THEME [ENV.2012.6.4-2]
[Long-term monitoring experiment in geologically active regions of Europe prone to natural hazards: the Supersite concept]

Grant agreement for: Collaborative project*

Annex I - "Description of Work"

Project acronym: MARsite

Project full title: " New Directions in Seismic Hazard assessment through Focused Earth Observation in the Marmara Supersite "

Grant agreement no: 308417

Version date: 2012-10-08

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Part A

Workplan Tables

A1: Project summary

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per project

General information			
Project title [3]	New Directions in Seismic Hazard assessment through Focused Earth Observation in the Marmara Supersite		
Starting date [4]	01/11/2012		
Duration in months [5]	36		
Call (part) identifier [6]	FP7-ENV-2012-two-stage		
Activity code(s) most relevant to your topic [7]	ENV.2012.6.4-2: Long-term monitoring experiment in geologically active regions of Europe prone to natural hazards: the Supersite concept		
Free keywords [8]		Supersite, Seismic Hazard, Marmara Region, Real-time Monitoring	

Abstract [9]

The recent devastating earthquakes and associated tsunamis in Japan, Indonesia, and Haiti, which killed more than half a million people, highlighted how mankind is still far away from a satisfactory level of seismic risk mitigation. Among the regions around the Mediterranean Sea for which earthquakes represent a major threat to their social and economic development, the area around the Marmara Sea, one of the most densely populated parts of Europe, is subjected to a high level of seismic hazard. For this region the MARSITE project is proposed with the aim of assessing the “state of the art” of seismic risk evaluation and management at European level. This will be the starting point to move a “step forward” towards new concepts of risk mitigation and management by long-term monitoring activities carried out both on land and at sea.

The MARSITE project aims to coordinate research groups with different scientific skills (from seismology to engineering to gas geochemistry) in a comprehensive monitoring activity developed both in the Marmara Sea and in the surrounding urban and country areas. The project plans to coordinate initiatives to collect multidisciplinary data, to be shared, interpreted and merged in consistent theoretical and practical models suitable for the implementation of good practices to move the necessary information to the end users.

A2:
List of Beneficiaries

Project Number [1]	308417	Project Acronym [2]	MARsite

List of Beneficiaries

No	Name	Short name	Country	Project entry month[10]	Project exit month
1	BOGAZICI UNIVERSITESI	KOERI	Turkey	1	36
2	Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum	GFZ	Germany	1	36
3	TURKIYE BILIMSEL VE TEKNOLOJIK ARASTIRMA KURUMU	TUBITAK	Turkey	1	36
4	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	IFREMER	France	1	36
5	ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA	INGV	Italy	1	36
6	ISTANBUL UNIVERSITY	IU	Turkey	1	36
7	KOCAELI UNIVERSITESI	KOU	Turkey	1	36
8	ISTANBUL TEKNIK UNIVERSITESI	ITU	Turkey	1	36
9	CONSIGLIO NAZIONALE DELLE RICERCHE	CNR (ISMAR-IREA)	Italy	1	36
10	BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES	BRGM	France	1	36
11	CENTRO EUROPEO DI FORMAZIONE E RICERCA IN INGEGNERIA SISMICA	EUCENTRE	Italy	1	36
12	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	CNRS	France	1	36
13	INSTITUT NATIONAL DE L ENVIRONNEMENT ET DES RISQUES INERIS	INERIS	France	1	36
14	AMRA - ANALISI E MONITORAGGIO DEL R ISCHIO AMBIENTALE SCARL	AMRA	Italy	1	36
15	Euro-Mediterranean Seismological Centre	EMSC	France	1	36
16	EUROPEAN SPACE AGENCY	ESA	France	1	36
17	UNIVERSITA DEGLI STUDI DI PAVIA	UNIPV	Italy	1	36
18	INSTITUT FRANCAIS DES SCIENCES ET TECHNOLOGIES DES TRANSPORTS, DE L'AMENAGEMENT ET DES RESEAUX	IFSTTAR	France	1	36
19	GURALP SYSTEMS LTD	Guralp Systems Limit	United Kingdom	1	36
20	DAIMAR SRL	DAIMAR srl	Italy	1	36

No	Name	Short name	Country	Project entry month[10]	Project exit month
21	SARMAP SA	sarmap S.A.	Switzerland	1	36

A3: Budget Breakdown

Project Number [1]	308417	Project Acronym [2]	MARsite

One Form per Project

Participant number in this project [11]	Participant short name	Fund. % [12]	Ind. costs [13]	Estimated eligible costs (whole duration of the project)					Requested EU contribution
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D	
1	KOERI	75.0	T	956,880.00	0.00	420,000.00	0.00	1,376,880.00	1,137,660.00
2	GFZ	75.0	T	551,760.00	0.00	0.00	0.00	551,760.00	413,820.00
3	TUBITAK	75.0	T	981,598.40	0.00	0.00	0.00	981,598.40	736,198.80
4	IFREMER	75.0	A	331,000.00	0.00	0.00	0.00	331,000.00	248,250.00
5	INGV	75.0	T	790,800.00	0.00	0.00	0.00	790,800.00	593,100.00
6	IU	75.0	A	484,560.00	0.00	0.00	0.00	484,560.00	363,420.00
7	KOU	75.0	F	93,000.00	0.00	0.00	0.00	93,000.00	69,750.00
8	ITU	75.0	T	253,520.00	0.00	0.00	0.00	253,520.00	190,140.00
9	CNR (ISMAR-IREA)	75.0	S	288,600.00	0.00	0.00	0.00	288,600.00	216,450.00
10	BRGM	75.0	A	356,400.00	0.00	0.00	0.00	356,400.00	267,300.00
11	EUCENTRE	75.0	T	77,760.00	0.00	0.00	0.00	77,760.00	58,320.00
12	CNRS	75.0	T	225,883.20	0.00	0.00	0.00	225,883.20	169,412.40
13	INERIS	75.0	A	179,399.00	0.00	0.00	0.00	179,399.00	134,549.25
14	AMRA	75.0	T	99,680.00	0.00	0.00	0.00	99,680.00	74,760.00
15	EMSC	75.0	T	0.00	0.00	0.00	132,320.00	132,320.00	132,320.00
16	ESA	75.0	S	176,400.00	0.00	0.00	0.00	176,400.00	132,300.00
17	UNIPV	75.0	T	81,080.00	0.00	0.00	0.00	81,080.00	60,810.00
18	IFSTTAR	75.0	T	80,560.00	0.00	0.00	0.00	80,560.00	60,420.00
19	Guralp Systems Limit	75.0	S	499,128.00	0.00	0.00	0.00	499,128.00	374,346.00
20	DAIMAR srl	75.0	T	314,880.00	0.00	0.00	0.00	314,880.00	236,160.00

Participant number in this project [11]	Participant short name	Fund. % [12]	Ind. costs [13]	Estimated eligible costs (whole duration of the project)					Requested EU contribution
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D	
21	sarmap S.A.	75.0	S	394,400.00	0.00	0.00	0.00	394,400.00	295,800.00
Total				7,217,288.60	0.00	420,000.00	132,320.00	7,769,608.60	5,965,286.45

Note that the budget mentioned in this table is the total budget requested by the Beneficiary and associated Third Parties.

*** The following funding schemes are distinguished**

Collaborative Project (if a distinction is made in the call please state which type of Collaborative project is referred to: (i) Small of medium-scale focused research project, (ii) Large-scale integrating project, (iii) Project targeted to special groups such as SMEs and other smaller actors), Network of Excellence, Coordination Action, Support Action.

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project, and it cannot be changed. The project number **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

2. Project acronym

Use the project acronym as indicated in the submitted proposal. It cannot be changed, unless agreed during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry info force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a detailed justification on a separate note.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Activity code

Select the activity code from the drop-down menu.

8. Free keywords

Use the free keywords from your original proposal; changes and additions are possible.

9. Abstract

10. The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

11. The number allocated by the Consortium to the participant for this project.

12. Include the funding % for RTD/Innovation – either 50% or 75%

13. Indirect cost model
- **A: Actual Costs**
- **S: Actual Costs Simplified Method**
- **T: Transitional Flat rate**
- **F :Flat Rate**

Workplan Tables

Project number

308417

Project title

MARsite—New Directions in Seismic Hazard assessment through Focused Earth Observation in the Marmara Supersite

Call (part) identifier

FP7-ENV-2012-two-stage

Funding scheme

Collaborative project

WT1
List of work packages

Project Number [1]	308417	Project Acronym [2]	MARsite

LIST OF WORK PACKAGES (WP)

WP Number [53]	WP Title	Type of activity [54]	Lead beneficiary number [55]	Person-months [56]	Start month [57]	End month [58]
WP 1	Coordination and Project Management	MGT	1	57.00	1	36
WP 2	Land-based long-term multi-disciplinary monitoring	RTD	5	75.00	1	36
WP 3	Long-term Continuous Geodetic Monitoring of Crustal Deformation	RTD	3	122.50	1	36
WP 4	Establishment of Borehole Observation System and High Resolution Seismic Studies in the Marmara Sea	RTD	6	150.50	1	36
WP 5	Real- and quasi-real-time Earthquake and Tsunami Hazard Monitoring	RTD	1	83.00	1	36
WP 6	Earthquake-Induced Landslide Hazard in Marmara	RTD	13	55.60	1	30
WP 7	Re-evaluation of the seismo-tectonics of the Marmara Region	RTD	8	63.00	1	36
WP 8	Monitoring seismicity and fluid activity near the fault using existing cabled and autonomous multipa	RTD	4	84.00	1	34
WP 9	Early Warning and Development of the Real-time shake and loss information	RTD	1	56.40	1	36
WP 10	Integration of data management practices and coordination with ongoing research infrastructures	RTD	10	35.00	1	36
WP 11	Dissemination	OTHER	15	16.00	1	36
			Total	798.00		

WT2:
List of Deliverables

Project Number [1]	308417	Project Acronym [2]	MARsite

List of Deliverables - to be submitted for review to EC

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D1.1	Project web-portal	1	1	2.00	O	CO	1
D1.2	Kick-off meeting report	1	1	2.00	R	RE	3
D1.3	Midterm Review Workshop report	1	1	6.00	R	RE	20
D1.4	Annual public report - 1	1	1	4.00	R	PU	12
D1.5	Annual public report - 2	1	1	4.00	R	PU	24
D1.6	Annual public report - 3	1	1	4.00	R	PU	36
D2.1	Report on multi-parameter data collection and integration from the Marmara area	2	5	23.00	R	PU	36
D2.2	Report on the status and improvement of the continuous fluid monitoring system	2	5	15.00	R	PU	30
D2.3	Report on multi-parameter data analysis including natural degassing distribution (CO2, CH4, Rn)	2	5	16.00	R	PU	34
D2.4	Report on interpretative models for correlating gas, crustal deformation and seismic activity	2	5	21.00	R	PU	34
D3.1	GPS Time Series and Velocity Maps	3	3	18.50	R	RE	18
D3.2	Deformation map obtained	3	3	9.00	R	RE	18

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
	by applying the SBAS and/or PSI technique to a sample C-band SAR data set						
D3.3	Deformation map obtained by applying the SBAS and/or PSI technique to a sample X-band SAR data set	3	3	7.00	R	RE	24
D3.4	Deformation map obtained by applying the SBAS and/or PSI technique to a sample L-band SAR data set	3	3	7.00	R	RE	36
D3.5	Deformation time series obtained by exploiting C-band data from Terrafirma project	3	3	7.00	O	RE	18
D3.6	Deformation maps obtained from the harmonization of InSAR and GPS data integration	3	3	17.00	D	RE	24
D3.7	Identification and localization of primary and secondary fault branches	3	3	17.00	R	RE	18
D3.8	Release of subsampling & modelling routines analytical model & 3-D numerical model of the observed d	3	3	16.00	R	RE	30
D3.9	Temporary license of the updated SARscape	3	3	5.00	P	RE	32

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
	advanced InSAR processing chain, including the support o						
D3.10	Report on methods and algorithms implemented for supporting advanced DInSAR processing and validatio	3	3	5.00	R	PU	36
D3.11	Temporary license of the updated SARscape advanced InSAR processing chain	3	3	5.00	P	CO	20
D3.12	Report on exploitation of independent sources for APS estimation and minimization	3	3	5.00	R	PU	24
D3.13	ERS and ASAR displacement time series obtained by exploiting independent sources for APS estimatio	3	3	4.00	P	PU	24
D4.1	Surface microearthquake array and borehole seismometers implementation	4	6	78.00	R	PU	18
D4.2	Report on the analysis of the response of the near surface geology on earthquake ground motion	4	6	23.00	R	PU	36
D4.3	Report on the high-resolution monitoring	4	6	19.50	R	PU	36

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
	in the Sea of Marmara using land-based arrays						
D4.4	Report on the high-resolution monitoring and analysis of the seismicity and velocity perturbations	4	6	10.00	R	PU	36
D4.5	Report on detection and cross-correlation of quarry blasts and receiver functions	4	6	10.00	R	PU	18
D4.6	Report on statistical analysis and modelling of seismic cluster triggering mechanisms	4	6	10.00	R	PU	36
D5.1	Upgrade of 16 GPS stations	5	1	20.00	P	PU	24
D5.2	Existing data set configuration for the further analyses and simulations and configuration scrutiny	5	1	21.00	O	RE	15
D5.3	Performance assessment of finite-fault inversion codes in the Marmara configuration	5	1	4.50	R	RE	30
D5.4	Near real-time estimation of most relevant earthquake source parameters	5	1	4.50	R	RE	30
D5.5	Ground motion simulation tools calibrated for the Marmara area	5	1	4.50	R	RE	24

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
	and synthetic PGV maps						
D5.6	Characteristics of tsunami source region in the Marmara region	5	1	7.50	R	RE	24
D5.7	Tectonic origin tsunami scenario database for the Marmara region	5	1	7.50	O	CO	36
D5.8	Improvement of probabilistic seismic hazard assessment for Marmara region	5	1	13.50	R	RE	36
D6.1	Report on local instability areas and advanced susceptibility mapping -1	6	13	21.10	O	RE	16
D6.2	Report on local instability areas and advanced susceptibility mapping -2	6	13	19.00	O	RE	24
D6.3	Report on the numerical modelling of ground motion and local site effects	6	13	15.50	R	RE	30
D7.1	Report on the re-evaluation of the seismo-tectonics and geo-hazards of the Marmara region	7	8	42.00	R	PU	36
D7.2	GIS database of the fault parameters	7	8	9.00	R	RE	36
D7.3	Report on the integration of faulting parameters	7	8	6.00	R	RE	36

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D7.4	Revisited historical earthquake catalogue	7	8	6.00	O	PU	36
D8.1	Report on repeated deployments of autonomous instruments	8	4	19.00	R	PU	26
D8.2	Report on high-resolution micro-earthquake characterization	8	4	16.00	O	CO	12
D8.3	Synthesis report on spectral and statistical analysis of marine multiparameter time series	8	4	11.00	R	PU	34
D8.4	Design of the next generation autonomous, multi-parameter seafloor instrumentation	8	4	38.00	R	PU	30
D9.1	Improvement of the earthquake risk assessment for Istanbul	9	1	22.00	R	RE	36
D9.2	Prototype landslide early warning monitoring system for the Marmara region	9	1	7.40	O	CO	24
D9.3	Improvement of Istanbul Earthquake Rapid Response System	9	1	23.00	R	RE	36
D9.4	Seismic vulnerability interpretation for risk assessment	9	1	4.00	R	RE	30

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D10.1	First report on the integration and links to other initiatives	10	10	5.00	O	PU	12
D10.2	Second report on the integration and links to other initiatives	10	10	8.00	O	PU	24
D10.3	international standards on architecture principles, metadata, data models, services and links	10	10	9.00	O	PU	18
D10.4	Report on integration of Earth Observation data, products and toolboxes	10	10	13.00	R	PU	30
D11.1	Public web page	11	15	1.00	O	PU	1
D11.2	Analysis of the target users and production of a communication plan	11	15	3.00	R	PU	6
D11.3	Data dissemination report	11	15	3.00	R	PU	24
D11.4	Educational material	11	15	7.00	O	PU	36
D11.5	Short Video	11	15	2.00	R	PU	6
			Total	763.00			

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP1	Type of activity [54]	MGT
Work package title	Coordination and Project Management		
Start month	1		
End month	36		
Lead beneficiary number [55]	1		

Objectives

The main objective of this WP is to ensure the successful completion of the project goals on time within the limits defined by the budgetary framework and quality standards imposed by the EU. This work package will oversee the administrative and financial management and it will ensure financial and scientific/technical coordination, project planning and evaluation of the project progress, while emphasizing quality assurance. The objectives are the following:
- Administration and co-ordination of the project resources, including budget spent and efforts utilized;
- Monitoring and control of the workplan and preparation of detailed workplans;
- Coordination and monitoring of the work among the WP Leaders;
- Compilation and issuing of periodic reports;
- Arrangement of the project level meetings and issuing the minutes;
- Structuring a consortium communication, including deliverables, reviews, etc.; and
- A clear and swift communication between the Project and the EC officers.

Description of work and role of partners

According to the Consortium Agreement drafted with reference to the simplified FP7 Model Consortium Agreement (DESCA 3.0), the Consortium General Assembly (CGA) will be the ultimate decision-making body of the Consortium. The Project Coordinator (PC) will be the legal entity acting as the intermediary between the Parties and the European Commission and will also be responsible for the execution of the Project. The PC will also report to and be accountable to the General Assembly. The Project Manager (PM) is in charge of all operational and management aspects of the project and will report directly. PC and PM will be supported by the MARsite Project Office (PO), which will execute the daily management tasks like the financial and contractual issues, the management of budget and time, the monitoring and execution of quality checks, the reporting to the EC and the PC, the communication and flow of information within the project and the necessary input to the project web portal. PO will be located at KOERI and will provide administrative and financial assistance to the PC and PM. Moreover, Project Coordinator will be assisted by a Project Coordinator Assistant who will also support the Project Manager in quality checks, the reporting to the EC and the PC, the communication and flow of information within the project and the necessary input to the project web portal. An External Expert Advisory Board (EEAB) will be appointed and steered by the PC and the CGA. A project web-portal will be created and maintained. The MARsite web-portal will be an essential element of the internal and external project communication. The portal will provide project overviews and highlights, up-to-date information on project results, including public and periodic reports where appropriate. Additional information project events including meetings, conferences and workshops as well as contact details will be available.
The activities of this work package are divided into three interrelated tasks:

Task 1. Project Management and Communication
The purpose of this task is to ensure effective implementation of the project management procedures through the following activities:
- Establishment and maintenance of a management structure and governance through the preparation and implementation of the Consortium Agreement;
- Coordination with the WP Leaders to plan project-related activities at the project, sub-project and WP levels;
- Elaboration and submission of periodic progress reports and cost statements;

- Cost and time management by maintaining the project budget, and managing the allocation of human and financial resources and related accounting;
- Preparation of annual review reports and review presentations;
- Preparation of annual workplans in coordination with the WP Leaders and revise when necessary;
- Establishment of a communication mechanism through e-mail, phone, video-conferencing, web-based conferencing, fax or face-to-face meetings;
- Organization of a kick-off and regular consortium meetings, prepare agendas, chair the meetings and elaborate minutes;
- Overall coordination and reporting to the EC representatives, including the submission of all project documentation and deliverables; and
- Creation and maintenance of a project web-portal.
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Task 2. External Expert Advisory Board
The purpose of this task is the foundation and maintenance of the External Expert Advisory Board. The EEAB will assist and facilitate the decisions made by the General Assembly of MARsite. The Project Coordinator will be responsible for writing the minutes of the EEAB meetings and prepare the implementation of the EEAB's suggestions. While the work package is organized and maintained by the project coordinator, all partners in the consortium will be contributing to the periodic delivery scheme foreseen.

Task 3. Quality Assurance and risk management
For quality management the following performance indicators will be identified: input, output, outcome and impact indicators. A consistent set of working guidelines will be implemented throughout the whole project. Process management will involve management of documents, which will be undertaken by the PM, whereas management of the quality of the input data will be the joint responsibility of the WP Leaders and the Project Coordinator. This task will include systematic activities to provide confidence that the project will satisfy relevant quality standards and will be performed throughout the project. The main potential risk in MARsite is the large number of participants, which may lead to inadequate communication, difficulty in overall management, insufficient participation and integration. These will be dealt with by the effective coordination among the WP leaders, PC, PM and PO supported by a clear CA and clear description of responsibilities in working plans, which will be dealt with in Task 1. Other risk areas may include deliverables being not on time or lacking quality, which will be addressed by the close monitoring of the project processes by the WP leaders, PC and PM.
The following activities will be carried out:
- Audit and review project plans to ensure the defined processes are followed;
- Audit and review project deliverables to ensure the work performed is according to the project plan;
- Assess the process improvements.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	57.00
	Total	57.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D1.1	Project web-portal	1	2.00	O	CO	1
D1.2	Kick-off meeting report	1	2.00	R	RE	3
D1.3	Midterm Review Workshop report	1	6.00	R	RE	20
D1.4	Annual public report - 1	1	4.00	R	PU	12

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D1.5	Annual public report - 2	1	4.00	R	PU	24
D1.6	Annual public report - 3	1	4.00	R	PU	36
		Total	22.00			

Description of deliverables

D1.1) Project web-portal: [month 1]

D1.2) Kick-off meeting report: [month 3]

D1.3) Midterm Review Workshop report: [month 20]

D1.4) Annual public report - 1: [month 12]

D1.5) Annual public report - 2: [month 24]

D1.6) Annual public report - 3: [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP2	Type of activity [54]	RTD
Work package title	Land-based long-term multi-disciplinary monitoring		
Start month	1		
End month	36		
Lead beneficiary number [55]	5		

Objectives

The aim of WP2 is the collection and integration of seismological, geochemical, and geodetic data to detect and model the interactions between fluids, crustal deformation and ruptures of the active tectonic structures of the Marmara area and, thereby, to contribute to its seismic hazard assessment. We aim to continue the monitoring of pre-earthquake transients by data recorded from the already established stations and networks. We will carry out in-situ measurements of fluid expulsions and their composition to recover information on changes in the fluid conduits and fluids chemistry, possibly related to pre-earthquake crustal deformation. Since some of the pre-earthquake transients might develop due to small nearby earthquakes, we aim to integrate existing seismological networks belonging to TUBITAK, KOERI and Kocaeli University (KOU). Additionally, we propose to develop multi-parameter data analyses and set-up of physical models that will enable us to correlate seismic and deformation activity with changes in near surface fluid (gas and water) emanation.

Description of work and role of partners

The objective of this WP is to collect, manage, and integrate all kinds of useful data for monitoring of the Marmara region. As modifications of the fluid geochemistry are normally related to changes in the mixing ratios of fluids from different sources, the genesis of the circulating fluids (including both gases and waters) and their behaviour in time may allow us to discriminate modifications due to the development of the seismogenesis (crustal deformation) or to episodes of faulting activity (ruptures, seismic shocks). A geochemical survey carried out at regular time intervals (monthly rate) over the time span of the entire project (3 years) integrated with high-frequency data from the existing continuous multidisciplinary monitoring networks will allow us to collect enough data providing the necessary information to discriminate seismogenic-related changes from seasonal and anthropic-induced modifications. The temporal changes of geochemical, geodetic and seismic data will be integrated and modelled to gain a step-forward for a deeper knowledge of the development of the seismogenic processes induced by the NAFZ activity thus contributing to a better assessment of the seismic hazard of the area. Several observations have already suggested (Caracausi et al., 2005; Heinicke et al., 2009; Italiano et al., 2004, 2009a, b) that fluids are intimately linked to a variety of faulting processes. Over the Marmara sea area, fluids generated by deep crustal processes seem to be released by the recent faulting activity (e.g. Geli et al., 2008, Gasperini et al., 2012) supporting the necessity to take a look at the seismic hazard assessment by a multilateral view integrating information coming from seismic activity, fluids geochemistry and crustal deformation.
In this WP coordinated by INGV, 6 different institutions contribute: INGV with geochemical field work for sample collection and natural degassing, laboratory analyses, geochemical data validation and contribution to continuous monitoring and data integration and modelling. TUBITAK, KOERI, KOU, and GFZ with data from existing seismic networks. TUBITAK also with geochemical sample collection and laboratory analyses and contribution on natural degassing measurements, data validation, data sharing, data integration and modelling; GFZ with task 2 coordination, management of continuous monitoring geochemical stations (together with TUBITAK), development of existing network with new stations (together with INGV). Ifremer will promote the consideration in WP2 of the submarine, multi-parameter data collected within WP8. After the multi-parameter data integration, all partners will contribute, to data analyses and modelling.

Task 1. Land-based geochemical and geophysical monitoring (F. Italiano - INGV, KOERI, TUBITAK, KOU)
The aim of the geochemical investigations is the assessment of the chemical and isotopic features of the discharged fluids to be used in an interpretative geochemical model aimed to constrain the fluids/faults

relationships. The geochemical features will allow us to identify the following topics: 1) Chemical and isotopic characterization aimed to constrain the origin of the fluids 2) the main End-Members involved in the studied system (crustal, mantle-derived, radiogenic, etc.); 3) type and degree of water-rock and gas-water interaction processes, 4) Mixing proportions among the End-Members and their temporal changes. As such, the goal of task 1 is to build up a wide geochemical data set regarding fluids circulation, origin and interactions with the faults over the Marmara area. The data will be also combined with those from "Marmara poly-project" (1997). The geochemical survey will include the monthly collection of:
- gas samples for chemical analysis, isotopic analysis of carbon of both CO2 and CH4, isotopic analysis of the noble gases (3He/4He, 36Ar/40Ar);
- water samples to make chemical analysis of major, minor and trace elements, isotopic composition of oxygen and deuterium; and
- samples for dissolved gas analysis to make both chemical and isotopic analyses.

The analytical work can be done by both INGV and TUBITAK that share the samples, perform the analyses validation, and merge the collected data before moving them to the task 3 and 4 activities.
A general survey for natural degassing measurements of CO2, Rn, CH4 will be also carried out at the earlier stage of the project. Since the discharge of any fluid at the surface is an indication of ground discontinuities, the preliminary results, proposed on GIS-generated maps, will allow us to recognize possible hidden fault traces even in the absence of other surface evidences. This aspect might become a very relevant feature of a faulted area to indicate high-risk of future superficial ruptures in coincidence of seismic events.

Task 2. In-situ measurement of fluid expulsions using existing/improved systems (H. Woith – GFZ, TUBITAK, INGV, KOU)
The existing in-land continuous fluid monitoring network is composed of automatic stations equipped with different probes as a function of the specific features of the selected site (e.g. radon soil degassing equipment, temperature and conductivity of thermal springs within the TUBITAK network covering the whole Marmara region; fluid pressure and water level within the local ARNET operated by GFZ). ARNET is located on the Armutlu peninsula SW of Istanbul centred on the western end of the rupture of the 1999 Izmit earthquake. The automatic stations can also perform real-time data transmission and/or in situ data storage. Based on the results of the fluid mapping (task 1) and a critical evaluation of the existing time-series of continuous measurements, we will choose key sites to install and test new fluid monitoring equipment (e.g. instruments to measure the content of dissolved gases developed at INGV) to be integrated with the existing TUBITAK network for radon and springs measurements and the fluid pressure sites of ARNET.

Task 3. Integration of real-time networks data for Marmara area (O. Tan - TUBITAK, KOERI, GFZ, INGV, KOU)
Around the Marmara Sea, KOERI, TUBITAK, KOU and GFZ independently run different networks (see WP4).
In this task, the main goal is to integrate real time data which comes from different networks. The starting point for this task is the collection of existing data from the continuous seismic, geochemical (spring waters and soil radon) and geodetic networks. For example, TUBITAK networks include more than 40 seismological, 35 geochemical and 21 GPS sites. The ARNET (Armutlu Network) includes 23 broadband and short period seismic stations plus 6 accelerometers and 5 hydrothermal stations. All collected data will be organized in a joint database. The existing GPS data will be evaluated, after a daily data cleaning and pre-analysis (to remove the atmospheric noise) and will be ready to serve for the MARsite project. This integration helps in understanding the anomalies in the time series, detect the false anomalies, and will be a powerful tool to interpret data sets together. Briefly, the main output will be a combined data catalogue of the multi-disciplinary observations ready to be processed in Task 4.

