

ET

EINSTEIN
TELESCOPE

INFRA-DEV Horizon Proposal for ET

M. Martínez



ICREA



Meeting ET BGR
29th March 2022

List of Partners & Third Parties



COUNTRY	Third parties
GERMANY	RWTH (Aachen), AEI (MPI), LUH (Hannover)
THE NETHERLANDS	VU (AMSTERDAM), UM (MAASTRICHT)
SPAIN	ICCUB (Barcelona), UV (Valencia), UIB (Mallorca) CDTI (Madrid)

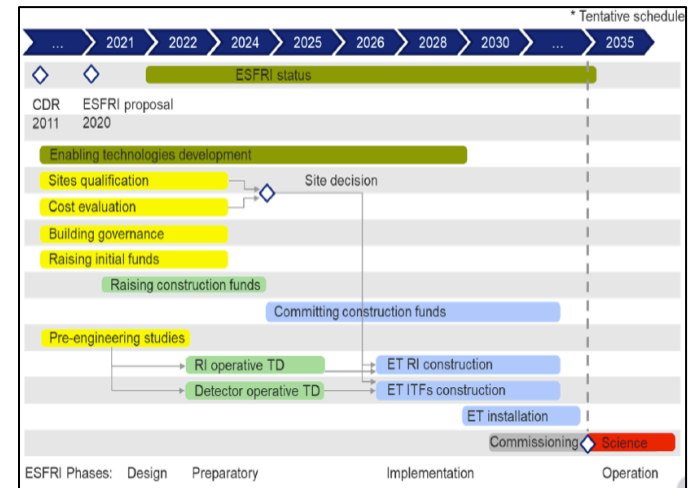
COUNTRY	Partners
AUSTRIA	U. LEOBEN
BELGIUM	U. ANTWERPEN
BELGIUM	U. LOUVAIN
EGO	EGO
FRANCE	CNRS
GERMANY	DESY
HUNGARY	WIGNER RCP
ITALY	INFN
THE NETHERLANDS	NIKHEF
POLAND	U. WARSAW
SPAIN	IFAE BSC-CNS (affiliated)
SWITZERLAND (associated partner)	U. GENEVA
UK	UKRI CARDIFF (affiliated) GLASGOW (affiliated)

ET INFRA-DEV mission

- We filed a proposal for **3.45M€** with 4 years duration (**14M€ total cost**)
 - ET collaboration considers this is the most adequate time scale
 - Still we aim for a site selection by 2024/2025

- The INFRA-DEV funding will be strategically used to (objectives)

- Define the Governance and Financial Framework
- ET legal entity
- Revisited ET design and Cost Evaluation
- Geographic Enlargement of the ET consortium
- Define a strong Project Office
- Pave the path towards a timely site decision
- Environmental and sustainability aspects
- Increase the social awareness on the project
- Computing model and user services



- Most of the work on refined TDRs for the RI in the following 4 years will rely on existing resources in the collaboration but also bringing new very special expertise on different aspects

Work Packages (WPs)

- **WP1 Coordination and Management**
- **WP2 Organization, Governance and Legal Aspects**
- **WP3 Financial Architecture**
- **WP4 Site Preparation**
- **WP5 Project Office / Engineering Dept.**
- **WP6 Technical Design**
- **WP7 Transfer of Technology**
- **WP8 Computing and Data Access**
- **WP9 Sustainable Development Strategy**
- **WP10 Education, Outreach and Citizen Engagement**

WPs were defined to cover the main INFRA-DEV missions and to address explicitly ESFRI recommendations

WP missions (1/3)

- **WP1 Coordination and Management**

1. Management
2. Coordination

- **WP2 Organization, Governance and Legal Aspects**

1. ET Internal Organization
2. Legal Framework
3. Enlargement of the ET Consortium
4. Political convergence
5. Connection to other observatories and communities
6. RI layout, Strategic issues and international networking

Coordinated by ET Project Directorate

- **WP3 Financial Architecture**

1. Cost evaluation
2. Cost Sharing
3. In-kind Contributions

Work Package	Coordinators	Institutions/ Countries
WP1 Coordination and Management	M. Martinez M. Balza	Spain
WP2 Organization, Governance and Legal Aspects	F. Ferroni J. van den Brand	Italy Netherlands
WP3 Financial Architecture	A. Sequi T. Berghöfer Ch. Arina	Italy Germany Belgium

WP missions (2/3)

