan and how to move forward as effectively as possible is a constant topic of discussion within the Project Office and with the Taskforce.

### ***ETO & BGR***

The ETO is responsible for the design process. One of the key basic requirements for the design of the Einstein Telescope (L-shape versus triangle) is still under investigation. In the scope of the European Strategy Forum on Research Infrastructures (ESFRI) and NGF application, a telescope in the shape of a triangle was selected. For this reason, the Project Office's feasibility study assumes a full-scope Einstein Telescope in the shape of a triangle. The discussion in the scientific community is being closely followed by the Project Office. The risk of a change in the scope is included in the register of risks.

Furthermore, the Project Office is awaiting crucial input from the ETO on the civil engineering, site standards and the site evaluation criteria.

### ***ETO & CERN***

Within the civil engineering framework the ETO (with the help of expertise at CERN) will set the functional and operational requirements for the tunnel layout and the cornerpoints; the Project Office will present an EMR design study. In order to develop the site-specific studies (as planned by the Project Office), it is essential to have timely input from ETO in the form of relevant functional and operational requirements for the tunnel and the cornerpoints, for example. ETO has been requested to provide these and there is coordination between the ETO and the Project Office Directorate.

The ETO and the BGR are also anticipating the selection process and the objective comparison/evaluation of sites (with the collaboration of scientists), as well as the organisation and funding of the ET after the site selection. In particular, the selection process including the selection criteria are important as input for the bidbook, and therefore indirectly for the feasibility study. It is not yet known when the data will be provided. However, it has been indicated that submission of the bidbook is expected not before 2026.

Until the Project Office has received input from the ETO (and following procedure on site-selection by the BGR), substantiated assumptions will be made where possible. The Project Office is focusing for now on 2025 for the first draft of a bidbook with the status of the feasibility study at that time. The project office is pressing the ETO organization to come up with these functional and operational requirements to prevent delays. There is discussion within ETO about the scope. The Project Office is taking action to clarify the demarcation between scientific and location-specific requirements. To this end, consultation between the project office and ETO will be intensified.



### 3 Contract management

#### 3.1 Purchasing & Tendering

Tenders up to Q4-2023:

##### Engineering

- Analysis of drilling data Cottessen (and Banholt) completed  
Note: the analysis has been completed; a second opinion will follow.
- Minimum requirements for tunnel, shafts, caverns (tunnelling technology) completed
- 1<sup>st</sup> Drilling campaign (Flanders, Wallonia, Netherlands) completed
- Borehole measurements completed
- Three component seismic nodes completed
- Civil Engineering (study of alternatives, draft design, cost estimation, logistics plan, register of risks)<sup>1</sup> completed

##### Environment

- GIS support/support of Landscape design completed
- Pre-planning study completed
- Drilling permits completed
- Private-law related to ET in progress

##### Project organisation Project Office:

- Project control manager completed

##### General:

- Safety assessment & guidance completed

<sup>1</sup> During the civil engineering tender process, it became clear that additional effort would be needed to achieve the desired level of detail in the design and associated cost estimate (AACE Class 3). The scope of the tender has been adjusted from a product-oriented set-up to one aimed at providing specialists in the various areas who, once awarded, will further develop and deliver the relevant products. This supports also the processing of the ETO input on the civil engineering design.

## 4 Technical management

### 4.1 General

Significant progress was made in detailing the 2024 activity plan. Third parties Amberg and TNO have provided additional perspectives and have added a first set of civil engineering and hydro-geological requirements to evaluate tunnel and cavern risks, including construction alternatives.

Working with the contracted firm Stump, the upcoming drilling campaign has been refined. Detailed plannings and logistics have been prepared and are constantly updated to converge in anticipation of a campaign start early March 2024.

6 and 7 December 2023 an international workshop was held at Nikhef, Amsterdam for members of the Site Preparation Board to discuss standards for technical measurements to determine the suitability of the different candidate sites for constructing the Einstein telescope. Progress was made towards a document to specify these standards.

The value of seismic measurements has been established and the scope of a possible campaign to support and complement the borehole data to establish the construction risks is being considered.

External constraints from anthropogenic noise and other environmental restrictions are being identified and have been integrated in the activity plan to mitigate the associated risks.

