

**SEVENTH FRAMEWORK PROGRAMME**

Capacities Specific Programme

Research Infrastructures

**Grant agreement for Combination of Collaborative Project and Coordination and Support Actions**

***Annex I - “Description of Work”***

**Project acronym: *KM3NeT-PP***

**Project full title: Preparatory Phase for a Deep Sea Facility in the Mediterranean for Neutrino Astronomy and Associated Sciences**

**Grant agreement no.: *212525***

Date of preparation of Annex I (latest version): 17 August 2009

Date of approval of Annex I by Commission:

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## **A. Budget breakdown and project summary**

**A.1. Overall budget breakdown for the project**

Participant number in this project	Participant name short	Estimated eligible costs (whole duration of the project)						Total receipts	Requested EC contribution
		RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	TOTAL A+B+C+D+E		
1	INFN	790400	344000	2844800	560000	-	4539200	1280000	
2	U-CYPRUS	-	-	46400	-	-	46400	15000	
3	CEA	332600	67500	385508	-	-	785608	534000	
4	CNRS	306880	77440	1167420	-	-	1551740	533000	
5	UHA-GRPHE	-	-	60800	-	-	60800	10000	
6	U-Erlangen	611200	128000	288000	105600	-	1132800	554000	
7	HOU	-	-	32000	-	-	32000	11000	
8	NCSR-D	-	47250	731430	-	-	778680	220000	
9	NOA-Nestor	236000	112000	1012000	-	-	1360000	680000	
10	U-Athens	38400	-	262560	-	-	300960	184000	
11	DIAS	48000	16000	19200	-	-	83200	32000	
12	FOM	584000	41600	579200	-	-	1204800	447000	
13	ISS	22750	-	68250	-	-	91000	19000	
14	CSIC	47600	19300	116060	-	-	182960	88000	
15	UB	-	109160	-	-	-	109160	73000	
16	UPVLC	42424	25069	71158	-	-	138651	59000	
17	UVEG	26560	7840	84480	-	-	118880	59000	
18	UNIABDN	16000	281600	51200	-	-	348800	145000	
19	U-Leeds	-	45600	36480	-	-	820800	28500	
21	USFD	-	31200	75680	-	-	106880	28500	
22	NIOZ	20400	-	-	-	-	20400	-	
Total		3123214	1353559	7932626	665600	-	13074999	5000000	

## **A.2. Project summary**

In the framework of the KM3NeT Preparatory Phase project (KM3NeT-PP) the strategic, legal and financial issues are addressed related to the construction of a European deep-sea infrastructure housing a cubic kilometre size Cherenkov neutrino telescope and providing access for deep-sea research.

Many technical issues are already addressed in the KM3NeT Design Study, started in 2006, that at the end of its work will deliver a Technical Design Report for the KM3NeT Cherenkov neutrino telescope. KM3NeT has been included in the ESFRI 2006 European Roadmap for Research Infrastructures. The KM3NeT Preparatory Phase project will provide the grounds to bring the project to its construction stage.

The Consortium performing the Preparatory Phase includes the participants involved in the KM3NeT DS. The major stakeholders are present. The work to be performed in KM3NeT-PP is structured in work packages aimed at addressing the following issues: political convergence towards a pan European facility; legal, governance and financial engineering; strategic issues and international networking; integration with regional and global marine and environmental systems (i.e. EMSO); preparing the production of the telescope components and the assembly and test of the system; definition of the data handling and dissemination scheme, and the operation of KM3NeT research infrastructure.

**A.3. List of beneficiaries**

<b>Beneficiary Number *</b>	<b>Beneficiary name</b>	<b>Beneficiary short name</b>	<b>Country</b>	<b>Date enter project **</b>	<b>Date exit project **</b>
<b>1 (coordinator)</b>	Istituto Nazionale di Fisica Nucleare	<b>INFN</b>	Italy	1	48
<b>2</b>	University of Cyprus	<b>U-Cyprus</b>	Cyprus	1	48
<b>3</b>	Commissariat à l’Energie Atomique	<b>CEA</b>	France	1	48
<b>4</b>	Centre National de la Recherche Scientifique	<b>CNRS</b>	France	1	48
<b>5</b>	Université de Haute Alsace	<b>UHA-GRPHE</b>	France	1	48
<b>6</b>	Friedrich-Alexander-Universität Erlangen-Nürnberg	<b>U-Erlangen</b>	Germany	1	48
<b>7</b>	Hellenic Open University	<b>HOU</b>	Greece	1	48
<b>8</b>	National Centre for Scientific Research “Demokritos”	<b>NCSR-D</b>	Greece	1	48
<b>9</b>	National Observatory of Athens	<b>NOA-NESTOR</b>	Greece	1	48
<b>10</b>	National and Kapodistrian University of Athens	<b>U-Athens</b>	Greece	1	48
<b>11</b>	Dublin Institute for Advanced Studies	<b>DIAS</b>	Ireland	1	48
<b>12</b>	Stiching voor Fundamenteel Onderzoek der Materie	<b>FOM</b>	The Netherlands	1	48
<b>13</b>	Institutul National de Cercetare-Dezvoltare Pentru Fizica Laserilor, Plasmei Si Radiatiei	<b>ISS</b>	Romania	1	48
<b>14</b>	Consejo Superior de Investigaciones Cientificas	<b>CSIC</b>	Spain	1	48
<b>15</b>	Universitat de Barcelona	<b>UB</b>	Spain	1	48
<b>16</b>	Universidad Politecnica de Valencia	<b>UPVLC</b>	Spain	1	48
<b>17</b>	Universitat de Valencia	<b>UVEG</b>	Spain	1	48
<b>18</b>	The University Court of the University of Aberdeen	<b>UNIABDN</b>	United Kingdom	1	48
<b>19</b>	University of Leeds	<b>U-Leeds</b>	United Kingdom	1	48

21	The University of Sheffield	USFD	United Kingdom	1	48
22	Stichting Koninklijk Nederlands Instituut voor Zeeonderzoek	NIOZ	The Netherlands	11	48

**Additional Information**

The beneficiaries of the project will work in close cooperation with their Ministries or Funding Agencies as indicated in the table below (attachment A contains the support letters from the Ministries or Funding Agencies). The official mandate from Member States, if any, and the specific national context are described in section B.2.2 “Beneficiaries”.

MINISTRY OR FUNDING AGENCY	COUNTRY	PROJECT BENEFICIARY
Ministry of University and Research	ITALY	INFN
Ministry for Education and Research	FRANCE	CNRS
Ministry for Education and Research	GERMANY	UNIVERSITY OF ERLANGEN
Greek Minister of Development	GREECE	NOA-NESTOR
FOM (Fundamenteel Onderzoek der Materie)	THE NETHERLANDS	FOM
Ministry of Education and Science	SPAIN	CSIC

## **B. Part B**

### ***B.1. Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan***

#### **B.1.1. Concept and project objectives**

The concept of the KM3NeT Preparatory Phase (KM3NeT-PP) project is to establish the legal, organizational and financial framework for the construction of a cubic kilometre size underwater neutrino telescope facility (KM3NeT).

The primary objectives of the KM3NeT-PP project are:

- to facilitate the political convergence process in matters of site selection, legal and governance issues and financial arrangements;
- to choose the appropriate legal form and governance model;
- to compare the physics performance, technological implications and time-scale issues related to different options for the construction phase;
- to prepare the plans for mass production of the core telescope components and of the deep-sea infrastructure;
- to create a framework for the handling and distribution of the data produced by the neutrino telescope;
- to assess the impact of the KM3NeT research infrastructure.

#### **B.1.2. Progress beyond the state of the art**

The KM3NeT scientific community comprises the three pilot projects ANTARES, NEMO and NESTOR and associated institutes from the field of marine science and geophysics. This community has already converged in a Design Study project for the study and definition of the technical aspects of a kilometre cube size underwater detector. The final product of the Design Study Project is a full Technical Design Report that describes the technical solutions to be adopted for the telescope construction.

The KM3NeT-PP will provide the needed steps towards the telescope construction. In particular, it will ensure a formal, coordinated, collaborative approach in Europe, at a high political level, by providing all the necessary background information and administrative support for a continuous consultation process between the relevant national authorities.

The KM3NeT-PP will define the legal form and governance model documents based on consensus requirements, will negotiate access rights to sites (shore and sub-sea), will deliver a financial engineering plan for the construction of the infrastructure taking into account the temporal funding profiles in Europe and will produce a business plan for its operation phase.

The proposed KM3NeT Infrastructure will be necessarily related with the EMSO Infrastructure. The KM3NeT-PP will ensure an efficient integration between KM3NeT and marine, environmental and geo-science agencies and organisations.



The final construction of the KM3NeT Infrastructure will need an industrial planning. The KM3NeT-PP will allow producing detailed construction plans for the telescope components taking into account the aspects connected with siting, industrial partnership and funding issues.

Finally the KM3NeT-PP will address the problem of providing data and the required computational resources to the user community.

### **B.1.3. S/T methodology and associated work plan**

#### *B.1.3.1. Overall strategy and general description*

Important ingredients of the Preparatory Phase are the support of a political process leading to the convergence of national policies towards a pan-European implementation of the KM3NeT Research infrastructure, the definition of a legal form and governance model and the definition of a financial plan for the construction of the infrastructure that takes into account the temporal funding profiles in Europe. For the construction and operation phase of the infrastructure a sound business plan is required.

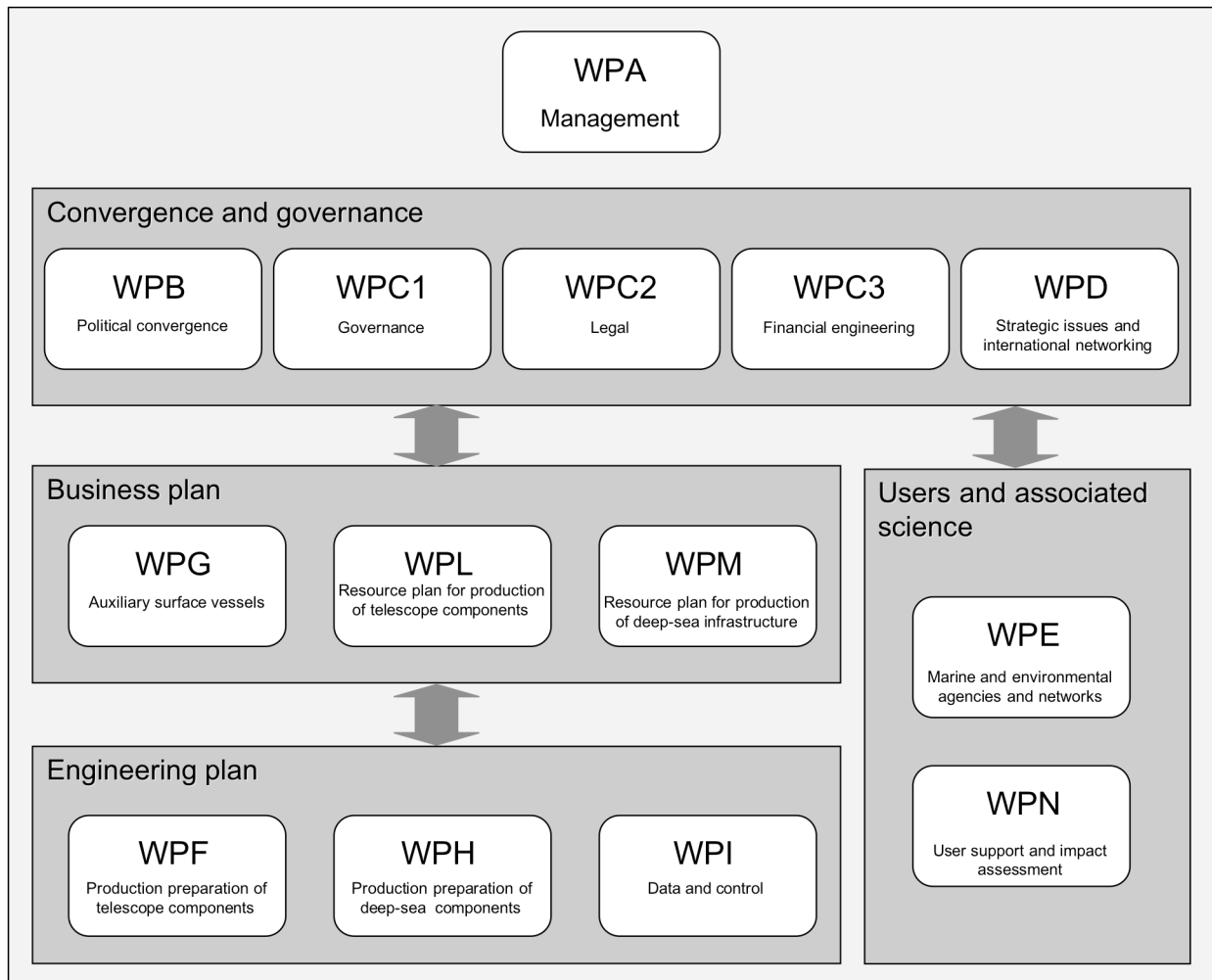
Work package WPB (Political Convergence) will have the task to form and coordinate two committees with high-level external representatives of funding agencies/ministries and science/technology, respectively. The charge of these committees will be to digest the information received from the other work packages (in particular WPC1, WPC2, WPC3 and WPD) and feed it into the relevant political processes in order to reach consensus for the implementation phase of the infrastructure. Resolving the legal, financial and strategical issues, is the objective of work package WPC1 (Governance), WPC2 (Legal) and WPC3 (Financial engineering), that will also address administrative issues related to the siting of the KM3NeT infrastructure. Further input to WPB will come from work package WPD (Strategic issues and international networking), where the options for a distributed, expandable infrastructure will be studied in terms of scientific performance and technological feasibility. In order to further strengthen the financial base for construction of the infrastructure, international cooperation will also be sought through WPD.