- **WP4 Site Selection**

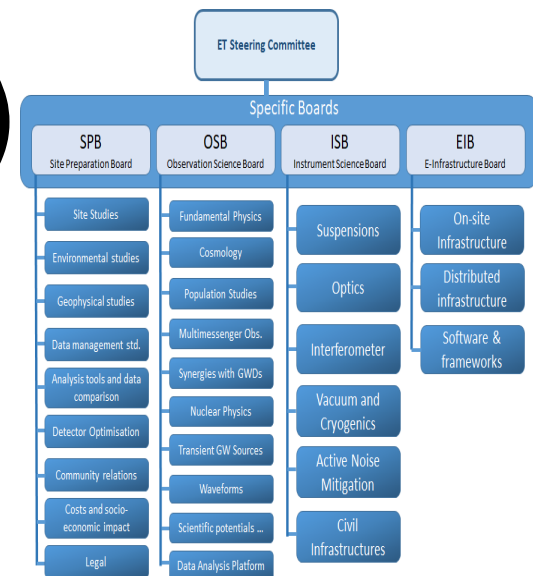
1. Site scientific evaluation
2. Socio-economic impact
3. Legal/Financial aspects of the RI implementation
4. Mediation planning

- **WP5 Project Office / Engineering Dept.**

1. Technical Coordination of the Project
2. Human resources qualification
3. Strategic decisions making process
4. Planning
5. Preparation for Production
6. Industrial Partnerships
7. Risk Management

- **WP6 Technical Design**

1. Infrastructure Technical Design
2. Experiment Technical Design
3. Scientific impact
4. Open Data Access and Services



Work Package	Coordinators	Institutions/ Countries
WP4 Site Selection	M. Carpinelli F. Linde	Italy Netherlands
WP5 Project Office	A. Freise R. Flaminio [R. Saban]	Netherlands France
WP6 Technical Design	M. Punturo H. Lueck [P. Chiggiato]	Italy Germany

As expected there is a strong synergy with existing ET internal organization

We also involved external experts with huge experience from CERN

WP missions (3/3)

- **WP7 Transfer of Technology**

1. Promotion of Innovative technologies
2. Liaison with industries, industrial returns
3. Intellectual Property

- **WP8 Computing and Data Access**

1. Computing model
2. Computing Resources
3. T0 Data Center
4. Data Preservation

- **WP9 Sustainable Development Strategy**

1. Low Carbon footprint
2. Liaison with Climate Change and Geoscience
3. Landscape and Environmental impact
4. Transportation

- **WP10 Education, Outreach and Citizen Engagement**

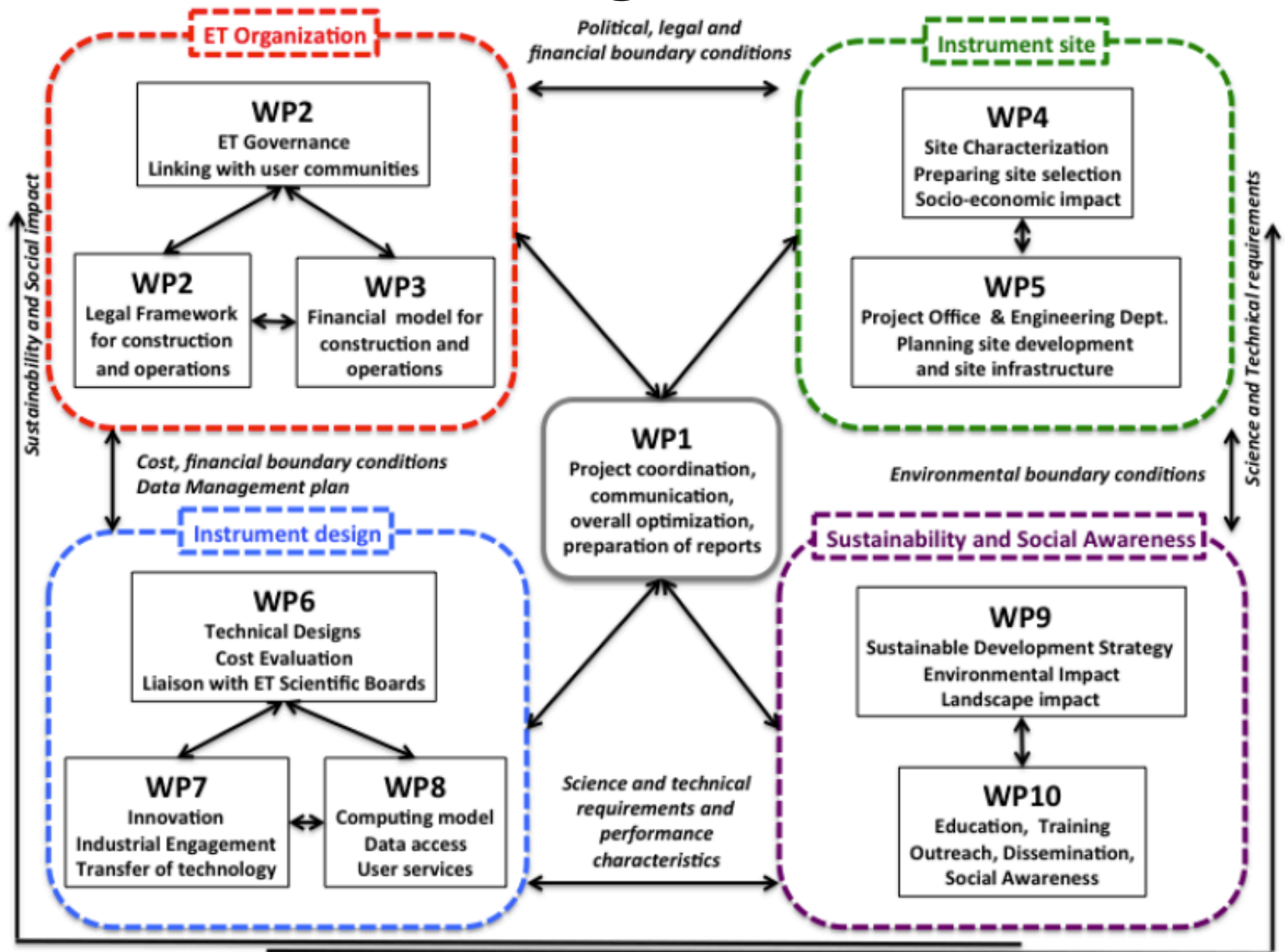
1. School Education Program
2. Dissemination and communication
3. Mentoring and Training
4. Diversity and Inclusion
5. Early Career Scientists