This stage of the project still focusses on gathering data to characterize the subsurface. The interpretation of these data from a civil engineering perspective are an important part of our plan. This also considering the leading position of civil engineering in interpreting the subsurface data and the technical feasibility. The Tunnel Engineering Consultants (TEC), a permanent joint venture between Royal HaskoningDHV and Witteveen+Bos, will carry out the technical feasibility study in cooperation with the Swiss partners Amberg, Lombardi and the Belgian Tractebel.

### 4.2 Technical progress

In Q4-2023, the following progress was made:

#### *Geological model*

The initial subsurface model built in Q1-2 (the Baseline Geological Model) was further refined and evaluated. As a continuous activity, all newly arriving subsurface data are being integrated into a comprehensive and consistent model.

#### *Boreholes*

- Detailed planning and logistics of the drilling of the first set of boreholes is converging to a campaign, start early March.
- Communication with the contracted drilling company (Stump) has been intensified to identify and mitigate risks and to ensure the availability of sufficient resources to operate smoothly and meet the time schedule.
- The core and sensor storage site at Aubel is being prepared for the first cores to arrive. It will also be equipped and used for storing, charging and data read-out of seismic sensors.

### *Noise and seismic measurements*

- An evaluation of all seismic tests has been completed and acquisition parameters have been established that would make the application of seismic technology relevant. Further planning has started to acquire geophysical data complementing the first borehole campaign.
- A tender for the procurement of 400 additional precise (all-direction measuring) seismic sensors has been completed and the shipment is expected mid-January. These sensors will be used for passive seismic and noise measurements.
- A noise measurement plan is being drawn up, to use boreholes and place seismometers at the bottom of these wells at target depth. Noise measurement plans are being aligned with plans to estimate the impact of wind turbines, as part of the project to assess the noise of wind turbines and possible mitigating measures.
- An external expert has been hired and appointed in the technical coordination team as lead of geophysical measurements.

### *Civil engineering*

- The integration of civil engineering expertise in the technical team to develop a risk-based construction model has been initiated by adding to the technical team a civil engineer. To firm up and extend this expertise a tender was completed to hire a consortium of firms to develop different construction scenarios, eventually leading to an analysis of construction feasibility and an optimal construction proposal and associated cost estimate, anticipating AACE Class 3 standards.

### *Hydrology*

- A hydrology workshop was held at the University of Liège to review current methodologies and discuss information requirements and the path forward to obtain the necessary data.
- One of the University of Liège staff members has been appointed as the lead of hydrology within the coordination team to become responsible for ensuring adequate hydrological data is being gathered and considered in developing construction scenarios.

## 5 Environmental management

### 5.1 Urban planning/integration

#### *Integration into the landscape*

The ET infrastructure is anticipated to be built almost entirely underground. The feasibility studies are also aimed at positioning the ET infrastructure underground as much as possible and where this is not possible, the integration is carefully designed with respect for nature and landscape. The exploitation phase is considered to have hardly any environmental impact and the construction of the Einstein Telescope is expected to have mainly temporary challenges that require serious attention: partly technical to mitigate effects (sustainable construction and integration) and partly through proper planning. Integration of the landscape is included in the feasibility studies. The legal frameworks, such as Natura 2000 areas, archaeology and monuments, groundwater extraction and protection areas set also clear frameworks for planning and licensing.

The Project Office will also study the options of logistics and construction methods causing as little environmental impact as possible. These include studies on drilling methods; the number of shafts and escape routes; the location where the soil would be transported out of the tunnel; the possible use of the railway for disposal and delivery; the choice of location for the work site; shortening the implementation time, etc. Meetings with stakeholders involved at the Montzen railway emplacement have been initiated to start a study on the feasibility of railway logistics.

The important issue of integration into the landscape is high on the agenda:

- There are regular contacts with the involved municipalities. There have been meetings with stakeholders like Staatsbosbeheer, SODM and governmental experts in the search area to exchange available information.
- May 2023, the Project Office had a meeting with Bestuurlijk Overleg Nationaal landschap Zuid-Limburg (*Administrative Consultation for the National Landscape of South Limburg*). This was followed by a dialogue on the relationship between the landscape and the construction and operation of the Einstein Telescope.
- There is international cooperation in the context of the Bocage landscape , which offers prospects for further collaboration. This will be explored, also considering the awarded official status of the Bocage landscape initiative. Flemish minister Zumal Demir announced this on 13 October 2023.