Task 4. Multi-parameter data analysis, physical models for correlating geochemical, geodetic and seismic activity (C. Seyis - TUBITAK, KOERI, IFREMER, INGV, KOU)
Data from the land based seismological, geochemical (spring waters and soil radon) and geodetic (microgravity, tilt, GPS) measurements already integrated in a database (task 3) will be analysed by different statistical approaches to remove periodical changes (e.g. earth-tide effects) thus discriminating changes and behaviours closely related to possible speed-up of seismogenic process. Marine data from the fault zone collected within WP8 will also be considered in the present task. Possible pre-earthquake „short-term" anomalies can be recognized and interpreted. Multi-parameter interpretative models can be proposed to contribute to the hazard assessment of the Marmara region.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	10.00
2	GFZ	2.00
3	TUBITAK	29.00
4	IFREMER	6.00
5	INGV	16.00
7	KOU	12.00
	Total	75.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D2.1	Report on multi-parameter data collection and integration from the Marmara area	5	23.00	R	PU	36
D2.2	Report on the status and improvement of the continuous fluid monitoring system	5	15.00	R	PU	30
D2.3	Report on multi-parameter data analysis including natural degassing distribution (CO2, CH4, Rn)	5	16.00	R	PU	34
D2.4	Report on interpretative models for correlating gas, crustal deformation and seismic activity	5	21.00	R	PU	34
		Total	75.00			

Description of deliverables

D2.1) Report on multi-parameter data collection and integration from the Marmara area: Report on multi-parameter data collection and integration from the Marmara area [month 36]

D2.2) Report on the status and improvement of the continuous fluid monitoring system: Report on the status and improvement of the continuous fluid monitoring system [month 30]

D2.3) Report on multi-parameter data analysis including natural degassing distribution (CO2, CH4, Rn): Report on multi-parameter data analysis including natural degassing distribution (CO2, CH4, Rn) [month 34]

D2.4) Report on interpretative models for correlating gas, crustal deformation and seismic activity: Report on interpretative models for correlating gas, crustal deformation and seismic activity [month 34]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP3	Type of activity [54]	RTD
Work package title	Long-term Continuous Geodetic Monitoring of Crustal Deformation		
Start month	1		
End month	36		
Lead beneficiary number [55]	3		

Objectives

In this WP, long-term continuous monitoring of the crustal deformation will be investigated by exploiting the existing geodetic crustal deformation monitoring systems (Marmara Continuous GPS Network, with the complementary GPS surveys) (Task 1). Additionally, we propose to process SAR data, made available through the Supersites Initiatives archives, acquired by the old and new generation radar sensors, to compute the time series of the occurred and on-going surface displacements (Task 2). To this aim, two different advanced InSAR techniques, the SBAS and PSI ones, will be applied to C-, X- and L- band SAR data. Hence, the integration of the GPS, SBAS and PSI measurements (Task 3), with the contribution of seismological data, will allow us to map the dense spatial-temporal evolution of the present-day crustal deformation phenomena affecting the MARsite area. After the separation of the regional and local deformation processes, we will develop analytical and numerical modelling to define the seismic cycle and map the deformations on the secondary branches of the NAFZ (Task 4). While studying the ERS1/2 and ENVISAT radar data sets, we will update the algorithms and software tools for the future ESA GMES Sentinel-1 A and B satellites (Task 5) and we will be ready for the future. To increase the quality of advanced InSAR analysis, we will develop new approaches to reduce the atmospheric in-homogeneities at the time of acquisition of the different SAR images (Task 6). All efforts will be combined to better determine the 4D deformations in order to understand earthquake cycle processes, to develop probabilistic earthquake forecasting models and to constrain the seismic hazard models in the Marmara region.

Description of work and role of partners

Task 1. Land-based continuous monitoring of crustal deformation (R. Cakmak - TUBITAK, ITU, KOERI)
Interpretation of the data, from existing geodetic crustal deformation monitoring systems (Marmara Continuous GPS Network of TUBITAK-MAGNET, with the complementary TUBITAK GPS surveys) show that the Marmara region is subject to faulting, compaction induced subsidence, inflation and landslides, each of which process is posing a hazard to population and infrastructure. This is a crucial task to measure the tectonic strain accumulation across the Istanbul metropolitan area and western section of the 1999 Izmit rupture by combining the InSAR and GPS data. During the project, this task will supply the key geodetic ground control data to other task, based on the short- and long-term deformations in order to produce the hazard maps. MAGNET daily data flows to TUBITAK's archive and merges with historical data, automatically. Using the daily updated archive, the GPS time series will be analysed to catch the short time deformation analysis, continuously. In addition, continuous time-series will be merged with survey data and the velocity maps will be obtained in semi-annual periods, in order to define long-term secular motions in detail.
Task 2. Exploitation of the SBAS and PSI algorithms for surface deformation analysis (M. Manzo - CNR-IREA, BRGM, INGV)
2.1 IREA intends to apply the advanced version of the SBAS technique to X-band SAR data acquired by the new generation radar sensors, made available through the Supersites Initiatives archives. This will allow monitoring the temporal evolution of crustal deformation occurring in selected areas of the NAFZ via the generation of displacement velocity maps and deformation time-series.
2.2 BRGM proposes to process SAR data made available through the Supersites Initiatives archives, acquired by the archived C-band radar sensors to retrieve time-series of surface displacement on selected areas of the NAFZ. This will allow us to map the spatial-temporal evolution of the present-day crustal deformation phenomena affecting the MARsite Area with high level of temporal/spatial details. The goal is to highlight the long-term behaviour of active faults and eventual interactions between structures. Complementarily, where

possible on selected areas -nominally on secondary branches of the NAFZ- we also propose to use the archived example L-Band data to demonstrate the advantages of L-band.
2.3 INGV will define in agreement with the other teams, selected areas over which start a detailed monitoring using the X-band COSMO-SkyMed constellation, with a revisit time of 4 or 8 days in ascending and descending geometries. INGV will also process the COSMO data using the SBAS or PSI techniques, depending on the area. . The high frequency of InSAR monitoring is expected to provide new information on possible deformation transients in the pre-seismic phase, while in case of seismic event the 4D deformation maps will monitor the evolution of the post-seismic strain diffusion. Moreover, the high-resolution deformation maps provided by COSMO are needed in Task 4 to separate the regional and local deformation processes.

Task 3. Integration and harmonization of InSAR, GPS and seismic data (S. Stramondo - INGV, KOERI)
Task 1 of WP2, Tasks 1 and 2 of WP3 and Tasks 1 and 2 of WP5 will be the main data sources for this task. In addition, the PSI products of TERRAFIRMA project will be used. In the framework of TERRAFIRMA the European Space agency (ESA) made available the whole SAR database (ERS-1-2 and Envisat) to be used applying PSI in order to obtain surface velocity maps and time series all over the Marmara Region area. In particular, the available PSI products of TERRAFIRMA cover the time interval 1992-2009. This time interval will be extended with new TerraSAR-X and COSMO-SkyMed data sets. The results will be validated with measurements in Task 1 of WP3 and other in situ data made available in other WPs.
The short-time revisit capability of COSMO-SkyMed data is extremely important when studying the theoretically predicted precursory phenomena to earthquake preparation (dilatancy), and the various processes occurring in the post-seismic phase: dilatancy recovery, pore pressure readjustments, afterslip and visco-elastic relaxation. The integration of high resolution InSAR deformation maps with the precise CGPS measurements is the only possible way to fully appreciate the patterns of these elusive signals, whose understanding is crucial to verify (or develop) the theories describing the seismic cycle.
In conclusion, under the contribution of seismological data sets, we will focus to integration and correlation of different data sources, for different earthquake data sets in the past and future.
INGV In the framework of the European project Terrafirma the European Space agency (ESA) made available the whole SAR database (ERS-1-2 and Envisat) to be used applying PSI in order to obtain surface velocity maps and time series all over the Marmara Region area. In particular, the available PSI products of TERRAFIRMA cover the time interval 1992-2009. This time interval will be extended with new TerraSAR-X and COSMO-SkyMed data sets. The results will be validated with measurements in Task1 of WP3 and other in situ data made available in WPs, and will be used for the modelling activities and CFF estimates in Task 4.
We will carry out the joint analysis of CGPS data and DInSAR time-series, to provide more accurate and cross-validated ground velocity maps. We will use the CGPS data to constrain the deformation components at long spatial wavelengths. Using the different information content of CGPS and DInSAR data we will model the effects of possible error sources due to atmosphere, topography, orbital biases.

Task 4. Separation of the regional and local deformation processes and modelling (T. Walter - GFZ, TUBITAK, IU, ITU, KOERI, INGV)
GPS and InSAR data commonly show various interfingered deformation processes. Separation of the regional and local deformation processes is required to further utilize data for kinematic and physical models. Using decomposition approaches such as those based on singular values, we propose to identify and separate the overlapping deformation signals. The goal is to identify dominant signatures in the data, which might be visually hidden due to their temporal and spatial scale. Furthermore, the task is to use these signals separately for quantitative analysis. This will be done by inversion methods that will be further developed to model both the original data and the decomposed signatures. The aim is to improve understanding of both local processes and regional scale processes. Local processes might be land compaction or landslides. Regional scale deformation processes might be the inter-seismic steady-state plate motion combined with co-seismic and transient deformation processes that have happened in the past, taking the full deformation time series and herewith time dependent rheological complexities into account.
In particular, modelling of the deformation processes is foreseen in the following ways; (a) elastic dislocation block-models with the aim to study microplate kinematics in the framework of major plate convergence, and active strain build-up at block-bounding faults. Kinematically consistent elastic block-model will be used to infer the pattern of fault-coupling on the plate-boundary faults, by a constrained inversion of GPS and InSAR velocity maps. (b) Time-series deformation data (from Multitemporal InSAR and CGPS) will be modelled using both analytical and numerical modelling techniques. Based on principal component analysis the space-time evolution of slip on fault planes is to be investigated during both the interseismic and post-seismic phases (for both archived and new incoming data streams). (c) Modelling of time-series data shall allow investigation of different rheological behaviours in the body and the fault zone, such as those associated with creep, visco-

and poro-elasticity and plastic deformations. (d) Modelling deformation data together with double integration of accelerometer data (see WP5), and finally (e) models shall allow to analyse the fault interaction with the Coulomb Failure Function (CFF), i.e. co-seismic and interseismic perturbations to the regional stress field.
As a final goal, the developed models shall be investigated with respect to microseismological data (see WP2 and WP4) to detect branches of the NAFZ, and to evaluate the power of such improved data handling for probabilistic earthquake forecasting.

Task 5. Extension and the transition into the new (GMES) satellite constellation and data for advanced InSAR analysis (P. Pasquali - SARMAP)
The future ESA GMES Sentinel-1 A and B satellites will represent an unprecedented source of regular, consistent and frequent SAR data, of high interest for any application that calls for continuous monitoring of small terrain displacements. As soon as the constellation will be operational, a continuous coverage will be guaranteed, with one acquisition every 6 days with characteristics suitable for interferometric combination. This feature has been obtained by exploiting a new acquisition modality (TOPS) that, implementing a burst-mode and scanning geometry, allows covering very large areas while worsening some geometric resolution in one (azimuth) of the two directions.
The availability of Sentinel-1 data will also cover the gap after the change of orbit of the ENVISAT satellite that hindered the possibility to continue the formation of displacement time series over long-time intervals. The new Sentinel-1 acquisition modality, while very interesting, calls for a significant update of the algorithms and software tools that are exploited during advanced (PS + SBAS) InSAR analysis of long SAR data time series.
The aim of this Task is first to update an existing operational processing chain for advanced InSAR analysis (the SARscape®Interferometric Stacking module), currently based on stripmap, spotlight and/or ScanSAR acquisitions, to also support the Sentinel-1 TOPS (Interferometric Wide Swath) acquisition mode. The launch of the first Sentinel-1 platform (Sentinel-1A) is currently scheduled for May 2013; it is hence foreseen that some of the developments will be performed with simulated data, and then with not fully-calibrated data originating from the mission's CAL/VAL campaign, when available. The updated processing chain will be then validated and exploited for processing new data obtained from the Sentinel-1 operational phase, to start building new displacement time series.

Task 6. Integrating a few independent sources for atmospheric artefacts reduction (MERIS, MODIS, OSCAR from JPL, GPS) into PSINSAR and SBAS analysis (A. Cantone - SARMAP)
Atmospheric in-homogeneities at the time of acquisition of the different SAR images that are combined together to perform advanced InSAR analysis are a significant source of artefacts (the so-called Atmospheric Phase Screen) and distortions, that ad-hoc filtering aims to minimize to increase the final accuracy of the displacement measurements.
The typical approach of these filtering algorithms relies on different expected temporal and spatial distribution of the APS respect to the displacement signal to be measured. In particular, it is expected that the APS is (for satellite acquisitions separated of one or more days) temporally uncorrelated (high-pass signal), while the deformation signal has a significant temporal correlation (low-pass signal). This assumption is, of course, risky, in particular in case of abrupt events like earthquakes, where discontinuities of the measured displacement are often directly to be related to real deformations and not to artefacts.
The availability of external, independent sources to characterize, estimate and as far as possible subtract APS components is hence a key issue to minimize their impact on the final measurements accuracy and not to risk to mix the atmospheric and displacement signals in what is subtracted from the original data. In this case three main types of sources can be considered: multi-spectral imagery (e.g. MERIS and MODIS sensors), weather forecast (e.g. WRF, ECMWF) models and GNSS (e.g. GPS) measurements; these systems can be exploited to estimate Zenith Path Delay layers at the time of acquisition of the SAR images and compensate for their temporal difference.
One goal of this work-package is to build a set of software bridges between the existing PS and SBAS SARscape® processing chain and ZPD layers obtained from the different cited sources. In particular, one example of such a data source will be the OSCAR system of JPL that allows dedicated software clients to request and obtain ZPD information that is derived from combined MODIS and ECMWF data. Another source of particular interest for ENVISAT ASAR data is the MERIS instrument. This sensor can acquire multi-spectral data at the same time and on the same area of ASAR, providing as standard product a water vapour layer that can be simply converted into ZPD estimation.
The ZPD data will be integrated within the SARscape advanced InSAR processing chain to optimize the APS filtering stages, minimizing artefacts due to possibly wrong assumptions.

The extended processing chain will then be exploited to generate new versions of displacement time series over the test site area, allowing to analyse and to quantify the improvements that can be obtained with this combined approach.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	5.00
2	GFZ	9.00
3	TUBITAK	24.50
5	INGV	20.00
6	IU	12.00
8	ITU	2.00
9	CNR (ISMAR-IREA)	21.00
10	BRGM	5.00
21	sarmap S.A.	24.00
	Total	122.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D3.1	GPS Time Series and Velocity Maps	3	18.50	R	RE	18
D3.2	Deformation map obtained by applying the SBAS and/or PSI technique to a sample C-band SAR data set	3	9.00	R	RE	18
D3.3	Deformation map obtained by applying the SBAS and/or PSI technique to a sample X-band SAR data set	3	7.00	R	RE	24
D3.4	Deformation map obtained by applying the SBAS and/or PSI technique to a sample L-band SAR data set	3	7.00	R	RE	36
D3.5	Deformation time series obtained by exploiting C-band data from Terrafirma project	3	7.00	O	RE	18
D3.6	Deformation maps obtained from the harmonization of InSAR and GPS data integration	3	17.00	D	RE	24
D3.7	Identification and localization of primary and secondary fault branches	3	17.00	R	RE	18

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D3.8	Release of subsampling & modelling routines analytical model & 3-D numerical model of the observed d	3	16.00	R	RE	30
D3.9	Temporary license of the updated SARscape advanced InSAR processing chain, including the support o	3	5.00	P	RE	32
D3.10	Report on methods and algorithms implemented for supporting advanced DInSAR processing and validatio	3	5.00	R	PU	36
D3.11	Temporary license of the updated SARscape advanced InSAR processing chain	3	5.00	P	CO	20
D3.12	Report on exploitation of independent sources for APS estimation and minimization	3	5.00	R	PU	24
D3.13	ERS and ASAR displacement time series obtained by exploiting independent sources for APS estimation	3	4.00	P	PU	24
		Total	122.50			

Description of deliverables

D3.1) GPS Time Series and Velocity Maps: GPS Time Series and Velocity Maps [month 18]

D3.2) Deformation map obtained by applying the SBAS and/or PSI technique to a sample C-band SAR data set: Second set of GPS Time Series and Velocity Maps [month 18]

D3.3) Deformation map obtained by applying the SBAS and/or PSI technique to a sample X-band SAR data set: Deformation map obtained by applying the SBAS and/or PSI technique to a sample X-band SAR data set [month 24]

D3.4) Deformation map obtained by applying the SBAS and/or PSI technique to a sample L-band SAR data set: Deformation map obtained by applying the SBAS and/or PSI technique to a sample L-band SAR data set [month 36]

D3.5) Deformation time series obtained by exploiting C-band data from Terrafirma project: Deformation time series obtained by exploiting C-band data from Terrafirma project [month 18]

D3.6) Deformation maps obtained from the harmonization of InSAR and GPS data integration: Deformation maps obtained from the harmonization of InSAR and GPS data integration [month 24]

D3.7) Identification and localization of primary and secondary fault branches: Identification and localization of primary and secondary fault branches [month 18]

D3.8) Release of subsampling & modelling routines analytical model & 3-D numerical model of the observed d: Release of subsampling & modelling routines analytical model & 3-D numerical model of the observed deformation for selected areas [month 30]

D3.9) Temporary license of the updated SARscape advanced InSAR processing chain, including the support o: Temporary license of the updated SARscape advanced InSAR processing chain, including the support of Sentinel-1 data [month 32]

D3.10) Report on methods and algorithms implemented for supporting advanced DInSAR processing and validatio: Report on methods and algorithms implemented for supporting advanced DInSAR processing and validation of displacement time series obtained on the test site based on Sentinel -1 data [month 36]

D3.11) Temporary license of the updated SARscape advanced InSAR processing chain: Temporary license of the updated SARscape advanced InSAR processing chain, including the support of OSCAR, MERIS, MODIS and other independent sources for APS estimation and minimization [month 20]

D3.12) Report on exploitation of independent sources for APS estimation and minimization: Report on exploitation of independent sources for APS estimation and minimization, and on comparison of results of advanced DInSAR processing of the Site, with and without exploitation of the independent sources [month 24]

D3.13) ERS and ASAR displacement time series obtained by exploiting independent sources for APS estimation: ERS and ASAR displacement time series obtained by exploiting independent sources for APS estimation and minimization over the test site [month 24]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP4	Type of activity [54]	RTD
Work package title	Establishment of Borehole Observation System and High Resolution Seismic Studies in the Marmara Sea		
Start month	1		
End month	36		
Lead beneficiary number [55]	6		

Objectives

Objectives
The main objective of this WP is to install a multi-parameter borehole system and surface array as closest as to the main Marmara Fault (MMF) in the western Marmara Sea, and measure continuously the evolution of the state of stress of the fault zone surrounding the MMF and to detect any anomaly or change which may occur before earthquakes by making use of the data from the arrays already running in the eastern part of the Marmara Sea. The data from the new borehole system is also integrated to the data set to be used in the analysis.
The key objectives of this WP are the following.
- To design and build multiparameter borehole system consisting of very wide dynamic range and stable borehole (VBB) broad band seismic sensor, and incorporate 3-D strain meter, tilt meter, and temperature and local hydrostatic pressure measuring devices,
- Determination of 1-D S-wave velocity structure beneath the borehole system by array microtremor measurements,
- Combining borehole and surface network data for earthquake location improvement,
- Determination of surface and near-surface effects on seismic waves,
- Estimation of the near-surface geology effects masking the source related information.
- Monitoring rupture nucleation and propagation using borehole and surface array data,
- Closely inspection and monitoring of the last stages of the preparation stage of a major rupture,
- To measure continuously the evolution of the state of stress of the fault zone surrounding the Main Marmara Fault (MMF), and to detect any anomaly or change which may occur before earthquakes,
- To identify the presence of repeating earthquakes along the MMF,
- To better understand the existing seismically active structures and their role in local tectonic settings,
- To understand the stress transfer mechanism from east to west,
- To obtain continuous high resolution locations of micro-seismicity including development of relative location technique from cross-correlation methods (multiplet analysis) and study the space-time evolution of the activity,
- To search for low frequency events (non-volcanic tremor) from continuous recording,
- To analyze triggering mechanisms like Coulomb transfer, aseismic slip, or fluid migration and possible declustering methods.
These activities will be performed by four well instrumented networks; one is multiparameter borehole system which will be deployed in the frame of this project, in the western part of MMF, and the other three which are already running are; 1) PIRES array having two sub arrays each consisting of five seismic stations located on the Princess Islands, very close to the MMF, 2) CINNET array located around Cinarcik Basin in the eastern part of MMF. The data from these networks will be integrated and outputted to other workpackages, especially to WP2, WP3 and WP6.

Description of work and role of partners

Task 1. Deployment of surface microearthquake array and borehole seismometers and integrating of borehole and surface array data for better location of microearthquakes (O. Ozel - IU, GURALP Systems(SME), GFZ, TUBITAK)
Bringing face to face the seismograms of microearthquakes recorded by borehole and near-surface instruments portrays quite different contents. The shorter recording duration and nearly flat frequency spectrum up to the

Nyquist frequencies of borehole records are faced with longer recording duration and rapid decay of spectral amplitudes at higher frequencies of a surface seismogram. The main causative of the observed differences are near-surface geology effects that masks most of the source related information the seismograms include, and that give rise to scattering, generating longer duration seismograms.
In view of these circumstances, studies on microearthquakes employing surface seismograms may bring on misleading results. Particularly, the works on earthquake physics and nucleation process of earthquakes requires elaborate analysis of tiny events. It is obvious from the studies on the nucleation process of the 1999 Izmit earthquake that tens of minutes before the major rupture initiate noteworthy microearthquake activity happened (Bouchon et al.,). The starting point of the 1999 rupture was a site of swarm activity noticed a few decades prior the main shock. Nowadays, analogous case is probable in western Marmara sea region, prone to a major event in near future where the seismic activity is prevailing along the impending rupture zone. Deploying a borehole seismometer e.g. in Marmara Island and/or eastern end of the Ganos fault zone may yield invaluable data to closely inspect and monitor the last stages of the preparation stage of major rupture.
The proposed Multiparameter digital Borehole seismic station will use the latest update technologies and design ideas to record “Earth tides” signals to the smallest magnitude -3 events. As the region is seismically active, strong motion sensors will also be incorporated so as to cover the widest dynamic range ever recorded in borehole systems. The Measurements of other parameters with the confines of a deep borehole will assist the study of seismology to give better understanding of seismic activities. The additional parameters are: local tilt, temperature, local hydrostatic pressure, local “3-D strain” and acoustic signals. The data collected by this system will be used in other tasks in the package, especially Task 2 and Task 3.

Task 2. Analyzing response of near-surface geology to earthquake ground motion and its effects masking the source related information through borehole data (S. Parolai - GFZ, IU)
This task will take advantage of the data from multi-parameter borehole system and surface array (Task 1). Strong motion data recorded by vertical arrays of accelerometers offer the opportunity to study the propagation of the waves in the subsoil. However, boreholes recording, that due to the lower signal-to-noise ratio and a smaller effect of the shallow layer attenuation might seems to be more appropriated to study source parameters and to determine the input ground motion, are affected by the contamination of down-going waves (Parolai et al., 2009) that have therefore to be removed before any estimation of source parameters can be carried out. On the other hand, the surface recordings might be strongly biased by the site response that has to be accounted for. Within this task, different methods for correcting the borehole seismograms, both based on the knowledge of the subsoil structure or independent from it (Bindi et al., 2010), will be tested, improved, and developed. The influence of the amplitude of ground motion recorded in the results of the different correction schemes (and therefore in turn on the source parameters, and in the estimation of the input ground motion) will be estimated. A close cooperation is envisaged with Task 1 of WP9, where recordings from data installed in nearby buildings (SOSEWIN) will also be examined.

Task 3. Monitoring the fault zone and source process in the near field (M. Bouchon - CNRS, KOERI, IU)
Continuous evolution of fault zone properties:
The zones surrounding major faults are highly fractured and their physical properties (density of open fractures, fluid presence and circulation, velocity of seismic waves) evolve with their state of stress. Recent advances based on seismic noise correlation techniques (Campillo and Paul, 2003), allow very fine measurements of possible changes in seismic wave velocities over time. We propose to use these techniques to monitor the evolution of seismic wave velocities in the zone surrounding the Main Marmara Fault (MMF).
We will proceed in two major stages. First, we will test the application of seismic noise correlation to the Marmara Sea environment and to the configuration of its permanent seismic stations. This will help define the stations and the paths of the seismic waves, which best sample the fault zone.
In a second stage, we will try to set-up and organize a semi-automatic system, which, from the Kandilli Observatory, will correlate the seismic signals and make a daily monitoring of the seismic wave velocities in the fault zone.
The objective of this work is to measure continuously the evolution of the state of stress of the fault zone surrounding the MMF and to detect any anomaly or change which may occur before earthquakes.
Search for repeating earthquakes on the Main Marmara Fault:
Recent advances in measuring deformation at the earth surface have changed considerably our view and understanding of how tectonic plates move relative to one another. With the discoveries of non-volcanic tremors, low-frequency earthquakes, slow slip events, and silent earthquakes over the last decade, our knowledge of the dynamics of plate motion has changed dramatically and has been greatly enriched. We now know that plate boundaries can slip in a variety of ways between the continuous slip that takes place at depth and the catastrophic slip of the large earthquakes. Because all the slip modes of a plate interface, like the North

Anatolian Fault, necessarily interact with one another, understanding where and when large earthquakes will occur requires accurate measurements of the various modes of slip of the interface. In this respect, repeating earthquakes have proven to be a powerful tool to investigate if a fault is slowly slipping (Vidale et al., 1994). Repeating earthquakes are small seismic events, typically a few hundred meters in size, which occur repetitively from time to time at exactly the same place. Each time they rupture the same patch of the fault, which requires a continuous reloading of stress. This reloading is produced by the slow slip of the fault area surrounding the patch. Thus, the simple presence of repeating earthquakes on a fault segment implies that this segment is slowly creeping. The amplitude and timing of these repeating events gives an estimate of the amount of slow slip that is occurring.
We will try to identify the presence of repeating earthquakes along the Main Marmara Fault. In a first stage this will require the fine relocation of events that occur along the various segments of the MMF and, in a second stage, the development of a computer code able to identify recurrent seismic waveforms. If we find these repeating events, we will model their source and study their timing to infer the presence and the rate of slow slip occurring. The observation that the Izmit earthquake began 44 minutes before the catastrophic rupture with the slow slip of the fault at depth, accelerating as the time to the earthquake was approaching (Bouchon et al., 2011), emphasizes the close connection that we think exists between slow slip and the nucleation of large earthquakes.
Task 4. High Resolution Seismology in Marmara Sea with Arrays (M. Aktar - KOERI, GFZ, CNRS, TUBITAK)
The Çınarcık Basin (CB) is the complex transition zone between the unruptured main Marmara Fault and the recently ruptured zone of Izmit-Duzce earthquake sequence. The details of the actual deformation in the basin are poorly understood despite the fact that it is critical in understanding the stress transfer mechanism from east to west. The microseismic activity provides the most effective keys for developing a realistic model of the on-going deformation (Bohnhoff et all, 2006). The seismic events on the inferred Northern Boundary Fault on the Cinarcik Basin are rare but provide the essential clues for the prominent rupture in Marmara Sea (Örgülü & Aktar, 2002; Karabulut et al, 2002; Özalaybey et al, 2002). Since the seismogenic zone is entirely offshore and the number of permanently operating OBS is very limited, a permanent seismic array (PIRES) was installed on the Prince Islands, at few kilometres distances to the fault. The array consists of two subarrays installed on the two outermost islands (Yassiada and Sivriada) of the Princes Islands group offshore Istanbul. Each PIRES subarrays consist of five seismic stations at the surface spaced in a cross-shape layout. The use of the array data improved by an order of magnitude both the detection and the resolution capabilities of the seismic monitoring on the northern boundary of CB (Bulut et al, 2009). The network has recently been enlarged towards the other Princes Islands in order to improve the azimuthal control of the focal area. We additionally integrate data from local permanent stations; the ARNET seismic network on the Armutlu peninsula and CINNET array (Task 5). Combined data allowed obtaining a well-resolved scale for the hypocentral map to better understand the existing seismically active structures and their role in local tectonic settings.
Second order source properties of the local activity will also be monitored in view of the observations published recently by Bouchon et al. (2011) related to the precursory phenomena of Izmit Earthquake (1999). PIRES arrays were already used to reveal the fine details of time dependent spectral properties of seismic swarms in Çınarcık Basin (Bulut et al, 2011). We plan to monitor whether the well-known scaling of corner frequency and moments holds for repeating events of various order of magnitude or if an intermediate behaviour similar to the Izmit Precursors can be observed.
The PIRES arrays will also be used to study the structural properties of the fault zone. Since the Marmara Fault is entirely offshore, the PIRES arrays are the only on-land stations which are located closest the fault zone in the whole of Marmara Sea. They are therefore best positioned to monitor the properties of the fault zone at close distance. The high accuracy of array processing will allow the monitoring of any possible structural transformation likely to occur inside the fault zone. In particular, a modification of pore pressure is expected to have a signature in the S-wave propagation characteristics. A systematic application of cross-correlation to the array data from active quarries will reveal minor details of the wave propagation at the upper crustal level. A similar on-line monitoring procedure will also be applied to the receiver functions of teleseismic events for monitoring of the total crust.
Task 5. Monitoring structural characteristics on Çınarcık Fault (CINNET) (H. Karabulut - KOERI, CNRS)
The analysis of the seismicity in the Çınarcık basin appears of central importance for addressing the question on the transition from the last Izmit, 1999, Earthquake to the next major event in the Marmara region. A fine monitoring of the seismicity in the East Marmara Sea region might help to address several important questions: how the westward migration of large earthquakes since 1939 will enter the Marmara Sea in a complex transition zone between the Izmit fault and the Main Marmara Fault (Dewey, 1976; Stein et al., 1997). Twelve years after Izmit earthquake, are we back to a background activity and how is this background activity related to the extension deformation of the region (Karabulut et al., 2002) What is the recent evolution of seismic clusters

observed in the Çınarcık basin (Karabulut et al, 2011). What are the interaction mechanisms between the North Anatolian Fault and the regional seismic cluster? Are the seismic clusters related to the nucleation of the major strike-slip events?
The recent analysis of the seismicity history in the Çınarcık Basin (Karabulut et al, 2011) provides interesting information on two types of aftershocks activity: the first type of enhancement is on strike-slip fault segments (Izmit Fault, Princes Island section of the Main Marmara Fault, Gemlik Fault) immediately following the main shock and related to Coulomb stress transfer; the second type of enhancement is attached to extensional clusters (Yalova, Tuzla) with a few days delay in the onset of strong activation, probably related to pore pressure increase. We observe a fast decay of the activity on strike-slip segments and slower evolution of seismic clusters with extensional features. Two years after the Izmit earthquake, seismic activity returned to the pre-earthquake pattern with most of the activity occurring within extensional clusters. It appears that the influence of the last large strike-slip event on the spatial seismicity distribution in the eastern Marmara Sea is less significant than the effect of the long term regional extension.
The CINNET network was deployed in 2008 around the Çınarcık basin to obtain a fine monitoring of the activity in the region (Karabulut et al, 2011). We propose to maintain and develop this network in connection with KOERI regional network. One objective is to update the network with telemetry systems and to implement up to date software for data management (Seiscomp). Scientifically, objectives are threefold: 1) obtain continuous high resolution locations of micro-seismicity including development of relative location technique from cross-correlation methods (multiplet analysis) and study the space-time evolution of the activity (Got et al, 1994); 2) search for low frequency events (non-volcanic tremor) from continuous recording (Shelly and Hardebeck, 2010); 3) analyze triggering mechanisms like Coulomb transfer, aseismic slip, or fluid migration and possible declustering methods.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	17.00
2	GFZ	27.00
3	TUBITAK	4.00
6	IU	52.00
12	CNRS	14.50
19	Guralp Systems Limit	36.00
	Total	150.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D4.1	Surface microearthquake array and borehole seismometers implementation	6	78.00	R	PU	18
D4.2	Report on the analysis of the response of the near surface geology on earthquake ground motion	6	23.00	R	PU	36
D4.3	Report on the high-resolution monitoring in the Sea of Marmara using land-based arrays	6	19.50	R	PU	36