Work Package	Coordinators	Institutions/ Countries
WP7 Transfer of Technology	M. Morandin R. van der Meer	Italy Netherlands
WP8 Computing and Data Access	S. Girona A. Stahl	Spain Germany
WP9 Sustainable Development Strategy	N. Arnaud S. Katsanevas [M. Marsella]	France EGO
WP10 Education, Outreach and Citizen Engagement	D. Rosinska M. Hendry	Poland UK

Bringing some experts from outside ET to deal with some aspects

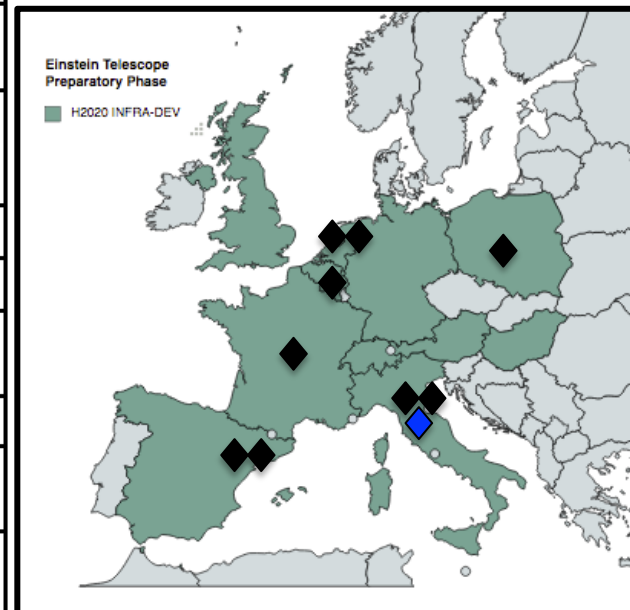
The process for defining the WP workforce brought new institutions interested in ET after it received the ESFRI recognition

ET-PP Organization



Lead Beneficiaries ♦

Work package No	Work Package Title	Lead Participant No	Lead Participant Short Name	Person-Months	Start Month	End month
1	Management & Coordination	1	IFAE	52,8 + 36 (EC)	1	48
2	Organization, Governance and Legal Aspects	6	NIKHEF	24,8 + 15 (EC)	1	48
3	Financial Architecture	7	UCL	48 + 32 (EC)	1	48
4	Site Preparation	6	NIKHEF	70,2	1	36
5	Project Office & Engineering Dpt.	5	CNRS	425+180 (EC)	1	48
6	Technical Design	3	INFN	123	1	48
7	Innovation and Industrial Engagement	3	INFN	87+21 (EC)	1	48
8	Computing and Data Access	2	BSC	69 + 33 (EC)	1	48
9	Sustainable Development Strategy	9	EGO	68,8 + 48 (EC)	1	48
10	Education, Outreach and Citizen Engagement	4	UW	139 + 24 (EC)	1	48
				Total person-months: 1038,6 + 299 (EC)		