The building blocks needed to define the business plan for the construction of the infrastructure will be worked out in work packages WPG (Auxiliary surface vessels), WPL (Resource plan for production of telescope components) and WPM (Resource plan for production of deep sea infrastructures) that together will provide to WPC3 the necessary support. These work packages are mainly devoted to preparing the path for a timely and cost-effective construction of the infrastructure. To facilitate a timely construction, the tendering procedure will be prepared by seeking expressions of interest or by issuing requests for proposals from industry. The requirements for the infrastructure at the identified assembly locations and for the human resources for the construction of the telescope will be assessed and documented in WPM. With a similar strategy, WPL will address the issues related to the deep-sea infrastructure. Finally, sea-surface logistics issues, like the transport of telescope components and sea operations, are the subjects of study in work package WPG.

The needed technical input to work packages WPL and WPM will be provided through the work packages WPF (Production preparation of telescope components) and WPH (Production preparation of deep-sea components). Pre-production models of the major building blocks of the telescope will be constructed in order to verify the plans for the mass production in the construction phase.

The operation phase of the neutrino telescope requires the definition of a framework for its data handling and dissemination. This issue, as well as the optimisation of the neutrino telescope operation with regard to user needs, will be addressed by work package WPI (Data and control). As the associated sciences are a very important objective of the KM3NeT infrastructure, a dedicated work package WPE (Marine and environmental agencies and networks) is devoted to the interface

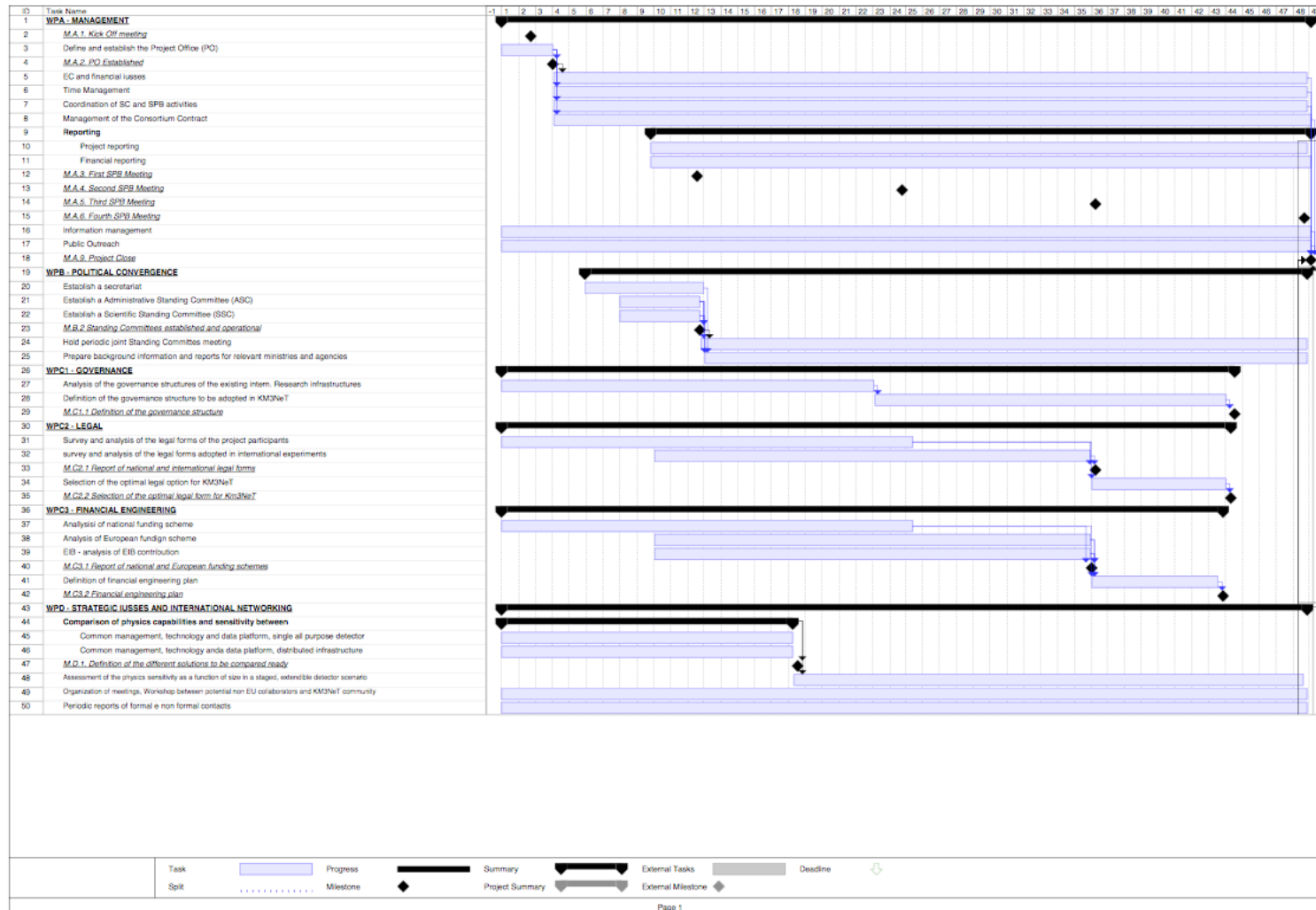
with marine, environmental and geo-science agencies. Here the synergies with ESONET/EMSO are given special attention.

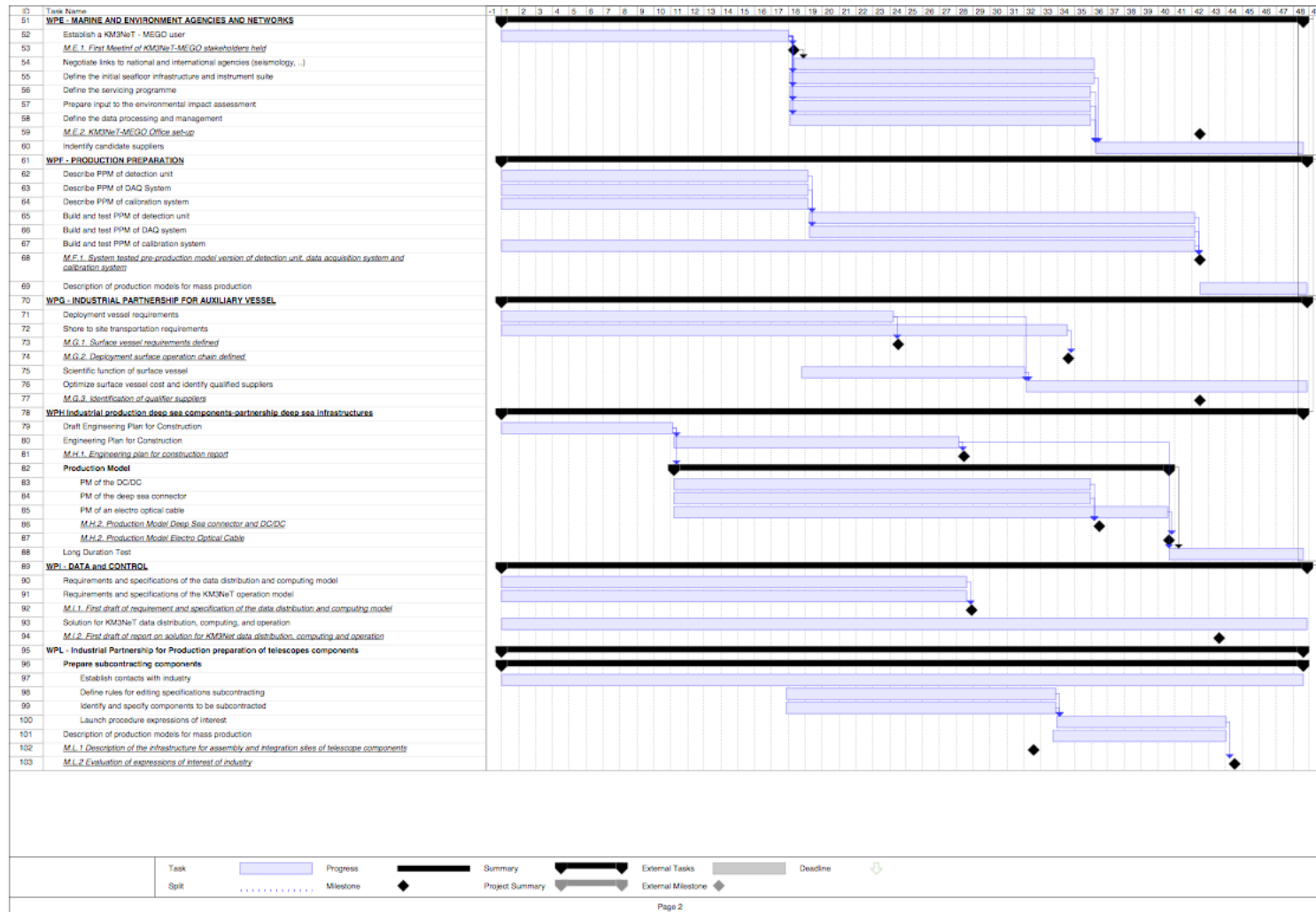


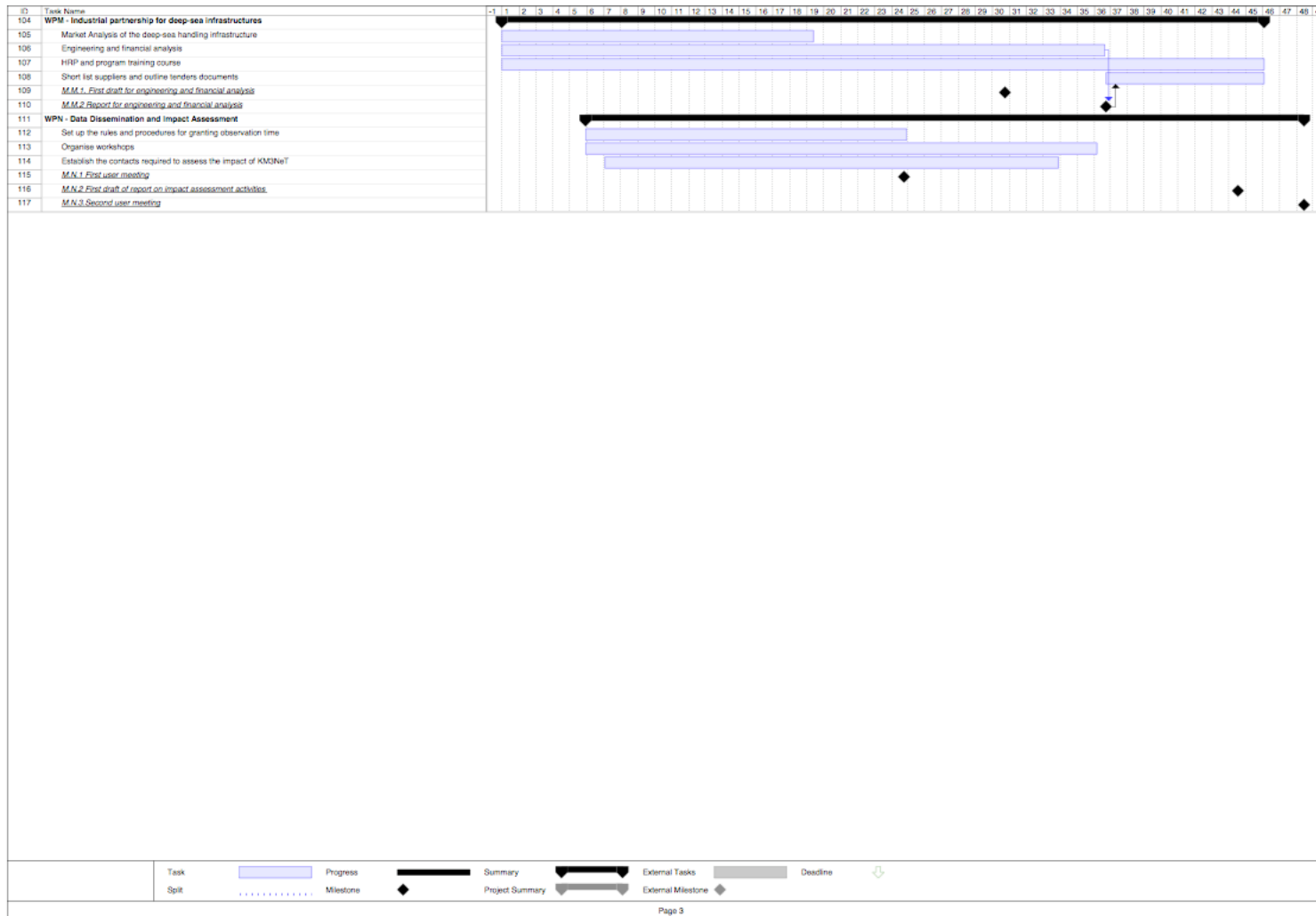
**Figure 2 - The KM3NeT-PP Work Package structure.**

Summary information on the work packages is given in Table 2a, a detailed time schedule of the associated tasks and subtasks associated in presented in the Gantt chart displayed in B.1.3.2. The interrelation of the work packages is shown in Fig. 1.