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D4.4	Report on the high-resolution monitoring and analysis of the seismicity and velocity perturbations	6	10.00	R	PU	36
D4.5	Report on detection and cross-correlation of quarry blasts and receiver functions	6	10.00	R	PU	18
D4.6	Report on statistical analysis and modelling of seismic cluster triggering mechanisms	6	10.00	R	PU	36
		Total	150.50			

Description of deliverables

D4.1) Surface microearthquake array and borehole seismometers implementation: Report on surface microearthquake array and borehole seismometers implementation (including system installation and data integration) [month 18]

D4.2) Report on the analysis of the response of the near surface geology on earthquake ground motion: Report on the analysis of the response of the near surface geology on earthquake ground motion [month 36]

D4.3) Report on the high-resolution monitoring in the Sea of Marmara using land-based arrays: Report on the high-resolution monitoring in the Sea of Marmara using land-based arrays (including the design of a semi-automatic monitoring system for noise correlations and the search of seismic tremors) [month 36]

D4.4) Report on the high-resolution monitoring and analysis of the seismicity and velocity perturbations: Report on the high-resolution monitoring and analysis of the seismicity and velocity perturbations in the Sea of Marmara using land-based arrays. [month 36]

D4.5) Report on detection and cross-correlation of quarry blasts and receiver functions: Report on detection and cross-correlation of quarry blasts and receiver functions [month 18]

D4.6) Report on statistical analysis and modelling of seismic cluster triggering mechanisms: Report on statistical analysis and modelling of seismic cluster triggering mechanisms [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP5	Type of activity [54]	RTD
Work package title	Real- and quasi-real-time Earthquake and Tsunami Hazard Monitoring		
Start month	1		
End month	36		
Lead beneficiary number [55]	1		

Objectives

The main aim of this WP is to implement an integrated approach by harmonizing geodetic and seismic data to be used in early warning applications, such as fast centroid moment tensor inversion and rapid slip inversion, so that in addition a quick determination of the rupture characteristics could also assist the identification of the tsunamigenic potential of an earthquake in combination with a tectonic origin tsunami scenario database. This integrated approach will provide a unique performance compared with only seismic or geodetic networks and false alarm will be minimized for Earthquake and Tsunami warnings. Together with a finite source description and calibration of available geodetic and seismic data, a rapid and quantitative Shake map generation scheme will be provided. For this purpose, data processing techniques and computing algorithms will be investigated and designed by making full use of the monitoring system of the MARsite. Rapid source information (not only hypocenter, magnitude but also, for example, rupture directivity) is vital, particularly for damage estimation in the configuration of the Marmara region and Istanbul with respect to the NAFZ, and especially the expected large earthquake. From this point of view inversion of geodetic data immediately enhances the speed and accuracy of the preliminary damage maps. It is intended to create high-resolution geodetic/seismic infrastructure, at a test site, to receive real-time GPS and Seismic data and is to develop and improve analysis techniques and methods to develop PGV shake maps that is obtained with automated finite-source inversion results. Taking into account the continuous geodetic (GPS) data will be a key issue. High resolution geodetic/seismic infrastructure will be installed (update of 26 GPS stations by cGPS with co-deployment of strong-motion sensors) in this area to provide real-time data necessary for the finite-source inversion (Task 1), rapid finite source inversion tools will be improved (Task 2), ground-motion simulation tools will be calibrated (Task 3), a scenario database for both for seismic and tsunami hazard evaluation will be created (Task 4), the final hazard map by taking into account uncertainties and ground-motion variability will be improved (Task 5) and finally long and short-term earthquake forecast maps will be developed (Task 6).

Description of work and role of partners

Task 1. Establishment of appropriate infrastructure (particularly for GPS and strong motion stations in Marmara Region) to obtain real time data (S. Ergintav – TUBITAK, KOERI, IU)
Two objectives of this task are to update 16 of 26 GPS sites in order to establish real-time data transmission and installation of strong ground motion instruments. The acquisition and harmonization of real time GPS and Strong Motion time series will provide excellent time resolution of real time earthquake monitoring and also provide to measurements of tectonic strain accumulation across the Marmara Fault zone. These measurements will also enable a quick determination of the rupture characteristics to assist the identification of the tsunamigenic potential of an earthquake. In other words, this refined and newly established infrastructure and combined GPS and Seismic real time data will contribute to develop real-time applications that allow to closely and rapid monitor earthquake processes and tsunami assessment.
The next-generation geodetic and seismic data can be used for EEW applications, fast centroid moment tensor inversion and rapid slip inversion. This infrastructure will also opportunity to research unknown fault parameters and decisive contribute to refinement of the seismic hazard map for this important region. This integrated approach will provide a unique performance compared with only seismic or geodetic networks and false alarm will be minimized for Earthquake and Tsunami warnings. Currently, the existing GPS monitoring arrays do not provide real-time data because of the absence of proper continuous power and communication infrastructure. All of the GPS sites (26) in Marmara Region will be improved upon by the installation of power source unit, (GPRS

or Satellite). The output of this Task will be real time GPS and Seismic time series and will be an input of the Task 2, 3 and 4.

Task 2. Near real-time determination of the earthquake finite-fault source parameters and models, based on GPS and strong motion data (A. Piatanesi - INGV, KOERI, GFZ, BRGM, IU)
Information about the extended source properties are needed for performing the ground motion simulation associated to the earthquake rupture on the causative fault. The main goal of this task is the fast determination of the earthquake source, with special focus on its finite-fault characteristics.
Analyzing geodetic and seismic data together using a Kalman filter will provide precise and true broadband record of displacements across the entire frequency range, including the static component. These analyses can be done in near real time and are particularly suited for capturing near-source large earthquakes.
In order to improve rapid ground-motion simulations in case of large earthquakes in the Marmara region, a new tool for rapid reconstruction of the rupture process of large earthquakes using near-field strong-motion and high-rate GPS data will be developed. The array-seismological method will be extended by taking into account empirical or synthetic Green's functions. Aim of such method will be providing a fast and reliable estimation of most relevant source parameters (e.g. moment magnitude, fault size, rupture duration, slip centroid) rather than achieving a high spatio-temporal resolution.
Furthermore, two finite-fault inversion programs will be developed, tested and compared. The first code implements a linear technique to invert strong motion and GPS data: it is very fast and produces a model of the earthquake rupture process in term of heterogeneous slip distribution, uniform rise time and constant rupture velocity. The second code is based on a simulated annealing technique: it is slower than the former, but it may handle very complicated rupture model with heterogeneous slip, rise time and rupture velocity, other than several kind of source time function. The performance of the above codes will be assessed in term of accuracy of the solution and quickness of the execution run through several synthetic tests, specifically designed for the Marmara Sea tectonic setting and observational network.

Task 3. Generation of a routine for simulation of strong ground motion based on integrated data (A. Hideo - BRGM, KOERI, INGV)
This task aims to establish the rapid PGV Shake maps through numerical simulations by integrating the various data (GPS and Strong Motion). Most of the automated Shake Map applications are primarily based on point source approximations; however finite source effects are significant for major earthquakes. First of all, in order to understand the variability of the ground motions, we intend to introduce a deterministic-stochastic finite source description (INGV). In parallel, we are going to optimize the existing numerical codes (e.g. finite difference, spectral element) in order to adjust the parameters requested from the expected PGV map resolution and rapidity (BRGM-KOERI). The numerical tools are to be available for further use. Finite source models are obtained from the geodetic and seismic data rapidly for major earthquakes (Tasks 1 & 2). Such information (hypocentre, fault dimension, rupture directivity and velocity, and some more) should be integrated in the simulations, and we examine the rapidity and the precisions of such rapid numerical PGV maps, which are useful for further earthquake and tsunami rapid information infrastructure (Tasks 4, 5 & 6). Multiple windows simulation techniques improved with site correction make it possible to simulate strong ground motion for generation of PGV ShakeMaps. The suitability and sensitivity of the inversion and simulation scheme for producing rapid Shake Maps will be tested by well-recorded earthquakes; however there are limited numbers of medium to large earthquakes that are recorded with GPS receivers. Among them 2004 Parkfield earthquake data can be utilized as test data. This earthquake was recorded at thirteen 1-Hz GPS receivers and several strong motion instruments. Simulated models will also be compared with distribution of ground shaking intensity provided by available Earthquake Early Warning Algorithms.

Task 4. Creating a scenario database for earthquake triggered tsunamis and Testing of the routine with well-studied events (N. Meral Ozel – KOERI, GFZ, INGV, BRGM)
The goal of the present task is to build up a detailed scenario database for all possible earthquakes in the Marmara Sea with a tsunamigenic potential. Due to the very short travel times in Marmara Sea, a Tsunami Early Warning System (TEWS) cannot rely on real-time calculations and has to be based on a pre-computed tsunami scenario database to be queried in real-time, basing on the initial determination of earthquake hypocentre and Magnitude, but also on dislocation models calculated from real-time inversion of geodetic and seismic data (from Tasks 2 and 4), similarly to e.g. the GI-TEWS in Indonesia. Such a database could be inspired to that implemented in the Japanese TEWS, which nonetheless will be adapted to Marmara region. The Marmara region will be divided in grid areas of 0.1°x0.1° and tsunami scenarios will be created for each bin, where the bin centre will be characterized as the epicentre location. Earthquake source parameters will be defined based on a study of characteristic source parameters in the region, supported with historical and statistical

studies. A decision support system for the TEWS should also be supported with offshore tsunameters and or hydrophone/pressure meters, if possible. In the presence of these tsunami data, together with seismic and geodetic data, the database might be also used as a set of Green’s functions for recovering the tsunami source via real time inversion with the aim of constraining the tsunami forecast. Moreover, these Green’s functions could be used for long-term probabilistic tsunami hazard assessment (PTHA) if earthquake recurrence times will be provided by Task 6 in this WP.

Task 5. Improvement of the probabilistic seismic hazard assessment by taking into account uncertainties and ground-motion variability (K. Sesetyan – KOERI, BRGM, INGV)
Probabilistic seismic hazard analysis (PSHA) is de¬fined as evaluation of the probability or likelihood that there will be ground motion in excess of certain levels during a specific time period. The basic analytical procedure used in present-day PSHA was originally proposed by Cornell (1968). Since that time there has been significant progress in scientific understanding of the earthquake process and in the technique for evaluation of the relevant seismology, geo¬logical, and geophysical data. Several studies with various degree of sophistication are conducted for the assessment of seismic hazard in the Marmara Region (Atakan et al., 2002; Erdik et al., 2004; Kalkan et al., 2008).
The betterment of the knowledge on the seismotectonic regime of the Marmara region will pave the path for development of alternative source models for the improvement of existing probabilistic hazard maps. In this connection, the most recent findings and outputs of different work packages of the project, in terms of seismicity, fault segmentation, slip rate data and association of past earthquakes with individual segments will be utilized. Various renewal-type stochastic models and characteristic earthquake occurrence will be utilized for the earthquake rupture forecasting. For near fault quantification of hazard at long period spectral accelerations, the directivity affects will be considered in the analysis. The epistemic and aleatory uncertainties will be rigorously treated respectively, through the use of a comprehensive logic tree analysis and the consideration of inter-event and intra-event variabilities.
The assessment of the inter-event correlation of earthquake ground motion will be facilitated through use the data obtained from the dense accelerometric network in Istanbul.

Task 6. Develop short-term earthquake forecast maps (M. B. Demircioglu – KOERI, INGV, BRGM)
The aim of this task is to focus on the development of short-term earthquake forecast maps for the Marmara region. The long term probabilistic hazard models are currently the most crucial forecasting tool against earthquake damage, because they are used as guidelines for earthquake safety provisions of building codes, whereas the short-term forecasting of the earthquake aftershocks is used for time-dependent seismic hazards to help communities prepare for potentially destructive aftershocks.
The improvement of the existing long-term earthquake hazard assessments in the Marmara region will be carried out under WP5-Task 5. The possibility of developing models for the short-term forecasts in the Marmara region will be investigated in this task based on the analysis of aftershock sequences and seismic clustering. The short-term model of Gerstenberger et al. (2007), used in EU FP6 NERIES Project, will also be considered. The possibility of integrating the studies with the on-going research in EU FP7 projects of REAKT and NERA as well as with the Collaboratory for the Study of Earthquake Prediction (CSEP, www.cseptesting.org) project will be explored.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	25.00
2	GFZ	9.00
3	TUBITAK	10.00
5	INGV	16.00
6	IU	13.00
10	BRGM	10.00
	Total	83.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D5.1	Upgrade of 16 GPS stations	1	20.00	P	PU	24
D5.2	Existing data set configuration for the further analyses and simulations and configuration scrutiny	1	21.00	O	RE	15
D5.3	Performance assessment of finite-fault inversion codes in the Marmara configuration	1	4.50	R	RE	30
D5.4	Near real-time estimation of most relevant earthquake source parameters	1	4.50	R	RE	30
D5.5	Ground motion simulation tools calibrated for the Marmara area and synthetic PGV maps	1	4.50	R	RE	24
D5.6	Characteristics of tsunami source region in the Marmara region	1	7.50	R	RE	24
D5.7	Tectonic origin tsunami scenario database for the Marmara region	1	7.50	O	CO	36
D5.8	Improvement of probabilistic seismic hazard assessment for Marmara region	1	13.50	R	RE	36
		Total	83.00			

Description of deliverables

D5.1) Upgrade of 16 GPS stations: Upgrade 16 GPS station to real-time by solar panel power and communication infrastructure deployment area and deployment of seismic instrumentation to GPS site in Marmara region [month 24]

D5.2) Existing data set configuration for the further analyses and simulations and configuration scrutiny: Existing data set configuration for the further analyses and simulations and configuration scrutiny on the currently available data for ground-motion simulations and the sensibility of the model parameters [month 15]

D5.3) Performance assessment of finite-fault inversion codes in the Marmara configuration: Performance assessment of finite-fault inversion codes in the Marmara configuration [month 30]

D5.4) Near real-time estimation of most relevant earthquake source parameters: Near real-time estimation of most relevant earthquake source parameters using near-field GPS and strong-motion array [month 30]

D5.5) Ground motion simulation tools calibrated for the Marmara area and synthetic PGV maps: Ground motion simulation tools calibrated for the Marmara area and synthetic PGV maps [month 24]

D5.6) Characteristics of tsunami source region in the Marmara region: Characteristics of tsunami source region in the Marmara region [month 24]

D5.7) Tectonic origin tsunami scenario database for the Marmara region: Tectonic origin tsunami scenario database for the Marmara region [month 36]

D5.8) Improvement of probabilistic seismic hazard assessment for Marmara region: Improvement of probabilistic seismic hazard assessment for Marmara region and model development for short term earthquake forecast based on seismic clustering [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3: Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP6	Type of activity [54]	RTD
Work package title	Earthquake-Induced Landslide Hazard in Marmara		
Start month	1		
End month	30		
Lead beneficiary number [55]	13		

Objectives

The 1999 Izmit and Duzce earthquakes in northwest Turkey have revealed the Ataköy area located westwards of Istanbul as affected by very significant local site effects (Sørensen et al., 2006). Moreover, the adjacent urbanized and geologically similar area of Cekmece has been geologically and geotechnically surveyed and characterized as a concentrated landslide prone area, showing high susceptibility to both landslide and liquefaction phenomena (Duman et al., 2005).
This fast developing area includes also critical facilities such as the Atatürk international airport and several industrial plants. Latest earthquake disasters underline how important better prediction of those geohazards is for the prevention of casualties and economic losses. Eventually, offshore landslide tsunamigenic hazard triggered by strong earthquake is clearly to be considered when reflecting about the closed situation of the Marmara sea.
The aim of this work package is to improve the preparedness of those seismically induced landslide geohazards, through the using and the improvement of monitoring and observing systems in hydrogeotechnical and seismically well-constrained areas within the supersite. Two areas,on-shore and off-shore, will be studied deeply to gain knowledge and improve the capabilities to work out guidelines for a LHS “Landslide Hazard Scale”, including earthquake triggering factor. The terrestrial western part of Istanbul and a potential submarine landslide detected at the entrance of the Izmit Gulf are the two identified targets.
As regards landslide pre-disposition, pre-existing geological, geomechanical and geomorpholocial and geophysical data, including high-resolution DInSAR data, will be selected and analysed to develop better understanding and enhance capabilities to hazard assessment and susceptibility mapping, including local site effects enabling the earthquake triggering of inactive or dormant landslide. Gain is expected as regards methodology for areas to be studied in the future (Task 1).
As regards local site effects, considering the pre-existent earthquake scenarios based on the closest NAF segment in the Marmara Sea (Pulido et al., 2004), ground motion modelling showed that highest ground motions are expected in this area, obviously due to its very close vicinity to the NAF. Ground motion data currently collected will be processed and modelled to grid and map site effects and to test them versus case studies (Task 2).

Description of work and role of partners

Description of work
Task 1. Investigations of local instability areas - onshore and offshore – and developing of advanced susceptibility mapping (P. Bigarre - INERIS, CNR(ISMAR-IREA), ITU, U.Pavia, INGV, TUBITAK)
Task 1.a Off-shore landslide and Tsunami hazard
It is well known that the shelves and slopes of the Sea of Marmara are prone to landslide/tsunamigenic hazard caused by the diffuse presence of potentially instable sedimentary bodies that could slump towards the basins centre as a consequence of major earthquakes. In fact, this has occurred during several strike-slip earthquakes, with mainly horizontal displacement, that have, however, caused local although destructive tsunamis, probably due to secondary mass movements caused by the shaking (Yalciner et al., 2002). The first step towards a mitigation of landslide-derived tsunami hazard has been the mapping of all potential gravitational sliding through the use of the dense-spaced marine geophysical database available. Thus, all previous geophysical surveys will be closely examined.
The first geophysical survey in the northern shelf was carried out to collect single-channel shallow seismic data, gravity cores and surface sediment sampling for studying Quaternary geology in the mid-1990s (Oktay et al.

2002). The second stage of data collection was after the disastrous earthquakes of 1999. A strong international effort that followed the 1999 Izmit earthquake that culminated with the MarNaut mission, where several dives were devoted to the study of gravitational deposits (Henry et al., 2008; Zitter et al., submitted). Then, although specific studies on fossil landslides have been carried out in the past (Gorur and Cagatay, 2010; Ozeren et al., 2010) a detailed study of submerged areas, that will be most likely sites of major landslides in the future, is missing.
Another offshore data set collected in 2007 by TÜBİTAK MAM, will be also used to focus on the fragment of the Western Black Sea fault (WBS). It includes high resolution bathymetry (<20m), bathymetry (20 m<H<100 m) and very dense shallow seismic lines along the shoreline (Ergintav et al., 2011). The multichannel seismic data acquisition is carried out for the first time at west of the Bosphorus in the northern shelf of the Sea of Marmara to investigate offshore structural features such as Çatalca Fault Zone and the shallow deformations as the result of possible submarine landslides to interpret the structural features offshore the Avcılar Peninsula (Ergintav et al., 2011).
By the way, ISMAR-CNR collected, during several expeditions starting from 2001, multi-beam bathymetry, high-resolution single- and multichannel seismic reflection data, as well as gravity cores on a major potential submarine landslide (4 x 2 x 0.2 km) located at the entrance of the Izmit Gulf, close to the W termination of the surface rupture of the 1999 Izmit earthquake (Gasperini et al., 2011). The dimensions and characteristics of the landslide, together with its location (close to the NAF northern strand, and facing the Istanbul coastline) are important reasons for attempting a detailed study of this major landslide, through already available geophysical data, and carrying out modelling along with ITU to predict its behaviour during the next major earthquakes that will probably affect this strand of the NAF.
Task 1.b On-shore landslides
The area of Cekmece, consisting essentially of gently rolling hills with low slopes, is covered by more than 400 landslides showing numerous scarps (Duman et al., 2005). Approximately half of all landslides are distributed between Büyükçekmece and Gürpınar area of the Avcılar Peninsula, which are important local landforms in the region.
Field investigations and analysis of this area have been published, delivering existing inventories, available GIS and existing monitoring of local block deformations with Global Positioning System (GPS). A deeper analysis will be undertaken (distribution, density and activity analysis of landslides, spatial persistence and temporal frequency of landslides) with further field survey for investigating landslides and evaluating the evolution of existing mass movements of much concern. Development of landslide hazard map and associated uncertainties will be carried out including strong ground motion along with estimated amplification site effects, dealing also with intense and/or prolonged precipitation as a potential worsening factor during seismic shaking. While carrying out geophysical investigations in relation with Task 2, an active landslide will be identified as a potential pilot site to be instrumented in the future with a specifically designed ground-based system for local continuous and multi-frequency observation to study physical interactions and early warning strategies.
Use of space multispectral/hyperspectral image data to identify geological and geophysical parameters and delineate corresponding areas will be completed to evaluate the resolution to identify landslide hazard-related features. Evaluation and fusion of the extracted features with InSAR related ones and geological/geophysical models should permit to design a suitable strategy to help defining a landslide hazard scale.
Moreover, the integration of geological and geomorphological analyses with high-resolution DInSAR data will allow the identification and characterization of activated and reactivated Deep-seated Gravitational Slope Deformations (DGSD). The modelling of the related deformations will permit to characterize from a geometrical point of view the sliding plane and to quantify the amount of slip.
Eventually, guidelines for an aggregation strategy between field surveys, ground-based and space geological and geophysical data will be produced to refine a regional landslide hazard scale to be used.

Task 2. Ground motion data, local seismic site effects and dynamic numerical modelling (O. Ozel - IU, IFSTTAR, INERIS)
Task 2.a Off-shore landslide and Tsunami hazard
The numerical modelling and laboratory testing of landslide generated Tsunami scenarios in the Sea of Marmara will be an ITU contribution. Collaborations between ISMAR and ITU are already under way to study a sediment mass at the entrance of the Izmit Bay. Several seismic images of the mass are being studied (Postacioglu and Özeren, 2008). A 3D generation model will be assimilated into a shallow-water finite-element Tsunami propagation code being developed at ITU. However, ITU will carry out numerical simulations of tsunamis generated by a possible mobilization of this mass. Furthermore, run-up scenarios will be produced by using the outputs from the numerical models. A 15 m long and 60 cm wide and 1.5 m high tsunami channel has been

constructed at ITU hydraulics lab to this end. Especially 1-D run-up scenarios will be tested in this channel (Özeren and Postacioglu, 2012).
Task 2.b On-shore landslides
The Ataköy area, also located in the same western part of Istanbul, has strongly been affected by the Mw=7.4 Izmit Earthquake although it is about 100 km away. Local site effects played obviously an important role to increase the damage together with the bad building stock. This has been confirmed from field studies and seismic data collected sometimes after the disaster.
The assessment of ground motion reference scenarios and local seismic amplification effect is possible by in-situ data acquisition and processing. Site effect studies (e.g. mapping of predominant frequencies and bedrock depth distribution, site amplification), 1D and 2D Vs structure around the north part of the NAFZ, specifically in the western part of Istanbul and its suburbs, will be studied. This will include compilation of strong motion data from the large earthquakes (Mw>5) in and around Marmara Sea, and the recent studies on strong ground motion and site effects, which have been performed in the area.
A series of geophysical surveys (determination of S-wave velocity structure at depth with active/passive array surface wave measurements) and geological investigations carried out by TÜBİTAK MAM, to obtain regional information on the macro scale bedrock properties with depth (Ergintav et al., 2011) will be considered to plan a new and pointed local geophysical study of the area.
A new campaign of ambient microtremor recording to assess in a cheap and fast way the fundamental resonance frequency of a given site, based on Horizontal-to-Vertical Spectral Ratio (HVSR) from single-station measurements (also known as "Nakamura method") (Nakamura 1989, Nakamura 2000, Lermo & Chávez-García 1993). The resulting spectral ratio gives frequency dependent amplification for the site.
Previous study on local site effects give evidence that the Avcilar district of western Istanbul (Özel et al. 2002, Tezcan et al. 2002) is characterized by the presence of soft sediments in basin structures and this has caused strong amplification of earthquake ground motion during past earthquakes. The alluvium, on the other hand, represents the most critical unit in terms of site amplifications and is limited to the fluvial depositional centres. The gentle topography of the area, with shallow synclines and anticlines plunging towards the Marmara Sea in the south, represents an environment significantly different from classical alluvial valleys or closed sedimentary basins. In this respect, the expected site effects also differ significantly (Sørensen et al., 2006).
The microtremor campaign will be carried out also to identify the best locations to set up a temporary local seismic network to integrate the Marmara Seismology Network of Turdep.
A local seismological network is needed to fill the gaps of available seismological catalogues to catch any microseismological activity (Ergintav et al., 2011). Then, a complementary local seismic network, composed of a few broadband accelerographs, will be temporary installed to enable a good focus on this area. Following the Seismicity Map and Earthquake Density Map of the USGS Earthquake Hazard Program for the Ataköy area it will be highly probably to record earthquakes (from small to moderate) in the near and far field conditions during two years of seismic monitoring. Two stations could be installed inside and outside the landslide area chosen as pilot site, a station on the limestone outcrop (if possible) as reference station and the other two stations on alluvial deposits with known lateral variations.
Thus, the site effects will be expressed in terms of amplification describing the ratio of the ground motion at the free surface to that at bedrock level. For local variations of site effect H/V spectral ratios are calculated for recorded microtremor data.
All geological-geotechnical derived from task 1 and seismic data available (from permanent existing stations and complementary local seismic array) concerning the selected area will aim at pointing out local seismic amplification effects due to geology, topography as well as directivity and polarization of seismic waves. A preliminary geological model will be defined on the basis of the available data to conduct 1D and 2D linear numerical modelling aiming at analysing the role of topographic and stratigraphic conditions (including effect of incidence, directivity and polarization) on the surface shaking. The local in-situ measurements and the numerical results will be extrapolated to give a good estimate of the amplification in the areas where only sparse data are available nowadays.
Engineering-geological models will be mainly defined based on the already available data to depict the landslide geometries and to define the more adapt rheologies to be considered for the involved soils. This will allow performing dynamic numerical simulations in nonlinear conditions devoted to: i) back-analyze historical events and sequences of monitoring records for validating and calibrating the engineering-geological models, ii) evaluate the role of geological features on permanent deformations as well as on landslide triggering; iii) quantify the effect of different seismic inputs. Most results of Task 2 will provide input into Task 1.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
3	TUBITAK	7.00
5	INGV	5.00
6	IU	7.00
8	ITU	2.00
9	CNR (ISMAR-IREA)	4.00
13	INERIS	11.10
17	UNIPV	16.00
18	IFSTTAR	3.50
	Total	55.60

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D6.1	Report on local instability areas and advanced susceptibility mapping -1	13	21.10	O	RE	16
D6.2	Report on local instability areas and advanced susceptibility mapping -2	13	19.00	O	RE	24
D6.3	Report on the numerical modelling of ground motion and local site effects	13	15.50	R	RE	30
		Total	55.60			

Description of deliverables

D6.1) Report on local instability areas and advanced susceptibility mapping -1: Report on local instability areas and advanced susceptibility mapping for offshore landslide and tsunami hazard [month 16]

D6.2) Report on local instability areas and advanced susceptibility mapping -2: Report on local instability areas and advanced susceptibility mapping for onshore landslides [month 24]

D6.3) Report on the numerical modelling of ground motion and local site effects: Report on the numerical modelling of ground motion and local site effects for onshore and offshore landslides and tsunami hazards [month 30]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP7	Type of activity [54]	RTD
Work package title	Re-evaluation of the seismo-tectonics of the Marmara Region		
Start month	1		
End month	36		
Lead beneficiary number [55]	8		

Objectives

Objectives of the WP7 are three-fold:
- To generate a GIS database and relevant bibliography on the evolution of the North Anatolian Fault from an earlier shear zone in and around the Sea of Marmara;
- To synthesise all data to prepare an active fault map of the Sea of Marmara with appropriate explanation of nature, age, distribution of deformation and history of activity of the fault population;
- To evaluate the earthquake history of the Sea of Marmara and surrounding region that is important in both predicting future events and seismic risk assessment in Istanbul and the Marmara region.