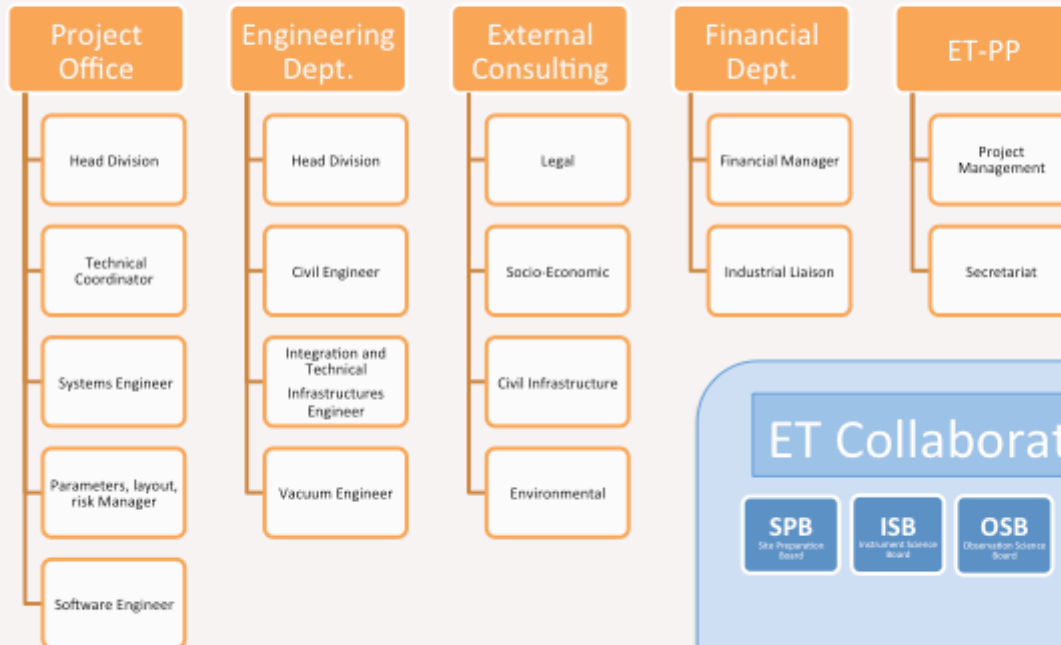


**1038 person-months in-kind
299 person-months requested**

Financial model

ET Council

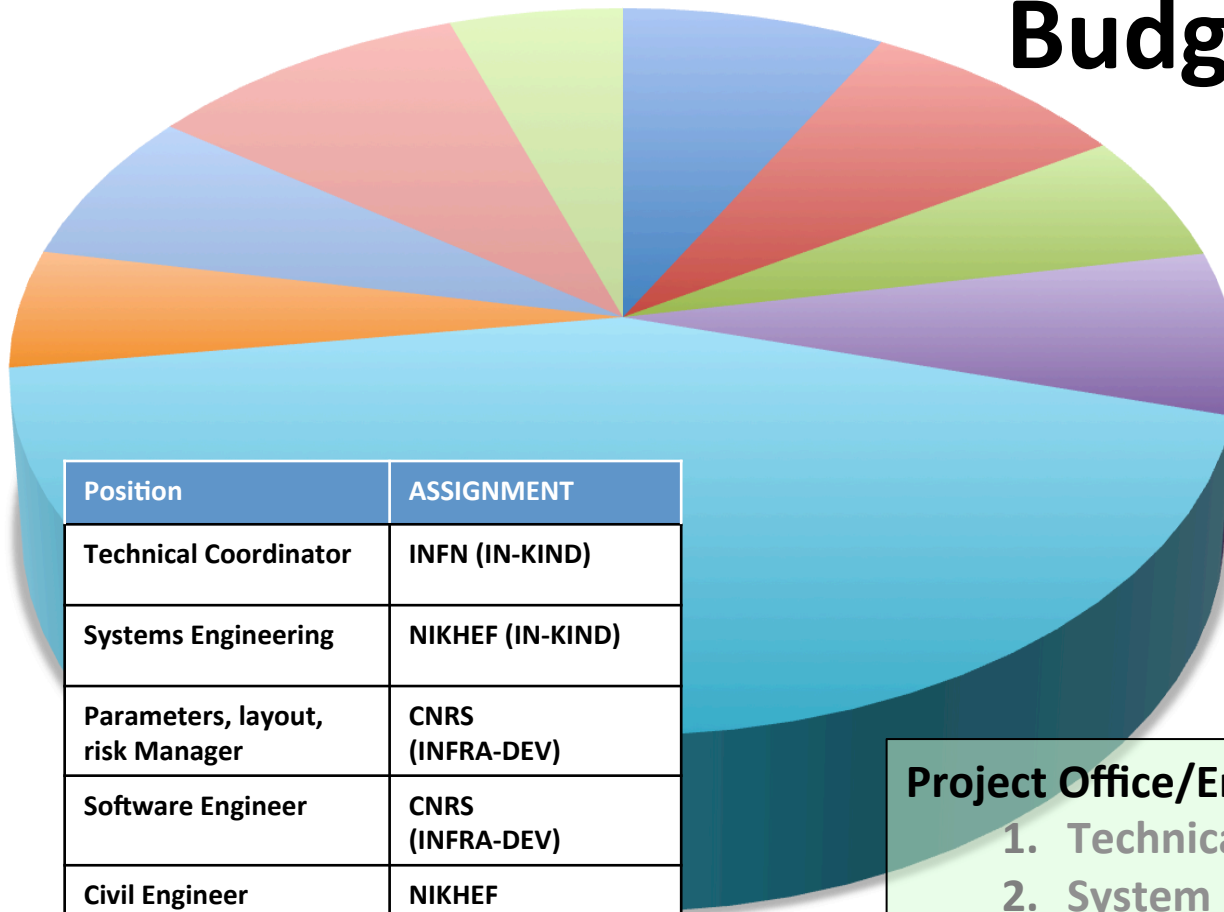
ET Project Directorate



WP #	Funding allocation (k€)
1	273,75
2	285,00
3	200,00
4	250,00
5	1515,00
6	---
7	181,30
8	237,50
9	330,00
10	177,50
TOTAL	3450,00