#### *Public law aspects*

In Q1-2023, the main points of public law procedures relevant to the implementation of the Einstein Telescope were examined in Wallonia, Flanders, and the Netherlands. In order to achieve the desired level of detail regarding the public law procedures required for the Einstein Telescope in Wallonia, Flanders, and the Netherlands, a request for an additional study was prepared by the Project Office in close coordination with the countries concerned. It was observed that in the study, a distinction should be made also in the planning aspects between the German and French Walloon areas. The tender for this legal study has been completed in Q4.

### *Private law aspects*

In addition to public law aspects, private law aspects are also considered, in the present case regarding how to deal with land ownership and land use during construction and during the operation of the tunnel. It turns out that the legal situation in the countries and regions within the search area is not uniform. In cooperation with Hasselt University, among others, an assignment will be drafted in the coming period to obtain further details of these private law aspects.

### *Geographical information (GIS)*

Geographical information, in the form of map layers, makes it possible to conduct analyses and supports the study of alternatives in the search for the most promising location for the Einstein Telescope.

The tender for managing geographical information was completed in Q2. The GIS specialist joined the project team from 1 September 2023; he is setting up the geographic information system, working closely with the development of the subsurface model generated by Engineering.

### *Nitrogen*

The issue of nitrogen obviously also plays a role in the Einstein Telescope project. Law firm Eubelius has conducted a study on the legal aspects of this subject. The study addresses the impact of the nitrogen regulations applicable in the Flemish and Walloon Regions (Belgium) on the construction and operation of the Einstein Telescope in the search area. As the nitrogen issue is and remains in a state of flux among public authorities, the study will be periodically updated on the basis of advancing insights.

## **5.2 Preventing undesirable activities**

Efforts remain undiminished to prevent undesirable activities (seismic noise vibrations) within the search and protection area in relation to the possible siting of the Einstein Telescope.

### Flanders and Wallonia

- Administrative commitments have been received from Flanders and Wallonia regarding the exclusion of subsurface noise in the search and protection area.
- Administrative guidelines have been formulated in that context on how to act in the case of new initiatives. Further legal safeguards are an issue and, for now, it seems that the interests of the Einstein Telescope candidature are sufficiently safeguarded.
- Ongoing initiatives, specifically in Wallonia, have been halted through court rulings. The Belgian State Council has stated against the Walloon Region on 28 March 2023 and cancelled the permit issued in 2021 for a windmill park of 6 wind turbines in Dalhem (ULiège against the Walloon Region, arrêt no 256 du 28 mars 2023). There is a ruling by the Flemish Council of State dated 30 March 2023 regarding annulment of the permit for wind turbines in Dalhem in favour of the interests of the Einstein Telescope. Also a permit for a wind turbine in Visé was cancelled by the Belgian State Council in September 2023.

### North-Rhine Westphalia

- The city of Aachen is planning to replace existing wind turbines and having new ones built. The plans presented include areas in the projected 10 km.-buffer zone surrounding the ET search area. Geothermal energy is also being considered. Both the Dutch science minister and the

Provincie Limburg (NL) have since September 2022 asked attention for the ET project and necessary conditions, following the moratorium in the Netherlands and Belgium.

- State Secretary Gonca Türkely-Dehnert has made the following statement during the interministerial conference in Brussels (26 September 2023) : *“Minister Nathanael Liminski has reached an understanding with the mayor of Aachen to the effect that the expansion of wind energy there should not compromise the development of the Einstein Telescope. The huge opportunity provided by the Einstein Telescope are in the shared interest of the entire region and therefore also the City of Aachen.”* To complete the feasibility studies and necessary conditioning aspects the Project Office Directorate has requested the NRW Ministries represented in the Taskforce to provide the necessary underpinnings.
- At the end of 2023 there was an application for a permit to exchange an existing wind turbine in the German part of the protection zone. There was a response by the Province of Limburg (NL), advising not to give the requested permit considering the conflict of interest within the Einstein Telescope 10 km.-buffer zone.

### The Netherlands

As a result of the moratorium, introduced by the Province of Limburg ordinance, competing activities are no longer possible. It is forbidden to realise new wind turbines. Mining and excavations are only allowed if they do not hinder the Einstein Telescope.