Description of work and role of partners

The main task of the seismotectonics group is to establish the geography of the active fault system in the Sea of Marmara, its history of activity, both in terms of geologic time (since its origination in the medial Miocene) and historical time (past earthquake record). The past earthquake record requires collaboration with historians and we hope to have such supports from expert historians. The mapping of the fault population under the Sea of Marmara is almost complete. The only outstanding bit is the connection with the Thrace Basin and a part of it has been mapped using the Turkish Petroleum Company's multichannel seismic data. Once that mapping is complete we shall have complete coverage of the active fault population of the Sea of Marmara. For the criterion of activity we simply take activity in the Quaternary as a sufficient condition, following the recommendation of Allen (1975). We acknowledge that faults may turn on and off within the time span represented by the Quaternary, but no fault belonging to a family as large and as active as the North Anatolian Fault becomes definitively dormant until the entire zone ceases its activity.
Parallel with the mapping of the faults, we shall evaluate the earthquake history of the Sea of Marmara and surrounding regions. The historical material available is huge and it is not possible for one person to deal with it. We shall have the cooperation of a historian team at the Marmara University, but also hope to consult the restoration department of the Faculty of Architecture of our own university. One serious problem is assessing historical seismicity is ascription of earthquakes to individual fault segments. Here we hope to be able to trench the suspected faults wherever possible on land. However, the closeness and on-going activity of major fault strands make definitive ascriptions difficult and we hope, at least, to be able to specify error margins in our ascriptions and produce a reliable epicentre map of historical earthquakes around the Sea of Marmara.
To understand the nature and distribution of activity along the North Anatolian Shear Zone during the geological past is of vital importance for this project. The previous estimates of the age and distribution of deformation were based on assumptions that did not stand the test of time. A serious problem is the distribution of the Neogene sediments within the Sea of Marmara. Previous estimates were based on assuming a basin-wide Neogene depocentre. More recent seismic profiling and studies of sedimentation rates on cores obtained during the numerous sea-borne missions showed that none of the Marmara basins can have any sediment older than top Pliocene at best. Almost all probably formed in the Pleistocene. This necessitates re-evaluation of the on-land sedimentary and geomorphological record and definition of the Neogene depocentres and areas of denudation in and around the Sea of Marmara. We believe that only after such a work one can make a true geological synthesis of the entire area from the late Cretaceous to the present.

Task 1. Re-evaluation of the seismo-tectonics and geohazards (P. Henry – CNRS, ITU, CNR-ISMAR)
Plate motion between Eurasia and Anatolia is known from geodesy, and models of slip partitioning between active faults in the transition from the Anatolian to the Aegean domains have been proposed (Meade, 2002;

Le Pichon et al., 2003; Flerit et al., 2004; Reilinger et al., 2006; Hergert et al., 2010). However, the distribution of slip between offshore faults in the Sea of Marmara remains problematic. Although most of the plate motion may occur on the Main Marmara Fault of Le Pichon et al. (2001), geomechanical models suggest that other fault branches could accommodate part of it, and thus present earthquake and tsunami hazards (Hergert and Heidbach, 2010). This is in agreement with estimate of geological (10,000 year time-scale) slip-rate estimate carried out along the submerged North-Anatolian Fault system (Polonia et al., 2004; Gasperini et al., 2011a).To date, deformation rates inferred from stratigraphy and geomorphology (Sorlein et al., in press; Grall et al., 2012; Beck et al., 2007; Armijo et al., 2005; Seeber et al., 2006) are the main observations available to constrain models. Model outputs have been compared with results of local studies (Hergert et al., 2011; Muller and Aydin, 2005) but a more complete confrontation with data is needed, also taking into account variations with time and the effect of sediment compaction. The aim of the proposed work is to fully integrate available constraints from geology into kinematic and mechanical modelling efforts.
Another important task to model the behaviour of seismogenic faults is to carry out reliable co-seismic estimate of deformation associated with major historical earthquakes. This has been recently attempted in the Sea of Marmara by different working groups, which applied the methods of Earthquake Geology to the submarine environment (Polonia et al., 2002; Armijo et al., 2005; Pondard et al., 2007; Gasperini et al., 2011b).
The very large marine geophysical data set acquired in the Sea of Marmara combines observations over a range of scales: multibeam bathymetry and imagery, micro bathymetry from ROV and AUV surveys, THR sounder profiles, High resolution 3D seismic and 2D profiles, deep penetration multichannel seismic, wide angle seismic surveys and tomography. Most are now accessible and structural interpretations have been published. Available age models from sediment core analysis, and stratigraphic interpretations in term of eustatic cycles, constrain sedimentation rates over the last 10 to 500 ka. These data will be integrated with heat flow data in basin subsidence models. At a few locations, geomorphologic and 3D stratigraphic interpretations yield constraints on horizontal displacement, which also need to be taken into account. The re-evaluation of fault kinematic models will thus proceed in three steps: (a) synthesis of data offshore (structure, geomorphology, stratigraphy, heat flow) and onshore (b) modelling of basin subsidence, sediment compaction and heat flow, (c) critical assessment of kinematic and geomechanical models.
Task 2. Integration of faulting parameters from paleoseismic and historical data for hazard assessment (L. Gasparini – CNR-ISMAR, KOERI, INGV, IFREMER)
The North Anatolian Fault (NAF) splays into several branches in the Marmara Region (Barka and Kadinsky-Cade, 1988; Sengor et al. 2005). The most active northernmost branch prolongs between Düzce and Izmit as the on land section and enters into the Sea of Marmara in the Izmit Gulf. GPS data and elastic block models clearly show that the southern branch has relatively lower strain accumulation. However, this section of the NAF produces large and destructive earthquakes as well. These branches are located very close to large cities such as Izmit, Bursa, Istanbul, which have very dense population and are centres of the industry in Turkey. It is well known that large earthquakes affected these settlements in the past and created many casualties, heavy destruction and economical loss.
Even many previous paleoseismological studies have been done along the North Anatolian Fault (NAF) in the Marmara Region, there are still lots of uncertainties for the past earthquakes (e.g.: Rockwell et al, 2001; Hitchcock et al., 2003; Klinger et al., 2003; Ferry et al., 2004; Pavlides et al., 2006; Pantosti et al., 2008; Dikbas and Akyüz, 2011). These studies and additional data from the Marmara Sea bottom (e.g.: Sari and Cagatay, 2002; McHugh et al., 2006; Beck et al., 2006; Cagatay et al., 2012) will be combined and integrated into a GIS-based database in this project. At least 2000-years earthquake history of the western NAF is aimed to be included within this database. The lack of precise paleoearthquake data for the southern branch of the NAF will be completed based on the fault segmentation models. Any lack of data for separate segments or gaps in historical records will be examined with new paleoseismological trench studies both on northern and southern branches of the NAF in the Marmara Region. It is believed that this study with its deliverables will provide important data for predicting future events and give strong background for seismic risk assessment in Istanbul and the Marmara region.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	4.00
4	IFREMER	1.00

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
5	INGV	10.00
8	ITU	36.00
9	CNR (ISMAR-IREA)	8.00
12	CNRS	4.00
	Total	63.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D7.1	Report on the re-evaluation of the seismo-tectonics and geo-hazards of the Marmara region	8	42.00	R	PU	36
D7.2	GIS database of the fault parameters	8	9.00	R	RE	36
D7.3	Report on the integration of faulting parameters	8	6.00	R	RE	36
D7.4	Revisited historical earthquake catalogue	8	6.00	O	PU	36
		Total	63.00			

Description of deliverables

D7.1) Report on the re-evaluation of the seismo-tectonics and geo-hazards of the Marmara region: Report on the re-evaluation of the seismo-tectonics and geo-hazards of the Marmara region [month 36]

D7.2) GIS database of the fault parameters: GIS database of the fault parameters including: i) a comprehensive bibliography of the North Anatolian Shear zone and Fault in and around the Sea of Marmara; ii) the active fault map; iii) the map of the Neogene depocenters and areas of denudation [month 36]

D7.3) Report on the integration of faulting parameters: Report on the integration of faulting parameters from paleoseismic and historical data for hazard assessment Map of Neogene depocenters and areas of denudation in and around of the Sea of Marmara [month 36]

D7.4) Revisited historical earthquake catalogue: Revisited historical earthquake catalogue based on onshore and offshore information (including from submarine seismo-turbidites) [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP8	Type of activity [54]	RTD
Work package title	Monitoring seismicity and fluid activity near the fault using existing cabled and autonomous multipa		
Start month	1		
End month	34		
Lead beneficiary number [55]	4		

Objectives

The objective of WP8 is to implement an integrated approach based on multiparameter seafloor observatories, to continuously monitor the micro-seismicity along with the fluid expulsion activity within the submerged fault zone. The discovery of very characteristic tremors, 44 minutes prior to the Izmit earthquake in 1999 [Bouchon et al, 2011], and the finding that gas reservoirs are connected to the Main Marmara fault zone [Bourry et al, 2009, Géli et al, 2008, Gasperini et al., 2012] opens new perspectives that were not imaginable a few years ago: if seismic tremors are found to be associated with clear anomalies in gas emission activity, then we will have more criteria for characterizing and identifying the recorded signals as indicators that the probability of occurrence of an impending earthquake is increasing. WP8 will hence contribute to find robust and multiparametric methods for implementing early warning strategies in the near future. KOERI presently operates a unique network of 5 cabled, seafloor observatories (SBOs) in the SoM, which provides seismological data from Broad-Band OBSs, along with accelerometric data, sea bottom temperature and pressure gauge data. This network needs to be complemented with an additional network of multiparameter, seafloor observatories to continuously collect geochemical and geophysical data from the immediate vicinity of the fault zone. However, the implementation of such observatories cannot be fulfilled within the time span and budgetary frame of MARsite. To get a step forward, additional data with autonomous seafloor instrumentation (such as SN4, that was deployed for almost 12 months in the Gulf of Izmit) will be collected within Task 1 and compared with periodical sampling collection of the water column in coincidence of the faulted/not faulted areas of the Marmara sea. The data from autonomous stations will be integrated and analyzed jointly with the KOERI network under Tasks 2 and innovative methods for multi-parameter data interpretation will be developed within Task 3 in order: i) to detect low magnitude earthquakes and improve the characterization of the near-fault micro-seismicity, particularly along the central part of the SoM; ii) to search for seismic tremors similar to those that were documented prior to the Izmit, 1999 earthquake; iv) to detect gas-bursts related events; v) to establish correlations between fluids and seismicity. The next generation of seafloor observatories for geo-hazard monitoring will be prepared within Task 4.

Description of work and role of partners

Description of work
Task 1. Collect multi-parameter time-series through three repeated (every 6 months) sea-based cruises, using existing autonomous seafloor observatories (SN-4, piezometers, OBSs, acoustic gas bubble detectors (G. Marinaro - INGV, KOERI, IFREMER, ITU, CNR-ISMAR)
The evidence that the seafloor of the sea of Marmara shows clear clues of recent faulting related to the last destructive Izmit event and areas where fluids vents into the sea water, supports the possibility to gain a better insight of new faulting phenomena based on a monitoring activity carried out by both seafloor observatories and periodical observations of the venting fluids.
Task 1 will take care of the collection of geophysical and geochemical data using existing submarine equipments (already used in the same area in previous projects) and oceanographic cruises to collect water samples aimed to constrain the origin of the vented fluids, their mixing ratios and possible interactions processes. This data set will be the reference for a correct interpretation of the multiparameter long-term time series.
Task 2. Seabed, continuous seismological monitoring and integration of multi-parameter datasets from cabled (KOERI's) and autonomous systems (T, p, seis) (C. Gürbüz – KOERI, IFREMER, INGV, ITU, CNRS)
The geophysical dataset (including micro-seismicity from Broad-Band OBSs, accelerometry, sea-bottom water pressure and temperature variations) collected by the submarine, cabled KOERI network will be analyzed within

Task 2. Specific methods will be implemented to detect earthquake doublets, e.g. similar earthquakes coming from the same location. These methods will also include the detection of slow slip events and seismic tremors, supposedly associated to the earthquake preparatory phase, based on laboratory and modeling results. This requires improvement of the techniques used for the determination of earthquake parameters (hypocenter location, moment magnitude, etc).

The land-based seismic network indicates that the central SoM is characterized by a relative absence of seismic activity, most particularly across the Kumburgas Basin and Central High. How much silent this segment actually is an open question of fundamental importance that will be addressed by combining the data from the KOERI permanent network and the data from the autonomous OBSs (see Task 1). Earthquake clusters and micro-earthquakes will also be specifically investigated to get information about future large earthquakes. Cluster earthquakes are small and impossible to locate with a limited number of stations. After locating a moderate earthquake, we will look for small earthquakes of similar size, by waveform correlation with the larger one, in order to list earthquakes coming from the same site.

Specific methods will also developed to detect non-seismic micro-events that have recently been interpreted as the result of gas outbursts from the Marmara seafloor. Recent, unpublished data indicate a relation between these non-seismic tremors and temperature variations. An upward displacement has also been observed on the vertical OBS component just before the gas bursts. The relations between non-seismic micro-events and gas outbursts will be fully documented within Task 2, with the view of finding indicators of seafloor deformation.

Task 3. Multi-parameter data analysis (P. Henry – CNRS, KOERI, IFREMER, INGV)

Monitoring of fluid emissions through the seafloor near an active fault is an innovative experiment, which requires the development of new methods for data analysis. On land around the Sea of Marmara, statistical properties of radon time series were shown to vary with seismic activity (Inan et al., 2008) and similar relationships will be looked for in the marine data set. Fluids migration is influenced by stress and strain rate variations, and in turn, fluids migration through the crust can be a source of induced seismicity (e.g.. Miller et al., 2004; Daniel et al., 2011). The primary objective of this task is thus to analyze time series of fluid parameters (fluid pressure in the sediment and at the seafloor, bubble flux, fluid velocity, fluid chemical composition), and examine possible correlations with micro-seismicity and strain. In addition, the influence of water level oscillations on fluxes should be taken into account, although these oscillations are relatively small in the Sea of Marmara. They display a complex spectrum with tidal as well as longer and shorter period oscillations (Alpar and Yüce, 1998). The modification in the flow regime and fluids composition can be also induced by tectonic events (Heinicke et al., 2009). Permanent seafloor seismological stations equipped with environmental sensors (pressure, temperature, salinity, current velocity) will bring records unaffected by coastal site effects and will be used to calibrate models of normal mode oscillations that have been developed at ITU. Characterizing normal oscillations in the Sea of Marmara will also have important outcome for the mitigation of tsunami hazard and for understanding the deposition of seismo-turbidites in the deep basins (Beck et al., 2004). Work planned thus comprises: (1) Analysis of fluid emission parameters and correlation with water column parameters, and micro-seismicity and strain; (2) modeling of water column oscillations and their consequences.

Task 4. Prepare the next generation of seafloor observatories for geo-hazard monitoring (F. Italiano – INGV, KOERI, IFREMER, ITU, DAIMAR)

The experience got after many years investigating fluids and their interactions with both the seafloor and tectonic structures, allows to better focus the attention on improvements of seafloor observatories devoted to long-term continuous monitoring of geohazards. Volcanic and tectonic-related fluids have the common feature that they can suddenly change in composition, flow rate, physical properties as a function of the intensity of the temporal development of the natural processes. Stress accumulation in an active fault is a slow process inducing normally changes in the circulating fluids over a similar temporal scale, while the closer is the rupture time, the faster are the related modifications of the fluids (including waters and gases with changes of some parameters over a time-scale from hours to seconds). A new generation of seafloor observatories should support the observation of both slow and quick variations, thus besides the collection of long-term data set it should enable a data collection in a real-time or, at least a near-real-time mode.

An improvement of the sea-floor equipments is planned in terms of the amount of contemporary active instruments, their interlink with “smart sensor” capacities (threshold detection, triggering) and the quality of the collected data. If the logistic conditions will allow it, a real-time data collection system is planned to be designed, built and deployed for a while (in cooperation with DAIMAR SME and Ifremer) in key locations of the SoM (Gulf of Izmit, Western High, Central High). The activities of planning, building, testing and deploying a new seafloor observatory may represent a reference for the future technology of submarine equipments, seafloor data collection, storage and transmission.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	15.00
4	IFREMER	13.00
5	INGV	20.00
8	ITU	3.00
9	CNR (ISMAR-IREA)	4.00
12	CNRS	5.00
20	DAIMAR srl	24.00
	Total	84.00

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D8.1	Report on repeated deployments of autonomous instruments	4	19.00	R	PU	26
D8.2	Report on high-resolution micro-earthquake characterization	4	16.00	O	CO	12
D8.3	Synthesis report on spectral and statistical analysis of marine multiparameter time series	4	11.00	R	PU	34
D8.4	Design of the next generation autonomous, multi-parameter seafloor instrumentation	4	38.00	R	PU	30
		Total	84.00			

Description of deliverables

D8.1) Report on repeated deployments of autonomous instruments: Report on repeated deployments of autonomous instruments [month 26]

D8.2) Report on high-resolution micro-earthquake characterization: Report on high-resolution micro-earthquake characterization using cabled OBS data and improved velocity, 3D model [month 12]

D8.3) Synthesis report on spectral and statistical analysis of marine multiparameter time series: Synthesis report on spectral and statistical analysis of marine multiparameter time series [month 34]

D8.4) Design of the next generation autonomous, multi-parameter seafloor instrumentation: Design of the next generation autonomous, multi-parameter seafloor instrumentation [month 30]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP9	Type of activity [54]	RTD
Work package title	Early Warning and Development of the Real-time shake and loss information		
Start month	1		
End month	36		
Lead beneficiary number [55]	1		

Objectives

This WP has the objective of improving the existing earthquake early warning (EW) and rapid response (RR) systems in the Marmara Region (Istanbul) with the addition of a pilot landslide monitoring and EW system and introduction of new space technologies for monitoring and assessment of vulnerabilities.
The timeliness of our efforts to address seismic risk is testified also by the appearance of a global, public-private partnership initiative such as the Global Earthquake Model (GEM), to establish uniform, open standards to calculate and communicate earthquake risk worldwide. MARsite will represent a key case study and may represent a GEM (Global earthquake Model) Regional Initiative, cross-fertilizing efforts in addressing geo-risk at both global and regional levels. Strong links -and thus effective coordination- between the MARsite consortium, GEO and GEM are ensured by the participation of a key research unit in Pavia, holding coordination of GEO Component C2 "Geohazards Monitoring, Alert, and Risk Assessment" of GEO task DI-01 "Informing Risk Management and Disaster Reduction", and representing GEM within GEO as the GEM Alternate Principal.
Real-time actions focusing on decreasing the risks and improving search and rescue for the protection of the population has emerged as a viable way to support these preventive actions. Earthquake EW and RR methodologies are essentially based on the real-time capabilities of seismic monitoring systems to provide a reliable prediction of earthquake size and damaging effects based upon measurements of ground-motion parameters in narrow time windows. We aim to improve risk assessment by fusion of seismic risk factors on Istanbul with incorporation of new online data, techniques and methodologies (Task 1), integrate the landslide risk factor into risk assessment by development of a pilot landslide EW system (Task 2), develop the Shake and Loss information by fusion of hazard data: Improvement of the Istanbul Earthquake Rapid Response System with incorporation of new online data and incorporation of new methodologies (Task 3), and then finally merge earthquake and seismic vulnerability data, and other geospatial items relevant to spatially focused risk assessment: GEO Supersite showcase (Task 4). This WP will strongly benefit from the findings of previous FP6 projects NERIES, LESSLOSS, SERIES and SAFER and will be closely associated with the current EU FP7 projects NERA, SHARE, SYNER-G, REAKT and the OECD-initiated Global Earthquake Model program (GEM, www.globalquakemodel.org) to provide synergy and to avoid duplication.

Description of work and role of partners

Description of work

Task 1. Improvement of risk assessment in Istanbul with incorporation of new data, techniques and methodologies (M. Erdik - KOERI, EUCENTRE, GFZ)
Several studies have been conducted on the earthquake risk assessment in Istanbul (e.g. Strasser et al, 2008; Ansal et al., 2009; Erdik and Durukal, 2010; Erdik et al., 2010). These studies considered scenario based earthquake ground motion with no consideration of the intra-event variability of the ground motion.
Yet, in addition to their intrinsic fragility relationships, the earthquake risk assessment of a megacity, such as Istanbul, with spatially distributed building portfolios and infrastructure systems requires quantification of the joint occurrence of ground-motion intensities at several sites, during the same earthquake (Jayaram and Baker, 2009).
In this task the current risk assessment (quantified in terms of building damage) will be improved by considering the intra-event variability of the ground motion. Geostatistical tools will be used to quantify the correlation between spatially distributed ground motion intensities based on the data obtained from the dense accelerometric network in Istanbul.

Task 2. Development of a pilot landslide EW system (A. Ansal - KOERI, INERIS)
This task aims to integrate the landslide risk factor into the risk assessment through development of a pilot landslide EW system
Landslides are one of the major causes of changes in landscape morphology for which reason the continuous monitoring of the latter must be considered as mandatory for landslide hazard and risk assessment (Ansal and Siyahi, 1994). Landslide monitoring and instrumentation can be performed at different levels and considering diverse set of parameters.
The monitoring system to measure the indicator parameters identified as signalling changes in stability. These may include:
- Meteorological monitoring - primarily rainfall, however also wind, pressure and temperature may also be measured and supplied to the weather prediction model as part of an iterative feedback for improving the short and long term forecasts.
- Geotechnical/geological/hydrological monitoring - may include point sensors such as pore pressure, slope rotation, tension crack extension or other measurements indicating the physical or morphological changes. More esoteric sensors may be considered as appropriate, for example geophones for local seismic or rock rupture identification, or monitoring of surface deformations using land- or satellite-based systems.
The steps for the development of a pilot landslide monitoring and early warning system will be: the implementation of in-situ and remote monitoring techniques; use GIS for geo-database or for data analysis and; definition of the alert thresholds through data analysis. The slope stability model implemented in the GIS framework should also be complimented by a risk prediction model to allow for the inherent uncertainty of this data to be directly incorporated in the GIS based analysis algorithms. The risk model implemented may include a decision tree or other decision making tool to allow interpretation of the GIS-based stability predictions (Ansal and Zlatovic, 1999). The risk model will form the framework for issuing warnings or initiating remedial actions, depending on the results of the risk model and the actions defined in the decision tree.
The actual sensors chosen will be determined according to the monitoring needs of the selected test sites. The findings summarised by Crosta and Franttini (2008) in the FP6 LESSLOSS Project will be utilized and efforts will be made to improve the available methodologies.

Task 3. Improvement of the Istanbul Earthquake Rapid Response System with incorporation of new online data and incorporation of new methodologies (C. Zulfikar - KOERI, AMRA)
Potential impact of large earthquakes on urban societies can be reduced by timely and correct action after a disastrous earthquake. Modern technology permits measurements of strong ground shaking in near real-time for urban areas exposed to earthquake risk. The Istanbul Earthquake Rapid Response System is currently equipped with 100+ instruments and two data processing centres aims at the near real time estimation of earthquake damages using most recently developed methodologies and up-to-date structural and demographic inventories of Istanbul city. For the near-real-time loss estimation systems: GDACS, WAPMERR, PAGER, and NERIES-ELER methodologies are used globally (Erdik et al., 2010).
The Istanbul Earthquake Rapid Response System will be enriched with the incorporation of additional data from the Marmara sea-bottom strong motion recorders and the 100 accelerometers being installed at the district regulators of the Istanbul gas distribution network (EU FP7 REAKT project).
The current methodology used for the near real time estimation of Shake Maps and losses after a major earthquake in İstanbul (Loss Maps) will be improved by: (1) developing faster estimation techniques of the ground motion distribution using the strong ground motion data gathered from the instruments; (2) improvement of the ground motion estimations as earthquake parameters become available and (3) updating the techniques for the estimation of building damage and casualties (together with their uncertainties) for given ground motion (Sesetyan et al.,2010).
The reduction of uncertainties in the basic ingredients of earthquake loss assessment will be tackled to ensure the reliability of the rapid loss assessments in Istanbul. The results of the relevant EU projects (such as NERIES, SAFER, NERA and REACT) as well as the Global Earthquake Model (www.globalquakemodel.org) will be utilized.

Task 4. Seismic Vulnerability Integration and GEO Showcase (F. Dell’Acqua , EUCENTRE)
The GEO C2 component "Geohazards Monitoring, Alert, and Risk Assessment" in GEO WP 2012-2015, is where currently the Supersite concept is addressed and defined in GEO. In the objective statements of C2 we find "Support global earthquake risk assessment. Improve global standards and establish regional programs for hazard and risk assessment in a global framework"; hazard understanding and monitoring has to be accompanied by an analysis of vulnerability aspects. Seismic hazard and vulnerability constitute the most important components of the seismic risk, as addressed by the Supersite initiative. As such, the seismic

vulnerability needs to be fully addressed for the proper estimation of the risk. This needs not entail a giant effort towards mapping vulnerability, as a significant step forward can be achieved by just focusing hazard analysis on areas where vulnerability is significantly present. Further steps in specifying vulnerability distribution will be attained by sourcing vulnerability data and models from the GEM (Global Earthquake Model Project) archive, which features an open model to data access. The EUCENTRE has experience and expertise in seismic risk computation and handling, and will define procedures and models to combine hazard and vulnerability information into a more general risk model. This will represent interesting material for a GEO Supersites Showcase, to be disseminated as an effective Supersite application on all-round seismic risk management at the various GEO and GEO-sponsored events, where government representatives may get a feeling of the GEO coordination advantages.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	22.00
2	GFZ	9.00
3	TUBITAK	2.00
6	IU	6.00
11	EUCENTRE	5.00
13	INERIS	1.40
14	AMRA	11.00
	Total	56.40

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D9.1	Improvement of the earthquake risk assessment for Istanbul	1	22.00	R	RE	36
D9.2	Prototype landslide early warning monitoring system for the Marmara region	1	7.40	O	CO	24
D9.3	Improvement of Istanbul Earthquake Rapid Response System	1	23.00	R	RE	36
D9.4	Seismic vulnerability interpretation for risk assessment	1	4.00	R	RE	30
		Total	56.40			

Description of deliverables

D9.1) Improvement of the earthquake risk assessment for Istanbul: Improvement of the earthquake risk assessment for Istanbul [month 36]

D9.2) Prototype landslide early warning monitoring system for the Marmara region: Prototype landslide early warning monitoring system for the Marmara region [month 24]

D9.3) Improvement of Istanbul Earthquake Rapid Response System: Improvement of Istanbul Earthquake Rapid Response System with new online data and new methodologies [month 36]

D9.4) Seismic vulnerability interpretation for risk assessment: Seismic vulnerability interpretation for risk assessment [month 30]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP10	Type of activity [54]	RTD
Work package title	Integration of data management practices and coordination with ongoing research infrastructures		
Start month	1		
End month	36		
Lead beneficiary number [55]	10		

Objectives

This work package concerns improving access to the wider community, outside the project consortium, of the data products and results of the project. This improved access concerns both dissemination of project results and conclusions to the general public and concerned stakeholders and also facilitating data access for the technical community (e.g. other researchers working on the Marmara Sea region). The work package is divided into three roughly equal tasks. They will focus on the development of data standards concerning the exploitation of data. These data standards will be consistent with existing international standards such as those recommended by the International Standards Organization (ISO) and the Open Geospatial Consortium (OGC) concerning web services and metadata, for example. Among other OGC standards, OpenSearch with geospatial and time extensions will be considered. This will help the interoperability of the data and results and it will also be in line with the GEOSS philosophy. Specifically Task 1 will liaise with on-going projects and seek to reach agreements concerning standards so that data products from MARsite and other projects can be integrated together. Activities in GEO-GEOSS and environmental ESFRI projects will be monitored and considered as well. Task 2 will propose a set of standards for the project and a pilot implementation of these standards will be undertaken to demonstrate their benefit. Task 3 specifically concerns facilitating access to information in ESA satellite data. To this end, processing services will be developed for generating value-added products, which could be particularly valuable for this project.