B.1.3.2. Timing of work packages and their components







## B.1.3.3. Work package list /overview

<b>WORK PACKAGE LIST</b>
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Work package No	Work package title	Type of activity	Lead beneficiary	Person-months	Start month	End month
<b>WPA</b>	MANAGEMENT	<i>MGT</i>	<u>INFN</u>	80	1	48
<b>WPB</b>	POLITICAL CONVERGENCE	<i>SUPP</i>	<u>INFN</u> <u>CNRS</u> <u>NOA-Nestor</u>	104	1	48
<b>WPC1</b>	GOVERNANCE	<i>SUPP</i>	<u>CNRS</u> <u>NCSR-D</u>	92	1	48
<b>WPC2</b>	LEGAL	<i>SUPP</i>	<u>CNRS</u> <u>NCSR-D</u>	74	1	48
<b>WPC3</b>	FINANCIAL ENGINEERING	<i>SUPP</i>	<u>CNRS</u> <u>NCSR-D</u>	76	1	48
<b>WPD</b>	STRATEGIC ISSUES AND INTERNATIONAL NETWORKING	<i>SUPP</i>	<u>CEA</u> <u>NCSR-D</u>	211	1	48
<b>WPE</b>	MARINE AND ENVIRONMENTAL AGENCIES AND NETWORKS	<i>COORD</i>	<u>UNIABDN</u>	70	1	48
<b>WPF</b>	PRODUCTION PREPARATION OF TELESCOPES COMPONENTS	<i>RTD</i>	<u>CEA</u> <u>FOM</u>	169	1	48
<b>WPG</b>	AUXILIARY SURFACE VESSEL	<i>SUPP</i>	<u>NOA-Nestor</u>	103	1	48
<b>WPH</b>	PRODUCTION PREPARATION OF DEEP-SEA COMPONENTS	<i>RTD</i>	<u>INFN</u>	59	1	48
<b>WPI</b>	DATA AND CONTROL	<i>RTD</i>	<u>U-Erlangen</u>	83	1	48
<b>WPL</b>	RESOURCE PLAN FOR PRODUCTION OF TELESCOPES COMPONENTS	<i>SUPP</i>	<u>CEA</u> <u>FOM</u>	133	1	48
<b>WPM</b>	RESOURCE PLAN FOR PRODUCTION OF DEEP-SEA INFRASTRUCTURES	<i>SUPP</i>	<u>INFN</u>	69	1	48
<b>WPN</b>	USER SUPPORT AND IMPACT ASSESSMENT	<i>COORD</i>	<u>U-Erlangen</u>	76	1	48
	<b>TOTAL</b>			1399		

## B.1.3.4. Deliverables list

<b>LIST OF DELIVERABLES</b>							
<b>Del. no.</b>	<b>Deliverable name</b>	<b>WP no.</b>	<b>Lead beneficiary</b>	<b>Estimated indicative person-months</b>	<b>Nature</b>	<b>Dissemination level</b>	<b>Delivery date (proj. month)</b>
<b>D.A.1</b>	First Year Reports	WPA	1	10	R	PU	13
<b>D.A.2</b>	Second Year Reports	WPA	1	20	R	PU	25
<b>D.A.3</b>	Third year Reports	WPA	1	20	R	PU	36
<b>D.A.4</b>	Fourth year and Final Reports	WPA	1	30	R	PU	48
<b>D.B.1</b>	First report from joint standing committee	WPB	1, 4, 9	45	R	PP	24
<b>D.B.2</b>	Final report from joint standing committee	WPB	1, 4, 9	59	R	PU	48
<b>D.C1.1</b>	Report of the existing governance structures	WPC1	4, 8	40	R	PP	28
<b>D.C1.2</b>	Definition of the governance structure	WPC1	4, 8	52	R	PP	44
<b>D.C2.1</b>	Report of the survey and analysis of the legal forms of the project participants	WPC2	4, 8	20	R	PP	28
<b>D.C2.2</b>	Report of the survey and analysis of the international legal forms	WPC2	4, 8	20	R	PP	36
<b>D.C2.3</b>	Selection of the optimal legal option for KM3NeT	WPC2	4, 8	34	R	PP	44
<b>D.C3.1</b>	Report of the national funding scheme	WPC3	4, 8	20	R	PP	28
<b>D.C3.2</b>	Report of the European funding scheme	WPC3	4, 8	25	R	PP	36
<b>D.C3.3</b>	Definition of the financial engineering plan	WPC3	4, 8	31	R	PP	44
<b>D.D.1</b>	Report on formal and informal contacts with non-EU parties	WPD	3, 8	100	R	PP	28
<b>D.D.2</b>	Report on comparison of physical performance between different options	WPD	3, 8	111	R	PU	44

<b>D.E.1</b>	Definition of sub-sea infrastructure locations and specifications	WPE	18	20	R	PP	30
<b>D.E.2</b>	Memorandum of Understanding for KM3NeT-MEGO	WPE	18	20	R	PP	36
<b>D.E.3</b>	Complete input to the Environmental Impact Assessment (EIA)	WPE	18	30	R	PU	44
<b>D.F.1</b>	Description of a pre-production model of a detection unit, calibration system, data acquisition system	WPF	3, 12	50	R	PP	30
<b>D.F.2</b>	System tested pre-production model version of detection unit, calibration system, data acquisition system	WPF	3, 12	74	R	PP	46
<b>D.F.3</b>	Description of the production model of the detection unit, calibration, data acquisition system for mass production in the construction phase including the QA/QC procedures	WPF	3, 12	45	R	PU	48
<b>D.G.1</b>	Report on suitable vessel type(s)	WPG	9	25	R	PP	30
<b>D.G.2</b>	Report on the surface aspects of deployment operations and scientific employment of surface vessels	WPG	9	40	R	PP	30
<b>D.G.3</b>	Report on training program for personnel	WPG	9	38	R	N/A	48
<b>D.H.1</b>	Engineering plan for construction	WPH	1	30	R	PP	28
<b>D.H.2</b>	Production model of the power converters, electro optical connectors and electro optical cables	WPH	1	10	P	PP	40
<b>D.H.3</b>	Report on long duration tests	WPH	1	19	R	PP	44
<b>D.I.1</b>	Report on the requirements and specifications of the data distribution and computing models	WPI	6	41	R	N/A	30



<b>D.I.2</b>	Report on solution for KM3NeT data distribution, computing, and operation	WPI	6	42	R	PP	44
<b>D.L.1</b>	Definition of production tests and rules for editing the specifications for subcontracting	WPL	3, 12	25	R	PP	40
<b>D.L.2</b>	Description of the infrastructure for assembly and integration sites of telescope components	WPL	3, 12	35	R	PU	46
<b>D.L.3</b>	Human resource plan for the production plan for the construction phase	WPL	3, 12	30	R	PU	46
<b>D.L.4</b>	Evaluation report of expressions of interest of industry	WPL	3, 12	43	R	PU	46
<b>D.M.1</b>	Report of market analysis	WPM	1	20	R	PU	20
<b>D.M.2</b>	Report for financial analysis	WPM	1	20	R	PP	36
<b>D.M.3</b>	HRP (Human Resource Plan)	WPM	1	29	R	PP	44
<b>D.N.1</b>	Report on user needs and requests	WPN	6	25	R	PU	32
<b>D.N.2</b>	Report on operation model and operation rules	WPN	6	25	R	PU	42
<b>D.N.3</b>	Report on impact assessment activities	WPN	6	26	R	PU	46
<b>TOTAL</b>							1399

B.1.3.5. *List of milestones***List and schedule of milestones**

<b>Milestone no.</b>	<b>Milestone name</b>	<b>WPs no's.</b>	<b>Lead beneficiary</b>	<b>Delivery date from Annex I</b>
M.A.1	Kick off meeting	A	1	2
M.A.2	PO, SC and SPB established	A	1	4
M.A.3	First SPB meeting	A	1	12
M.A.4	Second SPB meeting	A	1	24
M.A.5	Third SPB meeting	A	1	36
M.A.6	Fourth SPB meeting	A	1	48
M.A.6	Project close	A	1	48
M.B.1	Secretariat and Standing committee established and operational	B	1, 4, 9	12
M.C1.1	Definition of the governance structure	C1	4, 8	44
M.C2.1	Report of national and international legal forms	C2	4, 8	36
M.C2.2	Selection of the optimal legal form for Km3NeT	C2	4, 8	44
M.C3.1	Report of national and European funding schemes	C3	4, 8	36
M.C3.2	Financial engineering plan	C3	4, 8	44
M.D.1	Definition of the different solutions to be compared ready	D	3, 8	18
M.E.1	First meeting of KM3NeT – MEGO stakeholders held	E	18	18
M.E.2	KM3NeT – MEGO office setup	E	18	42
M.F.1	System tested pre-production model version of detection unit, data acquisition system and calibration system	F	3, 12	42
M.G.1	Surface vessel requirements defined	G	9	24
M.G.2	Deployment surface operation chain defined	G	9	34
M.G.3	Identification of qualified suppliers	G	9	42
M.H.1	Engineering plan for construction report	H	1	28
M.H.2	Production Model Deep Sea connector and DC/DC	H	1	36
M.H.3	Production Model Electro optical cable	H	1	40
M.I.1	First draft of requirement and specification of the data distribution and computing model	I	6	28
M.I.2	First draft of report on solution for KM3NET data distribution, computing and operation	I	6	42
M.L.1	Description of the infrastructure for assembly and integration sites of telescope components	L	3, 12	32

M.L.2	Evaluation of expressions of interest of industry	L	3, 12	44
M.M.1	First draft for engineering and financial analysis	M	1	30
M.M.2	Report for engineering and financial analysis	M	1	36
M.N.1	First user meeting	N	6	24
M.N.2	First draft of report on impact assessment activities	N	6	44
M.N.3	Second user meeting	N	6	48

B.1.3.6. *Work Package description*

<b>Work package number</b>	WPA	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Management		
<b>Activity Type</b>	MGT		
<b>WP Coordination</b>	INFN		

<b>Participant id</b>	INFN (1)	U-Erlangen (6)
<b>Person-months per beneficiary:</b>	64	16

**Objectives:**

The overall objective of work package WPA is the management of the KM3NeT-PP project in order to guarantee the timely achievement of project milestones and deliverables. WPA will:

- Ensure efficient and goal oriented management of the overall project, the committees and boards and the work packages;
- Ensure delivery of milestones, reporting duties and communication to the different participants and stakeholders;
- Ensure the communication with the EC.

**Description of work**

The work covered by WPA comprises the following tasks:

1. Establish the project office (PO); (INFN)
2. Manage coordination with EC; (INFN)
3. Manage all financial issues; (INFN)
4. Manage the schedule control and the development of the project (Time Management); (INFN)
5. Coordination of the Steering Committee and of the Strategic Project Board activities; (INFN)
6. Manage Consortium Agreement; (INFN)
7. Reporting activities (scientific, technical and financial); (INFN, U-Erlangen)
8. Knowledge and information management; (INFN, U-Erlangen)
9. Manage and coordinate the public outreach activities related to KM3NeT-PP. (INFN, U-Erlangen)

**Deliverables**

- D.A.1. First Year Reports
- D.A.2. Second Year Reports
- D.A.3. Third Year Reports
- D.A.4. Fourth Year and Final Reports

<b>Work package number</b>	WPB	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Political Convergence		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	INFN, CNRS, NOA-Nestor		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NCSR-D (8)
<b>Person-months per beneficiary:</b>	36	1	21	6	7
<b>Participant id</b>	NOA-Nestor (9)	DIAS (11)	FOM (12)	ISS (13)	CSIC (14)
<b>Person-months per beneficiary:</b>	15	1	4	3	3
<b>Participant id</b>	UVEG (17)	UNIABDN (18)	USFD (21)		
<b>Person-months per beneficiary:</b>	3	1	3		

**Objectives:**

The objective of this work package is to ensure a formal, coordinated, approach at a high political level providing all the necessary, up to date, background information and administrative support for a continuous consultation process between the relevant national authorities.

**Description of work**

The work in this WP consists in preparing all necessary information in order to facilitate the political convergence process in matters of site selection, legal and governance issues and financial arrangements. Such a formal, coordinated, approach at a high political level requires the setting up of a dedicated formal body consisting of senior-level delegates from Funding Agencies or Research Ministries of all stakeholder countries. The task of this Administrative Standing Committee (ASC) will be to prepare the ground for the necessary political decisions (at ministerial level) involving issues such as funding, siting and governance. Its operation will allow for an early identification of major political, legal and administrative obstacles to the creation of a new truly pan-European RI. Basically this committee provides the necessary formal interface between the scientific and the political processes.

The ultimate recipients of this information are the relevant national authorities.

The tasks to be performed in WPB will also be based on input information, to be provided from other WP, mainly from WPC1, WPC2, WPC3, WPD and WPE.