## **5.3 Research on mitigation measures**

The Task Force has requested the ET-EMR Project Office to act as the initiator and client for research on the impact of wind turbines on the Einstein Telescope and the potential of mitigation measures. Nikhef, RWTH, ULiège, KU Leuven and Hasselt University are collaborating on a project plan 2024-2025 to execute this study. Execution is planned to start in Q1-2024.

### *Other noise sources*

In parallel with the study on the impact of wind turbines and mitigation measures, a study on the potential impact of mining, excavation, railways, and geothermal sources on the Einstein Telescope and possible mitigation measures is also being taken up by the Project Office. A plan for these studies is in preparation.

## **5.4 Stakeholder management**

### *Preparing studies/activities*

In preparation for the various drilling campaigns and studies in the search area, Environmental Management is in contact with the relevant stakeholders, in preparation for the permit applications to be submitted. These include meetings with the involved municipalities.

### *State supervision - State Supervision of Mines and Mining Advisory Council*

After an initial consultation with representatives of the Netherlands' State Supervision of Mines (SSM), resulting from the advice of the National Growth Fund, had taken place in Q1-2023, SSM and the Ministry of Economic Affairs and Climate Policy looked into the legal position of SSM. Based on this initial exploration, it was concluded that SSM would have no legal role in the ET project, as the aim of the project is scientific in nature and not aimed at minerals extraction. However, SSM has substantial experience of work underground and the ET will operate in the ground. There will be further discussions with the Ministry of Economic Affairs and Climate Policy and SSM on what is desirable and what is legally possible, or can be made possible, in order for SSM to be involved in the project in some way. The Mining Advisory Council has declared not to have a role in the project. In parallel, state supervision will also be discussed at international level.

## **5.5 Regional communication**

### *Content strategy*

In July, the website [www.einsteintelelescope-emr.eu](http://www.einsteintelelescope-emr.eu) went live in 4 languages.

The first two issues of the Einstein Telescope newsletter were published in July and September. The first issue to about 600 subscribers; the second was sent to about 800 subscribers.

The valorisation platform went live as an independent website at the end of September under the direction of LIOF. It is its own website, but there is a lot of interaction with the general website. The layout of the valorisation platform is designed in the 'look and feel' of the general website.

Media monitoring started via the Clipit's system. This supplier came up with the best offer for our goals and wishes, in terms of quality and price.

To start the public campaign in the municipalities of the search area, an article about the Einstein Telescope (spread; 2 pages) was published at the end of December in door-to-door newspapers in Voeren (Dutch and French), Eijsden-Margraten, Gulpen-Wittem and Vaals. This is also expected to be published in Aubel in January 2024. In Walloon municipalities where no weekly door-to-door newspaper is published; 500 copies of the French-language version have been distributed and municipalities have been asked to refer to it via municipal communication channels (website, social media).

At the end of December, a New Year's greeting (animation) was sent from the project office to subscribers of the newsletter and to several hundred contacts. Total 'circulation': 1300.

## **5.6 Sustainability**

Led by Nikhef and the Maastricht Sustainability Institute, a working group has carried out an initial survey of a wide range of sustainability aspects in general terms in relation to the entire cycle of the Einstein Telescope project; this is done in the context of the ET Technologies project. In Q2-2023, preparations were made to further address and focus on the sustainability/environment/landscape theme in the second half of 2023 in cooperation with Hasselt University, partly on the basis of this initial survey, and to tailor it to the feasibility study.

## **5.7 Excavated materials/logistics**

### *Logistics*

The logistics surrounding the handling of large quantities of materials excavated from the subsurface, combined with the delivery of construction materials and the location of the work site, are the subject of the feasibility study. As more information is acquired on this, it turns out to be one of the most important research topics.

Discussions are taking place with Infrabel-NMBS about possible options relating to rail logistics and the use of the railway yard at Montzen in this regard. It is also being discussed with the Walloon and federal governments. It will become clear over the coming period to what extent there will be opportunities here.



## 6 Project control

### 6.1 General

A number of operational management and project control topics are dealt with in the field of Project Control. These topics focus on facilitating the Project Office and the managers of the specialist fields, guiding processes, monitoring the goal of the feasibility study, and managing risks.

