



GENERAL PROJECT REVIEW CONSOLIDATED REPORT (HE)

COVER PAGE

PROJECT	
Project number:	101079696
Project acronym:	ET-PP
Project name:	Preparatory Phase for the Einstein Telescope Gravitational Wave Observatory
Call:	HORIZON-INFRA-2021-DEV-02
Topic:	HORIZON-INFRA-2021-DEV-02-01
Type of action:	HORIZON-CSA
Service:	REA/C/04
Project starting date:	1/9/2022
Project duration:	48 months

PROJECT REVIEW	
Period covered:	not applicable
Reporting period number:	not applicable
Date of the latest version of DoA against which the assessment is performed:	22/8/2022
Date of meeting with consortium (if applicable):	25/10/2024 – 25/10/2024
Name of project officer:	Ioannis ANDREDAKIS
Name(s) of monitors:	Not applicable

1. OVERALL ASSESSMENT

1. Overall assessment
<p><input type="radio"/> The project has fully achieved its objectives and milestones for the period.</p> <p><input type="radio"/> The project has achieved most of its objectives and milestones for the period, with relatively minor deviations.</p> <p><input checked="" type="radio"/> The project has achieved some of its objectives and milestones. However, corrective action will be required.</p> <p><input type="radio"/> The project has failed to achieve critical objectives and/or milestones and/or is severely delayed.</p>
2. General comments (executive summary)
<p>The aim of the ET-PP project is to establish foundation for the European third generation gravitational wave detector, the Einstein Telescope (ET), which is a large international project with scientific, technical, networking, organisational and outreach aspects. It is of high importance for astrophysics research in the next decades due to the rapid development and increasing role of multi-messenger astronomy approach in tackling many open questions in astrophysics and in broader fundamental physics.</p> <p>The project has encountered several severe difficulties since the last review in Dec 2023. The major problems are that several key decisions have not yet been made and have even become more complicated due to undefined geometry design of the ET (triangle or 2L design). This affects the site selection, cost estimation and legal entity decisions. These problems are intertwined and as some important decisions have not yet been made, this endangers the whole timeline of the project and affects several of its aspects. The project is facing huge delays in important Deliverables and Milestones, some are expected to be reached only after the end of the ET-PP.</p> <p>Currently suggested approach that they will study all possibilities of the detector design and site locations in evaluation of costs and legal entity options is not credible, as this would multiply the work needed, while the ET-PP is already experiencing substantial delays. The network also does not provide convincing signs that with more information these decisions would in fact be reached more efficiently.</p> <p>Quality of some deliverables is not sufficient.</p> <p>More details are given in the following sections.</p>
3. Recommendations
<p>Summary of the recommendations:</p> <ol style="list-style-type: none">1. The project has to find a way to disentangle in the very near future the questions and decisions on the detector geometry design, site criteria and site location, legal entity, cost estimation and approach to political stakeholders. At the moment it seems that the project is stuck and that the prevailing attitude is that it is impossible to disentangle these decisions. Many of them lie outside of the ET-PP. The suggested approach is to first push for reaching the scientific consensus on which design geometry (triangle or 2L) is preferred. This would inform and ease the site selection decision based on scientific data. Clear picture of the preferred design and site (based on scientific data and arguments) would enable cost estimation and mutual, united approach to political stakeholders.2. Suggested approach to study all possible combinations of detector design, site location, legal entities is not credible as it would require substantially more person-power, while the ET-PP is already experiencing substantial delays in several work-packages, including those which do not depend on the decisions mentioned in 1.).3. Attitude to project's set deadlines, those that are in the control of the ET-PP, should be more serious.4. Processing and control of quality of documents (deliverables, reports, milestones) should be improved.5. Recommendation made in review in Dec 2023 need to be followed.6. It appears that the leadership/management of the ET-PP is not empowered enough to achieve the targets of ET-PP in the set timeframe. This should be improved. <p>Revision is requested for deliverables D5.1, D5.2, D5.3, D8.1, D10.2, and D10.3.</p>
4. EIC follow up actions (for EIC actions)
<p>Not applicable.</p>
5. Does the project meet the necessary conditions for receiving additional grants under the EIC? (for EIC actions)
<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>