A large fraction devoted to the creating of the Project Office/ Engineering Department (44%)
 Significant funding for expert consulting on legal and financial aspects, socio-economic impacts, and site selection related studies
 Significant funding for sustainability studies
 Funding for ET-PP management, KTT, Computing model, and Outreach/Communication

Budget allocation



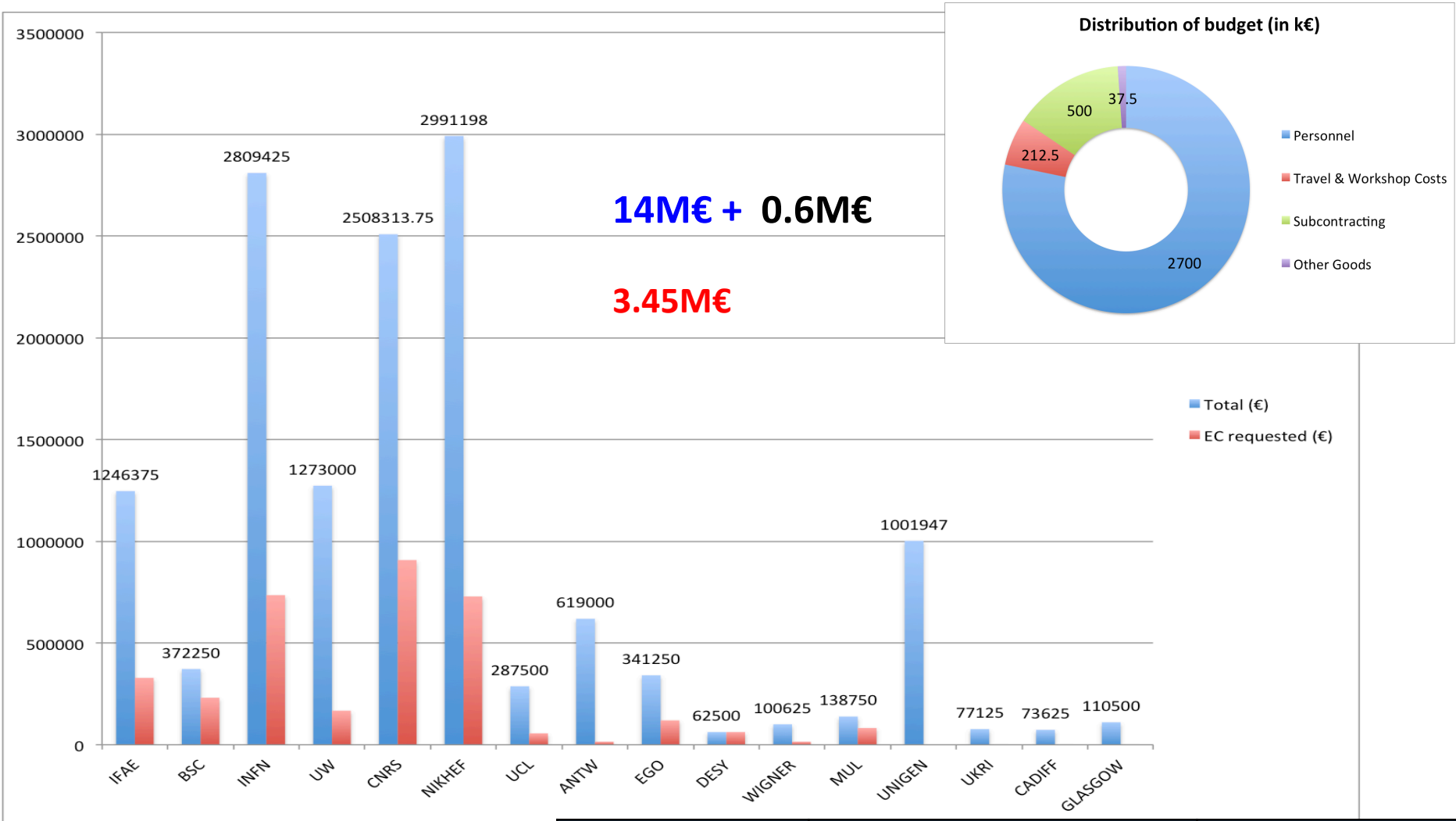
- MANAGEMENT/ADMINISTRATION
- LEGAL CONSULTER
- FINANCIAL MANAGER
- SITE SELECTION PREPARATION
- PROJECT OFFICE & ENGINEERING DEPT.
- INDUSTRIAL LIAISON
- COMPUTING
- SUSTAINABILITY
- OUTREACH/SOCIAL AWARENESS

Position	ASSIGNMENT
Technical Coordinator	INFN (IN-KIND)
Systems Engineering	NIKHEF (IN-KIND)
Parameters, layout, risk Manager	CNRS (INFRA-DEV)
Software Engineer	CNRS (INFRA-DEV)
Civil Engineer	NIKHEF (INFRA-DEV)
Vacuum Engineer	CNRS (INFRA-DEV)
Integration and Technical Infrastructures Engineer	INFN (INFRA-DEV)
Head Project Office	INFN (IN-KIND)
Head Engineering Department	NIKHEF (IN-KIND)

Project Office/Engineering Dept.