Tasks:

1. Establish a secretariat to coordinate the flow of documentation, and to set up meeting agendas (INFN, CNRS, NCSR-D, NOA-Nestor).
2. Establish an *Administrative Standing Committee (ASC)*, composed of senior-level delegates from Funding Agencies or Research Ministries of the stakeholder countries. Arrange periodic meetings. Provide and prepare input to these meetings (mainly from WPC1 and WPE) (INFN, CNRS, NCSR-D, NOA-Nestor, FOM).
3. Establish a *Scientific Standing Committee (SSC)*, composed of senior scientists. Arrange periodic meetings. Provide and prepare input to these meetings (mainly from WPD) (INFN, CEA, CNRS, NCSR-D, FOM).
4. Hold periodic joint Standing Committee meetings to monitor and evaluate EU and non-EU

developments. These meetings will include open sessions, where representatives of all involved parties can express their views and contribute to the ongoing process (INFN, CNRS, NOA-Nestor, all partners).

5. Prepare background information and reports for relevant ministries and agencies (INFN, CNRS, all partners).

### **Deliverables**

D.B.1. First report from joint standing committee

D.B.2. Final report from joint standing committee

<b>Work package number</b>	WPC1	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Governance		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	CNRS, NCSR-D		

<b>Participant id</b>	INFN (1)	U-Cyprus (2)	CEA (3)	CNRS (4)	U-Erlangen (6)
<b>Person-months per beneficiary:</b>	31	5	1	16	5
<b>Participant id</b>	NCSR-D (8)	NOA-Nestor (9)	FOM (12)	ISS (13)	CSIC (14)
<b>Person-months per beneficiary:</b>	14	3	4	3	3
<b>Participant id</b>	UNIABDN (18)	USFD (21)			
<b>Person-months per beneficiary:</b>	4	3			

**Objectives:**

This Work Package will work out the organizational structure for the management of the KM3NeT research infrastructure. The objective is the definition of the governance structure, which has to be set up prior to the construction of the infrastructure, and that will manage the construction, installation, maintenance and data taking phases.

**Description of work**

Main tasks of WPC1 are:

1. Analysis of the governance structures of the existing international research infrastructures and consortiums; (all partners)
2. Definition of the governance structure to be adopted in KM3NeT. (all partners)

**Deliverables**

- D.C1.1. Report of the existing governance structures
- D.C1.2. Definition of the governance structure

<b>Work package number</b>	WPC2	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Legal		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	CNRS, NCSR-D		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NCSR-D (8)
<b>Person-months per beneficiary:</b>	31	1	16	5	14
<b>Participant id</b>	NOA-Nestor (9)	FOM (12)			
<b>Person-months per beneficiary:</b>	3	4			

**Objectives:**

The objective of this work package is to define the legislative regulations for the KM3NeT research Infrastructure. Legal work will be performed at national and European level. The main objective of the WP is the development of the legal form and options for the constitution of the KM3NeT consortium.

**Description of work**

This work package will develop realistic and well-documented legal options to be considered by the Standing Committees established within WPB.

On the basis of technological and scientific decisions, two distinct options for the construction of KM3NeT will be under discussion:

- common management, technology and data platform, single all-purpose infrastructure;
- common management, technology and data platform, distributed infrastructure.

The two options will be assessed in WPD, while in WPC2 the optimal legal option for each of the two cases will be selected and studied.

Main tasks of WPC2 will be:

1. Survey of the legal forms of the project participants; (all partners)
2. Survey and analysis of the legal forms adopted in existing international research infrastructures and consortiums; (INFN, CNRS, U-Erlangen, NCSR-D, FOM)
3. Selection of the optimal legal option for KM3NeT.

The activities of this Work Package will also involve human resources external to the project, that will made be available by some of the involved partners. In particular:

- INFN will provide expertise through its Servizio Affari Internazionali of its Central Administrative Services on matters concerning legal aspects of the KM3NeT research infrastructure;
- CNRS will use the expertise available in its Direction des Affaires Juridiques (DAJ, <http://www.sg.cnrs.fr/daj/default.htm>) in order to ensure the outcome for the KM3NeT infrastructure is optimised on the legal point of view.



**Deliverables**

D.C2.1. Report of the survey and analysis of the legal forms of the project participants

D.C2.2. Report of the survey and analysis of the international legal forms

D.C2.3. Selection of the optimal legal option for KM3NeT

<b>Work package number</b>	WPC3	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Financial engineering		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	CNRS, NCSR-D		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NCSR-D (8)
<b>Person-months per beneficiary:</b>	31	1	16	5	14
<b>Participant id</b>	NOA-Nestor (9)	U-Athens (10)	FOM (12)		
<b>Person-months per beneficiary:</b>	3	2	4		

**Objectives:**

The objective of WPC3 is to examine the different possible resources for the construction of the KM3NeT research infrastructure as well as their time compatibility with the project timeline to select the optimal funding scheme for KM3NeT. Different funding options will also be evaluated both in the hypothesis of single and multi site option. The cash flow will also be evaluated.

**Description of work**

Main tasks of WPC3 are:

1. analysis of the national funding schemes that may concur to the funding of the KM3NeT research infrastructure; (all partners)
2. analysis of the European funding schemes and selection of those suitable for KM3NeT; (INFN, CNRS, NCSR-D, FOM)
3. EIB: analysis of the possibility of a EIB contribution; (INFN, CNRS, NCSR-D)
4. Definition of the financial engineering plan.

**Deliverables**

- D.C3.1. Report of the national funding scheme.
- D.C3.2. Report of the European funding scheme.
- D.C3.3. Definition of the financial engineering plan

<b>Work package number</b>	WPD	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Strategic issues and international networking		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	CEA, NCSR-D		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	UHA-GRPHE (5)	U-Erlangen (6)
<b>Person-months per beneficiary:</b>	45	24	33	8	15
<b>Participant id</b>	HOU (7)	NCSR-D (8)	NOA-Nestor (9)	U-Athens (10)	DIAS (11)
<b>Person-months per beneficiary:</b>	6	22	8	6	1
<b>Participant id</b>	FOM (12)	ISS (13)	CSIC (14)	UPVLC (16)	UVEG (17)
<b>Person-months per beneficiary:</b>	6	7	10	9	6
<b>Participant id</b>	U-Leeds (19)		USFD (21)		
<b>Person-months per beneficiary:</b>	3		2		

### Objectives:

The objectives of this work package are:

- Compare the physics performance, technological implications and time-scale issues related to various construction options or specific funding profiles.
- Assess issues related to the extendibility of the KM3NeT infrastructure.
- Explore and foster the possibility of additional funding and/or manpower resources from countries not currently involved in the KM3NeT-PP.

### Description of work

Due to the uncertainties related to the nature, origin and time profile of the funding sources for the KM3NeT infrastructure, the option of a single-technology, distributed or staged research infrastructure will be evaluated. The optimisation of these scenarios will take into account the physics focus, extendibility, construction time scales and technological choices.

This work package is also dedicated to exploring the possibility of additional funding sources and/or collaborators from countries outside of the EU. Several such countries already have activities closely related to the objectives of KM3NeT-PP, which could potentially be crystallised into financial and/or manpower resources for the KM3NeT infrastructure.

Contacts with countries in the process of developing their astroparticle physics programs will also be addressed; this may include non-EU Eastern European countries, China, India, South America, Taiwan etc. Due to their location around the Mediterranean basin, Middle Eastern and North African countries deserve special attention. Existing informal contacts with individual researchers may be fostered and formal contacts with research laboratories as well as their funding agencies may be established.

The following tasks are foreseen:

1. Comparison of physics performance between
  - common management, technology and data platform, single all purpose detector, and

- common management, technology and data platform, distributed infrastructure (INFN, CEA, CNRS, UHA-GRPHE, U-Erlangen, HOU, NOA-NESTOR, NCSR-D, FOM)
- 2. Assessment of the physics sensitivity as a function of size in a staged, extendible detector scenario (INFN, CEA, CNRS, UHA-GRPHE, U-Erlangen, NOA-NESTOR, NCSR-D, FOM)
- 3. Organisation of meetings and visits between potential non-EU collaborators and the KM3NeT-PP scientific community (INFN, CEA, CNRS, NOA-NESTOR, NCSR-D)
- 4. Periodic reports on formal and informal contacts with non-EU parties with a view to enlarge the KM3NeT-PP user community (INFN, CEA, CNRS, NCSR-D)

### **Deliverables**

D.D.1. Report on formal and informal contacts with non-EU parties

D.D.2. Report on comparison of physical performance between different options

<b>Work package number</b>	WPE	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Marine and environmental agencies and networks		
<b>Activity Type</b>	COORD		
<b>WP Coordination</b>	UNIABDN		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	NOA-Nestor (9)	UB (15)
<b>Person-months per beneficiary:</b>	15	4	3	7	12
<b>Participant id</b>	UPVLC (16)	UNIABDN (18)			
<b>Person-months per beneficiary:</b>	3	26			

### Objectives:

The objectives of this Work Package are:

- Create the organisational structure that will install, operate and develop the KM3NeT Marine, Environment and Geosciences Observatory (KM3NeT-MEGO) associated with the neutrino astronomy infrastructure.
- Ensure efficient integration between KM3NeT-MEGO and environmental agencies and organisations at the national, regional and international level through ESONET, EMSO, and other relevant initiatives such as HERMES IP (Hotspot Ecosystem Research on the Margins of European Seas) and OTN (Ocean Tracking Network), thus maximising dissemination and use of data.
- Support WPC1 and WPC3 in relation to environmental impact assessment of KM3NeT installation and operations.

### Description of work

KM3NeT-MEGO will address three main areas: (i) provision of a test bed for sub sea engineering and instrumentation; (ii) operational services, i.e. the supply of real-time data to national and international agencies with high standards of reliability in seismology, oceanography (GOOS), and tsunami detection; (iii) support of scientific research in 3 sites of the Mediterranean Sea.

The following tasks are covered in WPE:

1. Establish a KM3NeT-MEGO user and implementation group, which will also be considered as a Regional Implementation Committee group in the frame of ESONET NoE and EMSO (INFN, CNRS, NOA-NESTOR, UNIABDN)
2. Negotiate links to national and international operational agencies in seismology, oceanography and tsunami detection (INFN, CNRS, NOA-NESTOR, UB, UNIABDN)
3. Define the initial sea floor infrastructure and instrument suite (INFN, CNRS, NOA-NESTOR, UB, UNIABDN)
4. Define the servicing programme (UNIABDN)
5. Prepare input to the environmental impact assessment (UB, UNIABDN)
6. Define data processing and management (UB, UNIABDN)
7. Identify candidate suppliers of hardware, software and services and prepare drafts of invitation to tender documents (INFN, CNRS, NOA-NESTOR, UNIABDN)

KM3NeT-MEGO is used to denote a function within this preparatory phase and will not supersede

existing local and regional institutions. It is intended to participate to ESONET or EMSO arrangements (European, national, regional) and to ensure that the opportunities for the associated sciences realm in KM3NeT are maximised. Where existing agreements are already in place these can be expanded or modified.

**Deliverables**

- D.E.1. Definition of sub-sea infrastructure locations and specifications
- D.E.2 Memorandum of Understanding for KM3NeT-MEGO
- D.E.3. Complete input to the Environmental Impact Assessment (EIA)

<b>Work package number</b>	WPF	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Production preparation of telescope components		
<b>Activity Type</b>	RTD		
<b>WP Coordination</b>	CEA, FOM		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NOA-Nestor (9)
<b>Person-months per beneficiary:</b>	30	19	22	30	4
<b>Participant id</b>	FOM (12)	ISS (13)	CSIC (14)	UPVLC (16)	UVEG (17)
<b>Person-months per beneficiary:</b>	44	4	6	4	4
<b>Participant id</b>	NIOZ (22)				
<b>Person-months per beneficiary:</b>	2				

**Objectives:**

The objective of this work package is to prepare the mass production in the construction phase of the core components of the telescope. A smaller scale pre-production model of a detection unit will be built and system-tested. A description of the production model including the QA/QC procedures for the construction phase will be delivered.

**Description of work**

The major component of the KM3NeT telescope will be the *detection unit*, which is defined as a vertical structure with *optical modules* attached, high-pressure glass vessels containing one or more photon sensors. Detection units can be clustered into larger units for deployment. *Calibration units* could be defined as separate units or as integral part of the detection unit. The respective work in WPF will be based on the corresponding decision to be taken in the frame of the KM3NeT Design Study. The work package covers the following tasks.

1. Describe, build and test a small-scale pre-production model (PPM) including QA/QC procedures of a detection unit, the calibration system and the data acquisition system (INFN, CEA, CNRS, U-Erlangen, NOA-NESTOR, FOM, CSIC, UPVLC, UVEG, NIOZ). This task is broken down into the following subtasks:
  - (a) PPM of an optical module;
  - (b) PPM of a detection unit;
  - (c) PPM of the calibration system;
  - (d) PPM of the data acquisition system.
2. Describe the production model for mass production in the construction phase of the detection unit, the calibration system and the data acquisition system (INFN, CEA, CNRS, U-Erlangen, FOM, CSIC, UPVLC, UVEG, NIOZ).

**Deliverables**

- D.F.1. Description of a pre-production model of a detection unit, calibration system, data acquisition system
- D.F.2. System tested pre-production model version of detection unit, calibration system, data acquisition system
- D.F.3. Description of the production model of the detection unit, the calibration system and the data acquisition system for mass production in the construction phase including the QA/QC procedures



<b>Work package number</b>	WPG	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Auxiliary surface vessels		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	NOA-Nestor		

<b>Participant id</b>	INFN (1)	CNRS (4)	NOA-Nestor (9)	U-Athens (10)
<b>Person-months per beneficiary:</b>	35	9	28	31

### Objectives:

This work package addresses issues concerning the buying/building/chartering of ships, sea operations and servicing. The objectives are:

- Define shore to site transportation and subsequent deployment requirements, define necessary shore infrastructure.
- Define surface vessel requirements, identify, evaluate, test and demonstrate suitability of vessel types, estimate time periods needed and optimise process. Develop the training program for the necessary personnel.
- Identify qualified suppliers.
- Optimise surface vessels costs (charter, build, buy) including operations and service.