### 6.2 Finances

#### Plan and budget 2024-2026

The Taskforce has, with consent, taken notice of the plan for the feasibility studies at its meeting 30 August 2023 in Hasselt. On 30 August 2023 it was concluded by the Taskforce that the Project Office directorate and the steering group would discuss and present a proposal at the next Taskforce meeting. Considering the contributions from the Netherlands, Belgium and Germany were invited to provide for the additional funding for the feasibility study.

The Project Office prepares to deliver a civil engineering design and cost overview, according to AACE Class 3 standards. This will provide an accuracy range (between -20% and +30%) for the civil engineering works. The Project Office Directorate requested the Taskforce and Governments to provide further means necessary, considering the following:

- Consultations with civil engineering and geology experts have proven that to deliver the required AACE Class 3 design and budget will require an additional effort in both the civil engineering design and the necessary subsurface studies. This also includes a proposal to provide research on the impact and mitigating measures of wind turbines.
- The European ETO Directorate has announced to develop a plan of action, anticipating AACE Class 3 standards. Estimates are made that it will take at least until 2026 for the preparations to the site decision; additional time and inflation are included in the budget.
- Consultations with EMR stakeholders have proven a need for additional efforts in environmental studies, stakeholder management and communication.

To execute the plan will require a total budget of 49 M€. The Project Office has been provided with 25 M€ in funding by the Government of the Netherlands (23 M€) and the Province of Limburg of the Netherlands (2 M€). The Project Office Directorate therefore requested the Governments for the additional funding of 24 M€.

IPM-discipline	Current <sup>1</sup>	Proposed <sup>1</sup>	Delta <sup>1</sup>	Justification/explanation	Current <sup>1</sup>	Proposed <sup>1</sup>	Delta <sup>1</sup>
Projectmanagement	2	3	1				1
Contractmanagement	0	0	0				0
Technical management	18	38	20	Civil Engineering AACE Class 4 -> AACE Class 3	1	11	10
				More boreholes / borehole measurements	9	15	6
				More intensive active seismic campaign	3	5	2
				Additional Noise studies	1	2	1
				Organisation / other	4	6	2
Environmental management	3	6	3	Additional Communication cost / Logistic study AACE Class 4 -> AACE Class 3	3	6	3
Project Control	2	2	0				0
<b>Total</b>	<b>25</b>	<b>49</b>	<b>24</b>				<b>24</b>

<sup>1</sup> amounts \* 1 million

In the Taskforce meeting of 20 November 2023 the Project Office Directorate has presented the plan and budget proposal 2024-2026, as addressed in a letter to the Taskforce (dated 8 November 2023). The Project Office Directorate stated that a budget decision in the coming 3-6 months would be necessary for the ET-EMR Project Office to start procurement on the additional activities in time.

### **6.3 Schedule**

Following the message from the European ETO organisation, the delivery of the bidbook is planned for 2026. This poses the risk of a 'Longer lead time', as mentioned in the Q1 report. The consequences for both the schedule and the budget have been incorporated into the updated project schedule (Annex 1) and budget.