1. Technical Coordinator (in-kind)
2. System Engineering (in-kind)
3. Parameters, Layout, Risk Manager
4. Software Engineer
5. Civil Engineering
6. Vacuum Engineer
7. Integration and Technical Infrastructures Engineer

Design of the vacuum system by CERN (in-kind funding included for first year)



Only taking into account contributions related to coordination of tasks

COUNTRY	Third parties	In-kind contribution (€)
GERMANY	RWTH (Aachen), AEI (MPI), LUH (Hannover)	110000
THE NETHERLANDS	VU (AMSTERDAM), UM (MAASTRICHT)	335000
SPAIN	ICCUB (Barcelona), UV (Valencia), UIB (Mallorca) CDTI (Madrid)	133000

Deliverables (I) 41 deliverables

Table 3.1c: List of Deliverables

Deliverable (number)	Deliverable name	Work package number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
D1.1	Report to EC	WP1	IFAE	R	PU	M18
D1.2	Report to EC	WP1	IFAE	R	PU	M36
D1.3	Report to EC	WP1	IFAE	R	PU	M48
D2.1	Report providing options for legal entity	WP2	NIKHEF	R	PU	M12
D2.2	Minutes of meetings with EC and involved ministries	WP2	NIKHEF	R	PU	M12
D2.3	Legal entity statutes	WP2	NIKHEF	R	PU	M36
D2.4	Roadmap to establish the legal entity and its implementation.	WP2	NIKHEF	R	PU	M48
D3.1	Handbook for design and construction phase	WP3	UCL	R	PU	M36
D3.2	Handbook for operating phase	WP3	UCL	R	PU	M42
D3.3	Financial plan and Scenario analysis	WP3	UCL	R, O	PU	M48
D4.1	Scan of legal procedures, permitting and land acquisitions i.e. the steps to be taken prior to starting excavations.	WP4	NIKHEF	R	PU	M10
D4.2	Updated socio-economic impact studies	WP4	INFN	R	PU	M15
D4.3	Complete quantification of all the aspects impacting the ET performance.	WP4	UW	R	PU	M22
D4.4	3D geology, hydrology, etc. model with detailed localisation of the ET infrastructure.	WP4	INFN	R	PU	M27
D4.5	Robust and complete cost and schedule estimates of the excavations.	WP4	NIKHEF	R	PU	M36
D5.1	Structure and mandate of the Project Office	WP5	CNRS	R	PU	M25
D5.2	Functionalities required from the tools in support of the project management	WP5	CNRS	R	PU	M25
D5.3	Structure and mandate of the Engineering Department	WP5	CNRS	R	PU	M25
D5.4	Funcional Engineering Department	WP5	NIKHEF	R	PU	M28
D5.5	Funcional Project Office	WP5	INFN	R	PU	M28

← Legal entity statutes (M36)

← Financial plan (M48)

← Socio-economic Impact (M15)

← ET site characterization (M27)

← Cost Estimates (M36)

← Functional Project Office (M28)

← Functional Engineer Dept. (M28)

Deliverables (II)

41 deliverables

D6.1	Refined Science Case	WP6	UNIGE	R	PU	M18
D6.2	Vacuum pipe Design	WP6	ANTW	R	PU	M24
D6.3	Preliminary RI TDR	WP6	INFN	R	PU	M24
D6.4	Preliminary DET TDR	WP6	NIKHEF	R	PU	M24
D6.5	RI TDR	WP6	INFN	R	PU	M40
D6.6	DMP and Data Access Policy	WP6	DESY	R	PU	M46
D7.1	Innovation plan	WP7	IFAE	R	PU	M12
D7.2	Report on industry engagement plan execution	WP7	NIKHEF	R	PU	M42
D7.3	Model for pursuing in ET a balanced industrial return	WP7	INFN	R	PU	M33
D7.4	Report on TT and Intellectual property management in ET	WP7	INFN	R	PU	M44
D8.1	Computing and Data Requirements	WP8	UNIGE	R	PU	M18
D8.2	Computing and Data Model	WP8	UNIGE	R	PU	M42
D8.3	Data Access Implementation Guidelines	WP8	BSC	R	PU	M48
D9.1	ET Sustainable Development Implementation Strategy	WP9	CNRS	R	PU	12
D9.2	ET Environmental impact assessment and mitigation strategy	WP9	INFN	R	PU	24
D9.3	ET CO2 footprint ET assessment and mitigation strategy	WP9	EGO	R	PU	36
D10.1	Initiate strategic media and communications plan	WP10	UW	R	PU	12
D10.2	Launch consortium website and social media accounts	WP10	EGO	Web	Global	24
D10.3	Formulate strategic media and communications plan	WP10	NIKHEF	R	PU	24
D10.4	Complete bank of graphics and multimedia resources	WP10	IFAE	R	Global	36
D10.5	Launch ECR mentorship and training programme	WP10	UKRI	R	PU	44