Description of work and role of partners

Task 1. Integration, data portal and links to other initiatives (P. Favali - INGV, BRGM, KOERI)
This task will be responsible for liaising between MARsite and on-going projects (such as other Supersites initiatives), especially projects related to the Marmara area (e.g., the FP7 project REAKT). The countries of the institutes participating to MARsite are fostering their efforts on seismic measurements inland and at sea through two European large-scale environmental infrastructures of the ESFRI roadmap (http://cordis.europa.eu/esfri/roadmap.htm), EPOS (European Plate Observing System, http://www.epos-eu.org/) and EMSO (European Multidisciplinary Seafloor Observatory, http://www.emso-eu.org/), presently both coordinated by INGV, responsible of this task in MARsite. The constitution of an EMSO ERIC during the next year , is expected to involve all the countries of MARsite consortium and consequently to ensure a long lasting cooperation on MARsite data. This task will integrate the data collection, archiving and dissemination of MARSITE according to the state of the art data management rules of EMSO and EPOS. The Marmara Sea is one of the nodes of EMSO in which a permanent installation at sea is being integrated with land-based networks. This topic is a perfect area for building actual synergies between the two infrastructures and the results of MARsite can assist in this. The main goal of this task is to reach agreements concerning standards so that data products from MARsite and other initiatives can be integrated together.
In addition, coordination with the Group on Earth Observations (GEO), the INSPIRE Directive and Global Monitoring for Environment and Security (GMES) will be sought. This coordination may involve contributions by members of the consortium to meetings concerning these initiatives in order to develop common approaches and to share best practices. Consideration of environmental policy-relevant findings will be made and a clear summary of the implications of these results on relevant policy will be produced at the end of the project.
This task will also develop a portal, where data and results from the project could be downloaded. This portal will be based on an existing activities being undertaken at KOERI. Progress made in Task 2 on data standards and

by TUBITAK on data dissemination infrastructure in other projects will help guide the development of this portal. It is planned that this portal will be based at KOERI with a back-up made by TUBITAK.
The open access data policy requested for European projects on environment data is modulated in the special case of Civil Security issues such as Marmara supersite by the priority of early warning and real time response as presented in WP9. In case of crisis, data access has to be delayed for actors outside the decision making process. It will remain anyway accessible for the sake of reanalysis.

Task 2. Development of standards for metadata, data models and services following international norms (e.g. ISO and OGC) (J. Douglas - BRGM, INGV)
MARsite involves many dozens of different data types and sources, from real-time point-based measurements to hazard maps. For example, WP2 will provide long-term land-based data, WP3 provides data from long-term continuous geodetic monitoring of crustal deformation, borehole data will come from WP4, real-time data from seismological networks will be available via WP5 and data from sea-based instruments will come from WP8. However, all of these data are currently available in different formats. Consequently it is difficult to analyse these different information sources together, which is a significant impediment on scientific investigations in the Marmara Sea. Therefore, this task aims to develop standards for metadata, data models and services for information sources currently provided by the project partners that are consistent with international forms. Furthermore, the target is to compile all available data in a single server for the entire Marmara region in well established formats currently used by seismologist, geodesists and marine geophysicists.The project will define rules to build an open architecture able to include new data providers, sensor information and services. These rules should be based on the recommendations defined in the Architecture and Data Committee of GEOSS. The use of standards and interoperability arrangements are key elements in the design of the architecture of the project. The existing standards will be used to discover data and services, to improve the access to the data and sensors information, and to provide results. The agreement among the partners to use standards specified by ISO and OGC (like Observations and Measurements, or the group of Sensor Web Enablement – SWE- specifications) will improve the connection to existing monitoring networks. These standards will be clearly defined within a report, which will also consist of analysis conducted in Task 1 on the links to other initiatives. Once this report has been finalized, a representative set of data types and sources will be selected for which these standards will be implemented as part of a pilot implementation consisting of a web portal and tools to access and display the various datasets. In addition, access to the value-added services developed within Task 4 of this WP will also be implemented within this pilot. This pilot will then be accessible to the wider community via the GEO broker, which provides a unique access point to federate services.

Task 3. Fostering access to and integration of Earth Observation data products tailored to the needs of the geo-hazard community (P.P. Mathieu - ESA)
This task aims to generate innovative Earth Observation (EO)-based products tailored to the needs of the geo-hazard community and to make them available together with other sources of data (e.g. in-situ and model output) in a seamless manner through the GENESI collaborative data platform, which already serves a wide Earth Science community, including some Environmental ESFRI infrastructure projects. This will require pre-processing the data sets provided by the consortium, taking account of their specific features (e.g. model / satellite / in-situ, format, meta-data), to make them accessible to the whole community. It is also foreseen to foster the exploitation of ESA EO data, from the archive of radar data and new generation of Explorers Missions, by using new algorithms (available from the science community) to generate EO products dedicated to the study of geo-hazards. This Task will address a variety of EO products related to geo-hazards, with focus on the generation of EO-based gravity changes products. Particular attention will be on the exploitation of the new generation of GOCE products. The idea is to provide scientists with an easily integrated tool to make sense of heterogeneous data and advance our understanding of natural hazards, enabling them to do science without investing efforts in technical data processing.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	3.00
3	TUBITAK	5.00
5	INGV	4.00

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
10	BRGM	10.00
16	ESA	13.00
	Total	35.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D10.1	First report on the integration and links to other initiatives	10	5.00	O	PU	12
D10.2	Second report on the integration and links to other initiatives	10	8.00	O	PU	24
D10.3	international standards on architecture principles, metadata, data models, services and links	10	9.00	O	PU	18
D10.4	Report on integration of Earth Observation data, products and toolboxes	10	13.00	R	PU	30
		Total	35.00			

Description of deliverables

D10.1) First report on the integration and links to other initiatives: First report on the integration and links to other initiatives [month 12]

D10.2) Second report on the integration and links to other initiatives: Second report on the integration and links to other initiatives [month 24]

D10.3) international standards on architecture principles, metadata, data models, services and links: Report on international standards on architecture principles, metadata, data models and services and improving links with other projects [month 18]

D10.4) Report on integration of Earth Observation data, products and toolboxes: Report on integration of Earth Observation data, products and toolboxes, including links with GEOWOW GEOSS and ENVRI e-infrastructure [month 30]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT3:
Work package description

Project Number [1]	308417	Project Acronym [2]	MARsite

One form per Work Package

Work package number [53]	WP11	Type of activity [54]	OTHER
Work package title	Dissemination		
Start month	1		
End month	36		
Lead beneficiary number [55]	15		

Objectives

This workpackage concerns the dissemination of the project results to a wider community in general. The single task of this WP will be in charge of dissemination to the general public through, for example, printed brochures and the project website and also the development of dissemination materials to help in interactions with interested stakeholders in the Marmara Sea region, e.g. the Istanbul municipality.

Description of work and role of partners

Task 1. Dissemination (R. Bossu – EMSC, KOERI with input from other WPs)
This task will consist of various dissemination activities to publicize the MARsite project to various communities. MARsite will take appropriate measures to engage with the public and the media about the project and to especially highlight the financial support of the European Union. The first subtask is the compile of an identity card of the project for use on the project website and in other formats. The project website will be compiled to include news, events, presentations and other relevant information. A Project Factsheet will be made available at the onset of the project as well as at each reporting period, which will be communicated to the Project Officer. The website will also include a set of high-quality re-usable illustrations for use in future publications.
A quarterly project newsletter will be produced, which will be circulated to interested parties and available for download from the website. To better focus the dissemination, an analysis will be undertaken to define the target users and public and produce a communication plan for the dissemination and public outreach strategy of MARsite, defining possible approaches to address the target users (e.g. policy-makers and industry in the Marmara region; the scientific community, including partners of related projects; and mass media/general public). Each target audience has their own information requirements, and it is essential that MARsite project information material appropriately target the specific audience groups. Social networks are becoming a major communications channel and they contribute to an improved dialogue with society; hence, we propose to exploit those open innovative channels to publish and spread information targeted to large public. Publications in media will also be accounted for, as well as the number of printed materials produced and distributed.
Certain aspects of the project may also benefit from short video presentations and, therefore, a short video targeting a wide public audience will be produced. Although electronic dissemination is becoming increasing important we will also create and distribute leaflets presenting the objectives and the main steps of the project.
At community events (e.g. scientific conferences) booths will be animated by members of the project to inform people about MARsite. In addition, this task will develop educational material in English (leaflet and booklets for wide distribution) and Turkish (with the assistance of KOERI for use within the area surrounding the Marmara Sea) on themes of the MarSite project to increase public awareness of the results. MARsite will deposit an electronic copy of all these material and the published version or the final manuscript accepted for publication of a scientific publication relating to foreground published before or after the final report on the project website.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	KOERI	1.00
15	EMSC	15.00

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
	Total	16.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D11.1	Public web page	15	1.00	O	PU	1
D11.2	Analysis of the target users and production of a communication plan	15	3.00	R	PU	6
D11.3	Data dissemination report	15	3.00	R	PU	24
D11.4	Educational material	15	7.00	O	PU	36
D11.5	Short Video	15	2.00	R	PU	6
		Total	16.00			

Description of deliverables

D11.1) Public web page: Public web page [month 1]

D11.2) Analysis of the target users and production of a communication plan: Analysis of the target users and production of a communication plan for the dissemination and public outreach strategy of MARsite [month 6]

D11.3) Data dissemination report: Report on data dissemination including project web page [month 24]

D11.4) Educational material: Educational material in English and Turkish on themes of the MarSite project to increase public awareness of the results [month 36]

D11.5) Short Video: Short video targeting a wide public audience [month 6]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	1	1	Issue of the D1.2
MS2	MS2	1	6	Meeting/Report
MS3	MS3	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	1	18	Meeting/Issue of the D1.4
MS5	MS5	1	24	Meeting/Report
MS6	MS6	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	1	36	Meeting

WT4:
List of Milestones

Project Number [1]	308417	Project Acronym [2]	MARsite

List and Schedule of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	MS1: Kick-off meeting	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	1	Issue of the D1.2
MS2	MS2	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	6	Meeting/Report
MS3	MS3	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	12	Meeting/Report
MS4	MS4: 1st Periodic Report and Mid-term Review Workshop	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	18	Meeting/Issue of the D1.4
MS5	MS5	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	24	Meeting/Report
MS6	MS6	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	30	Meeting/Report
MS7	MS7: 2nd Periodic Report and Project Final Meeting	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9, WP10, WP11	1	36	Meeting

WT5:
Tentative schedule of Project Reviews

Project Number [1]	308417	Project Acronym [2]	MARsite

Tentative schedule of Project Reviews

Review number [65]	Tentative timing	Planned venue of review	Comments, if any
RV 1	18	KOERI, Istanbul -Turkey	First Project Review Meeting is aimed to be held in the fringes of the Midterm Review Workshop.
RV 2	36	KOERI, Istanbul-Turkey	Second and Final Project Review Meeting is aimed to be held in the fringes of the Project Final Meeting.

WT6:
Project Effort by Beneficiary and Work Package

Project Number [1]	308417	Project Acronym [2]	MARsite

Indicative efforts (man-months) per Beneficiary per Work Package

Beneficiary number and short-name	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8	WP 9	WP 10	WP 11	Total per Beneficiary
1 - KOERI	57.00	10.00	5.00	17.00	25.00	0.00	4.00	15.00	22.00	3.00	1.00	159.00
2 - GFZ	0.00	2.00	9.00	27.00	9.00	0.00	0.00	0.00	9.00	0.00	0.00	56.00
3 - TUBITAK	0.00	29.00	24.50	4.00	10.00	7.00	0.00	0.00	2.00	5.00	0.00	81.50
4 - IFREMER	0.00	6.00	0.00	0.00	0.00	0.00	1.00	13.00	0.00	0.00	0.00	20.00
5 - INGV	0.00	16.00	20.00	0.00	16.00	5.00	10.00	20.00	0.00	4.00	0.00	91.00
6 - IU	0.00	0.00	12.00	52.00	13.00	7.00	0.00	0.00	6.00	0.00	0.00	90.00
7 - KOU	0.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00
8 - ITU	0.00	0.00	2.00	0.00	0.00	2.00	36.00	3.00	0.00	0.00	0.00	43.00
9 - CNR (ISMAR-IREA)	0.00	0.00	21.00	0.00	0.00	4.00	8.00	4.00	0.00	0.00	0.00	37.00
10 - BRGM	0.00	0.00	5.00	0.00	10.00	0.00	0.00	0.00	0.00	10.00	0.00	25.00
11 - EUCENTRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00
12 - CNRS	0.00	0.00	0.00	14.50	0.00	0.00	4.00	5.00	0.00	0.00	0.00	23.50
13 - INERIS	0.00	0.00	0.00	0.00	0.00	11.10	0.00	0.00	1.40	0.00	0.00	12.50
14 - AMRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	0.00	0.00	11.00
15 - EMSC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00
16 - ESA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	0.00	13.00
17 - UNIPV	0.00	0.00	0.00	0.00	0.00	16.00	0.00	0.00	0.00	0.00	0.00	16.00
18 - IFSTTAR	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	3.50
19 - Guralp Systems Limit	0.00	0.00	0.00	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.00
20 - DAIMAR srl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00	0.00	0.00	24.00
21 - sarmap S.A.	0.00	0.00	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00

WT6:
Project Effort by Beneficiary and Work Package

Beneficiary number and short-name	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8	WP 9	WP 10	WP 11	Total per Beneficiary
Total	57.00	75.00	122.50	150.50	83.00	55.60	63.00	84.00	56.40	35.00	16.00	798.00

WT7:
Project Effort by Activity type per Beneficiary

Project Number [1]	308417	Project Acronym [2]	MARsite

Indicative efforts per Activity Type per Beneficiary

Activity type	Part. 1 KOERI	Part. 2 GFZ	Part. 3 TUBITAK	Part. 4 IFREMER	Part. 5 INGV	Part. 6 IU	Part. 7 KOU	Part. 8 ITU	Part. 9 CNR (IS	Part. 10 BRGM	Part. 11 EUCENTR	Part. 12 CNRS	Part. 13 INERIS	Part. 14 AMRA
1. RTD/Innovation activities														
WP 2	10.00	2.00	29.00	6.00	16.00	0.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WP 3	5.00	9.00	24.50	0.00	20.00	12.00	0.00	2.00	21.00	5.00	0.00	0.00	0.00	0.00
WP 4	17.00	27.00	4.00	0.00	0.00	52.00	0.00	0.00	0.00	0.00	0.00	14.50	0.00	0.00
WP 5	25.00	9.00	10.00	0.00	16.00	13.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
WP 6	0.00	0.00	7.00	0.00	5.00	7.00	0.00	2.00	4.00	0.00	0.00	0.00	11.10	0.00
WP 7	4.00	0.00	0.00	1.00	10.00	0.00	0.00	36.00	8.00	0.00	0.00	4.00	0.00	0.00
WP 8	15.00	0.00	0.00	13.00	20.00	0.00	0.00	3.00	4.00	0.00	0.00	5.00	0.00	0.00
WP 9	22.00	9.00	2.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	5.00	0.00	1.40	11.00
WP 10	3.00	0.00	5.00	0.00	4.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
Total Research	101.00	56.00	81.50	20.00	91.00	90.00	12.00	43.00	37.00	25.00	5.00	23.50	12.50	11.00
2. Demonstration activities														
Total Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Consortium Management activities														
WP 1	57.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Management	57.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Other activities														
WP 11	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total other	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total	159.00	56.00	81.50	20.00	91.00	90.00	12.00	43.00	37.00	25.00	5.00	23.50	12.50	11.00

WT7:
Project Effort by Activity type per Beneficiary

Activity type	Part. 15 EMSC	Part. 16 ESA	Part. 17 UNIPV	Part. 18 IFSTTAR	Part. 19 Guralp	Part. 20 DAIMAR	Part. 21 sarmap	Total
1. RTD/Innovation activities								
WP 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75.00
WP 3	0.00	0.00	0.00	0.00	0.00	0.00	24.00	122.50
WP 4	0.00	0.00	0.00	0.00	36.00	0.00	0.00	150.50
WP 5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.00
WP 6	0.00	0.00	16.00	3.50	0.00	0.00	0.00	55.60
WP 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.00
WP 8	0.00	0.00	0.00	0.00	0.00	24.00	0.00	84.00
WP 9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.40
WP 10	0.00	13.00	0.00	0.00	0.00	0.00	0.00	35.00
Total Research	0.00	13.00	16.00	3.50	36.00	24.00	24.00	725.00
2. Demonstration activities								
Total Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Consortium Management activities								
WP 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.00
Total Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.00
4. Other activities								
WP 11	15.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00
Total other	15.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00
Total	15.00	13.00	16.00	3.50	36.00	24.00	24.00	798.00

WT8:
Project Effort and costs

Project Number [1]	308417	Project Acronym [2]	MARsite

Project efforts and costs

Beneficiary number	Beneficiary short name	Estimated eligible costs (whole duration of the project)						Requested EU contribution (€)
		Effort (PM)	Personnel costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs OR lump sum, flat-rate or scale-of-unit (€)	Total costs	
1	KOERI	159.00	636,500.00	6,000.00	220,300.00	514,080.00	1,376,880.00	1,137,660.00
2	GFZ	56.00	282,312.00	0.00	62,538.00	206,910.00	551,760.00	413,820.00
3	TUBITAK	81.50	414,409.00	6,000.00	195,340.00	365,849.40	981,598.40	736,198.80
4	IFREMER	20.00	138,481.00	0.00	105,276.00	87,243.00	331,000.00	248,250.00
5	INGV	91.00	335,500.00	6,000.00	155,000.00	294,300.00	790,800.00	593,100.00
6	IU	90.00	247,500.00	0.00	55,350.00	181,710.00	484,560.00	363,420.00
7	KOU	12.00	61,000.00	0.00	16,500.00	15,500.00	93,000.00	69,750.00
8	ITU	43.00	101,000.00	0.00	57,450.00	95,070.00	253,520.00	190,140.00
9	CNR (ISMAR	37.00	196,300.00	0.00	40,900.00	51,400.00	288,600.00	216,450.00
10	BRGM	25.00	173,800.00	0.00	21,200.00	161,400.00	356,400.00	267,300.00
11	EUCENTRE	5.00	40,000.00	0.00	8,600.00	29,160.00	77,760.00	58,320.00
12	CNRS	23.50	119,507.00	26,000.00	5,420.00	74,956.20	225,883.20	169,412.40
13	INERIS	12.50	78,542.00	5,023.00	14,600.00	81,234.00	179,399.00	134,549.25
14	AMRA	11.00	44,000.00	0.00	18,300.00	37,380.00	99,680.00	74,760.00
15	EMSC	15.00	78,000.00	0.00	4,700.00	49,620.00	132,320.00	132,320.00
16	ESA	13.00	104,000.00	0.00	10,000.00	62,400.00	176,400.00	132,300.00
17	UNIPV	16.00	45,675.00	0.00	5,000.00	30,405.00	81,080.00	60,810.00
18	IFSTTAR	3.50	36,400.00	0.00	13,950.00	30,210.00	80,560.00	60,420.00
19	Guralp Sys	36.00	108,000.00	0.00	346,128.00	45,000.00	499,128.00	374,346.00
20	DAIMAR srl	24.00	168,000.00	0.00	28,800.00	118,080.00	314,880.00	236,160.00
21	sarmap S.A	24.00	201,600.00	0.00	10,400.00	182,400.00	394,400.00	295,800.00

WT8:
Project Effort and costs

Beneficiary number	Beneficiary short name	Estimated eligible costs (whole duration of the project)						Requested EU contribution (€)
		Effort (PM)	Personnel costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs OR lump sum, flat-rate or scale-of-unit (€)	Total costs	
Total		798.00	3,610,526.00	49,023.00	1,395,752.00	2,714,307.60	7,769,608.60	5,965,286.45

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It cannot be changed unless agreed so during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

53. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

54. Type of activity

For all FP7 projects each work package must relate to one (and only one) of the following possible types of activity (only if applicable for the chosen funding scheme – must correspond to the GPF Form Ax.v):

• **RTD/INNO =** Research and technological development including scientific coordination - applicable for Collaborative Projects and Networks of Excellence

• **DEM =** Demonstration - applicable for collaborative projects and Research for the Benefit of Specific Groups

• **MGT =** Management of the consortium - applicable for all funding schemes

• **OTHER =** Other specific activities, applicable for all funding schemes

• **COORD =** Coordination activities – applicable only for CAs

• **SUPP =** Support activities – applicable only for SAs

55. Lead beneficiary number

Number of the beneficiary leading the work in this work package.

56. Person-months per work package

The total number of person-months allocated to each work package.

57. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

58. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

59. Milestone number

Milestone number:MS1, MS2, …, MSn

60. Delivery date for Milestone

Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

61. Deliverable number

Deliverable numbers in order of delivery dates: D1 – Dn

62. Nature

Please indicate the nature of the deliverable using one of the following codes

R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

63. Dissemination level

Please indicate the dissemination level using one of the following codes:

• **PU =** Public

• **PP =** Restricted to other programme participants (including the Commission Services)

• **RE =** Restricted to a group specified by the consortium (including the Commission Services)

• **CO =** Confidential, only for members of the consortium (including the Commission Services)

• **Restreint UE =** Classified with the classification level "Restreint UE" according to Commission Decision 2001/844 and amendments

• **Confidentiel UE =** Classified with the mention of the classification level "Confidentiel UE" according to Commission Decision 2001/844 and amendments

• **Secret UE =** Classified with the mention of the classification level "Secret UE" according to Commission Decision 2001/844 and amendments

64. Delivery date for Deliverable

Month in which the deliverables will be available. Month 1 marking the start date of the project, and all delivery dates being relative to this start date

65. Review number

Review number: RV1, RV2, ..., RVn

66. Tentative timing of reviews

Month after which the review will take place. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

67. Person-months per Deliverable

The total number of person-month allocated to each deliverable.

PART B

Introduction

The recent devastating earthquakes and associated tsunamis in Japan, Indonesia, and Haiti, which killed more than half a million people, highlighted how mankind is still far away from a satisfactory level of seismic risk mitigation. Among the regions around the Mediterranean Sea for which earthquakes represent a major threat to their social and economic development, the area around the Marmara Sea, one of the most densely populated parts of Europe, is subjected to a high level of seismic hazard. For this region the MARSite project is proposed with the aim of assessing the "state of the art" of seismic risk evaluation and management at European level. This will be the starting point to move a "step forward" towards new concepts of risk mitigation and management by long-term monitoring activities carried out both on land and at sea.

The decision of the European Parliament and of the Council dated 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013) gives clear emphasize on the sustainable management of the environment and its resources through the advancement of knowledge on the interaction between the climate, biosphere, ecosystems and human activities, and the development of new technologies, tools and services, in order to address global environmental issues in an integrated way. The specific emphasize with respect to the area of interest for MARsite Consortium was placed on earth and ocean systems changes, on tools and technologies for monitoring, prevention, mitigation and adaptation of environmental pressures and risks. Within this scope, the decision clearly reflected the urgent need to address natural hazards, especially with respect to improvement of forecasting and integrated hazards — vulnerability — and risk assessments for disasters related to geological hazards (such as earthquakes, volcanoes, tsunamis) and their impact; development of early warning systems and improve prevention, mitigation and management strategies, also within a multi-risk approach. This decision and the following call on FP7 Environment Theme were the main motivators for the MARSite Consortium.

The MARSite project aims to coordinate research groups with different scientific skills (from seismology to engineering to gas geochemistry) in a comprehensive monitoring activity developed both in the Marmara Sea and in the surrounding urban and country areas. The project plans to coordinate initiatives to collect multidisciplinary data, to be shared, interpreted and merged in consistent theoretical and practical models suitable for the implementation of good practices to move the necessary information to the end users.

Part B of the Dow is informing on the concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan MARsite. It also provides details of the implementation of the project, including management structure and procedures. Information on each beneficiary and the consortium as a whole is also provided together with the resources to be committed. A description of the strategic impact expected and plan for the use and dissemination of foreground is given at the end.

Table of Contents

B1. Concept and objectives, progress beyond state-of-the-art, S/T methodology and work plan

B 1.1 Concept and project objectives

Earthquakes continue to cause destruction around the world, including in the European region. In only the last twelve years, substantial damage and casualties were produced in 1999 Izmit (Turkey), 1999 Athens (Greece) and 2009 L'Aquila (Italy) to name just three damaging earthquakes. Fortunately none of these events was as catastrophic as earthquakes in, for example, Istanbul in 1509 and 1766, Izmir in 1688, Eastern Sicily in 1693 and Lisbon in 1755. For more than two millennia the Marmara region has been the crossroads between east and west. Being a continuously populated region and having as its centre Istanbul, the capital of both Eastern Roman and Ottoman empires, the historical seismicity record is continuous and relatively complete. Earthquake records spanning two millennia indicate that, on average, at least one medium intensity (Io=VII-VIII) earthquake has affected Istanbul in every 50 years. The average return period for high intensity (Io=VIII-IX) events has been about 250-300 years, the last one of which was in 1766.

Unfortunately, this type of catastrophic event is now expected in the Marmara region, with a probability in excess of 65% in 30 years, due to the existing seismic gap and the post-1999 earthquake stress transfer at the western portion of the 1000km-long North Anatolian Fault Zone (NAFZ), passing through the Marmara Sea about 15 km from Istanbul. The well-documented historical earthquakes in Marmara Region and the earthquakes occurred in the last century indicate that the segments of the NAFZ are seismically active and have the capability of generating destructive earthquakes (Figure 1).

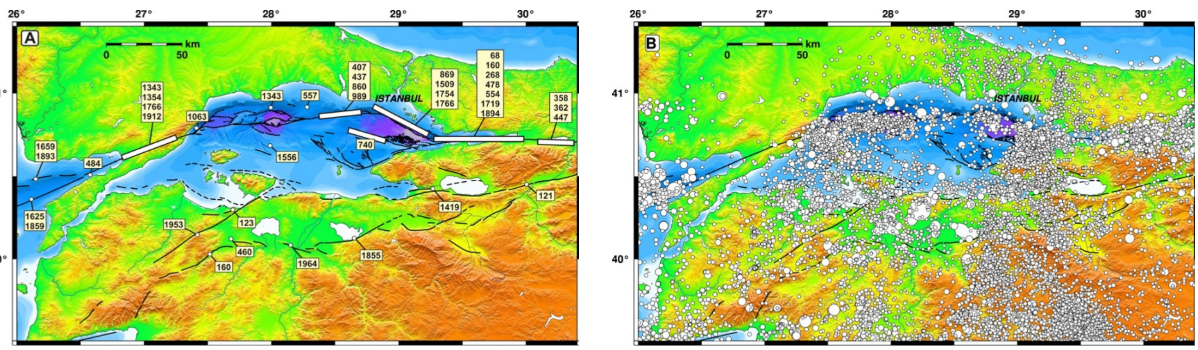

Figure 1. A) The occurrence years and possible locations of historical earthquakes (redrawn from Ambraseys, 2002). B) The seismicity of the Marmara Region from combined catalogues of KOERI and TUBITAK (1964-2011, M≥2.5).

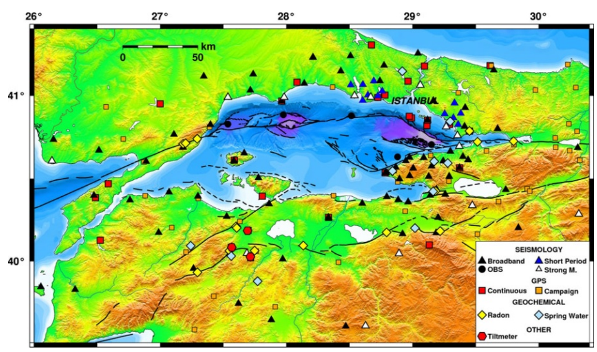

Figure 2. The instrumental infrastructure of the project partners in the Marmara Region.

Istanbul is fully aware of this impending problem and the authorities are in the process of taking all conceivable physical and social steps for preparedness and mitigation of the risk. Parallel to these efforts, local scientists have installed extensive on- and off-shore multi-disciplinary observation networks in the region (Figure 2). The Marmara Region has been monitoring by about 400 stations.. The city of İstanbul has also earthquake early-warning and rapid-response systems (Figure 3).

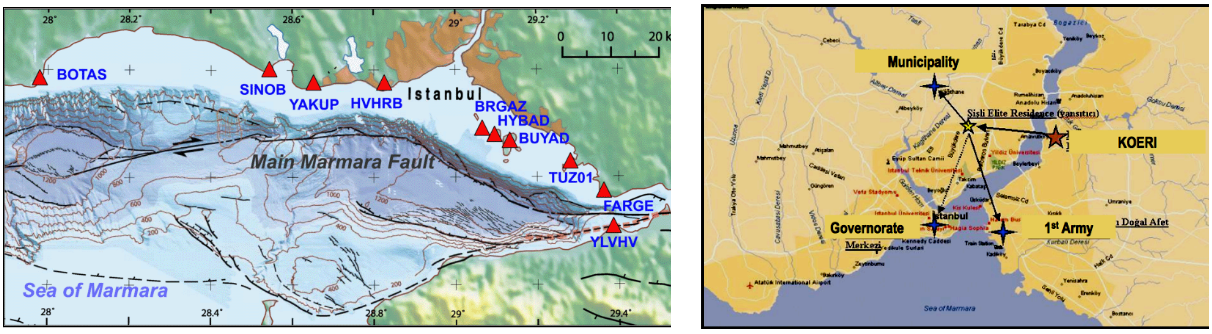

Figure 3. Istanbul early warning stations (left) and Data Communications infrastructure of the İstanbul Early Warning System (right).