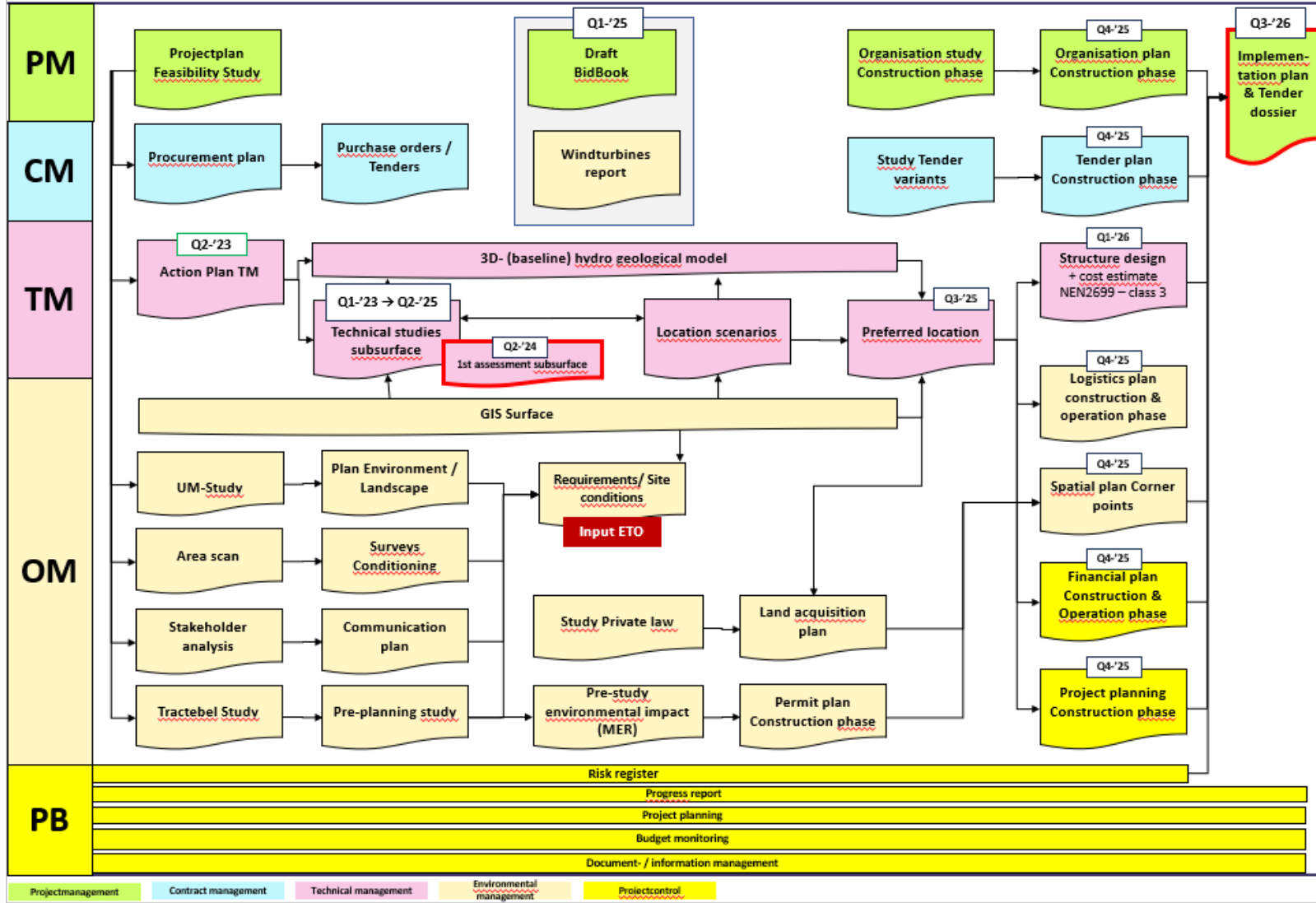
The diagrammatic representation of the product planning (see next page) has also been updated based on the latest information.

# Product Planning Feasibility Phase

P5.2\_002\_V1.0

**GO - NO GO - moment**

Note: The available data from the first drilling campaign and (sub)surface studies will be used to make a first assessment of the feasibility.



## 6.4 Quality

To ensure quality, a start was made on setting requirements. The requirements encompass:

- The process of preparing and submitting a compelling bidbook;
- The process of meeting the terms of the NGF grant decision;
- The Einstein Telescope system (below and above ground);
- The temporary system serving the construction of the Einstein Telescope.

The timely input of requirements from the European ET organisation ETO is important.

## 6.5 Risks

The risk management process will be carried out using the RISMAN method, which is widely used for construction and infrastructure projects characterised by high complexity, many stakeholders with diverging interests, and uncertainty about costs and lead times due to planning procedures.

The steps in this cyclical process are:

- Identifying (based on the IPM structure and underlying processes);
- Quantifying (assessing risks for probability of occurrence and potential impact on Time, Money, Quality, the Environment, Image, and Safety);
- Establishing management measures;
- Implementing and evaluating management measures;
- Updating risk.