### Description of work

The objectives translate directly in the following set of tasks:

1. Explore shore-to-site transportation requirements (INFN, CNRS, NOA-NESTOR, U-Athens)

The KM3NeT neutrino telescope will be composed of a large number of identical modules to be deployed on the very deep-sea bottom. These modules will be of complex construction and an assessment of transportation means from shore to deployment site has to be defined. The overall constraint will be the cost, and to this effect modifications of standard vessels or novel vessel types will be considered. Related shore infrastructure requirements to allow final testing before transport to site will be defined.

2. Assess vessel selection and training of personnel (INFN, CNRS, NOA-NESTOR, U-Athens)

A detailed scenario of module deployment will be developed and tested. Suitable vessel types will be defined, taking into account existing types of standard design or cost effective novel design vessels. Telescope module connection to the underwater electro-optical cable network for power and data transfer may require the deployment of special ROVs or AUVs. Suitably modified locally available vessels might provide an optimal, cost effective, dedicated, ROV launch and support solution without the overheads associated with ROV carrying scientific vessels. Such options will be analysed. This task will also use the results of task 1 above in order to define the optimal vessel functionality. The deployment of the neutrino telescope modules will require highly trained personnel for the actual deployment, subsequent servicing over ten years and ancillary tasks. A study will be performed in order to define the training procedures, the qualification system and the optimal training program.

3. Assess scientific employment of surface vessels (INFN, NOA-NESTOR, U-Athens)

An assessment of the functionality of a vessel to provide a platform for surface detectors to be used for calibration purposes will be performed.

4. Optimise surface vessel costs and identify suitable suppliers (INFN, CNRS, NOA-NESTOR, U-Athens)

Following a thorough market search, the issue of chartering, building or buying the vessels will be addressed. Special or modified vessels may be required in order to deploy and service the KM3NeT infrastructure. The required number and availability of such vessels will depend on the module production rate, deployment duration and frequency of operation. Moreover, service vessels will be needed for the duration of the neutrino telescope operation. Thus, the number, type and acquisition mode of vessels will be optimised with respect to cost and reliability.

### **Deliverables**

D.G.1. Report on suitable vessel type(s)

D.G.2. Report on the surface aspects of deployment operations and scientific employment of surface vessels

D.G.3. Report on training program for personnel

<b>Work package number</b>	WPH	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Production preparation of deep sea components		
<b>Activity Type</b>	RTD		
<b>WP Coordination</b>	INFN		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	NOA-Nestor (9)	U-Athens (10)
<b>Person-months per beneficiary:</b>	39	6	5	5	3
<b>Participant id</b>	UNIABDN (18)				
<b>Person-months per beneficiary:</b>	1				

**Objectives:**

The major objective of this work package is to prepare production/acquisition specification reports for the main components of the deep-sea infrastructure, i.e. the main electro-optical cable, the junction box, and the components for the power transformation and distribution.

**Description of work**

One of the main components of the neutrino telescope will be the electro-optical cables for transmission of power and data between shore and off-shore modules. Junction Boxes (JB) and deep-sea operated electro-optical connectors will be needed to connect the main electro-optical cable to the various vertical modules (strings, towers) that will host the photon detectors and all other needed instruments and electronics. A set of DC/DC and/or AC/DC transformers will be required to adapt the power to the needs of the off-shore electronics. High quality assessment will be required for the production and assembly of all these components. The procedures for the production and the assembly activities will be studied and integrated in an overall system engineering and validation report (engineering plan for construction). The deployment of the detector modules, their handling underwater and their connection to the junction box(es) are likely to require remotely operated vehicles (ROVs and/or AUVs) equipped with manipulating tools. The use of ROVs and AUVs, possibly envisaging a system of AUV docking stations around the deep-sea detector, will be optimized. Long duration tests of some critical components will also be performed.

In detail, the following tasks will be performed:

1. Draft of an engineering plan for construction of relevant components of the deep-sea infrastructure needed for the neutrino telescope (INFN, CEA, CNRS, NOA-NESTOR, U-Athens). This activity contains the following subtasks:
  - (a) electro-optical cable;
  - (b) DC/DC and/or AC/DC converters;
  - (c) deep-sea operated electro-optical connectors;
  - (d) junction box;
  - (e) deep-sea docking station;
  - (f) ROV and/or AUV needed for the deep-sea handling infrastructure;
  - (g) manipulating tools to be mounted on the ROV;
  - (h) control software for docking station operations.
2. Set up an engineering plan for construction of the deep-sea handling infrastructure (INFN,

CNRS); this activity is split into the following subtasks:

- (a) docking station;
  - (b) handling and manipulating tools;
  - (c) ROV/AUV system;
3. Set up a production model (PM) of relevant components (INFN, CEA, CNRS), with the following subtasks:
- (a) PM of an electro-optical cable;
  - (b) PM of the DC/DC and/or AC/DC converters;
  - (c) PM of deep-sea operated electro-optical connectors.
4. Long duration tests of some critical components:
- (a) ROV and/or AUV;
  - (b) ROV mateable connectors;
  - (c) DC/DC converters.

### **Deliverables**

D.H.1. Engineering plan for construction

D.H.2. Production model of the power converters, electro optical connectors and electro optical cables

D.H.3. Report on long duration tests

<b>Work package number</b>	WPI	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Data and Control		
<b>Activity Type</b>	RTD		
<b>WP Coordination</b>	U-Erlangen		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NOA-Nestor (9)
<b>Person-months per beneficiary:</b>	16	1	4	40	7
<b>Participant id</b>	DIAS (11)	FOM (12)	UPVLC (16)	UNIABDN (18)	
<b>Person-months per beneficiary:</b>	6	4	4	1	

**Objectives:**

The major objective of this Work Package is to create the framework for the handling of the neutrino telescope data. This requires the production of computing and storage models and to set up a ready-to-implement solution for the neutrino telescope operation system.

**Description of work**

The KM3NeT neutrino telescope will continuously watch large parts of the sky to detect neutrinos of cosmic origin on top of the irreducible background of neutrinos produced in interactions of cosmic rays with the atmosphere (atmospheric neutrinos). Large computing resources are required to identify neutrino candidates in the neutrino telescope data stream (online filter), and to further process, analyse and store the filtered data (offline analysis). Whereas design and verification of the online filter are based on the results of the KM3NeT Design Study, the implementation of the data distribution and analysis environment will be covered in WPI. The operation of the KM3NeT neutrino telescope will require continuous monitoring supported by automated and remotely operated control processes. The corresponding technical environment(s) need to be prepared.

In detail, the following tasks are covered in WPI:

1. Prepare the implementation of the data distribution model produced in the Design Study and set up a computing model, including the assessment of the use and/or allocation of GRID technologies and resources (INFN, CEA, CNRS, U-Erlangen, NCSR-D, FOM).
2. Produce a scientific operation model for the KM3NeT neutrino telescope, including remote control systems (possibly using virtual control room techniques) and adjustment procedures for the online filter operation (INFN, U-Erlangen, FOM).

**Deliverables**

- D.I.1. Report on the requirements and specifications of the data distribution and computing models  
D.I.2. Report on solutions for KM3NeT data distribution, computing, and operation

<b>Work package number</b>	WPL	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Resource plan for production of telescope components		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	CEA, FOM		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NOA-Nestor (9)
<b>Person-months per beneficiary:</b>	41	26	16	3	8
<b>Participant id</b>	FOM (12)	CSIC (14)	UVEG (17)		
<b>Person-months per beneficiary:</b>	34	3	2		

**Objectives:**

The objective of the Work Package is to identify and define suitable locations for mass production of telescope components, resulting in a human resource plan for the construction phase. The locations for mass production will be identified in terms of infrastructure and human resources. The tendering procedure for components to be subcontracted in the construction phase will be prepared by seeking expressions of interest from industry.

**Description of work**

Locations suitable as assembly and integration site for mass production will be defined and identified both in terms of infrastructures and human resources, resulting in a description of the required infrastructures and a human resource plan for the construction phase.

Based on the work for the pre-production version of the detection unit in WPF, components suitable to be subcontracted to industry and those to be constructed in the consortium laboratories in the construction phase will be identified and their pricing will be assessed. For components to be subcontracted in the construction phase a robust framework protecting the project against unforeseen contingencies will be defined. Specifications for the evaluation of the quality of subcontracting agencies will be made.

The work package covers the following tasks:

1. Define the infrastructure required for mass production of telescope components (INFN, CEA, CNRS, U-Erlangen, FOM).
2. Assess the amount of human resources required in the construction phase of the telescope (INFN, CEA, CNRS, U-Erlangen, FOM).
3. Assess suitable locations for mass productions in terms of infrastructure and available human resources (INFN, CEA, CNRS, U-Erlangen, FOM).
4. Prepare subcontracting of components in the construction phase. This task comprises the following subtasks:
  - (a) Establish contacts with industry (INFN, CEA, CNRS, FOM);
  - (b) Define the rules for editing the specifications for subcontracting (INFN, CEA, CNRS, FOM);
  - (c) Identify and specify components to be subcontracted in the construction phase (INFN, CEA, CNRS, FOM).
  - (d) Launch the procedure for expressions of interest by industry and document the responses (INFN, CEA, CNRS, FOM).

**Deliverables**

- D.L.1. Definition of production tests and rules for editing the specifications for subcontracting
- D.L.2. Description of the infrastructure for assembly and integration sites of telescope components
- D.L.3. Human resource plan for the production plan for the construction phase
- D.L.4. Evaluation report of expressions of interest of industry

<b>Work package number</b>	WPM	<b>Start date or starting event:</b>	1
<b>Work package title</b>	Resource plan for production of deep-sea infrastructures		
<b>Activity Type</b>	SUPP		
<b>WP Coordination</b>	INFN		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	NOA-Nestor (9)	U-Athens (10)
<b>Person-months per beneficiary:</b>	54	8	2	2	2
<b>Participant id</b>	UNIABDN (18)				
<b>Person-months per beneficiary:</b>	1				

**Objectives:**

The major objective of this work package is to define a procedure for the acquisition (or for the chartering) of deep sea remotely operated vehicles and tools (ROVs, AUVs). Qualified suppliers, capable to act as partners in the construction and installation of deep-sea infrastructures, will be identified.

**Description of work**

Possible solutions for the deep-sea handling infrastructure will be identified, by analysing the market and identifying possible partners capable to provide the ROVs and/or AUVs needed for the deep-sea infrastructure. In this WP several solutions will be analysed: medium-term time charter, long-term time charter, co-ownership, ownership (new or second-hand). A HRP (Human Resources Plan) and a training program for the technical team/staff necessary for the deep sea operation will be developed.

In detail, the following tasks are part of WPM:

1. Market Analysis of the deep-sea handling infrastructure strictly based on the system technical specification resulting from WPH;
2. Financial analysis strictly based on the outcome of WPH;
3. HRP and program training course;
4. Short list suppliers and outline tenders documents.

**Deliverables**

- D.M.1. Market analysis report
- D.M.2. Financial analysis report
- D.M.3. HRP (Human Resources Plan)



<b>Work package number</b>	WPN	<b>Start date or starting event:</b>	1
<b>Work package title</b>	User support and Impact Assessment		
<b>Activity Type</b>	COORD		
<b>WP Coordination</b>	U-Erlangen		

<b>Participant id</b>	INFN (1)	CEA (3)	CNRS (4)	U-Erlangen (6)	NCSR-D
<b>Person-months per beneficiary:</b>	19	6	5	14	4
<b>Participant id</b>	NOA-Nestor (9)	DIAS (11)	FOM (12)	CSIC (14)	UVEG (17)
<b>Person-months per beneficiary:</b>	2	1	4	3	1
<b>Participant id</b>	UNIABDN (18)	U-Leeds (19)		USFD (21)	
<b>Person-months per beneficiary:</b>	1	10		6	

**Objectives:**

This Work Package has two major objectives:

- Investigation of the needs and requests of the user communities (in and beyond the KM3NeT consortium) concerning data dissemination, data formats, computing support and infrastructure operation.
- Assessment of the impact of the KM3NeT research infrastructure and the related facilities on the European Research Area (ERA).

**Description of work**

While Work Package WPI will deal with the implementation of the data distribution and analysis environment, the necessary coordination effort across the European science community is covered in WPN. This requires a thorough understanding of the user needs concerning data formats, user interfaces and support, analysis standards relevant to a broad scientific community far beyond the KM3NeT consortium and data access conditions. For the operation of the KM3NeT neutrino telescope, requests of the user community, e.g. to adjust online filter algorithms such as to provide increased sensitivity for specific celestial directions (*observation time*) will have to be assessed, prioritised and implemented if endorsed. The rules governing these processes need to be prepared.

In addition, the impact of the research infrastructure and the related facilities on the European Research Area will be assessed. This requires a continuous communication with key representatives of the science communities and the related institutions and funding agencies.