The GEO concept of Supersites has generated considerable interest since its first appearance in Task DI-09-01a in the GEO Work Programme 2009-2011. The concept of facilitating "Retrieval, integration and systematic access to remote sensing & in-situ data in selected regional areas exposed to geological threats ("Supersites")" was seen as a means to improve efficiency of expensive monitoring and research efforts by geographically focussing them. A "white paper" and a "strategic plan" were circulated among the data providers and in the scientific community to make connections and help identify needs and expectations in order to make the concept and -especially- its operation more focussed and thus effective. MARsite will represent a significant European contribution to the Supersite initiative and thus to the Global Earth Observation System of Systems (GEOSS), in that it will:

- " lead to better scientific understanding of the geophysical processes" (Supersite Strategic Plan)
- "contribute in-situ data to a unifying e-infrastructure" (Supersite Strategic Plan)
- "broaden our knowledge about geological extreme events" (Supersite White Paper)
- "reduce our vulnerability to geologic hazards" (Supersite White Paper)

All the above is in the end aimed at:

- " mitigation of geological disasters" (Supersite Strategic Plan)
- "Informing Risk Management and Disaster Reduction" (DI-01 component of GEO WP 2012-2015 as accepted at the GEO-VII Plenary held in Istanbul on 16-17th November 2011)
- "Improved use of observations and related information to inform policies, decisions and actions associated with disaster preparedness and mitigation." (GEOSS Strategic targets)
- and, in a global perspective, "Support to the successful implementation of the Hyogo Framework for Action 2005-2015" (GEOSS Strategic targets)

In this perspective, to improve the understanding of and preparedness for geological disasters, the existing monitoring capabilities in the Marmara region indicate a strong need for a European initiative. The call ENV.2012.6.4-2 (Long-term monitoring experiment in geologically active regions of Europe prone to natural hazards: the Supersite concept) responds to this pressing need and formulates very clear priorities in support of:

a) long-term hazard monitoring and evaluation through collaboration with existing monitoring networks in a cross-cutting mode;
b) development of novel instruments and instrumentation that will serve as the next generation of geo-hazards monitoring/observing systems;
c) strengthening the capacity for the predictability of geohazards through the development of models to better analyze and forecast extreme events at the regional level;
d) improvement of our understanding of hazard and to contribute to risk management for the protection of citizens, socio-economic life and built environment; and
e) fostering of collaboration activities and further integration of the geo-hazard research field.

The MARsite project thus proposes to identify the Marmara region as a 'Supersite' within European initiatives to aggregate on-shore, off-shore and space-based observations, comprehensive geophysical monitoring, improved hazard and risk assessments encompassed in an integrated set of activities to respond to all priorities identified in the ENV.2012.6.4-2 call.

In particular, MARsite aims to harmonize geological, geophysical, geodetic and geochemical observations to provide a better view of the post-seismic deformation of the 1999 Izmit earthquake (in addition to the post-seismic signature of previous earthquakes), loading of submarine and inland active fault segments and transient pre-earthquake signals, related to stress loading with different tectonic properties in and around Marmara Sea. Moreover, the results will be considered as earthquake/landslide triggering mechanisms along the Marmara Sea's shoreline and they will support tsunami hazard modelling. These studies are planned to contribute to high-quality rapid source-mechanism solutions and slip models, early warning and rapid-response studies. The project outputs will also be adapted to improve various phases of the risk management cycle with the creation of a link between the scientific community and end users. In this context, MARsite will develop novel geo-hazard monitoring instruments including high-resolution displacement meters, novel borehole instrumentation and sea-bottom gas emission and heat-flow measurement systems, in association with the relevant industrial sectors and SMEs.

We have seen over the last few decades the improvement of seismic hazard assessment through several EU projects (such as, NERIES, SAFER and SHARE). Future developments will no doubt improve our assessment of hazard, and the MARsite project aims to coordinate different scientific skills (from seismology through engineering to geochemistry). MARsite plans to coordinate initiatives of important European partners focused on: the collection multidisciplinary data; their dissemination, interpretation and fusion to produce consistent theoretical and practical models; following good practices so as to provide the necessary information to end users; and updating seismic hazard and risk evaluations in the region, particularly in Istanbul.

To fulfil the requirements of the call, MARsite identifies a number of objectives that drive its implementation, the definition of the activities and the composition of the consortium. The MARsite strategic objectives are to:

Achieve long-term hazard monitoring and evaluation by in-situ monitoring of: earthquakes, tsunamis, landslides, displacements, chemical-radioactive emission and other physical variables and by the use of space-based techniques.

Improve existing earthquake early-warning and rapid-response systems by involving common activities, participants, competences, knowledge and experts from Europe.

Improve ground shaking and displacement modelling by development/updating of source models and the use of probabilistic and deterministic techniques with real-time and time-dependent applications.

Pursue scientific and technical innovation by including state-of-the-art R&D in developing novel instruments and instrumentation.

Interact with end users and contribute to the improvement of existing policies and programs on preparedness, risk mitigation and emergency management.

Build on past and on-going European projects (e.g. TERRAFIRMA, PREVIEW, LESSLOSS, NERIES, SERIES, TRANSFER, SHARE, SYNER-G, TRIDEC, NERA and REAKT) by including their contributions and principal partners, avoiding duplication and using their successes and momentum to create a better understanding of geo-hazards.
Complement actions conducted in **EPOS** (European Plate Observing System) and **EMSO** (European Multidisciplinary Seafloor Observatory) ESFRI large-scale Research Infrastructures, in the **GMES** initiative (Global Monitoring for Environment and Security) and in the **GEO Work Programme 2009-2011**, and, consequently, in **GEO Work Programme 2012-2015**

B 1.2 Progress beyond the state of the art

MARsite aims to achieve measurable progress beyond the state-of-the-art in all the thematic objectives identified for the project and in phases leading to substantial progress in the monitoring of earthquake generation processes, in the integration and coordination of existing in-situ observatories, in promoting scientific and technological implementation of novel near-fault monitoring systems and in opening of new horizons in the comprehension of the mechanics of earthquakes and faulting. It is important to note that this progress will be produced by scientists and engineers from many European countries, to the benefit of all European countries.

Progress in Coordinating and Integrating European Participation in Geo-hazard Observatories

In order to fully meet one key requirement of the Call, it is paramount to coordinate and integrate existing near-fault monitoring infrastructures in the Marmara region and to manage data and information at a pan-European level. European scientists have played a major role in the study of the North Anatolian Fault passing under the Marmara Sea (Main Marmara Fault) concerning strain accumulation and earthquake probabilities. In this connection, the detailed offshore surveys conducted in the Marmara Sea by Le Pichon et al. (2003) and Armijo et al. (2002) yielded two important, yet differing, alternate structural models that are currently under discussion.

European research and monitoring infrastructures have also been used to improve our models describing the active deformation processes generating earthquakes, landslides and tsunamis. These efforts include EU FP6 and FP7 projects NERIES, LESSLOSS, TRANSFER, SAFER, NERA and REAKT. However, MARsite will be the first European-scale initiative to use the existing research infrastructure in seismology in the Marmara Region to create efficient means to exchange data, information, modelling and monitoring tools with the specific aim of monitoring, evaluating and understanding of the earthquake hazard phenomenon in the region. MARsite as a comprehensive near-fault observatory will create the operational basis for a concerted European scientific investigation on earthquake initiation and on-going processes. This will serve to increase European scientific competitiveness on the international stage as well as progress our capacity to understand catastrophic earthquake phenomena and contribute to mitigation of their effects.

Progress in Implementation of Novel Monitoring Systems (Ground- and Space-based)

In the past decade the technological development of monitoring instruments for seismology, geodesy and geochemistry led to advances in the understanding of geo-hazards, earthquake source mechanisms, seismic-wave generation processes and imaging earthquake ruptures. Notable examples are broad-band seismometers (including continuous high-sampling GPS) and In-SAR measurements. Despite these technological advances, there still exists a strong need to develop novel instruments, instrumentation systems and monitoring technologies especially for near-fault observational systems and for direct fault rupture imaging. The following are key elements in this project; 1) borehole seismometers allowing for the observation of earthquake waves in a noise-free environment with very high signal-to-noise ratios, which increases the detection threshold and allows the study of earthquake initiation as well as the monitoring of transients associated with strain accumulation processes, 2) the Self-Organizing Seismic Early Warning Information Network (SOSEWIN), previously developed in the FP6 SAFER project, being an innovative, self-organizing wireless mesh information network made up of low-cost sensors, which will be further improved for use in near-field monitoring of earthquakes, and 3) the integration of GPS (including continuous GPS) with different remote sensing techniques for getting better resolution and follow the temporal change of crustal movement.

MARsite will serve as the platform for an integrated, multidisciplinary, holistic and articulated framework for dealing with fault zone monitoring, capable of developing the next generation of observatories to study earthquake generation processes. The main progress will be the fusion of ground- and space-based monitoring systems dedicated to geo-hazard monitoring. These efforts can benefit the two European environmental large-scale infrastructures, included in the ESFRI Roadmap (http://cordis.europa.eu/esfri/roadmap.htm): EPOS (European Plate Observing System, http://www.epos-eu.org/) and EMSO (European Multidisciplinary Seafloor Observatory, http://www.emso-eu.org/).

The European Plate Observing System (EPOS) is a long-term integrated research infrastructure (RI) plan to:

- Promote innovative approaches for a better understanding of the physical processes controlling earthquakes, volcanic eruptions, unrest episodes and tsunamis as well as those driving tectonics and Earth surface dynamic.
- Increase the accessibility and usability of multidisciplinary data from monitoring networks, laboratory experiments and computational simulations enhancing worldwide interoperability in Earth Science by establishing a leading integrated European infrastructure and associated core services.

To this end, EPOS integrates the scattered European RIs for solid Earth Science, and builds new e-science opportunities to monitor and understand the dynamic and complex solid-Earth System. The integration plan includes permanent national and regional geophysical monitoring networks (seismological, GPS), the observations from "in-situ" observatories (volcano observatories, fault zone test-sites, Supersites), geological repositories (in synergy with EuroGeoSurveys) temporary monitoring and laboratory experiments, a cyber-infrastructure for data mining and processing, and facilities for data integration, visualization and modelling.

This requires strengthening the European capability to create high quality data, both observed and simulated, and to facilitate access to data products. To this task EPOS will:

1. Create the Thematic Core Services – European bodies that will coordinate and guarantee access to data already existing at the national level for each of the solid Earth disciplines;
2. Create the Integrated Core Services, which will provide the IT layer above these Thematic Nodes allowing integrated access to the entire EPOS datasets
3. Provide the governance and the legal framework required in order to coordinate the management and implementation of the Thematic and Integrated Core Services.

EPOS is currently a Preparatory Phase project funded under the Seventh Framework Programme. The community consists of 20 partners for 18 countries (Italy, France, Germany, The Netherlands, Romania, Iceland, Switzerland, United Kingdom, Norway, Turkey, Ireland, Portugal, Spain, Greece, Sweden, Poland, Denmark, Czech Republic and 1 non-governmental organization ORFEUS, managed by KNMI) and 6 associated partners (Slovak Republic, Finland, Slovenia, Austria, Israel and 1 international organization EMSC) for a total of 23 countries.

National implementation plans have been already launched in these countries to support the national RIs participating to the EPOS integration plan and secure their fundings as well as to implement the coordination among the hundreds of institutes managing facilities at national level.

EMSO is a large-scale European Research Infrastructure (RI) of the ESFRI roadmap composed of fixed-point, seafloor and water column observatories with the basic scientific objective of real-time, long-term monitoring of environmental processes related to the interaction between the geosphere, biosphere, and hydrosphere. It is geographically distributed in key sites of European waters, spanning from the Arctic, through the Atlantic, Mediterranean Sea and Marmara Sea to the Black Sea. EMSO will be the sub-sea segment of the Global Monitoring for Environment and Security (GMES) initiative and will significantly enhance the observational capabilities of European member states. An open data policy compliant with the recommendations being developed within the GEOSS initiative (*Global Earth Observation System of Systems*) will allow for shared use of the infrastructure and the exchange of scientific information and knowledge. EMSO is an essential tool for deep sea research including geosciences and geo-hazards, physical oceanography, biology and non-living resources. Cabled seafloor observatories are needed to collect simultaneously long-time series of data identifying temporal evolutions, cyclic changes and capturing episodic events related to oceanic circulation, deep-sea processes and ecosystems evolution. In addition long-term monitoring will allow the capture of episodic events such as earthquakes, submarine slides, tsunamis, benthic storms, bio-diversity changes, pollution and other events that cannot be detected and monitored by conventional oceanographic sea-going campaigns.

Figure 4: EMSO sites (2011 update)

Figure 4 shows the location of the EMSO sites presently targeted to establish permanent, fixed-point observatories. The Scientific Partners participating in the FP7-funded EMSO-

Preparatory Phase project (12 countries involved: Italy, France, Germany, Ireland, Spain, Sweden, Greece, United Kingdom, Norway, Portugal, Turkey, The Netherlands), along with the respective Funding Agencies representatives, envisaged to adopt the European Research Infrastructure Consortium (hereinafter “ERIC”), set up by Council Regulation (EC) n° 723/2009 of 25 June 2009, as the legal structure for EMSO. The foundation of the EMSO-ERIC represents a unique initiative to sustain investment in open ocean observatories, allowing Europe to be at the forefront of ocean observation along with similar infrastructures in the USA, Canada, Japan, China, Taiwan and Australia.

Progress in Understanding of Earthquake Phenomena

Despite advances in earth science observations, scientists are not able to fully document the pre-, co- and post-rupture phases of an impending catastrophic earthquake. Three main and currently studied problems of earthquake science are to understand the dynamics of: fault systems, fault rupture and ground motions, all coupled through the complex and nonlinear processes of brittle and ductile deformation distributed over a strongly heterogeneous crust.

The MARsite project provides a real opportunity for the understanding of these main problems through measurements conducted as a result of a long-term robust monitoring instrumentation and appropriate theoretical methodologies for understanding earthquakes and associated phenomena (e.g. landslides and tsunamis) in a near-source environment. In this connection MARsite aims to use dedicated in-situ observatories to support progress in the understanding of earthquakes and triggering processes through the development of novel near-source observation techniques and innovative methodologies for their analysis. The scientific relevance of the MARsite project are also evidenced by the long-term earthquake science research goals identified by the US National Research Council: fault recognition (location, slip rate and earthquake history); fault system dynamics: the kinematics and dynamics of interacting faults; fault zone characterization: 3D structure and material properties of fault zones; earthquake source: nucleation, propagation and arrest in realistic fault systems; seismic hazard analysis and development of reliable information systems for rapid alert. Contributing to these goals and the related progress on the understanding of earthquakes is the main goal of MARsite.

Progress in Hazard Assessment

As earthquake hazard assessments that quantify the ground shaking are of prime interest for any earthquake risk management programme, MARsite aims to update and improve existing seismic hazard assessments through full treatment of aleatory and epistemic uncertainties; formal expert elicitation procedures as per the SSHAC (Senior Seismic Hazard Analysis Committee) guidance (NUREG/CR-6372: Recommendations for PSHA: Guidance on Uncertainty and Use of Experts); and a logic tree representation of the whole hazard model. To understand the variability of near-fault ground motion strongly controlled by the rupture characteristics and to achieve progress on its modelling, dense strong motion arrays are needed. In this respect, MARsite offers the use of Istanbul’s rapid response system that encompasses 200 instruments. The sensitivity of the Istanbul rapid-response system also allows imaging the micro-earthquake sources to detect stress field variations and related evaluations to achieve progress on earthquake predictability.

The improved long-term seismic hazard assessment will incorporate: revised fault models (with special attention to fault segmentation), reconciliation of differing GPS fault slip and strain rate estimates and, slip-rate constraints on faults and improved recurrence-interval estimates. Progress will also be achieved in short-term hazard modelling (earthquake forecast) through research on: proper characterization of various earthquake-related statistical relationships, understanding patterns of seismicity in time and space and, testing methodologies with those developed for California (Collaboratory for the Study of Earthquake Predictability, CSEP).

Furthermore, MARsite aims to apply the multidisciplinary observations collected in the project to promote procedures for real-time monitoring of seismogenic faults that will contribute to the improvement of the current earthquake rapid-response system, to better understand near-fault ground motions and their variability. Progress on waveform modelling and the development of common guidelines to use advanced waveform modelling in local site evaluations will pave the way for amendments to building codes to account for local topography and geology.

Progress in Earthquake Early-Warning and Rapid-Response Systems

Earthquake early-warning systems have the capability to reduce earthquake risk through servo-actuated safety measures or to give short timely alerts to schools, for example. Earthquake rapid-response systems serve to provide ground shaking and loss maps (or information) immediately after an earthquake through theoretical assessments and empirical analysis of observations. Progress on earthquake early warning and rapid response will be achieved in MARsite, following on from the previous FP6 SAFER and FP7 REAKT projects, through collaboration of European scientists on the improvement of the methodology and the databases of these projects.

The current Istanbul earthquake early warning system using 12 strong-motion stations and several early warning algorithms varying from PGA and CAV thresholds to t-Pd techniques will be further improved by alternative threshold-based methods, such as PRESToPlus algorithm, based on an evolutionary approach for regional early warning using a dense network surrounding the fault system, with an on-site threshold based system, which correlates the information acquired from the early portion of the signal to predict the amplitude of the final ground shaking. Tests will also be conducted to assess the suitability of other methodologies used in California and Taiwan, such as: Tauc-Pd Onsite, Virtual Seismologist and ElarmS.

MARsite project will directly benefit from the earthquake rapid response system involving 200 strong-motion recorders in Istanbul, used for post-earthquake rapid response within a few minutes (ground shaking intensity (Shake Maps), physical damage and casualties (Loss Maps)). Nowadays, the accurate estimation of vulnerability of buildings is generally made using accurate, complex models which have to be fed with large amounts of in-situ data and are thus generally capable of covering only a limited geographical scope. MARsite will implement and test a system for producing a zero-level estimation of vulnerability relying in principle on remote-sensing data only to decouple the evaluation of seismic vulnerability from the availability of in-situ data. This will be done in the framework of GEOSS. Earth Observation systems have the potential of being the key enabling technology in large-scale estimation of seismic vulnerability.

The Istanbul Early Warning and Rapid Response system performances will be improved by the incorporation of data from the real-time GPS networks that has the advantage of capturing motions throughout the entire earthquake cycle (interseismic, seismic, coseismic and postseismic). MARsite will improve the early warning signal-generation capability and real-time assessment of shaking and damage and methodologies to deliver a risk-based decision platform to support risk mitigation activities of local authorities.

B 1.3 S/T Methodology and associated work plan

MARsite will make use of the Schedule Performance Index (SPI), which is a measure of project efficiency given by Project Management to gauge the progress and efficiency. An SPI score of 1 or greater is an optimum goal since it shows the Project Management that the project is on track and has favorable conditions of meeting the required goals. However, a of SPI less than 1 is to be avoided since that shows the project is not meeting goals and is showing unfavorable conditions that could lead to project failure if the current course of action is allowed to continue. If the SPI is showing a trend that is at or approaching 1, the Project Management Office will re-evaluate the current conditions of the project and begin an analysis of the current project trends and begin corrective actions. If the Schedule Performance Index trend is rising, the Project Management will analyze the goals and the current favorable conditions to possibly re assess the project's short term goals. SPI is a ratio of Earned Value (EV) to the Planned Value (PV). Earned Value is the value of the project at its current timeframe. EV refers to the precise and specific value of all sum total of completed project work to date. These earned values are expressed in terms of a budget that has been formulated previously, has been reviewed, and has been approved, and has in turn been assigned to a particular work element by a particular work breakdown structure represented with the GANTT Chart of MARSite. Planned Value is the overall projected value of the project at the same time as the Earned Value. PV will be used by the project management team to refer specifically to actual and finally authorized budget that is determined in the early stages of a project that is assigned by the project management team to the sum total of the scheduled work that is intended to be accomplished as part of the scheduled activity and or as part of the previously determined work schedule breakdown structure represented with the GANTT Chart of MARSite. To determine the project's SPI the Project Management divides the EV by the PV. This can also be shown as a simple formula; SPI=EV/PV

Beyond these performance indicators, the deliverables of MARsite are direct tools of performance, research, result, progress and impact indicators and do constitute the baseline data. Each deliverable is defined as a concrete product defined as time series, maps, models, instruments, methods, algorithms and databases. Milestones, defined at project level at regular intervals of 6 months, will be the key elements of monitoring the Project's progress to ensure that it will stand ready for any review at any time.

For the Marmara region, following the 17 August 1999 Izmit earthquake, we have detailed seismic observations and have collected very valuable data and gain useful information on the location and orientation of fault segments in the Marmara region (both land and sea). By continuously monitoring the Marmara region since early 2000s, we have obtained encouraging data for studying pre-earthquake transients (İnan et al., 2008). Based on existing networks that will be improved in the proposed project, we will be able to obtain critical data that will enable us to construct physical models of crustal deformation; in turn this will enable us to scrutinize different physical models and provide further inputs to risk evaluation. We believe that the improvement of the existing TUBITAK geochemical monitoring network with what INGV is already testing in Sicily will create a very powerful geochemical network. Our approach will serve to select target areas for concentrated measurements (perhaps relocation of some land-based observation stations) and to optimally configure arrays to monitor the relevant processes on faults. Finally, improvement of our understanding of hazard in the Marmara region will contribute to risk management for the protection of citizens, socio-economic life and the built environment. In short, with this project we plan to build on and improve the existing geochemical and geodetic network for continuous monitoring, aided by InSAR data, to continuously monitor and report to decision makers if any abnormal behaviour is detected. This is a very important mission and if and when it succeeds, it will be an example for continuous and applied earthquake research in other earthquake prone regions of the world.

B 1.3.1 Overall strategy and general description:

WP leaders will ensure the regular communication among the partners in each package. The team of partners, with their recognized expertise and wide network, are in a good position to overcome the challenges to be met during the three years of research. They have been and/or are involved in a number of major European research projects very relevant for the field of earth sciences, natural hazards, vulnerability and risk assessment. The consortium is strong, well diversified, composed of very skilled researchers and strong enough to replace a WP leader in case of any withdrawal. Descriptions of Risk and corresponding Remedial Actions are given in Table 1.

Risk	Impact	Remedial Action
Large Number of Participants	From the management point of view, the main potential risk in MARsite is the large number of participants, which may lead to inadequate communication, difficulty in overall management, insufficient participation and integration.	These will be dealt with the effective coordination among the WP leaders, Project Coordinator (PC), Project Manager (PM) and the Project Office (PO) supported with a Consortium Agreement (CA) and clear description of responsibilities in the work plan
Delivery timing and quality problems	Other risk areas may include deliverables being not on time or of insufficient quality.	These risks will be addressed by the close monitoring of the project processes by the WP leaders, PC and PM.
Communication	Concerning the communication, a clear distinction is made between internal project communication as a part of management activities and the external project communication. One of the challenges of international projects with partners with different cultural and linguistic backgrounds is the communication and information flow.	A document management system will be implemented by the PM to archive all project reports and documentation. Teleconferences will be held on a quarterly basis and annual CGA meetings will allow an in-depth review in

<table>
<tr><td></td><td></td><td>person.</td></tr>
<tr><td>System problems</td><td>MARsite focuses on the design, development, implementation and testing of multi-parameter borehole system for monitoring continuously the evolution of the state of stress in the fault zone surrounding the Main Marmara Fault (MMF), and for detecting any anomaly or change that may occur before earthquakes. The achievement of this objective depends on the multi-parameter system working properly to deliver the anticipated benefits.</td><td rowspan="3">GURALP Systems, who is a participant of this project as an SME, is the producer of such systems and it is involved in similar projects worldwide, thus they have great experience in dealing with such problems. MARsite will also be supported with the WP4 leader's experience in operational works (such as the installation of the earthquake early-warning system in Istanbul and the first telemetric network in Turkey). Such delays can be compensated during the course of the project and consequently, they will not affect carrying out the proposed studies.</td></tr>
<tr><td>Borehole operations risks</td><td>Similar borehole operations may also face problems such as underground water monitoring, which requires additional isolation measures with a potential of a delay in the respective deliverables.</td></tr>
<tr><td>Instrument deployment related risks</td><td>Some technical delays may occur in the deployment of the instrumentation or in data acquisition after the deployment. These possible delays may have effects on relevant tasks that will use the data from this system.</td></tr>
<tr><td>Site related risks</td><td>For the installation of the seismic instruments at the GPS sites there may be similar problems concerning site selection. This logistical issue may also be a problem with the improvement of the existing GPS infrastructure concerning 16 sites</td><td rowspan="2">The operational capabilities of KOERI support a very good cooperation and familiarity with the national and local authorities, which will be the major help in addressing such issues. The installation of the systems in field surveys with high-tech equipment and the maintenance of all the necessary equipment may need experienced local support. TUBITAK, as one of the local key partners of MARsite, will contribute to the field teams, using its skilled electronic engineers and well-equipped electronic labs. Both KOERI and TUBITAK have necessary operational experience and skilled personnel working in mobilized emergency field teams to address such issues. It is expected that in case of such a failure, the</td></tr>
<tr><td>Data Communication Risks</td><td>The operational components of the project may also face network communication problems leading to reduction in the data availability and thus delay in the submission of the deliverables.</td></tr>
</table>

		communication links can be recovered in 12 hours.
Meteorological Conditions	The meteorological conditions are the primary concern in marine operations during the deployment stages within the Marmara Sea. These may have the potential to delay respective deliverables	The work plan is structured in such a way that many kinds of infrastructural operations are to be conducted in the very early stages of the project so that any possible delay may be compensated during the project. Moreover, ITU has long years of experience organizing and coordinating marine operations and scientific cruises.
Vandalism	Vandalism is unfortunately a source of concern for any type of instrument installation.	The habitants in the neighbourhood of MARsite instrument sites will be properly informed through cooperation with the local authorities.
General	The PC, supported by the PM and the PO, working in coordination with the WP leaders is responsible for the identification of the general specific risks of the project and the definition of remedial actions	An update of the work package and activity risk will be reported to the consortium when necessary. An effective Project Portal will allow prompt access to all the relevant information.

Table 1: Risks and corresponding remedial actions in MARsite

The detailed work description is broken down into eleven work packages with associated Work package list, Deliverables list, List of milestones, Description of each work package and Summary effort table. Graphical presentation of the components showing interdependencies in MARsite is shown in the PERT diagram below.

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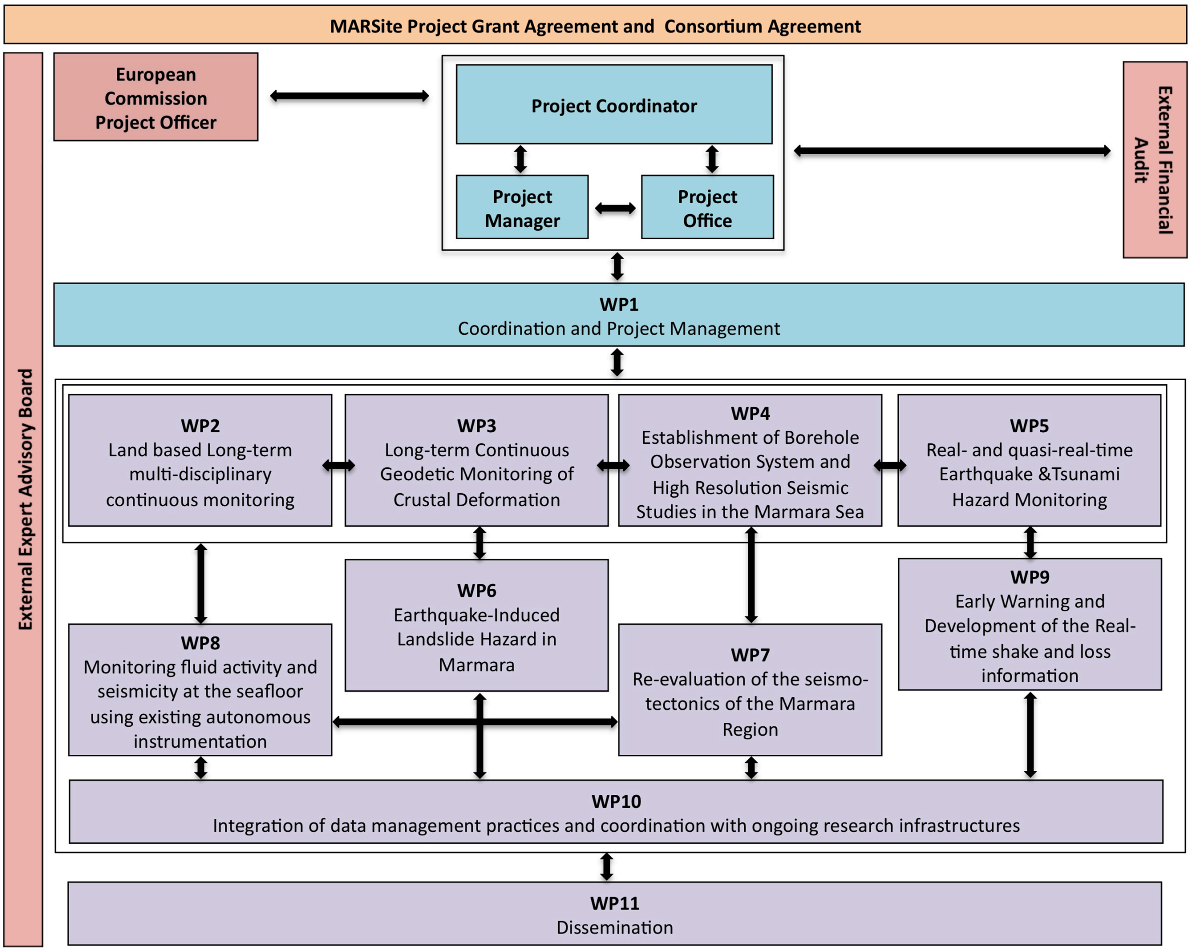

Figure 5: Project PERT Diagram

B 1.3.2 Timing of work packages and their components:

The project is divided into eleven work packages (WPs) that constitute the processes involved in earthquake generation and the physics of short-term seismic changes, 4D deformations to understand earthquake cycle processes, monitoring fluid activity and seismicity on land and at the seafloor using existing autonomous instrumentation, early warning and the development of real-time shaking and loss information, real- and quasi-real-time earthquake and tsunami hazard monitoring and earthquake-induced landslide hazard. Short descriptions of the WPs are provided in Table 2 and the timing of the different WPs and their components is shown in the GANTT chart given in Figure 6.