<input checked="" type="radio"/> Not applicable

2. OBJECTIVES AND WORK PLAN

1. Is the progress reported in line with objectives and work plan as specified in the DoA? If there are significant deviations, please comment.
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
Here we give the summary of the progress in specific Work Packages (WP). WP 1 – Management and Coordination No new deliverable in this WP was planned in the period since the previous review in Dec 2023. We would like to point out that there was a mistake in the »Updated summary of possible actions in ET-PP timeline« referring to the delivery D4..6, which does not exist. Presumably the deliverable D6.6., referring to DMP, should be mentioned here. WP 2 – Organisation, Governance and Legal Aspects The ET-PP requests the extension of the deliverable 2.3 Legal entity status until M47 with the caveat that the change of content might be needed in the future depending on how discussions progress in terms of geometry design, site selection and legal framework. ET legal framework involves high level participations on governmental level with the ET Board of Governmental representatives (BGR) as the decision making body. Decision of legal framework is a prerequisite for the development of legal documents and content for statutes. Discussion of governance aspects was made during the BGR-7 workshop in Oct. It concluded with the finding that BGR need to consult experts in their Ministries. New workshop is planned in Q1 2025 with discussion paper in Q2 2025. In Q3-Q4 2025 follow-up of BGR conclusions is planned. It is expected that the sufficient consensus on a preferred legal framework will not be reached in time to deliver the legal documents and contents of statutes in M36. It is possible that deliverables D2.3 and D2.4 will not be finished before M48, and will extend beyond the end of the ET-PP. WP 3 – Financial Architecture No deliverables were planned in this period. WP 4 – Site preparation This WP experiences severe difficulties in meeting milestones and deliverables, due to complexity of the activities involved in the sites, well beyond anticipated. Milestones M2 (Document detailing site-specific characteristics that impact ET sensitivity and its duty cycle) and M3 (Common methodology to estimate impact of site characteristics on ET sensitivity and operation, and if required, a scheme to compensate it) have been postponed: Document on M2 was delivered to the EC Portal. Document about M3 is expected in March 2025. Deliverables D4.2, D4.3, D4.4, and D4.5 are delayed and are expected in Mar 2025, July 2026, Feb 2026, and July 2026, respectively. Deliverable D4.2 is expected to be limited due to incomplete information on site localisation, subsurface geology, geo-technical understanding etc. Teams in Sardinia and EMR work on different time frames. Deliverable 4.3 also depends on local site teams progress. Similar situation is with D4.4 and D4.5. It was suggested that these deliverables are addressed in EC interim review in Jan 2026. In addition to site candidates Sardinia and EMR, there is now also the third site candidate site in Lusatia. How this will impact the activities and planning of WP 4 is not yet clear. WP 5 – Project Office and Engineering Department This WP delivered the documents D5.1., D5.2, and D5.3. We find parts of this documents to be very general and not including necessary information. We request revision of these documents as specified: D5.1. Structure and mandate of the Project office

The document needs some improvements:

- Executive summary is very generic. A more specific summary of the document (i.e. what are its main findings/conclusions) is required.
- Parts of the text in the beginning of the document are very generic with some unnecessary repetitions.
- Definition of the Project Office's mandate should be more specific. For example: What is its position inside ETO, ETC? To who is it responsible to?
- Section "5. The Project Office structure" starts with the sentence "Once the mandate and the organizational structure are defined" – shouldn't this (structure and mandate of the project office) be given in this deliverable?
- Structure of the Project office in Fig. 2 is not clear: what is the position of the »Project office Support, IT manager etc« with respect to the »Project Office Coordination« unit? It is not clear what is the substructure of WPs, how many person-power they should include for optimal running etc.?

D5.2 Functionalities required from the tools in support of the project management

Requirements for tools are well described. However:

- Executive summary is too generic. A more specific summary of the document (i.e. what are its main findings/conclusions) is required.
- The statement in 4.4. »During the process of evaluation we have evaluated EDMS CERN but also ATRIUM IN2P3 and Alfresco.« needs follow up information on the suitability of the ATRIUM IN2P3 and Alfresco.
- Configuration Management Wiki page is not accessible for review.
- In 4.6. it is stated that Regsuite, Visure, IBM DOORS and PT Codebanner tools were evaluated, however only the results for Jama Connect are provided in the table, and even those have an appended comment "To Be Checked". There is no comment whether the other three tools in the table (Easyredmine, MS Project Server, EDMS CERN) do not fulfil either of the requirements or were not evaluated. More detail conclusion would be welcome.
- Also in 4.8. it is stated that Regsuite, Visure, IBM DOORS and PT Codebanner, were evaluated, however only the results for Jama Connect are provided in the table. There is no comment whether the other three tools in the table (Easyredmine, MS Project Server, EDMS CERN) do fulfil or not either of the requirements or were not evaluated. More detail conclusion would be welcome.
- In 4.10 some description and conclusion would be welcome. It is not clear why ZOOM and Youtube channel do not satisfy requirement 1.
- In 4.12 some description and conclusion would be welcome.
- In 4.14. it seems that the work is still in progress.
- More details are needed about the Data management Tool mentioned in 4.16.
- Risk Management Wiki page is not accessible for review.
- Also in 4.18. it is stated that Regsuite, Visure, IBM DOORS and PT Codebanner, were evaluated, however only the results for Jama Connect are provided in the table. There is no comment whether the other three tools in the table (Easyredmine, MS Project Server, EDMS CERN) do fulfil or not either of the requirements or were not evaluated. More detail conclusion would be welcome.
- In 4.20. it seems that the work is still in progress with only two tools evaluated so far. There is no comment on when/if others will be evaluated, too.
- In section 5 it is stated that the evaluation of the Product Lifecycle Management tools is still under discussion and have not started yet.
- The conclusion is that several evaluations of tools are not yet concluded. And that "the Project Office will be able to propose a set of tools which will have been the subject of a complete evaluation and will be able to meet the requirements of the PO" at the end of the preparatory phase.
- A summary of evaluation of tools and preliminary recommendation on tools which would be preferred/appropriate and could be used overall or at least for several different WPs, would be welcome.

D5.3. Structure and mandate of the Engineering Department

- Executive summary: more specific summary of the document (i.e. what are its main findings/conclusions) is required.
- Definition of the Engineering Department's mandate should be more specific. What is its position inside ETO, ETC? To who is it responsible to? Chain of command.
- In section 3 more details on what is meant by »vertical team structure« need to be provided.
- Resources, in particular personnel, seem to be uncertain. This raises concern. More information and plan would be welcome.

WP 6 – Technical Design

The deliverable D6.1 (Refined Science Case) is delayed and is expected in Feb 2025. The new timeline is attributed to the decision of the ET Collaboration management to give the highest priority to the investigation of the science potential

of ET in different geometrical configurations, i.e. to compare the triangle vs the 2L geometry. The work related to this was carried out outside of the ET-PP, but its results are important as the input for the preparation of the ET Science Blue Book which constitutes the D6.1 deliverable. The scientific conclusions of this work (paper by Marica Branchesi et al JCAP07(2023)068 “Science with the Einstein Telescope: a comparison of different designs”) are that the most performant configuration, is a 2L configuration with 15km long arm interferometer oriented at 45 degrees. For this reason, the Blue Book, in addition to the original geometry of a triangle of 10km of side, will refine the science case also for this new geometry. This comparison was not part of the original ET-PP. It requires more time and person-power, and opens up additional discussions within the ET collaboration, international gravitational wave community, ETO, funding agencies etc. The geometrical configuration of ET is indeed of crucial importance. The scientific decision on best configuration should be achieved as soon as possible.

The deliverable D6.2 (Vacuum pipe Design) was expected by Sep 2024. It is now planned for Dec 2024

The deliverable D6.4 (Preliminary Detector TDR) was expected by Sep 2024. A new timeline is requested due to uncertainties in the ET optical layout and organizational changes following from the review of the initial Product Breakdown Structure. Deliverable D6.4, for both, the triangular and the 2L configurations, is not expected before July 2025. A better understanding of the expected timeline should be available by the time of the RP2 review.

The deliverables D6.3 and D6.5 (Research Infrastructure TDRs) were planned for Sep 2024 and Feb 2026, respectively, however a new timeline and redefinition of these deliverables are requested.

The preparation of the Research Infrastructure (RI) TDR is under the responsibility of ETO. An MoU with CERN has been defined for the development of the ET civil infrastructure and to assist in performing proper reviews of the related information originated by the different candidate sites. A second MoU with CERN is being prepared to develop ET technical infrastructure. The structure of the Civil Infrastructure TDR is expected by Q2 2025 and the structure of the Technical Infrastructure Preliminary TDR by Q4 2025.

The timelines are affected by the (Preliminary) DET TDR, which is delayed (not before July 2025), being an input for the (Preliminary) RI TDR requirements.

ETO is currently working towards the civil infrastructure layout for the triangle configuration for local teams and contractors to start the design of the underground civil infrastructure. The start of work on the layout for the 2L configuration is expected soon.

This shows that newly opened discussions and uncertainties in the preferred geometry of the ET are causing additional work and delays in the ET-PP.