Science case (M18)



Detector TDR (M24)



RI TDR (M40)



Model for balanced Industrial returns (M33)



Computing model (M42)



Environmental impact and its mitigation (M24)



CO2 footprint (M36)



ET Web site (M24)



ECR mentorship and training Programme (M44)

Milestones

25 Milestones

First Recourse Board Meeting (M33)

ET Collaboration in place (M12)

Table 3.1d: List of milestones

Milestone number	Milestone name	Related work package(s)	Due date (in month)	Means of verification
M1.1	ET-PP first year internal review	WP1	M12	Workshop
M1.2	ET-PP middle term internal review	WP1	M24	Workshop
M1.3	ET-PP final internal review	WP1	M45	Workshop
M3.1	Constitution / first meeting of the resource board	WP3	M33	Workshop
M4.1	Document detailing the site-specific characteristics that impact ET sensitivity and its duty cycle.	WP4	M3	Report
M4.2	Common methodology to estimate impact of site characteristics on ET sensitivity and operation and, if required, a scheme to compensate it.	WP4	M10	Report
M5.1	The recruitment of the Project Office team is completed.	WP5	M15	Report
M5.2	All three documents (WP5-D1, D2 and D3) are published.	WP5	M25	Report
M5.3	The Engineering Department as a functional unit complete	WP5	M27	Report
M5.4	The Project Office as a functional unit	WP5	M27	Report

	complete			
M6.1	ET Collaboration in place	WP6	M12	ET Symposium
M7.1	Analysis of promotion strategies accomplished	WP7	M8	Report
M7.2	Engagement plan produced	WP7	M10	Report
M7.3	Analysis of balanced industrial return strategies accomplished		M15	Report
M8.1	Workflows Requirements collection and constraints: computing and data	WP8	M12	Workshop (+D8.1)
M8.2	Computing Infrastructures availability for ET workflows, characteristics	WP8, WP9	M24	Workshop (+ D8.1)
M8.3	On site infrastructure, computing and data model	WP8, WP6	M36	Workshop (+D8.2)
M8.4	Low latency and offline workflows and computing model	WP8, WP6	M40	Workshop (+D8.2)
M8.5	Data management, access, policy and implementation	WP8, WP6, WP2	M46	Workshop (+D8.3)
M9.1	Preliminary sustainability plan	WP9	M12	Report
M9.2	ET Sustainability Workshop	WP9	M18	Workshop+Report
M9.3	Final sustainability plan	WP9	M48	Report
M10.1	Appointment of Communications and Outreach Coordinator	WP10	M8	Appointment contract
M10.2	ET Consortium website and social media launched	WP10	M24	Public launch
M10.3	ECR Mentorship and Training programme established	WP10	M44	Report

Common Methodology for site characterization (M10)

On site Computing model (M36)

Sustainability Workshop (M18)