WP Number	WP Short Description
1	The main objective of WP1 is to ensure the successful completion of the project goals on time within the limits defined by the budgetary framework and quality standards imposed by the EU. WP1 is also responsible for the Consortium Management, assessment of progress and results addressed in them.
2	The aim of WP2 is the collection and integration of seismological, geochemical, and geodetic data to detect and model the interactions between fluids, crustal deformation and ruptures of the active tectonic structures of the Marmara area and, thereby, to contribute to its seismic hazard assessment.
3	In WP3, long-term continuous monitoring of the crustal deformation will be investigated by exploiting the existing land and space based geodetic crustal deformation monitoring systems.
4	A multi-parameter borehole system and surface array as closest as to the main Marmara Fault (MMF) in the western Marmara Sea will be installed in WP4 to measure continuously the evolution of the state of stress of the fault zone surrounding the MMF and to detect any anomaly or change which may occur before earthquakes by making use of the data from the arrays already running in the eastern part of the Marmara Sea.
5	WP5 will concentrate on real- and quasi-real-time Earthquake &Tsunami Hazard Monitoring, where an integrated approach by harmonizing geodetic and seismic data to be used in early warning applications will be implemented, so that in addition a quick determination of the rupture characteristics could also assist the identification of the tsunamigenic potential of an earthquake in combination with a tectonic origin tsunami scenario database.
6	The aim of WP6 is to improve the preparedness of those seismically induced landslide geohazards, through the using and the improvement of monitoring and observing systems in hydrogeotechnical and seismically well-constrained areas within the supersite.
7	Re-evaluation of the seismo-tectonics of the Marmara Region will be conducted in WP7.
8	Monitoring seismicity and fluid activity near the fault using existing cabled and autonomous multiparameter seafloor instrumentation will be performed in WP8.
9	WP9 will focus on Early Warning and Development of the Real-time shake and loss information for the supersite
10	Integration of data management practices and coordination with ongoing research infrastructures are the responsibilities of WP10, through which the data and the results will be exploited.
11	Analysis of the target users and production of a communication plan for the dissemination and public outreach strategy of MARsite , together with the dissemination activities will be the responsibility of WP11.

Table 2: Short descriptions of WPs

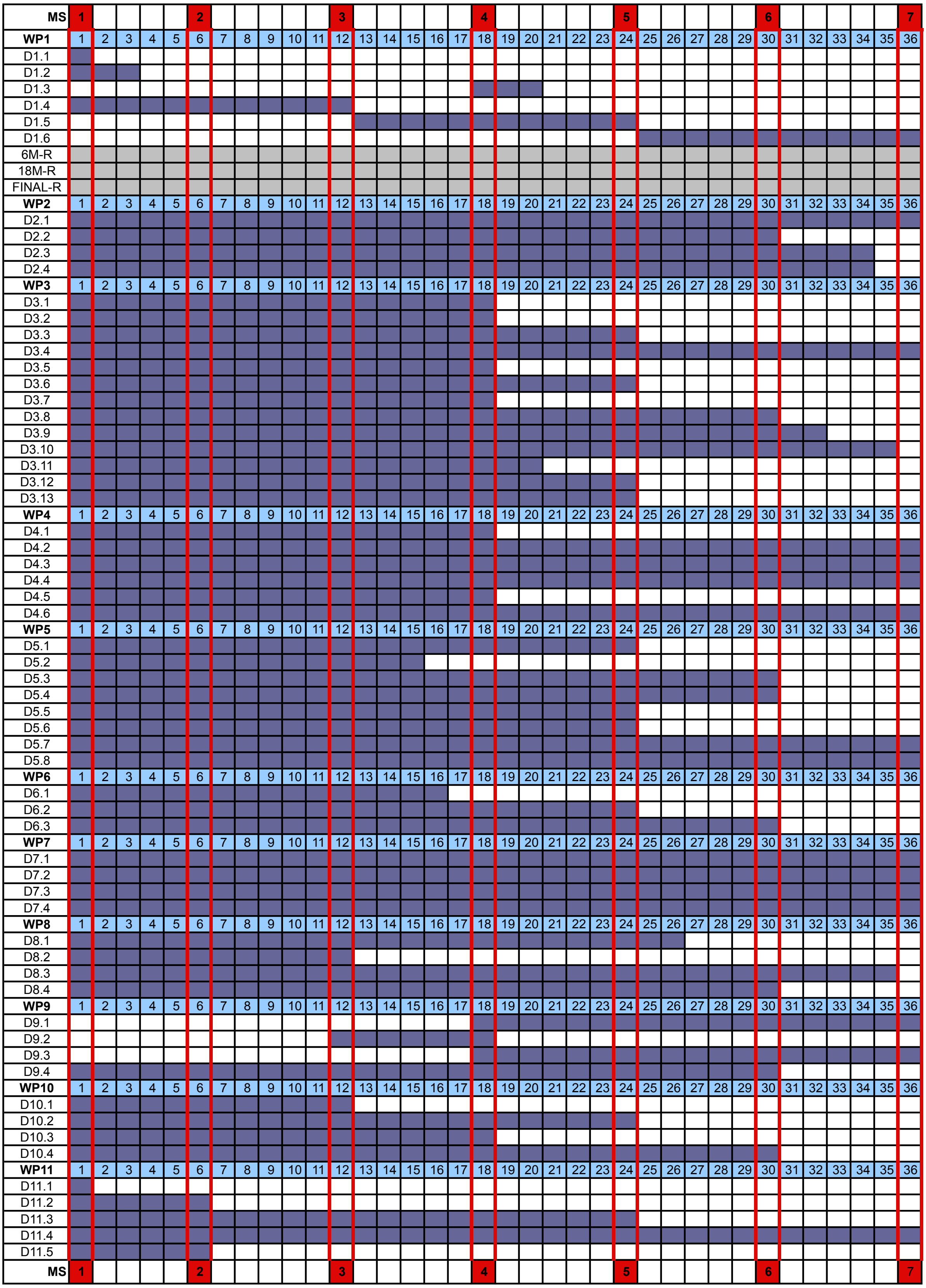

Figure 6: MARsite Project GANTT Chart. Milestones are shown in red colums with the corresponding months in red boxes. Please note that 6-monthly internal reports, 18-monthly periodic reports and Project Final Report to be produced by WP1 (shown as grey in the chart) require 35 PM in total but are not considered as deliverables.

B2. Implementation

B 2.1 Management structure and procedures

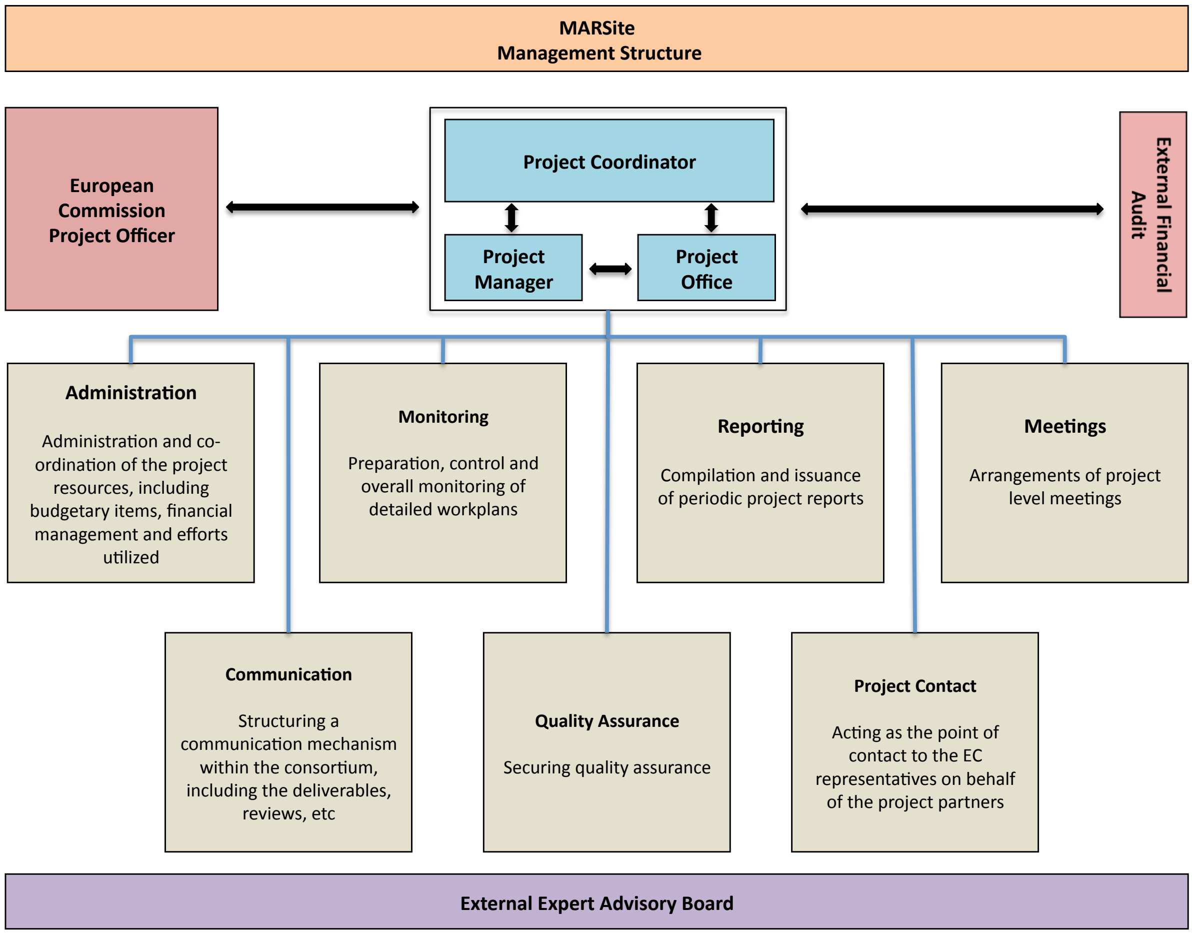

Figure 7: Management Organization Structure in MARsite

The structure of the project management will be organised in such a way to ensure the successful completion of the project goals on time with respect to the available budget and quality standards dictated by the European Projects framework. The proposed management structure will involve co-ordination and quality assurance, including the following specific goals:

- administration and co-ordination of the project resources, including budgetary items, financial management and efforts utilized;
- preparation, control and overall monitoring of detailed workplans;
- compilation and issuance of periodic project reports (six-monthly and annually);
- arrangements of project level meetings;
- structuring a communication mechanism within the consortium, including the deliverables, reviews, etc.;
- acting as the point of contact to the EC representatives on behalf of the project partners; and
- securing quality assurance.
-

The management of the project requires also ensuring timely and satisfactory generation and dissemination of the project related information. It will provide the linkage among people, ideas and information that are required for the successful completion of the project. To accomplish this, communication mechanisms through e-mail, phone, tele/video-conferencing, and face-to-face meetings will be established. The management will also be responsible for the organisation of the Kick-off and regular consortium meetings including preparations of the agendas, chairing and elaborations of meeting minutes.

Concerning the quality assurance, all activities will be implemented in such a way to ensure that the project will satisfy the relevant quality standards. Project plans will be regularly reviewed to ensure that they follow the defined processes within the project. Deliverables will also be subject to review and a special review mechanism will be implemented. If necessary, deviations from the standard organizational project processed will be approved especially to assess the process improvements.

MARsite Consortium has agreed on Special Clause 5 on Project Review with the following terms:

1. A project review shall be held at a mid-term stage and at the end of the project.

2. At least two months before the date of the review the Commission shall communicate to the consortium in accordance with Article 8 the modalities of the project review, including, where appropriate, any meeting it may propose to convene and that it may request the consortium to organise. Each beneficiary is requested by the Commission to attend such meeting in accordance with Article II.3.h. Costs incurred by the consortium in relation to the project review shall be eligible under the activity referred to in Article II.16.5.

3. The project review shall be made on the basis of the satisfactory completion of due deliverables, milestones listed in Annex I as well as on the progress reported in the periodic report for the period considered.

B 2.1.1 Consortium Structure

MARsite Consortium includes 21 partners from 7 nations of the Euro-Mediterranean area. The partners include universities, research institutes and agency. A **Consortium Agreement** (CA) has been drafted with reference to the simplified FP7 Model Consortium Agreement (DESCA 3.0). According to this, **Consortium General Assembly** (CGA) will be the ultimate decision-making body of the Consortium. **The Project Coordinator** (PC) will be the legal entity acting as the intermediary between the Parties and the European Commission and will also be responsible for the execution of the Project. The PC shall also report to and be accountable to the General Assembly. An External Expert Advisory Board (EEAB) will be appointed and steered by the PC and the CGA.

B 2.1.2 Project Coordinator (PC)

PC is the primary contact person for the project in overall. PC is responsible for the execution and management of the project, the reporting of progress to the commission and to the consortium, and for the liaisons among the MARsite governing bodies. Mrs. Nurcan Meral Özel (KOERI) will coordinate MARsite and will be supported by Mr. Ocal Necmioglu (KOERI) as the Project Coordinator Assistant.

B 2.1.3 External Expert Advisory Board (EEAB)

The EEAB shall assist and facilitate the decisions made by the General Assembly. The members of the EEAB are required to sign a non-disclosure agreement no later than 30 days after their nomination or before any confidential information will be exchanged, whichever date is earlier. The Project Coordinator shall write the minutes of the EEAB meetings and prepare the implementation of the EEAB's suggestions. The EEAB members shall be allowed to participate in General Assembly meetings upon invitation but have not any voting rights. EEAB will monitor the progress of the project and advice the CGA on all issues of general scientific policy. EEAB will represent the interest of the wider scientific community not represented by the consortium. Their respective members include key figures in earth sciences. EEAB will meet annually with the CGA and review project plans, progress and results.

The following names have been selected as the members of the EEAB:

Rob Reilinger (Massachusetts Institute of Technology)
Friedemann Wenzel (Karlsruhe Institute of Technology)
Xavier Le Pichon (Collège de France)

EEAB members have relevant experience of the main area (Marmara Region) and relevant experience main research component of the work. They are globally recognized and well-respected scientists with expertise of the region, earth and space observation and data analysis and modelling. These attributes place them in a favourable position to evaluate MARsite project. EEAB members global undisputable reputation is an assurance on the objectivity, transparency and the fair treatment procedure led to the selection of them.

B 2.1.4 Project Manager (PM)

MARsite Project Manager (PM) is in charge of all operational and management aspects of the project. PM will directly report to PC and shall be appointed at the time of the conclusion of the contract and start working immediately.

B 2.1.5 Project Office (PO)

PC and PM will be supported by the MARsite Project Office (PO), which will execute the daily management tasks like the financial and contractual issues, the management of budget and time, the monitoring and execution of quality checks, the reporting to the EC and the PC, the communication and flow of information within the project and the necessary input to the project web portal. PO will be located at KOERI and will provide administrative and financial assistance to the PC and PM.

B 2.1.6 Project Web Portal

Project Manager, supported by the Project Officer, will be in charge of the execution and maintenance of the project web portal to provide a platform to the tasks foreseen under WP1.

B 2.1.7 Consortium Agreement

A Consortium Agreement has been drafted with reference to the simplified FP7 Model Consortium Agreement (DESCA 3.0) and will be signed by all partners. It will set the structure of the consortium and the responsibilities of all of its members in relation to the undertaking of the project's activities, as well as the relationship of the Consortium with the European Commission. It will also cover all legal issues relating to roles and responsibilities of the partners, project management, end User role, ownership, commercial rights, data sharing and distribution, exploitation and dissemination of the project results, confidentiality and intellectual property rights.

B 2.1.8 Work Package Leaders

WP Leaders manage their respective WP and are fully responsible for the quality and timely delivery of the deliverables foreseen by the WPs. They work in coordination with the PC and PM to ensure interconnectivity with other work packages. They confirm their progress on all issues at least quarterly, or based on needs, to the PC and PM.

Other than the organizational aspects described above, the management is focused on the time, budget, quality, process, risks and communication aspects of the project.

Each WP leader will draft a detailed schedule for all activities and quality procedures will be reported to the PC and PM on a quarterly basis to ensure the **time** management. The **budget**ary issues will be dealt according to the “Section 7: Financial provisions” of the Consortium Agreement. An external company will be hired to conduct annual financial audit. For the management of the **quality**, following performance indicators will be identified: input, output, outcome and impact indicators. A consistent set of working guidelines will be implemented throughout the whole project. Process management will involve management of documents which will be undertaken by the PM, whereas management of the quality of the input data will be the joint responsibility of the WP Leaders and the PC. The main potential **risk** in MARsite is the large number of participants, which may lead to inadequate communication, difficulty in overall management, insufficient participation and integration. These will be dealt with the effective coordination among the WP leaders, PC, PM and PO supported with a clear CA and clear description of responsibilities in working plans. Other risk areas may include deliverables being not on time or lacking quality, which will be addressed by the close monitoring of the project processes by the WP leaders, PC and PM. Concerning the **communication**, a clear distinction is made between internal project communication as a part of management activities and the external project communication. One of the challenges of international projects with partners in different cultural and linguistic background is the communication and information flow. A document management system will be implemented by the PM to hold all project reports and documentation. Teleconferences will be held on a quarterly basis and in person annual CGA meetings will allow an in-depth review. Finally, the WP leaders of each WP will ensure the regular communication among the partners in each package.

B 2.1.9 Reporting to the European Commission Project Officer (ECPO)

PC will be responsible for the production of the following reports in the English language on behalf of the Consortium, supported by the WP Leaders, PM and PO, and to forward them to the ECPO according to the following conditions and time scales*:

* T0: Project Start Date, TE: Project End Date, TN: last day of the month N

B 2.1.10 6-monthly reports

Overview of the work completed in the respective biannual period including major results and events, problems and delays encountered, corrective actions taken. If necessary, measurable intermediate and final objectives will be updated. 6-monthly reports are not deliverables and will be produced internally to monitor the progress of the work foreseen by the Grant Agreement and to provide basis for the milestone meetings scheduled every 6 months.

B 2.1.11 Periodic Reports

The 18-monthly and 36 monthly periodic reports shall comprise an overview, including a publishable summary, of the progress of work towards the objectives of the project, including achievements and attainment of any milestones and deliverables. These reports should include the differences between work expected to be carried out and that actually carried out, together with an explanation of the use of the resources, and a financial statement, from each beneficiary together with a summary financial report consolidating the claimed Community contribution of all the beneficiaries in an aggregate form**.** These periodic reports will also contain the list of peer-reviewed scientific publications accepted for publication in the reporting period. It should be noted that Periodic reports are not deliverables and will be disseminated to the ECPO and Reviewers at T18 and T36.

B 2.1.12 Annual Public reports

These reports will be designed for web publishing for a broad public outside the Consortium. The principle aim is to document the main results obtained and promote the objectives of the project. Annual Public reports will be disseminated to the public at 12 months intervals.

B 2.1.13 Final report

The final report will summarize the work carried out and the results obtained under the Grant Agreement. The principle function of this report will be the assessment of the project output. A non-public part will include prospects for further development and exploitation plans. A dedicated chapter will review the extent to which stated goals have been achieved. Final report will be disseminated to the ECPO and Reviewers at T36 accompanied by a DVD, or an equivalent digital storage medium, containing all the contractual reports and other deliverables. A Project Final Meeting will be organized for the effective dissemination of Project Results and synthesis of the final report will be disseminated to the public at T36. The final report is not a deliverable.

B 2.1.14 Meetings

The beneficiaries will ensure adequate representation at the following meetings:

Project kick-off meeting

To launch the project and refine plans and arrangements for the initial implementation phase.
Participants: Consortium Members
Venue: to be decided

Midterm Review Workshop

A midterm review workshop will be organized at the 18th month of the project. The aim will be both to review progress and discuss any significant problems and deviations and to evaluate intermediate results and to assess quality, impact and effectiveness of project work. The workshop will also be open to the scientific community to obtain a critical evaluation of the progress achievements and future outlook.

Project Conference/Workshop

This meeting is also the project final meeting to present the work and the results accomplished to a wider scientific community.

Participants: WP Leaders, PC, PO, external scientists and experts, decision and policy makers
Venue: to be defined

B 2.2 Beneficiaries

1-BOGAZICI UNIVERSITESI - KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE (KOERI)

KOERI, established in 1868 as the Imperial Observatory, has a long tradition of earth observation and science. KOER's National Earthquake Monitoring Center (NEMC) is a 24/7 operational center comprising 150 BB and 61 strong motion sensors at the national level. About 200 digital strong motion accelerographs are operated by KOERI as dense urban network in and around Istanbul (Rapid Response and Early Warning System). KOERI also operates 5 sea-floor multi-instrument observation systems in the Sea of Marmara and hosting the National Tsunami Warning Centre for Turkey under the ICG/NEAMTWS initiative. The previous MARsite relevant experience of KOERI includes the development of IEEWS (Istanbul Earthquake Early Warning System), IERRS (Istanbul Earthquake Rapid Response System); participation to SOSEWIN (Self Organizing Seismic Early Warning Information Network), EC-FP6 SAFER and NERIES Projects. Two other currently on-going FP7 projects are NERA "Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation" and SHARE "Seismic Hazard Harmonization in Europe". Other international Projects KOERI is involved are "TerraFirma Extention, Tectonic Theme - TFX-TT", EMME "Earthquake Model of the Middle East Region", and GEMECD "Global Earthquake Model - Earthquake Consequence Database" projects. KOERI is also a partner of the FP-7 Project TRIDEC focusing on new technologies for real-time intelligent earth information management involving large volume of data including sensor systems, geo-information repositories and simulation and data-fusion tools to be used in Tsunami Early Warning Systems.

KEY RESEARCHERS INVOLVED IN MARsite
Nurcan Meral Ozel
Nurcan Meral Ozel is the Project Coordinator for MARsite. She is the coordinator of all seismological operations in KOERI and presently she acts as a vice director. She has a PhD Degree in Seismology from Hokkaido University (Japan), and has 28 years of experience in seismology, including two years of experience at the International Seismological Centre. She is a full-time faculty member of KOERI and supervises graduate students. Her research areas are stress state of moderate and deep earthquakes, especially those occurring in subduction zones, earthquake source, tsunami modelling, seismic arrays monitoring, historical earthquakes, and tsunami&earthquake early warning systems. She is the Director of Nuclear Test Monitoring Centre of Turkey with personnel and budgeting responsibilities (2006-Present). She is responsible for the coordination of activities for the establishment of a National and Regional Tsunami Warning Centre, where she is the Tsunami National Contact person on behalf of the Republic of Turkey. She has led several national and international research projects on earthquake research in Turkey and has been involved, both as coordinator and as participant, in several national and international projects, including Eurosismos, NERIES and SAFER. She represents also KOERI in the consortium of the FP-7 Project TRIDEC focusing on new technologies for real-time intelligent earth information management to be used in tsunami early warning systems.
Mustafa Erdik (professor; KOERI Director; author or co-author of about 200 technical publications; editor in chief of the Soil Dynamics and Earthquake Engineering journal since 1999; coordinat/participant in UN-IDNDR RADIUS (1998-2000), GSHAP (1997-2001), IGCP-ESC SESAME (2000-2003), recent EC-FP6 projects PREVIEW, TRANSFER, SAFER

and NERIES projects); **Cemil Gurbuz** (professor; expert in investigation of crustal structure of earth's crust by geophysical methods; leader of the establishment of Marmara SBO System Project); **Doğan Kalafat** (manager of NEMC; earthquakes, seismicity patterns and aftershocks); **Haluk Ozener** (professor; KOERI Vice Director; Chair of Geodesy Department; tectonic Geodesy; member and director of over 20 research projects and the author/co-author of over 100 publications; chair of sub-commission 3.2 (Tectonic and Earthquake Geodesy) of IAG (International Association of Geodesy); **Hayrullah Karabulut** (professor;Chair of Geophysics Department; seismicity in Marmara Sea; earthquake source, seismicity, tomography at local and regional scales; fault zone imaging, seismic modelling and inversion); **Mustafa Aktar (**professor; theoretical and instrumental seismology; rupture process; microseismic activities; foreshock and aftershock processes); **M. Atilla Ansal** (professor; coordinator of EU-FP7 Project URBANQUAKE; Chief Editor of International Journal "Bulletin of Earthquake Engineering" and Editor in Chief for Book Series on "Geotechnical, Geological and Earthquake Engineering"; Secretary-General of European Association for Earthquake Engineering since 1994; published over 200 papers in journals, conference proceedings, books and as research reports on soil mechanics, soil dynamics, microzonation, liquefaction, site amplification, earthquake hazard scenarios); **Ali Ozgun Konca** (assistant Professor; joint inversion of seismic and geodetic data; earthquake source characteristics using near-field strong-motion data); **Can Zulfikar** (Senior Researcher; Earthquake Rapid Response System related hazard, damage and loss estimations, temporary and permanent monitoring, evaluation of GMPEs with regional strong ground motion records; real-time information of Earthquake ShakeMap, Damage and LossMaps); **Gülüm Tanircan** (assistant professor; earthquake risk assessment for major cities; kinematic and dynamic earthquake rupture processes and strong ground motion simulations); **Karin Sesetyan** (researcher; earthquake hazard and risk assessment and simulation of strong ground motion); **Mine B. Demircioğlu (**researcher; seismic hazard and risk assessments)**; Mehmet Yılmazer** (researcher; waveform data archiving and management systems; real time earthquake analysing; data communication); **Cüneyt Tüzün** (manager of the EMME project; assessment of the seismic hazard); **Ocal Necmioglu** (researcher; tsunami modelling and scenarios; will also assist the Project Coordinator)

2- HELMHOLTZ-ZENTRUM POTSDAM DEUTSCHES GEOFORSCHUNGS-ZENTRUM (GFZ)

GFZ was founded in 1992 as the national research institution for geosciences in Germany and is *ab initio* member of the Helmholtz Association of National Research Centres. With currently more than 1100 staff GFZ combines all solid earth science fields including geodesy, geology, geophysics, mineralogy, palaeontology and geochemistry, in a multidisciplinary scientific and technical environment. Research is accomplished using a broad spectrum of methods, such as in-situ monitoring and observations, satellite geodesy and remote sensing, deep geophysical sounding, scientific drilling, and the experimental and numerical modelling of geo-processes. Understanding of fault processes and seismogenic hazards is a major area of research within GFZ, which is also at the forefront of developing international disaster management, risk reduction and hazard assessment methodologies and policies. In order to furnish its operations around the globe and in space, GFZ maintains massive scientific infrastructure and platforms, including observatories, and a modular Earth science infrastructure. Since its foundation GFZ had been involved in various earthquake research projects in Turkey, presently focusing on the Marmara region in the frame of the "Plate Boundary Observatory" initiative. GFZ has a relevant experience in coordinating and participating to international projects, e.g. **GEISER**, Geothermal Energy Integrating Mitigation of Induced Seismicity in Reservoirs (FP7-ENERGY-2009); **CO2CARE**, CO2 Site Closure Assessment Research (FP7-ENERGY-2010); **GITEWS** German Indonesian Tsunami Early Warning System Project; **SAFER,** Seismic Early Warning for Europe (FP6: ENV 6.3.IV.2.3); **MATRIX,** New Multi-Hazard and Multi-Risk Assessment Methods for Europe (FP7-ENV-2010); **REAKT**, Strategies and Tools for Real Earthquake Risk Reduction (FP7-ENV-2011).

GFZ will work on the following themes: Improvement of *in-situ* fluid measurement systems (WP2), geodetic monitoring of crustal deformation (WP3), microseismic monitoring of the eastern Marmara seismic gap (WP4), analysis of the response of near-surface geology to earthquake ground motion and its effects on masking source-related information derived from borehole data (WP4), simulation of earthquake/tsunami scenarios for the Marmara Sea region (WP5), improvement of rapid finite source inversion tools (WP5), and the development of new procedures for the real-time estimation of the effective shaking of a building (WP9).

KEY RESEARCHERS INVOLVED IN MARsite

Jochen Zschau: Head of the Section "Earthquake Risk and Early Warning"; Georg Dresen: Head of the Section "Deformation and Rheology"; Marco Bohnhoff: Coordinator of GONAF (Geophysical Observatory at the North Anatolian Fault); Fatih Bulut: source properties of earthquakes; Thomas R. Walter: InSAR crustal deformation modelling and signal decomposition; Rongjiang Wang: Numerical modelling of geodetic and strong motion data; Stefano Parolai: Seismological site effects and amplification; Claus Milkereit: Low-cost sensor development for Early Warning; Oliver Heidbach: Stress modelling; Birger-G. Lühr: Microseismicity; Heiko Woith: Earthquake hydrogeology.