Based on the inventory of March 2023, the follow-up process was given form and content in Q2-2023. Below are four risks that were specifically addressed in the last quarter:

Risk	Management
Discussion in the scientific community on the shape of the Einstein Telescope (triangle versus L)	Focus on current scope as adopted by ESFRI and NGF (triangle);  Monitor development closely.  Establish a formal framework and information exchange between the ETO and Project Office directorates.
Subsurface noise, plans for wind turbines and geothermal energy in the protection area.	We monitor the conditions. The Taskforce is provided with the information to discuss the conditioning aspects. A study on mitigating measures will be carried out. We refer to paragraph 5.2 for the current situation.
Longer lead time because of, e.g., <ul style="list-style-type: none"><li>• deliverables from ETO</li><li>• decision-making in various</li></ul>	Monitor ETO closely

<p>countries</p> <ul style="list-style-type: none"> <li>• sound subsurface studies</li> </ul>	<p>Intensive coordination within Task Force</p> <p>Carry out studies simultaneously</p> <p>Planning and budget have been adjusted based on the indication from ETO.</p>
<p>Stress on budget</p>	<p>Manage costs</p> <p>Additional cover (partners) is proposed; see paragraph 6.2.</p>
<p>Continuity of technical team in various countries</p>	<p>Put on the agenda for the Task Force / MoU</p>

## 6.6 Information management

### *Document management/control information*

After the system for archiving, document management (SURFdrive) and project information was set up and put into operation in Q1-2023, it is structurally and systematically filled from Q2 onwards, so that this information is available to the members of the Project Office.

## 6.7 Facilities

Based on the action plan and in consultation with the managers of the specialist fields, it will be ensured that appropriate staffing of the Project Office; accommodation; integrity and social safety protocols in the workplace; insurance cover; complaints protocol, etc., are in place. These issues were successively addressed during the first half of 2023.

# Annex 1 Project planning

ET Productenplanning 22-01-2024																											
Id	Taaknaam	Start	Eind	1ste kwartaal				2de kwartaal				3de kwartaal				4de kwartaal											
				jan	feb	mrt	apr	mei	jun	jul	aug	sep	okt	nov	dec	jan	feb	mrt	apr	mei	jun	jul	aug	sep	okt	nov	dec
	<b>0. Start</b>	2-1-23	2-1-23																								
	0. Start	2-1-23	2-1-23																								
	<b>B. Subsurface</b>	3-1-23	31-12-25																								
	1.20 Organisation	3-1-23	31-12-25																								
	3.01 1st set Boreholes	21-3-23	8-8-24																								
	3.02 2nd set Boreholes	12-4-24	27-3-25																								
	3.04 Noise (ERT, passive seismic, anthropogenic noise measurements)	23-6-23	13-3-25																								
	3.06 Active Seismic	21-2-23	17-3-25																								
	3.10 Geomechanics, -fysics, -hydrology	16-5-23	31-12-25																								
	3.20 Collect/Analyse existing data	21-3-23	21-12-23																								
	3.25 Data management / 3D modelling	21-2-23	11-11-24																								
	3.30 Design	26-12-23	31-12-25																								
	<b>D. Project Office</b>	3-1-23	6-1-27																								
	0.40 ETO-BGR-Taskforce	1-8-23	27-5-24																								
	1.10 Administrative decision making	22-7-26	6-1-27																								
	1.20 Organisation	3-1-23	31-12-25																								
	1.40 Implementation plan - Tender dossier	28-5-24	20-7-26																								
	2.10 Procurement	21-2-23	13-10-25																								
	4.60 Logistics	18-8-23	8-10-26																								
	5.10 Planning & Finance	5-3-24	31-12-25																								
	<b>E. Communication</b>	3-1-23	22-6-26																								
	1.20 Organisation	3-1-23	31-12-25																								
	4.40 Stakeholdermanagement	21-2-23	22-6-26																								
	<b>F. International strategy</b>	3-1-23	31-12-25																								
	1.20 Organisation	3-1-23	31-12-25																								
	<b>G. Spatial planning</b>	3-1-23	31-12-25																								
	1.20 Organisation	3-1-23	31-12-25																								
	4.10 Spatial planning	3-1-23	31-12-25																								
	4.60 Logistics	11-7-23	31-12-25																								
	4.70 Environment / Landscape	21-2-23	31-3-25																								
	<b>H. NGF-finance</b>	3-1-23	9-11-26																								
	5.20 NGF	3-1-23	9-11-26																								
	<b>Z. End</b>	21-7-26	21-7-26																								
	Z. End	21-7-26	21-7-26																								