In detail, the following tasks are covered in WPN:

1. Set up the rules and procedures for granting observation time (U-Erlangen, DIAS, FOM, UNIABDN, U-Leeds, USFD);
2. Organise workshops of the potential user communities of the KM3NeT neutrino telescope data. Set up the rules and formats for publicising KM3NeT data, based on the results of these workshops. Cross-coordinate these activities with ongoing projects of the high-energy astroparticle and astrophysics communities, in particular with regard to multi-messenger studies (INFN, CEA, CNRS, U-Erlangen, NOA-NESTOR, DIAS, FOM, UNIABDN, U-Leeds, USFD);
3. Establish the contacts required to assess the impact of KM3NeT, organise corresponding meetings

(e.g. in conjunction with conferences or ApPEC/ASPERA workshops) and produce a concluding report on this impact assessment (all).

**Deliverables**

D.N.1. Report on user needs and requests

D.N.2. Report on operation model and operation rules

D.N.3. Report on impact assessment activities

*B.1.3.7. Efforts (person-months) for the full duration of the project*

		WPA	WPB	WPC1	WPC2	WPC3	WPD	WPE	WPF	WPG	WPH	WPI	WPL	WPM	WPN	
1	INFN	64	36	31	31	31	45	15	30	35	39	16	41	54	19	487
2	U-Cyprus			5												5
3	CEA		1	1	1	1	24	4	19		6	1	26	8	6	98
4	CNRS		21	16	16	16	33	3	22	9	5	4	16	2	5	168
5	UHA-GRPHE						8									8
6	U-Erlangen	16	6	5	5	5	15		30			40	3		14	139
7	HOU						6									6
8	NCSR-D		7	14	14	14	22								4	75
9	NOA-NESTOR		15	3	3	3	8	7	4	28	5	7	8	2	2	95
10	U-Athens					2	6			31	3			2		44
11	DIAS		1				1					6			1	9
12	FOM		4	4	4	4	6		44			4	34		4	108
13	ISS		3	3			7		4							17
14	CSIC		3	3			10		6				3		3	28
15	U-Barcelona							12								12
16	UPVLC						9	3	4			4				20
17	UVEG		3				6		4				2		1	16
18	UNIABDN		1	4				26			1	1		1	1	35
19	U-Leeds						3								10	13
21	USFD		3	3			2								6	14
22	NIOZ								2							2
	<b>Total</b>	<b>80</b>	<b>104</b>	<b>92</b>	<b>74</b>	<b>76</b>	<b>211</b>	<b>70</b>	<b>169</b>	<b>103</b>	<b>59</b>	<b>83</b>	<b>133</b>	<b>69</b>	<b>76</b>	<b>1399</b>

**Annex 1 – KM3NeT-PP - 212525**

<i>Beneficiary</i>	INFN	U-Cyprus	CEA	CNRS	UHA-GRPHE	U-Erlangen	HOU	NCSR-D	NOA-NESTOR	U-Athens	DIAS
RTD											
WPF	30	-	19	22	-	30	-	-	4	-	-
WPH	39	-	6	5	-	-	-	-	5	3	-
WPI	16	-	1	4	-	40	-	-	7	-	6
<b>Total 'RTD'</b>	<b>85</b>	<b>0</b>	<b>26</b>	<b>31</b>	<b>0</b>	<b>70</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>3</b>	<b>6</b>
SUPPORT											
WPB	36	-	1	21	-	6	-	7	15	-	1
WPC1	31	5	1	16	-	5	-	14	3	-	-
WPC2	31	-	1	16	-	5	-	14	3	-	-
WPC3	31	-	1	16	-	5	-	14	3	2	-
WPD	45	-	24	33	8	15	6	22	8	6	1
WPG	35	-	-	9	-	-	-	-	38	31	-
WPL	41	-	26	16	-	3	-	-	8	-	-
WPM	54	-	8	2	-	-	-	-	2	2	-
<b>Total 'Support'</b>	<b>304</b>	<b>5</b>	<b>62</b>	<b>129</b>	<b>8</b>	<b>39</b>	<b>6</b>	<b>71</b>	<b>70</b>	<b>41</b>	<b>2</b>
COORDINATION											
WPE	15	-	4	3	-	-	-	-	7	-	-
WPN	19	-	6	5	-	14	-	4	2	-	1
<b>Tot 'Coordination'</b>	<b>34</b>	<b>0</b>	<b>10</b>	<b>8</b>	<b>0</b>	<b>14</b>	<b>0</b>	<b>4</b>	<b>9</b>	<b>0</b>	<b>1</b>
MANAGEMENT											
WPA	64	-	-	-	-	16	-	-	-	-	-
<b>Tot 'Management'</b>	<b>64</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>SUBTOTAL BENEFICIARIES</b>	<b>487</b>	<b>5</b>	<b>98</b>	<b>168</b>	<b>8</b>	<b>139</b>	<b>6</b>	<b>75</b>	<b>95</b>	<b>44</b>	<b>9</b>

**Annex 1 – KM3NeT-PP - 212525**

<i>Beneficiary</i>	FOM	ISS	CSIC	UB	UPVLC	UVEG	UNIABDN	U-Leeds	USFD	NIOZ	TOTAL ACTIVITIES
RTD											
WPF	44	4	6	-	4	4	-	-	-	2	169
WPH	-	-	-	-	-	-	1	-	-	-	59
WPI	4	-	-	-	4	-	1	-	-	-	83
Total 'RTD'	48	4	6	0	8	4	2	0	0	2	<b>311</b>
SUPPORT											
WPB	4	3	3	-	-	3	1	-	3	-	104
WPC1	4	3	3	-	-	-	4	-	3	-	92
WPC2	4	-	-	-	-	-	-	-	-	-	74
WPC3	4	-	-	-	-	-	-	-	-	-	76
WPD	6	7	10	-	9	6	-	3	2	-	211
WPG	-	-	-	-	-	-	-	-	-	-	103
WPL	34	-	3	-	-	2	-	-	-	-	133
WPM	-	-	-	-	-	-	1	-	-	-	69
Total 'Support'	56	13	19	0	9	11	6	3	8	0	<b>862</b>
COORDINATION											
WPE	-	-	-	12	3	-	26	-	-	-	70
WPN	4	-	3	-	-	1	1	10	6	-	76
Tot 'Coordination'	4	0	3	12	3	1	27	10	6	-	<b>146</b>
MANAGEMENT											
WPA	-	-	-	-	-	-	-	-	-	-	80
Tot 'Management'	0	0	0	0	0	0	0	0	0	0	<b>80</b>
<b>SUBTOTAL BENEFICIARIES</b>	<b>108</b>	<b>17</b>	<b>28</b>	<b>12</b>	<b>20</b>	<b>16</b>	<b>35</b>	<b>13</b>	<b>14</b>	<b>2</b>	

<b>OVERALL TOTAL BENEFICIARIES</b>		
<b>BENEFICIARY N.</b>	<b>BENEFICIARY NAME</b>	<b>TOTAL EFFORT (PERSON- MONTHS)</b>
1	INFN	487
2	U-Cyprus	5
3	CEA	98
4	CNRS	168
5	UHA-GRPHE	8
6	U-Erlangen	139
7	HOU	6
8	NCSR-D	75
9	NOA-NESTOR	95
10	U-Athens	44
11	DIAS	9
12	FOM	108
13	ISS	17
14	CSIC	28
15	UB	12
16	UPVLC	20
17	UVEG	16
18	UNIABDN	35
19	U-Leeds	13
21	USFD	14
22	NIOZ	2
<b>TOTAL MAN MONTHS</b>		<b>1399</b>

## B.2. Implementation

### B.2.1. Management structure and procedures

The KM3NeT Preparatory Phase project is performed under the regulations of a Grant Agreement between the EC and the KM3NeT-PP Consortium. A Consortium Agreement will further detail all the other necessary regulations.

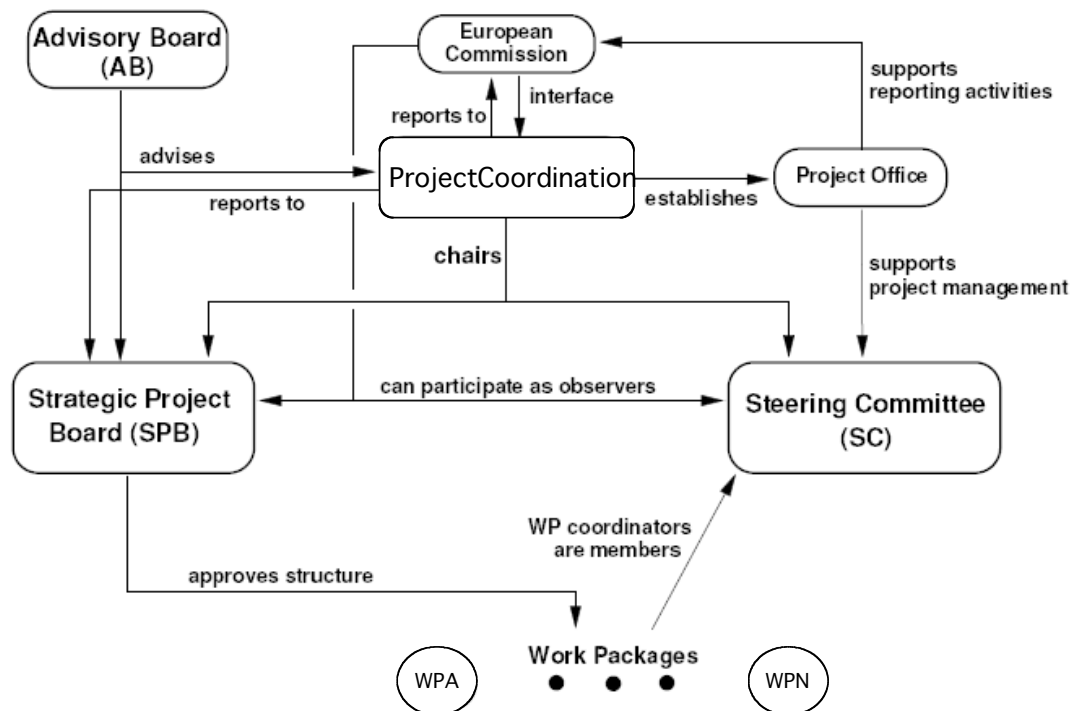


Figure 3 - The KM3NeT-PP management structure

The management structure, displayed in figure 2, is composed of the following entities:

#### Project Coordination :

The KM3NeT Preparatory Phase (KM3NeT-PP) project is coordinated by INFN, supported by U-Erlangen.

The tasks of the Project Coordinator (PC) comprise the coordination of the management of the KM3NeT-PP project, the reporting activities, the chairing of the Strategic Project Board (SPB) and the Steering Committee (SC; see below) as well as the coordination of the public outreach activities and the relation with the scientific communities. The Project Coordinator (PC) also coordinates and integrates the work produced by the Work Packages of the project.

He takes responsibility that all the activities of the WPs are coherently scheduled and realized. He provides, together with the SC, all actions necessary in order to prevent or to correct

possible project deviations. The PC interacts continuously with the WP leaders; he is the single contact point between the consortium and the EC.

A Consortium Agreement (CA) will be concluded by the KM3NeT-PP participants once the Grant Agreement has been signed. The PC takes responsibility to draft the CA, to establish consensus between the participants on its contents and to pursue the signing process.

#### Project Office (PO):

The Project Office (PO) supports the KM3NeT-PP coordinator in managing the project. It is composed mainly by administrative staff and by technical staff equipped with the necessary tools.

#### Steering Committee (SC):

The Steering Committee (SC) is the supervising board of the project and reports to the SPB (see below). It is composed by the work package coordinators and the Project Coordinator, who also chairs it. SC meetings are foreseen twice per year. The work of the SC will be supported by the PO (e.g. organising of meetings).

The tasks of the SC are:

- Monitoring the status of the work;
- Monitoring the timing and the results of the project;
- Preparing decisions of the SPB concerning the project execution, in particular concerning financial, strategic and scientific/technical issues;
- Taking measures to prevent or solve problems or deviations with respect to the scope baselines of the project;
- Executing the actions recommended by the SPB.

#### Strategic Project Board (SPB):

The Strategic Project Board (SPB) is the main decision making body of the KM3NeT-PP project. The SPB is composed of one representative per country or funding agency. Rules of voting will be based on the relative share of funding and will be defined in the Consortium Agreement. The SPB is chaired by the PC, who also organises, through the PO, the meetings of the SPB that are foreseen at least once per year.

The tasks of the SPB are:

- Discussion and assessment of the documents produced by the SC;
- Reaching agreement on the critical points of the project as well as the official documents proposed and produced by the SC;
- Decision on the integration of new members or the exclusion of defaulting members;
- Approval of the administrative and financial decisions related to the progress of work of the project;
- Decisions on a possible reorganisation of the management structure of the WPs (including the replacement of WP lead beneficiaries and work package coordinators);
- Decision on matters related to the Consortium Agreement.



### Work Package Leaders:

In order to facilitate the activities for the project execution, the project is structured in Work Packages (WPs). Each WP has one or several coordinator(s) nominated by the leading beneficiary(ies) of the WP(s). The WP coordinator(s) represent(s) the WP in the SC and oversee the execution of the WP activities, with particular attention to time schedule, milestones, deliverables, quality considerations and budget. It is the responsibility of the WP coordinator(s) to set up an appropriate management structure for each WP, which should be adapted to the special needs of the individual WP and must include representatives of all partners participating in the WP.

The tasks of the WP Leaders are:

- Organise, manage and monitor all the activities of the respective WP;
- Organise periodical meetings for the analysis of the WP's status of work.