The ET-PP team concludes that the original ET-PP plan for producing a full RI TRD before the end of the ET-PP project is untenable, and would like to redefine D6.3 and D6.5 deliverables so that a Preliminary TDR RI is produced by the end of the project, fall 2026. Therefore, current D6.5 is deemed unfeasible before the end of ET-PP.

D6.6 (ET Data Management Plan and Data Access Policy) is expected in July 2026, as planned.

WP 7 - Innovation and Industrial engagement

No deliverables were planned in this period. It is foreseen that future deliverables and milestones will be met.

WP8 – Computing and Data Access

Deliverable D8.1. Computing and Data requirements was submitted to the EC. We request the revision of the document as follows:

- Executive summary is very generic. A more specific summary of the document (i.e. what are its main findings/conclusions) is required.
- The document tries to estimate the computing and data requirements based on experience of CERN and LIGO/Virgo detectors. Of course, the requirements will depend on the phase of the project and yet unknown rate of triggers. However, the motivation for factors used (i.e. 3 and 5) should be better presented; proper estimation for the low latency computing requirements and pre-merger alerts is lacking. Several scenarios could be investigated.
- Summary of all computing requirements (with numbers) would be useful in the Conclusions.

WP9 – Sustainable Development Strategy

The M17 document received comments from EC. The revised version, addressing these comments, was prepared, however it was not delivered before the scheduled EC interim review. The ET-PP coordinator and ETO Directorate decided to postpone the delivery of the new document to allow for further improvements, including contributions from a private consulting company, an expert on the sustainability aspect of big projects. The plan is to hire consulting services, which will also help with D9.1 and D9.2., which are delayed and are now expected in Oct 2025. A new version of the

M17 document is expected by May 2025. The D9.1 is delayed due to limited time availability of key expert personnel in this matter inside the consortium. D9.2 is delayed due to required compliance with a design of the infrastructure (which is still under discussion) and due to delay in the outcomes from the studies in the site candidate areas. For the D9.3 (ET CO2 footprint ET assessment and mitigation strategy) EGO is recruiting a dedicated expert. This document is expected by Oct2025, with two month delay. The milestone M19 (Final Sustainability Plan) is expected in July 2026, as planned.

WP10 – WP 10: Education, Outreach and Citizen Engagement

Deliverables D10.2 and D10.3 were submitted for this review. The rest of the WP 10 deliverables and milestones are expected as planned.

Deliverables D10.2 and D10.3 are of good quality, however we require some revisions, as follows:

D10.2. Launch consortium website and social media accounts

The report is of sufficient quality. However, it seems that out of all social media accounts planned only one (Facebook profile) has been launched. There seems to be a delay also with the launch of new web-site: although the report prepared in the middle of Oct says that it will be public soon, in the beginning of Dec it is still not.

Please, comment and make a reliable plan when new webpage will be available and when other social media accounts are planned.

D10.3. Formulate strategic media and communication plan

The plan is well thought through and has the aim to establish the central communication point of the project. This is commendable and necessary. However, it is not clear from the plan how the »confusion caused by too many websites, logos, and entities communicating on behalf of ET« will be dealt with. It is recommended to present a table with all of the project's different webpages and discuss how they will be connected (or not) to the main webpage and media and communication plan in general.

2. Are the objectives of the project still scientifically, technologically and economically relevant?

- Yes
- No
- Partially
- Not applicable

The final objectives of the project are still scientifically, technologically and economically relevant.

3. Critical risks

- Yes
- No
- Partially
- Not applicable

In addition to the risks identified in the DoA, which are still relevant, additional critical risks exist:
 - Additional new risks arose due to undefined geometrical design of the ET, which causes the delays and uncertainties of timelines in the design of RI, site selection, cost estimates, suitable legal frameworks, environmental impacts etc.

4. Does the project respect the ‘do no significant harm’ principle?

- Yes
- No
- Partially
- Not applicable

yes

5. Is the gender dimension appropriately taken into account?

- Yes
- No

<input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
Gender dimension was not specifically addressed in this review. However, the leadership appears to be dominated by men. A more gender-balanced composition is advisable.
6. Does the project respect the commitments concerning open science as described in the DoA? Is it undertaking additional open science practices?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
Open science practices were not specifically addressed in this review.
7. Is the project adequately integrating social sciences or/and humanities? (for SSH topics)
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
8. Have the ethics/security deliverables due for the current period been adequately addressed and approved?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
9. Did the fellows/staff members demonstrate sufficient knowledge of the research project?
<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input type="radio"/> Not applicable
The fellows/staff members are experts in their respective fields with sufficient knowledge relevant to the project.
10. Were the fellows aware of their rights and obligations as a Marie Skłodowska Curie fellow?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
11. Did any issues requiring REA follow-up arise during the meeting?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
12. Has the project effectively addressed the relevant standardisation aspects in R&I activities?