Gantt Charts

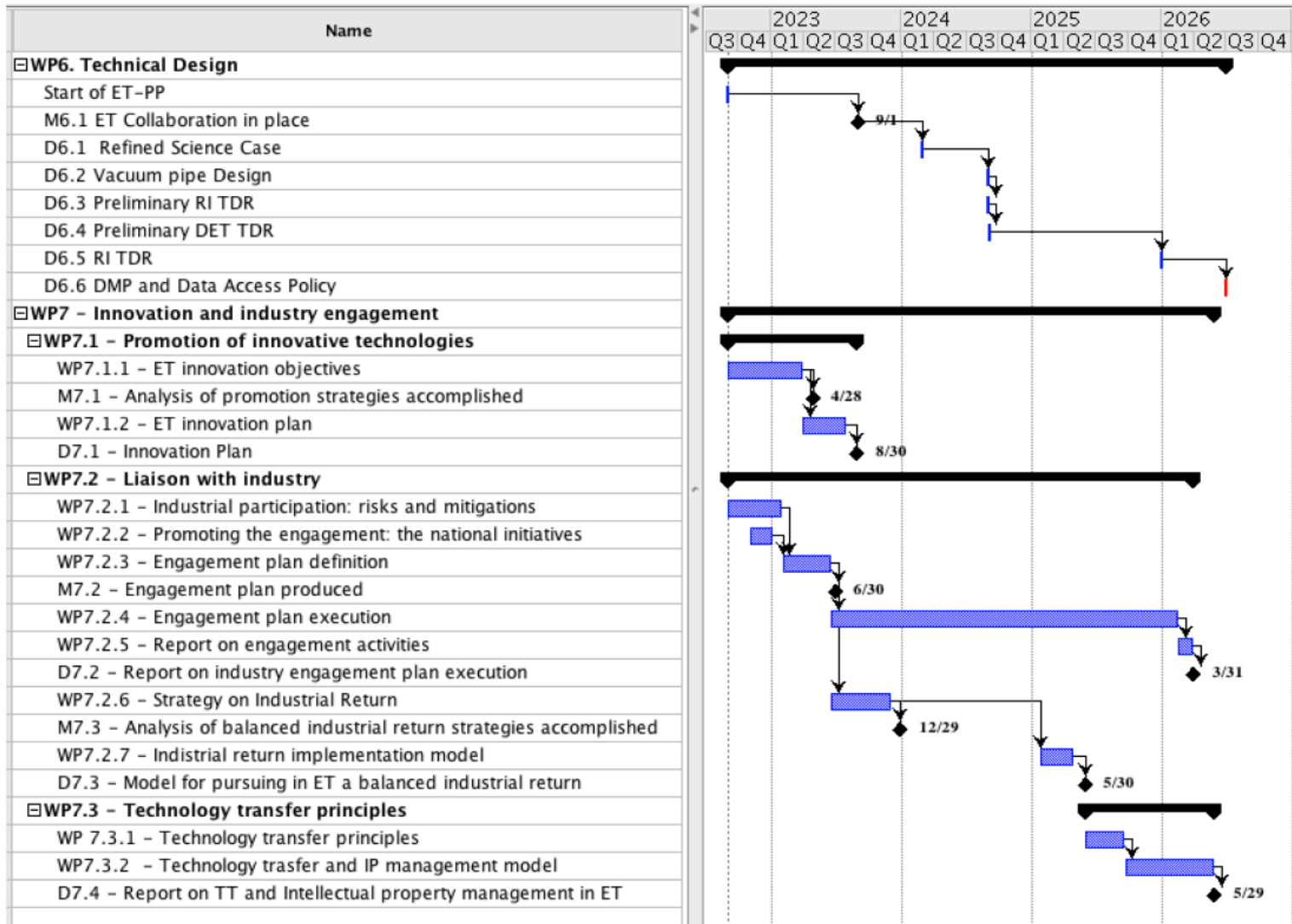


Figure 4: Gantt chart corresponding to the WP6-WP7. The starting date is assumed to be 1-Sept-2022.

ET-PP after submission

- ET-PP started already to work without waiting for the EC resolution
 - Running ET-PP monthly coordinating meetings
 - Common Document repository now in place @ EGO
 - Drafting ET initial bylaws
 - Preparing June ET symposium

The screenshot shows the 'ET-PP Organization' page. At the top, it says 'Welcome to the INFRA_DEV web' and 'ET-PP Organization'. Below this is a project organization chart with ten Work Packages (WP1-WP10) and their interactions. WP1 is central, coordinating overall optimization and reports. WP2 (ET Governance) and WP3 (Financial model) are linked to WP1. WP4 (Site Characterization) and WP5 (Project Office & Engineering Dept.) are linked to WP1. WP6 (Technical Designs) and WP7 (Innovation) are linked to WP1. WP8 (Computing model) and WP9 (Sustainable Development Strategy) are linked to WP1. WP10 (Education, Training) is linked to WP9. The chart is surrounded by boundary conditions: Political, legal and financial; Instrument site; Environmental; and Science and technical. A sidebar on the left contains a 'Toolbox' with options like 'Create New Topic', 'Index', 'Search', etc., and a 'Webs' section listing various projects and tools.

- Ongoing WP and WP-WP interactions
 - Collecting information on governance and financial models from other organizations
 - Building the WP teams
 - Establishing regular meetings
 - SWOT analyses
 - Mapping Tasks with ET Divisions
 -

	T8.1 T0 Data center	T8.2 Computing and Data Model	T8.3 Resources	T8.4 Data Access Implementation	
D1 Software, frameworks, data challenges		Computing frameworks computing domains data formats	Resources for frameworks execution and data storage availability	Data availability Data releases format	TTG Technology Tracking working Group
D2 Services and Collaboration Support			Resources and infrastructure for services and collaborative tools	Tools for monitoring, AAI (IAM), data access	
D3 Computing and data model, Resource Estimation	T0 storage and computing resources estimation	Computing model data model	Resources estimation		
D4 Multimessenger alerts infrastructure				Tools for multi messenger alerts	

Example: WP8 Tasks and EIB Divisions

Final Notes

- ET-PP Horizon-Europe INFRA-DEV proposal was submitted to the EC (**3.45M€ requested**)
 - Well defined WPs and Deliverables
 - Focused on establishing a strong Project Directorate
 - The funding was strategically placed as needed
- The proposal includes 16 partners from 12 countries and a number of institutions contributing as third parties (**11M€ in-kind**)
- Difficult exercise but we consider the result is a very good and balanced proposal
- ET-PP activities already initiated

It is clear that all the required activities in the ET Preparatory Phase cannot be solely supported by the (limited) INFRA-DEV funds and the consistent support from the funding agencies is crucial.

The success in reaching ET-PP objectives relies on a fluent interaction with the BGR members in the following four years.