### External Advisory Board (AB):

An External Advisory Board will be established in order to facilitate the information flow and maximise synergy between the KM3NeT-PP and other related infrastructure projects or scientific committees. Currently, representatives of the EMSO and the ESONET projects, the IceCube and Baikal neutrino telescope collaborations and from ASPERA (the astroparticle physics ERAnet project) are foreseen. Further members can be appointed by the SPB.

The tasks of the AB are to:

- Support the SPB and the Project Coordinator by providing experts advice on specific political, financial, strategic and scientific/technical issues;
- Monitor the project status.

## **B.2.2. Beneficiaries**

### **Italy**

INFN has received, on 18 April 2007, an official mandate from the Italian Ministry of the University and Research to represent Italy in the KM3NeT Preparatory Phase. The Ministry will consider the possibility for an active participation in the implementation phase based on the results of the Preparatory Phase project.

INFN has also received, on 10 April 2007, an official letter from the President of the Sicilian Regional Government declaring an engagement with a contribution of 30 M€ up to in case that the Sicilian site is chosen for the infrastructure installation.

#### *1. Istituto Nazionale di Fisica Nucleare*

INFN supports all research activities in sub-nuclear, nuclear and astroparticle physics in Italy. INFN will coordinate the KM3NeT-PP project, will coordinate the work package WPH (Industrial production for deep sea components), WPM (Industrial partnership for deep sea infrastructures), and together with CNRS and NOA-NESTOR coordinate the WPB. Moreover, INFN will contribute to all other work packages of the KM3NeT-PP project.

## **Cyprus**

For Cyprus no mandate has been given by the Member State.

### **2. University of Cyprus**

The physics department of U-Cyprus hosts all research activities in particle physics and astrophysics in the Republic of Cyprus. Through its small participation in WPC the University of Cyprus will ensure a close link and flow of information between the relevant national authorities and the KM3NeT community. U-Cyprus will contribute to the governance issues addressed in work package WPC1.

## **France**

The Ministère de l'Éducation Nationale, de l'Enseignement Supérieur et de la Recherche supports two financial agencies relevant for astroparticle physics funding in France; the Institut National de Physique Nucléaire et de Physique des Particules (IN2P3), a division of the Centre National de la Recherche Scientifique (CNRS) and institutes from the Commissariat à l'Énergie Atomique (CEA) that are part of the Direction des Sciences de la Matière (DSM). For the construction of large infrastructures, the ministry, via the cellule 'Très Grandes Infrastructures', can also contribute directly to investments costs. Letters expressing support for the KM3NET-PP from the minister and also the CNRS are included in the Appendix.

### **3. Commissariat à l'Énergie Atomique**

CEA is a national scientific and engineering agency playing a major role in energy, information technology and health, with a strong emphasis on fundamental research. The institutes participating to this project belong to the Direction des Sciences de la Matière of the CEA. They are located at the Saclay centre and comprise astro-nuclear, particle physicists, and environment researchers. CEA participants benefit from a strong technical support. CEA will co-coordinate work packages WPD, WPF and WPL, make further significant contributions to WPH, WPI, WPM and WPN, and be involved in WPE; in addition, CEA will be actively involved in the political and legal/administrative work in WPB and WPC1, WPC2 and WPC3.

### **4. Centre National de la Recherche Scientifique**

CNRS will participate in the KM3NeT-PP project through IN2P3, which is responsible for coordinating the national research program in fundamental particle, nuclear and astroparticle physics. It comprises 18 research laboratories working in close collaboration with the French university system. The following IN2P3 laboratories will join the KM3NeT preparatory phase: Centre de Physique des Particules de Marseille (CPPM), the Institut Pluridisciplinaire Hubert Curien (IPHC) in Strasbourg and the Laboratoire AstroParticule et Cosmologie (APC) in Paris. CNRS will co-coordinate the work packages WPB, WPC1, WPC2, WPC3 as well as make important contributions to all of the other work packages except WPA.

CNRS participates to KM3NeT-PP with a third party called "Université de la Méditerranée Aix-Marseille 2".

### **5. Université de Haute Alsace**

The Université de Haute Alsace will participate with the Groupe de Recherche en Physique des Hautes Energies (GRPHE) that is a laboratory involved in particle and astroparticle physics experiments. The GRPHE group is experienced in database design, in physics simulation and

analysis and in detector construction and will contribute to the study of a distributed, extendible infrastructure in work package WPD.

## **Germany**

In Germany decisions on the funding of ESFRI and other research infrastructures are taken by the federal research ministry, BMBF. The decision process concerning KM3NeT involves consultations with the executive office responsible for particle and astroparticle physics, PT-DESY. Even though PT-DESY is centrally involved in the scientific advisory process and in decision preparation, it is not entitled to take decisions on its own part.

It should be noted that the two ESFRI projects of highest national priority are XFEL and GSI/FAIR, both located in Germany and with major commitments of the German government. Beyond that, a national roadmap for research infrastructures does not yet exist, but an effort to produce it has been initiated. The exact procedures and responsibilities in this process are not yet defined. A final commitment of the BMBF for KM3NeT support (or a decision not to support KM3NeT) cannot be expected soon.

Nevertheless, the BMBF and PT-DESY are well aware of KM3NeT and its German component. Support for the KM3NeT-PP project, in particular for a German representative in the WPB political standing committee, is being sought through the BMBF. The University of Erlangen is recognised to be leading the KM3NeT effort in Germany, as indicated in the letter of the BMBF dated 27 April 2007 (see annex of the PP proposal).

### **6. Friedrich-Alexander-Universität Erlangen-Nürnberg**

The physics institute of U-Erlangen has experience and is active in particle/astroparticle detector development and in computing issues for large-scale experimental activities. U-Erlangen has recently established the Erlangen Center for Astroparticle Physics (ECAP), providing infrastructure and technical personnel for large astroparticle activities. U-Erlangen coordinates the KM3NeT DS. The contributions of U-Erlangen to KM3NeT-PP will be:

- Provision of auxiliary support for communication and reporting issues in WPA;
- Contributions to the strategic work packages WPB, WPC1, WPC2, WPC3, in particular linking the efforts to the ongoing KM3NeT Design Study;
- Contributions to WPD, WPF and WPL;
- Major contributions to and coordination of WPI and WPN.

## **Greece**

State research funding is controlled and distributed to Greek Universities and Research Institutions mainly via the General Secretariat for Research and Technology of the Ministry of Development. The Chief Officer is the Secretary General who is a political appointment. He reports directly to the Minister of Development who then reports to the Cabinet of Ministers.

The General Secretariat will play the leading role in Greece in the political negotiations in the KM3NeT Preparatory Phase while NOA-NESTOR plays the leading role in the scientific matters.

### **7. Hellenic Open University**

The Astroparticle Physics Group of the School of Natural Science and Technology of the HOU has experience and is active in developing data acquisition, monitoring and analysis components. The HOU is making a considerable scientific contribution to the ongoing Design Study for KM3NeT and is expected to participate actively in the scientific programme of the planned research infrastructure. HOU participates in the WPD.

### 8. National Centre for Scientific Research « Demokritos »

NCSR-D is the largest research organisation in Greece. The NCSR-D KM3NeT team has considerable experience in matters of EU science policy. NCSR-D will contribute to WPB, WPC1, WPC2, WPC3 and WPD through coordination and support activities. In WPD it will also contribute to the study of the distributed facility option and will make a small contribution in WPN related to the implementation of the data distribution model.

### 9. National Observatory of Athens

The NESTOR Institute of Astroparticle Physics of the National Observatory of Athens (NOA) has been leading the Greek effort in neutrino telescoping since the early 1990's. As the only public research organisation exclusively engaged in astroparticle physics it has been nominated by the supervising ministry to act as co-coordinator of WPB. It will also participate in all other WP's except WPA and will coordinate WPG.

### 10. National and Kapodistrian University of Athens

The University of Athens team has been part of the Greek neutrino telescoping effort since its beginnings in the early 1990's. It has acquired extensive experience in matters of marine operations and hardware and will contribute mainly to WPG, with smaller contributions to WPC3, WPD, WPH and WPM.

## **Ireland**

For Ireland no mandate has been given by the Member State.

### 11. Dublin Institute for Advanced Studies

DIAS is the leading Irish centre for studies in cosmic ray physics, astrophysics, astronomy and geophysics. It also has interests in GRID and high-performance computing and virtual observatories. DIAS will contribute to the KM3NeT-PP project by taking part in the political and strategic discussions in WPB and WPD and will act as a link to the TeV gamma astronomy community with regard to data dissemination to the user community (WPI and WPN).

## **The Netherlands**

In the Netherlands, FOM – Foundation for Fundamental Research on Matter – is the funding agency for physics research. Its research division Nikhef, the National institute for subatomic physics, is the leading Dutch institute in the Preparatory Phase of the KM3NeT project. FOM receives the major part of its budget from the Dutch funding agency NWO. In order to secure the Dutch contribution to the investments needed to construct KM3NeT, FOM – via Nikhef – has submitted a dedicated capital investment proposal to NWO. In this proposal an investment budget of 8.8 M€ has been requested. Once approved, another 4.8 M€ will be invested by FOM via Nikhef. The proposal has already be ranked as the highest physics investment proposal of 2008, and is now in competition with proposals from other sciences. A decision regarding this investment proposal will be taken by the summer 2008. Once approved the budget profile is expected to run from late 2008 until 2015. Complementary to these capital investments, the Netherlands expects to commit the equivalent of 1.5 M€ per year in terms of manpower (scientific and technical).

12. Stichting voor Fundamenteel Onderzoek der Materie

In the KM3NeT-PP project, FOM will contribute to the discussion in WPB, investigate the physics performance for several options of a distributed facility (WPD), co-coordinate and make major contributions to WPF and WPL and contribute to the implementation of the data distribution model and the scientific operation model for KM3NeT (WPI and WPN).

22. Stichting Koninklijk Nederlands Instituut voor Zeeonderzoek

NIOZ Royal Netherlands Institute for Sea Research is the National Oceanographic Institution of the Netherlands. In the KM3NeT-PP project, NIOZ will contribute to WPF for the construction and test of the small-scale pre-production model and to the definition of the production model for mass production.

**Romania**

The founding of Romanian research is mostly achieved through research projects, which are selected from submitted proposals after peer review process. The National Authority for Scientific Research and Innovation (ANCS) is the Romanian funding agency for scientific research. ANCS mandated several agencies in its coordination for the management of different research programs inside the National Plan for Research, Development and Innovation 2 (PNCI-2).

13. Institutul National de Cercetare-Dezvoltare Pentru Fizica Laserilor, Plasmei si Radiatiei

The Institutul National de Cercetare-Dezvoltare Pentru Fizica Laserilor, Plasmei si Radiatiei will participate through its affiliate Institute of Space Sciences ISS (in Magurele-Bucharest), that has recently been endorsed as a new participant in the KM3NeT Design Study. ISS has experience in astroparticle physics from its former contribution to the MACRO experiment, at LNGS Gran Sasso, Italy, and is a member of the ANTARES Collaboration. Its contributions to the KM3NeT-PP project are: involvement in the political and strategic processes (WPB, WPC1), investigation of distributed facility options (WPD), pre-production and prototyping activities (WPF).

**Spain**

For Spain CSIC has received a mandate from the Spanish Ministry of Education and Science.

14. Consejo Superiore de Investigaciones Cientificas

CSIC and the University of Valencia cooperate through IFIC as one of the Spanish leading institutes in particle physics. IFIC's group, which has a broad experience in Particle Physics experiments, has made important contributions in ANTARES to the detector design, calibration and data analysis. The contributions of CSIC to the KM3NeT-PP Project are: strategic work to foster the Spanish involvement in the KM3NeT project (WPB), comparison of physics performance of a distributed infrastructure (WPD), and contributions to WPF and WPL.

15. Universitat de Barcelona

Universitat de Barcelona (UB) researchers belong to CRG Marine Geosciences (CRG-MG), a research group that focuses on modern deep-sea ecosystems and their environmental setting, including water column studies, especially in the Mediterranean Sea where CRG-MG has addressed research objectives that are of direct relevance for KM3NeT. CRG-MG has a broad experience on complex sea-going activities. Within KM3NeT-PP, GRC-MG will team up with other relevant partners to contribute to the marine-related aspects of work packages WPE.

UB participates to KM3NeT-PP with a third party called “Fundació Bosch i Gimpera” (FBG). This is a foundation integrated and controlled by the Universitat de Barcelona, and it is in charge of the administrative and financial management of European projects at the UB. The FBG is not a UB subcontractor since it belongs to the UB Group. The FBG is making their resources available to UB. The personnel hired for this project by FBG works on the premises of UB and under its responsibility. Costs of FBG will be charged by UB but recorded in the accounts of FBG.

#### 16. Universidad Politecnica de Valencia

Universidad Politecnica de Valencia takes part in the Acoustic and Optic Devices and Systems R&D program (DISAO). The main research topics are acoustics for neutrino telescopes, both for acoustic positioning in the sea and for acoustic neutrino detection. UPVLC is a member of ANTARES being involved in the positioning calibration system and other tasks. In addition to an involvement in the political/strategic discussions (WPB, WPD), UPVLC will contribute to WPF.

#### 17. Universitat de Valencia

Universitat de Valencia has hands-on experience on time calibration of neutrino telescope. Effectively, UVEG and CSIC form a common group with a common expertise profile and research interest. The UVEG and CSIC objectives concerning the KM3NeT-PP project are therefore very similar. On the managerial/ political side, the representative of Spain in ASPERA will contribute to WPB for UVEG.