- Yes
- No
- Partially
- Not applicable

13. Did the EIC beneficiaries prioritise IP protection over dissemination when applicable, particularly with regards to results with market potential?

- Yes
- No
- Partially
- Not applicable

14. Have the comments and recommendations from previous project reviews been taken into account?

- Yes
- No
- Partially
- Not applicable

Recommendations from previous review were not taken fully into account, in particular to provide the necessary background information.

3. IMPACT

1. Is the proposed pathway to achieve the expected outcomes and impacts still credible?
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
The proposed pathways to achieve the expected outcomes and impacts are still credible. However, a new pathway to disentangle the geometrical design, site location and political decisions needs to be taken in order for the project to achieve its goals (before the end of the project or even with some delay).
2. How will the project have an impact on policy making (if any)?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
3. Please indicate the EU headline priorities to which the project has contributed or will contribute to.
<input checked="" type="checkbox"/> European Green Deal <input type="checkbox"/> Economy that works for people <input checked="" type="checkbox"/> Europe for the digital age <input type="checkbox"/> Promoting the European way of life <input checked="" type="checkbox"/> A stronger Europe in the world <input type="checkbox"/> A new push for democracy
4. Are the measures to maximise impact still suitable? (n/a for EIC Pathfinder)
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
The measures to promote the project and maximise its impact are suitable. The project may have a major impact on the science, industry and society, however, there are some issues due to complicated situation the project has found itself in.
5. Are the measures for public/stakeholder engagement properly implemented? (for EIC Pathfinder)
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
6. Translation into innovation (for EIC Pathfinder)
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially

Not applicable

7. Empowering key actors (for EIC Pathfinder)

Yes

No

Partially

Not applicable

4. IMPLEMENTATION

1. Has the project been efficiently and effectively managed (including risk management)?
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
The project is very complex, in scientific, technological, organisational, environmental, and political aspects. It has encountered even further complications with uncertainties in the geometry of the design and site location candidates, which imposes severe risks of delays and not reaching its goals. The project therefore requires strong leadership and management to lead the process of disentangling the questions and decisions on the detector design, site criteria and site location, legal entity, cost estimation and approach to political stakeholders. Current management appears not to be empowered enough to achieve the targets of ET-PP in the set timeframe.
2. Have all the obligations described in the grant agreement (contract) been respected by the participants (including ethics and security requirements, if applicable)?
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
Overall, the participants are well engaged in the project, however the project's set deadlines (those in control of the project participants) should be followed more strictly. Also the quality of some documents (deliverables, reports, milestones) should be improved.
3. Have all participants contributed to the project according to the work-plan described in the DoA?
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
See the comments on the deadlines and quality of documents.
4. Have the EIC beneficiaries protected the IPR of the results with market potential (foreground) as planned in the DoA (including patents filing or any other formal IPR protection)? How do the beneficiaries plan to get return on investment over the generated IP? (for EIC Pathfinder)
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
5. Have the participants disseminated project results (foreground) and have they communicated project activities and results as planned in the DoA (e.g. through publications, a page for the project on social media, press-releases, a website, video/film, etc.) and have they included a reference to EU funding?
<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Partially <input type="radio"/> Not applicable
The participants communicated about the project through publications, however there appears to be some delay in setting up the project website and social media accounts.

6. If the plan for exploitation and dissemination provides for exploitation primarily in non-associated third countries, have the participants explained how that exploitation is still in the EU interest? Is it acceptable?

- Yes
- No
- Partially
- Not applicable

7. Are the critical implementation risks and mitigation actions described in the DoA still relevant?

- Yes
- No
- Partially
- Not applicable

Critical risks described in the DoA are still relevant. In addition, new risks arose (see "Objectives and Work Plan").

5. RESOURCES (N/A FOR LUMP SUM AND UNIT GRANTS)

1. Were the resources used as described in the DoA and were they necessary to achieve the project objectives?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
This was not part of this review.
2. If there are significant deviations from planned budget, have they been satisfactorily justified?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
This was not part of this review.
3. If unforeseen subcontracting costs are declared, do you agree with them?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
Not part of this review, as it was not combined with a Reporting Period.
4. If unforeseen in-kind contributions costs are declared, do you agree with them?
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Partially <input checked="" type="radio"/> Not applicable
Not part of this review, as it was not combined with a Reporting Period.