### **United Kingdom**

Astroparticle Physics projects such as KM3NeT-PP are funded by the Science and Technology Facilities Research Council (STFC) that has recently formed following a merger of 2 other bodies, namely PPARC and CCLRC. As a consequence of this merger, STFC is currently undergoing an extensive consultation and road-mapping exercise. The UK astroparticle physics groups in KM3NeT-PP (Leeds, Liverpool and Sheffield) are currently preparing a Statement of Interest (SoI), this is the first step towards future STFC funding for KM3NeT-PP. The STFC response to that SoI should be known by Autumn 2008.

#### 18. The University Court of the University of Aberdeen

UNIABDN will be coordinating WPE (Marine and environmental agencies and networks) and support the Environmental Impact Assessment in the KM3NeT-PP project, will be actively involved in WPB and WPC1, and will make smaller contributions to WPH, WPI, WPM and WPN.

#### 19. University of Leeds

The School of Physics and Astronomy at the University of Leeds has expertise in photo-detector development, electronics systems design and physics analysis. The foreseen contributions to the KM3NeT-PP project are in WPB (participation in the political process), WPD (study of staged and/or distributed facilities) and in WPN (data dissemination).

#### 21. University of Sheffield

The Particle Physics and Particle Astrophysics (PPPA) at Sheffield is active in a number of areas of particle astrophysics including neutrino astrophysics and dark matter searches. The group has been involved in the leadership of previous successful EU funding applications including ILIAS. U-Sheffield will participate in the political process in WPB, contribute to calibration issues in WPF, WPL and study GRID options in WPI and WPN.

### **B.2.3. Consortium as a whole**

#### *Sub-contracting*

Some work packages require a certain amount of legal, financial and technical expertise that cannot be provided directly by the beneficiaries. It is necessary to complement the available expertise by external consultants.

A legal consultancy is foreseen in WPC2, WPC3 and WPD to provide an expertise on the legal, financial and policy matters dealt in these Work Packages. The subcontractors will form an integral part and will work very closely with the in house team. About 50000 € for WPC2, 30000 € for WPC3 and 30000 € for WPD are foreseen over the 3 years of the KM3NeT-PP.

A technical consultancy with “AIM consultancy” is required in WPM to provide external expertise in the deployment of the structures, cables and junction boxes as well as the underwater ROV connections. They will also ensure the personnel safety aspects of any sea operations. For the Antares pilot project, AIM consultancy has been responsible for the overall coordination of all the sea operations. An amount of about 121300 € is foreseen over the 3 years of the KM3NeT-PP.

Further subcontracting costs for the provision of legal, financial or technical services may occur during the KM3NeT-PP project.

All subcontracts will respect the Model Grant Agreement and the corresponding documents and additionally corresponding national rules.

#### *Third parties*

The Centre de Physique des Particules de Marseille (CPPM) is an IN2P3 laboratory that participates in the project. This laboratory is a Joint Research Unit “UMR 6550”, members of which are the CNRS and the Université de la Méditerranée Aix-Marseille 2 and, therefore, the personnel of these members participates in the project. The University staff in CPPM involved in the project may be estimated to about 15persons-months for an amount of around 100000 €.

### **B.2.4. Resources to be committed**

#### **WPA**

The activities of WPA are the project management and reporting, that will be carried out through the Project Office, that will have to be established, and by continuous contacts between the coordinator and the other partners.

The indicative budget of 416000 € (excluding indirect cost) contains cost for:

- personnel cost about 84%;
- travel and subsistence about 13.5%;
- consumables about 2.5%.

#### **WPB**

Work package WPB (Political convergence) deals with support activities aimed at establishing committees and ensuring the information flow needed to facilitate the political convergence process. The indicative budget, excluding indirect cost, is 600350 €. It contains cost for:

- personnel cost about 79%;
- travel and subsistence about 18.5%;
- consumables about 2.5%.

### **WPC1**

Work package WPC1 (Governance) deals with support activities aimed at studying the governance model. The indicative budget of the WPC1, excluding indirect cost, is 493100 €.

The budget contains cost for:

- personnel cost about 82%;
- travel and subsistence about 15%;
- consumables about 2.5%.

### **WPC2**

Work package WPC2 (Legal) deals with support activities aimed at studying the legal form. The indicative budget of the WPC2, excluding indirect cost, is 455900 €. About 50000 € for subcontracting are foreseen, as described in section B.2.3.

The budget contains cost for:

- personnel cost about 75%;
- travel and subsistence about 11%;
- consumables about 2.5%.

### **WPC3**

Work package WPC3 (Financial engineering) deals with support activities aimed at studying the funding profile. The indicative budget of the WPC3, excluding indirect cost, is 446300 €. About 30000 € for subcontracting are foreseen, as described in section B.2.3.

The budget contains cost for:

- personnel cost about 78%;
- travel and subsistence about 12%;
- consumables about 2.5%.

### **WPD**

Work package WPD (Strategic issues and international networking) deals with support activities aimed at the comparison of physics performance between different options and promote contacts with other non-EU partners.

The indicative budget of 1101825 € (excluding indirect cost) contains cost for:

- personnel cost about 79%;
- travel and subsistence about 16%;
- consumables about 2%.

An amount of about 30000 € is foreseen for subcontracting as described in paragraph B.2.3.

### **WPE**

Work package WPE (Marine and environmental agencies and networks) aims at coordinating the integration of the KM3NeT infrastructure with the marine and environmental organizations at a national and international level.

The indicative budget of 453925 € (excluding indirect cost) contains cost for:

- personnel cost about 75%;
- travel and subsistence about 21%;



- consumables about 4%.

## **WPF**

Work package WPF (Production preparation) deals with RTD activities aimed at preparing the mass production of the telescope detection units.

The indicative budget of 1211700 € (excluding indirect cost) contains cost for:

- personnel cost about 65%;
- travel and subsistence about 14%;
- consumables about 20%.

## **WPG**

Work package WPG (Industrial partnership for auxiliary vessels) deals with support activities aimed at defining the scheme for surface vessel operation.

The indicative budget of 622000 € (excluding indirect cost) contains cost for:

- personnel cost about 65%;
- travel and subsistence about 17%;
- consumables about 18%.

## **WPH**

Work package WPH (Industrial production for deep sea components) deals with RTD activities aiming at preparing the specifications for the main components of the deep-sea infrastructure.

These activities will be pursued by a specialized engineering team, partly formed by already existing staff personnel and partly to be hired specifically on this project.

The indicative budget of 347000 € (excluding indirect cost) contains cost for:

- personnel cost about 75%;
- travel and subsistence about 22%;
- consumables about 3%.

## **WPI**

Work package WPI (Data and control) deals with RTD activities aimed at creating the framework for the handling of the telescope data. This will require a specialised team equipped with the necessary computing facilities.

The indicative budget of 408700 € (excluding indirect cost) contains cost for:

- personnel cost about 84%;
- travel and subsistence about 11%;
- consumables about 5%.

## **WPL**

Work package WPL (Industrial partnership for production preparation) deals with support activities aimed at assessing the infrastructure and resources needed for mass production of the telescope detection units.

The indicative budget of 754600 € (excluding indirect cost) contains cost for:

- personnel cost about 87%;
- travel and subsistence about 10%;
- consumables about 3%.

## **WPM**

Work package WPM (Industrial partnership for deep sea infrastructures) deals with support activities aimed at identifying solutions for the deep-sea handling infrastructure. These activities will be pursued by an engineering team, partly from existing staff and partly to be hired for the project, through contacts with possible industrial partners.

The indicative budget of 503852 € (excluding indirect cost) contains cost for:

- personnel cost about 62%;
- travel and subsistence about 11%;
- consumables about 4%.

An amount of about 121300 € is foreseen for subcontracting as described in paragraph B.2.3.

## **WPN**

Work package WPN (User support and Impact Assessment) deals with coordination activities aimed at investigating the needs of the user community and assess the impact of the new infrastructure on the ERA.

The indicative budget of 393600 € (excluding indirect cost) contains cost for:

- personnel cost about 79%;
- travel and subsistence about 17%;
- consumables about 2%.

### **B.3. Potential impact**

#### **B.3.1. Strategic impact**

The KM3NeT-PP project will enhance and complement the activities performed in the ongoing KM3NeT DS with the necessary strategic, political, funding, legal, administrative and technical activities required to start construction of the KM3NeT RI in a timely manner, i.e. soon after the KM3NeT-PP completion.

Critical issues addressed in the project are:

- to resolve the absence of adequate decision making mechanisms through which the national and regional political and financial priorities will be reconciled with scientific and technological considerations. Once these mechanisms have been set up (in work package WPB), and start to operate with input from WPC1, WPC2, WPC3 and WPD, work towards multilateral agreement on the joint implementation of the infrastructure will be pursued in a structured environment;
- to structure the technological and financial interplay of the KM3NeT RI with the EMSO Infrastructure, also on the ESFRI Roadmap. Work package WPE is dedicated to this issue;
- to prepare the industrial planning for the KM3NeT RI that has to proceed in the absence of a host organisation (such as CERN) providing expertise and advice. This task is dealt within work packages WPF, WPG, WPH, WPL and WPM;
- to provide data and the required computational resources to the user community (inside and beyond the KM3NeT consortium) and to prepare the control mechanisms for the operation of the KM3NeT RI, again in absence of a centre such as CERN providing the corresponding services. This issue is addressed in WPI and WPN.
- The impact of the KM3NeT-PP project and, beyond that, of the KM3NeT RI on the European Research Area (ERA) will be assessed in the framework of WPN.

Beyond the importance of the KM3NeT-PP project for the KM3NeT RI itself, it will play an important role in consolidating the Europe-wide coordination of astroparticle physics projects, in particular by demonstrating for a prime pilot example of a large European research infrastructure Europe's success as an "incubator", providing invaluable support up to the implementation step. The KM3NeT project is recognised by the European Strategy Forum for Research Infrastructures (ESFRI) on their roadmap of 2006, and it is strongly supported by the Astroparticle Physics European Coordination (ApPEC) in the roadmap "Astroparticle Physics in Roadmap". This latter roadmap is currently being evolved to a priority list of astroparticle physics projects in Europe under coordination of the ERANet project ASPERA initiated by ApPEC. The KM3NeT consortium is well represented in this ongoing process, and the KM3NeT-PP project will provide the basis for reinforcing the KM3NeT interests in the overall Europe-wide science coordination and at the same time help to shape European science policy by providing immediate communication with the relevant political instances.

#### **B.3.2. Risk assessment and related communication strategy**

The primary objectives of the KM3NeT-PP project are:

- to facilitate the political convergence process in matters of site selection, legal and governance issues and financial arrangements;

- to choose the appropriate legal form and governance model;
- to compare the physics performance, technological implications and time-scale issues related to different options for the construction phase;
- to prepare the plans for mass production of the core telescope components and of the deep-sea infrastructure;
- to create a framework for the handling and distribution of the data produced by the neutrino telescope;
- to assess the impact of the KM3NeT research infrastructure

The risks of failure to achieve this will be formally analysed and monitored through a risk management plan that will be produced by the Project Office.

The Risk Management Plan (RMP) will be presented by the PC to the SPB and SC during the first meeting, in order to be discussed and approved.

Risks to the project will be identified by analysis of the project plan. Each risk will be catalogued as follows:

- reference number
- risk title
- risk description
- probability of the risk
- impact of the risk
- date of opening
- date of closing
- early mitigation description

A probability (on a scale from 1 [low] to 5 [high]) will be assigned to each risk and the impact on the project will be classified as low, medium or high.

The PC, with the cooperation of the PO, will keep a register of all the identified risks. During each meeting of the SPC the risk register will be presented. The highest ranked risks are those with high probability and/or highest potential impact on the project.

Each WP Leader will contribute to the redaction of the RMP and will notify, during the project, the PC of any new risk. The WP Leader, the individual or the group directly working on a task will normally be the responsible for the risk. Closure of risks, through successful mitigation measures or completion of tasks will be notified to the coordinator.

## List of Acronyms

**ANTARES:** Astronomy with a Neutrino Telescope and Abyss environmental Research

**ApPEC:** Astroparticle Physics European Coordination

**ASC:** Administrative Standing Committee

**ASPERA:** AStroParticle ERAnet

**AUV:** Autonomous Underwater Vehicle

**CA:** Consortium Agreement

**EIA:** Environmental Impact Assessment

**EIB:** European Investment Bank

**EMSO:** European Multidisciplinary Seas Observatory

**ERA:** European Research Area

**ESFRI:** European Strategy Forum on Research Infrastructures

**ESONET:** European Seas Observatory Network

**GOOS:** Global Ocean Observing System

**HERMES:** Hotspot Ecosystem Research on the Margins of European Seas

**KM3NeT-DS:** KM3NeT Design Study

**KM3NeT-PP:** KM3NeT Preparatory Phase

**MEGO:** Marine Environment and Geosciences Observatory

**NEMO:** Neutrino Mediterranean Observatory

**NESTOR:** Neutrino Extended Submarine Telescope with Oceanographic Research

**NoE:** Network of Excellence

**OTN:** Ocean Tracking network

**PC:** Project Coordinator

**PM:** Production Model

**PPM:** Pre-Production Model

**PO:** Project Office

**QA:** Quality Assurance

**QC:** Quality Control

**RI:** Research Infrastructure

**RMP:** Risk Management Plan

**ROV:** Remotely Operated Vehicle

**SC:** Steering Committee

**SSC:** Scientific Standing Committee

**SPC:** Strategic Project Board

**WP:** Work Package