3-TUBITAK

TUBITAK Marmara Research Center (MRC) Earth and Marine Sciences Institute (EMSI), is a research and technology centre conducting strategic researches using advanced technology based on measurements, monitoring and computer-aided modelling. The Institute leads especially the governmental organizations and municipalities via the multi-disciplinary scientific researches. Its vision is to become "A Center of Excellence" in the areas of active tectonics and the underground resources in Turkey and in the region. Its mission is to conduct social benefit focused applied researches based on measurement, monitoring and modelling in the areas of active tectonics and the underground resources. The strategic objectives are to apply multi-disciplinary researches toward hazard mitigation of devastating earthquakes, to facilitate the use of the scientific information obtained from the researches on Geo-hazards of geologic origin as a basis for disaster preparedness aiming to increase social welfare, in cooperation with the implementing organizations, on re-evaluation of the petroleum and natural gas regions; aiming for development of the limited hydrocarbon resources in Turkey, to increase the number of experienced researchers to conduct the R&D activities in the most needed disciplines and areas of Earth Sciences and to decrease the financial overburden to national budget. The following key researchers have took part (coordinator/researcher) in several national/international projects of the institute such as Marmara Region GPS Monitoring Network, Monitoring Earthquake Activity at Marmara Region by Multidisciplinary Studies and Research on Probable Effects on Istanbul Coastal Zone/ Continental Shelf, Investigation of Possible Active Faults in Istanbul Land Area and

Development of Landslide Determination and Monitoring Methodologies by Multidisciplinary Researches in Istanbul Metropolitan Area, Seismotectonic Properties of the Eastern Aegean, Testing New Methods for Prediction of Earthquakes in the Marmara Region, Multi-Disciplinary Earthquake Researches in High Risk Regions of Turkey Representing Different Tectonic Regimes.

KEY RESEARCHERS INVOLVED IN MARsite

Semih ERGİNTAV is chief senior researcher. His on-going research is in establishment and management of GPS networks, analysing and modelling of the GPS time series, conventional and unconventional signal processing of geophysical data, active tectonics of eastern Mediterranean region, earthquake seismology, aftershock studies, gravity, InSAR analysis, modelling of fault dynamics, crustal deformation. He has coordinated several projects about determining dynamic and deformation characteristics of Marmara Region. Seismotectonic Properties of the Eastern Aegean

Onur Tan is senior researcher. He worked as a research and teaching assistant at İstanbul Technical University Dept. of Geophysics. He is responsible for TUBITAK micro-seismology network. His scientific interests are active tectonics of Turkey/Aegean/Caucasus, seismicity of the Sea of Marmara, seismology network design/establishment/managing, aftershocks, real-time earthquake monitoring, waveform inversion, source mechanisms, earthquake catalogues, background noise, double-difference location algorithms, stress analyses, crustal deformations.

Rahşan ÇAKMAK KOŞMA is senior researcher. Her investigations focus on geodesy, kinematic and dynamic analysis, earthquake cycle, active tectonics of Turkey, continuous and survey GPS station networks design/establishment/ managing, crustal deformations and modelling.

Cemil SEYİS is senior researcher. He is currently working on his PhD thesis titled as "Effects of Geologic, Pedologic and Atmospheric Conditions to the Movement of Soil Radon Gas". He is responsible for EMSI soil radon gas & spring water monitoring network. His scientific interests are geochemical anomalies as possible earthquake precursors, radon and spring water monitoring network designing/establishing/managing, geographical information systems.

4-IFREMER

Ifremer (the French Research Institute for Marine Studies) is a public body of industrial and commercial nature, the only French organisation with an entirely maritime purpose. It has an annual budget of approximately 150 Million €, employs about 1385 people (researchers, engineers, sailors, technicians and administrative staff), runs 72 laboratories or research departments, located in 24 stations or centres along the mainland coast and in the French Overseas Territories, operates 7 research vessels, 2 manned submersibles (Cyana and Nautile), one 6000-metre ROV (Remotely Operated Vehicle), as well as testing facilities. Being involved in all the marine science and technology fields, Ifremer has the capability of solving different problems with an integrated approach, in four main areas: i) understanding, assessing, developing and managing the ocean resources, including exploration of the deep sea; understanding ocean circulation (in relation with the global change) ; sustainable management of fishery resources and development of aquacultural production; ii) improving knowledge, protection and restoration methods for marine environment, including: modelling of coastal zones and ecosystems, behaviour of pollutants, observation and monitoring of the sea; iii) production and management of equipment of national interest, and most particularly heavy equipment for oceanography (oceanographic vessels, underwater vehicles and equipment, etc); iv) helping the socio-economic development of the maritime world. Ifremer has a long record in the development of underwater technology and sea-bottom observatories.

KEY RESEARCHERS INVOLVED IN MARsite

Louis Géli (WP8 Leader), originally a seismologist, obtained his PhD in Grenoble in 1985, under the supervision of Pierre-Yves Bard and Michel Bouchon. He started his career at Ifremer in 1986 as a marine geophysicist. Since then, he has a long record of sea-going experiments and lead major international expeditions on the study of accretion processes (e.g. the Pacantarctic project, to explore the Pacific-Antartic Ridge in 1996). While working on seafloor processes, he realized the importance of seawater circulation along faults in submarine environments. After a sabbatical among seismologists at the Institute of Geophysics and Planetary Physics (Scripps Institution of Oceanography), in 2005, he recently returned back to seismology, in order to investigate the relationships between fluids and seismicity at active, submarine faults. He is also a specialist of deep seafloor monitoring, and was the coordinator of the ESONET Marmara-DM project and a member of the Science Council of the EC ESONET NoE Project. Since 2009, Louis Géli is the Head of the Marine Geoscience Department of Ifremer (64 permanent people and ~40 non-permanent people). The multidisciplinary subsea observatory engineering team in Ifremer will be very active in MARsite.

Jean Francois Rolin is in charge of the seafloor observatory programme at Ifremer. He has a long experience in project management and is very familiar with EU procedures. He will assist Louis Géli in coordinating WP8.

Jérôme Blandin, co-coordinator with J.F. Rolin of the ASSEM project (FP5 framework) has designed and operated subsea observatories in several regions during the last 8 years including Esonet Demonstration Missions.

Yves Auffret has participated to the Neptune Canada project and leads the technical Work Package of EMSO Preparatory Phase.

5-INGV

INGV was meant to gather all scientific and technical institutions operating in Geophysics and Volcanology and to create a permanent scientific forum in the Earth Sciences. INGV cooperates with universities and other national public and private institutions, as well as with many research agencies worldwide in the larger frame of several European and international programs. The new institution, currently the largest European body dealing with research in Geophysics and Volcanology, has its headquarter in Rome and large representatives in Milano, Bologna, Pisa, L'Aquila, Napoli, Catania and Palermo. The main mission of INGV is the monitoring of geophysical phenomena in both the solid and fluid components of the Earth. This fundamental task includes the development and maintenance of the necessary instrumentation and infrastructures as well as real time surveillance, early warning and forecast activities. In addition to being analysed for research purpose, the data and the observations supplied by numerous monitoring networks are regularly addressed to public institutions and the scientific community. INGV operates in close coordination and under the control of the Ministry of Education and of Scientific and Technological Research and with Civil Protection authorities, both national and local level. INGV also cooperates with the Ministry of Environment and the Ministry of Defence in the frame of large research programs of national and supranational relevance. In cooperation with selected Italian universities INGV develops its own program of higher education such as doctoral courses and fellowships. Given the nature and social relevance of most of INGV activities, special attention is given also to public outreach through special publications, participation to scientific exhibitions and the Internet. INGV has been and is involved in many EC projects since early '90, as coordinator or partner. Presently INGV is the coordinator of the preparatory phase of EPOS and EMSO, both ESFRI large-scale research infrastructures.

KEY RESEARCHERS INVOLVED IN MARsite

Paolo Favali, Research Director; expert in seismology, marine geophysics, and natural hazards; an actor at international level in the new "Seafloor Observatory Science"; coordinator of many EU projects since 1995 (e.g., GEOSTAR, GEOSTAR-2 and ORION-GEOSTAR-3); since 2001 Head the Geo-Marine Unit at INGV; coordinates the Preparatory Phase of the ESFRI infrastructure EMSO; published more than 100 papers on international and Italian journals. **Francesco Italiano;** Senior Researcher; installed and developed the first Italian laboratory for helium isotopes measurements; responsible for the Geochemical Monitoring of the Italian Seismic Areas in 2001-2007; was the INGV coordinator of projects for the geochemistry of fluids over seismogenic areas (Italy, Slovenia, and Turkey) and for the assessment of the natural degassing at national scale during the last five years; about 100 papers published on peer reviewed Journals; **Salvatore Stramondo**; Senior Researcher; Adjunct Professor at the University of Calabria; Invited Researcher at the CNR-IRECE (1997), IPGP (1998), JPL (2000), and IIT (2001); SAR interferometer techniques and geophysical applications; authored >30 international papers; coordinator of the TERRAFIRMA Tectonic Theme GSE project; Editor of Remote Sensing Journal and Associate Editor of IEEE GRS Letters since 2009. **Stefano Salvi;** research director; use of space geodesy data for the study of earthquakes and volcanoes; has been PI or co-PI for several research projects; coordinator of the SIGRIS project. **Aybige Akinci**; Senior Researcher; single and multiple scattering attenuation models, seismic attenuation and crustal attenuation, probabilistic seismic hazard map and ground motion relations; participated in EC projects RELIEF, LESS-LOSS and REAKT; author of more than 60 publications. **Alessio Piatanesi**; Researcher; 18 years' experience in seismological research, including forward and inverse modelling of tsunami, geodetic and strong motion data for source determination; co-author of about 50 peer-review papers; involved in EU projects GITEC, GITEC-TWO, TRANSFER, NERA, and VERCE. **Daniela Pantosti**; Research Director; experience in Active Tectonics, Earthquake Geology, Paleoseismology, and Seismic Hazard; leaded and participated in several active tectonics and paleo-seismological ; participated and leaded EC projects (e.g., FAUST, CORSEIS, RELIEF, EUROPALEOS, 3HAZ, TRANSFER); in the Editorial Board of Tectonophysics and BSSA, JEE and IJG; author of more than 70 ISI publications. **Giuditta Marinaro**; technologist; responsible for the scientific payload of seafloor observatories managed by INGV; member of the Data Management Council of ESONET; INGV project manager for KM3NeT.

6-ISTANBUL UNIVERSITY (IU) - DEPARTMENT of GEOPHYSICS

Being established in 1453 and thus being among the oldest 10 universities in Europe, Istanbul University has more than 5000 academic stuff. Its educational activities range from bachelor degree to doctoral degree in 20 faculties and 16 institutes. Research activities have been carrying out through research institutes encompassing Arts and Humanities, Social Sciences, Business and Management, Information Technology, Science, Medical Studies and Engineering. The Geophysical Department is under Engineering Faculty of IU and consisted of three divisions; Seismology Division, who will be taking part in this project, Applied

Geophysics Division and Physics of the Earth Division. The emphasis of academic activities of Seismology Division is placed on: Seismic zonation and compilation of earthquake catalogues; Characteristics of strong earthquake ground motion; Simulation of strong ground motion, Site and soil response analysis; Earthquake hazard and risk analysis; Earthquake source mechanisms; Crustal Structure; Earthquake early warning systems and algorithms.

KEY RESEARCHERS INVOLVED IN MARsite

Oguz Ozel is full professor at the Istanbul University. He took part in some important national projects (e.g. Establishment of Earthquake Early Warning and Rapid Response System, EEWRR; German-Turkish Earthquake Prediction Project). He also involved in some FP6 projects PREVIEW, SAFER, TRANSFER and SOSEWIN. His primary research interests are in the field of engineering seismology (earthquake site effect estimation, earthquake microzonation, seismic noise by single station and 2D seismic arrays), crustal structure and seismic early warning systems and algorithms. He is also the member of "The group of explosion seismology" in Japan for crustal structure studies.

Ali Pinar is a full professor at the same department. His peer reviewed articles mostly encompass the field related with kinematics of the earthquake sources of different sizes including CMT solutions of microearthquakes. He is also experienced in deriving the state of the crustal stress and its relation with the nearby faults. Thus, in the frame of the project he will contribute in understanding the behaviour of the tiny events and try to construct a bridge between the small and large events.

Esref Yalcinkaya is Associate Professor in the Seismology Division of Istanbul University. He took part in some national projects supported by TUBİTAK. His primary research fields are engineering seismology (1D-2D site effects, experimental and numerical site transfer functions, strong ground motions, finite fault simulation of earthquakes, ambient noise studies).

7-KOCAELI UNIVERSITY (KOU)

Kocaeli University (KOU) established in 1992 and now one of the leading young University in Turkey. The Geophysical Department is under Engineering Faculty of KOU and consisted of three divisions; Seismology Division, Applied Geophysics Division and Physics of the Earth Division. Department of Geophysics has who will be taking part in this project, the emphasis of academic activities of Seismology Division is placed on: Seismic zonation and compilation of earthquake catalogues; Monitoring microseisimic activity, monitoring seismicity patterns, Characteristics of strong earthquake ground motion; Simulation of strong ground motion, Site and soil response analysis; Earthquake hazard and risk analysis; Earthquake source mechanisms; Crustal Structure; Earthquake early warning systems and algorithms, Trapped waves and shear waves splitting analysis, microtremor observations and modelling, earthquake prediction studies and disaster management systems and disaster reduction studies.

KEY RESEARCHERS INVOLVED IN MARsite

Serif Baris, Director of the Earth and Space Sciences Research Center of Kocaeli University and full professor at Kocaeli University. His research focuses on earthquakes, seismicity patterns, seismic tomography, natural disasters and the development of seismic early warning systems. In the past, he had coordinated large co-operative international research projects like the Japanese-Turkish project on installing a local seismic network and he worked in many international research projects on monitoring seismicity and aftershocks. At present, he

operates a local seismic network consisting of 28 seismometers, and 6 accelerometers at the eastern part of the Marmara Region, Turkey.
Deniz CAKA, Research Assistant at Department of Geophysical Engineering at Kocaeli University. He has studying "Shear Wave Splitting Analysis in an around Armutlu Peninsula on his Phd. thesis since 2005. He is responsible for the 28 seismic network's hardware and maintenance in the eastern part of the Marmara Region, Turkey. He had joined some national/international projects as a researcher. He focuses on anisotropy, seismicity and local earthquakes.
Berna TUNC, PhD, full time research assistant at Kocaeli University. Her research focuses on earthquake tomography, earthquake source mechanism, earthquake intensity. She took part in one "The Scientific and Technological Research Council of Turkey (TUBITAK)", one "Prime Ministry State Planning Organization (DPT)", one international project in co-operation with "Deutsches GeoForschungsZentrum (GFZ)" and many national projects. She continued her PhD study in Christian Albrechts University in Kiel, Germany during one year. She joined some international courses on 3D seismic modelling. She runs a local seismic network established on Armutlu Peninsula and surrounding area in Turkey.

8- ISTANBUL TECHNICAL UNIVERSITY (ITU)

ITU-EMCOL is specialized in marine and lake studies related to natural hazards and environmental changes, covering a wide range the fields such as submarine earthquake geology, tsunamis, submarine landslides, floods, climate and environmental changes. EMCOL projects are in the fields of paleoceanography, paleolimnolgy and geohazards (earthquakes, submarine landslides and associated tsunamis). EMCOL has the field and laboratory equipment for sampling and physical-property and geochemical analyses of marine and lake sediments, as well as for mapping active faults by high resolution seismic reflection method in marine and lake basins. EMCOL was established a 3-year FP6-2004-ACC-SSA-2 project funds (Contract No. 17490) and involved in EC FP6 and FP-7 projects such as ESONET, EMSO and HYPOX as a partner.

KEY RESEARCHERS INVOLVED IN MARsite
Ali Mehmet Celal Şengör is a Professor of Geology. His present research interest shows great variety from Tectonic evolution of the Tethyan domain to the history of tectonics and philosophy of science and many neotectonic researches in Turkey still depend on his 1980 neotectonic definition and classification. He is author or co-author of many papers regarding the NAF and particularly its structure and kinematics in the Sea of Marmara. He has published more than 100 papers and 15 books. His is member of many scientific societies and is given a number of awards and medals from different academic institutions. Some of these are; President's Award, The Geological Society of London (1984), Member of the Academia Europea (1990), Honorary Member of the Austrian Geological Society (1990), youngest founding member of the Turkish Academy of Sciences (1993), Membre Associé de la Société géologique de France (1994), Honorary Fellow of the Geological Society of America (1994), The Rammal Medal of the Société Française de Physique et la Fondation de l'École Normale Supérieure (1994), The Bigsby Medal of the Geological Society of London: (1999), Foreign Associate of the U.S. National Academy of Sciences, (Elected 2000), Foreign Associate of the American Philosophical Society (2004), Foreign member of the Russian Academy of Sciences (2006), Honorary Doctor of Science Degree, University of Chicago (2009), and The Steinmann Medaille of the Geologische Vereinigung (2010) **Namık Çağatay** is the director of ITU-EMCOL and his research areas include marine geology and geochemistry in general,

and marine geohazards and paleooceanography in particular. With more than 25 years of research experience, he has been involved as a principal scientist in many international projects in the Sea of Marmara and Black Sea. He has coordinated the EC-FP6 project EMCOL and involved in the EC FP6 and FP7 projects ESONET, EMSO and HYPOX as a researcher and the steering committee member. He has published 66 peer-reviewed papers in international journals. In the MARsite project, he will be mainly involved in tasks related to the collection of multi-parameter time series, the design of the next generation of seafloor observatories for geohazard monitoring, submarine earthquake records, estimation of the deformation rates and the seismic risk assessment in the Sea of Marmara. **Ziyadin Cakir** has been studying crustal deformation due to slow or sudden movements along active faults in the Mediterranean region using space geodetic techniques (InSAR and GPS) over 10 years. His recent scientific activities are modelling earthquakes, strain accumulation and stress interactions tectonically active regions. He has also been involved in the marine studies of active faults in the Sea of Marmara. **H. Serdar Akyüz** is Professor of Geology mainly focusing on tectonic geomorphology and paleoseismology of many active fault systems in Turkey. He participated in many national and international projects such as EC-FP5 project RELIEF and EC-FP6 project APAME. He has about 30 SCI papers and about 600 citations mostly on active tectonics of Turkey. **Naci Görür** is a professor at the Geology Department and an expert on tectonics and sedimentation and marine geology with more than 60 papers published in international journals. Prof. Gorur has been the scientific coordinator (of the Turkish side) of all the marine investigations being carried out in the Sea of Marmara since the 1999 earthquakes. **M. Sinan Özeren** is an assistant professor in the Department of Geology and worked extensively on issues related to continental deformation, tsunamis and fluid dynamics. He participated in several marine geophysical cruises, including submarine dives, to target problems related to the active fault structure in the Sea of Marmara and related fluid circulation and pore pressures within the sediments and developed a series of programs to calculate geodetic strain rates on land, applicable also for underwater geodesy.

9-CNR(ISMAR-IREA)

The Consiglio Nazionale delle Ricerche (CNR) is the main public research entity in Italy with more than 100 Institutes grouped in 11 Departments. The aim of CNR is to carry out, promote, spread, transfer and improve research activities in the main sectors of knowledge growth and of its applications for the scientific, technological, economic and social development of the Country. The Institute for Electromagnetic Sensing of the Environment (IREA), a CNR institute, incorporates a Microwave Remote Sensing Group that is active since 1987. Their main research interest is Differential SAR interferometry (DInSAR), with two main aims: (1) development of effective tools for detecting and monitoring of earth surface deformations; (2) demonstration of applicability of the proposed techniques in real scenarios. IREA-CNR is the initiator of the well-known Small BAseline Subset (SBAS) processing technique for generating deformation time series starting from SAR data. This technique has successfully been applied over the last decade on different volcanic and seismogenetic areas in the world (Mt. Vesuvius and Etna, Campi Flegrei and Long Valley calderas, Tenerife, San Andreas Fault, Abruzzi region, Athens, Hayward Fault). IREA-CNR has a high level expertise in scientific SAR and DInSAR algorithm development, as demonstrated by its large number of scientific publications in international ranked journals. Finally, IREA-CNR has been involved in a number of National and International Project in the SAR related field, as coordinator or participant. ISMAR-CNR (Istituto di Scienze Marine) is the main CNR Institute for marine research. ISMAR conducts research in polar, oceanic and Mediterranean regions, focusing on the following themes: the evolution of oceans and their continental margins, studying submarine volcanoes, faults and slides and their potential impacts onshore the influence of climate change on oceanic circulation, acidification, bio-geochemical cycles and marine productivity submarine habitats and ecology, and the increasing pollution of coastal and deep-sea environments the evolution of fish stocks with a view to keeping commercial fishing within sustainable limits and improving mariculture and aquaculture practices natural and anthropogenic factors impacting economically and socially on coastal systems from pre-history to the industrial epoch. With its Marine Geology department (Bologna) and the ship Urania, ISMAR conducted 5 marine-geological cruises in the Sea of Marmara, since 2000, to study the effects of the 1999 Izmit earthquake, applying the pioneering methods of the Submarine Paleoseismology. It also took part, in cooperation with INGV to the deployment of the SN-4 seafloor observatory in the Izmit Gulf.

KEY RESEARCHERS INVOLVED IN MARsite

Mariarosaria Manzo is a Research Scientist working on DInSAR data processing and applications for the monitoring of surface displacements produced by subsidence, volcano activity and earthquakes. **Antonio Pepe** is a Research Scientist working on DInSAR algorithm development and their application for the monitoring of surface displacements produced by subsidence, volcano activity, and earthquakes. **Giuseppe Solaro** is a Research Scientist and working on SBAS-DInSAR data processing and to the geophysical modelling of seismic sources by inverting DInSAR and geodetic data. **Pietro Tizzani** is a Research Scientist with research interests of processing of SAR data acquired by the C- and X- band sensors, and integrated geophysical numerical modelling of volcanic sources by inverting DInSAR, geodetic and geothermal data. **Luca Gasperini** is senior research scientist is the author of several publications in international journals such as Nature, Earth and Planetary Science Letters, Journal of Geophysical Research, etc. His main interests are geophysical methods, structural geology, seismic stratigraphy, plate tectonic reconstructions and submarine paleoseismology. He has been involved in the study of NAF in the Sea of Marmara since 2001, organizing and taking part as chief scientist to 4 oceanographic expeditions in the Turkish waters on board of the CNR ship Urania. **Alina Polonia** is a research scientist and took part and organized geological/geophysical expeditions in the Pacific Ocean, Eastern Mediterranean Sea, Sea of Marmara and the Ionian Sea. Main research interests are structure of active margins, accretion and tectonic erosion processes along convergent plate boundaries, submarine earthquake geology. **Giuliana Panieri** is research scientist working on paleoenvironmental investigations, paleoceanographic and geochemistry of foraminifera in the study of specific marine environments such as those characterized by rising methane gas hydrate, mud volcanoes, hydrothermal emissions and oxygen deficit. **Fabrizio del Bianco** is research scientist working on structural geology, stratigraphy and marine technologies.

10- BUREAU DE RECHERCHES GÉOLOGIQUES ET MINIÈRES (BRGM)

BRGM is a French public institution providing R&D and expertise for public policies, decision making and citizen information in different fields of the Earth Sciences. Activities at BRGM cover areas such as observation, mapping and databases, development and modelling for surface and subsurface processes, natural risks evaluation, management and mitigation and the protection of the environment. BRGM also provides support for EU policies in partnership with other geological surveys (EuroGeoSurveys). The Risks (RIS) division, which will be involved in the MARsite project, features teams of renowned international experience in the fields of geotechnical, earthquake, landslide, coastal and structural engineering, emergency management with activities related to numerical modelling, natural hazards evaluation, vulnerability assessment and risk mitigation. In addition, BRGM's Information Systems and Technologies (STI) Division is greatly experienced in the gathering, storage, structuring and dissemination of environmental Information (e.g. within the FP6 Integrated Project ORCHESTRA concerning the development of an open information technology architecture and services for risk management and in the implementation of the European INSPIRE Directive for the dissemination of geospatial data). BRGM has coordinated or contributed to many EC research projects in risk and vulnerability evaluation fields, such as: RISK-BASE, LESSLOSS, ORCHESTRA (FP6); ENSURE, SHARE, SAFELAND, PERPETUATE, MIA-VITA, SYNER-G, MATRIX, ENVISION, REAKT, EuroGEOSS (FP7).

KEY RESEARCHERS INVOLVED IN MARsite

John Douglas is an expert in engineering seismology. He has authored and co-authored over 40 articles in scientific and engineering journals mainly concerning seismic hazard assessment. He won the French Association for Earthquake Engineering (AFPS) Young Researcher Prize in 2011. He was awarded his accreditation to supervise research (Habilitation à diriger des recherches, HDR) in 2010. He was heavily involved in the FP6 project ORCHESTRA, which concerned interoperability in risk evaluation. This experience will be valuable in the leading of WP10 of MARsite.

Hideo Aochi is a senior researcher in seismology, working especially on earthquake dynamic rupture and ground-motion modelling. He coordinates research activities concerning seismic hazard assessment within the RIS division and some French national projects in Earth sciences. Winner of prize from Seismological Society of Japan in 2007. He was awarded this HDR in 2009.

Marcello De Michele is a researcher in remote sensing. "Laurea" in Geological Sciences, M.Sc. in remote-sensing and PhD in seismo-tectonics, Marcello de Michele's research focuses on InSAR processing and Sub Pixel offset techniques for ground displacement measurements. His main interests are remote sensing applications to seismotectonics and natural hazards.

Jean Jacques Serrano is an expert in information technology. He has direct experience in INSPIRE, firstly as part of the Implementing Rules drafting teams, as the former chair of the Network services drafting team, and now the chair of Thematic Working Group for Geology and Mineral Resources. He has participated in various European projects: ORCHESTRA, a project to design an open-service-oriented architecture for risk management in Europe, he focused on designing and implementing Web services as well as Portal design and in OneGeology-Europe project as WP5 leader to define the standards for web services and the data model to use. He is now the EuroGEOSS project coordinator.

Agnès Tellez-Arenas is an expert in information technology, with a PhD in computer sciences. She has participated in the European project Onegeology-Europe to design and implement a services-oriented architecture and the associated portal, and she is also involved in the European project PanGeo, as work package leader, to specify and implement web services for displaying geohazard information for 52 European towns.

11-EUCENTRE

The European Centre for Training and Research in Earthquake Engineering (EUCENTRE) is one of the most powerful laboratories for earthquake engineering research in Europe, with about 110 research associates and a testing facility including a large shaking table. The

EUCENTRE foundation fosters research and training aimed at reduction of seismic risk, at the same time bridging between the academia and professional worlds. Among the various Sections composing the EUCENTRE the Aerospace Section focuses on remote sensing applications in the field.

KEY RESEARCHERS INVOLVED IN MARsite

Fabio Dell'Acqua leads the Aerospace Section at the EUCENTRE. He has led and collaborated to several projects in the field of remote sensing for risk and damage assessment from natural disasters. He was the Point of Contact of Task DI-09-01a "Seismic Vulnerability Mapping" in GEO WP 2009-11, and he has recently been appointed coordinator of component C2 "Geohazards Monitoring, Alert, and Risk Assessment" of the Disasters Task in GEO WP 2012-2015. He also serves as the GEO Alternate Principal for the Global Earthquake Model, and as Editorial Board Member of the Elsevier Journal of Information Fusion. He has published over 40 papers on international, peer-reviewed scientific journals, a few papers on the national journal "Progettazione Sismica" (Seismic Design), over 130 papers at international conferences, 4 book chapters.

Diego Aldo Polli is a specialist on the exploitation of remotely sensed data and GIS in risk management contexts. He collaborated to different projects funded by EU, ESA and the Italian Space Agency; he contributed to developing the SAFER-qualified product "BASeDaLe" for radar-based seismic damage mapping in urban areas.

Gian Michele Calvi is the President of the EUCENTRE and Professor of Structural Engineering at IUSS Pavia - Istitute of Advanced Study of Pavia.

12-CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE –CNRS

CNRS (Centre National de la Recherche Scientifique) is a public basic-research organization that defines its mission as producing knowledge and making it available to society. CNRS operates its own laboratories as well as joint research units (JRU) it maintains jointly with universities, other research organizations (e.g. IRD), or industry. CNRS laboratories are located throughout France and cover all fields of research. Scientists from three CNRS laboratories are involved in this project: CEREGE (European Centre for Research and Education in Environmental Geosciences) in Aix en Provence ; IPGS in Strasbourg ; ISTerre in Grenoble and LDO/IUEM (Laboratoire Domaines Océaniques, Institut Universitaire Européen de la Mer) in Brest. CNRS is primarily involved in WP 4, 7 and 8 and will contribute to data integration into WP3.

KEY RESEARCHERS INVOLVED IN MARsite

Pierre Henry (CEREGE-UMR 7330) works in the field of tectonophysics and is director of Research in CNRS. He led the MarNaut cruise, with R/V L'Atalante and Submersible Nautile, and acquired an unique knowledge on the hydrogeological system related to the North Anatolian fault. CEREGE main contributions will be modelling studies in WP7 and WP8. Pierre Henry will lead multi-parameter analysis of the marine data set (WP8 Task 3) and contribute in WP7 Task 1 to the integration of geological/geophysical data in kinematic and geomechanical models of the fault network.

Michel Bouchon, obtained his Ph.D. degree from the Massachusetts Institute of Technology. He is presently Directeur de Recherche at CNRS and Visiting Professor at MIT. His fields of expertise are seismic wave propagation, seismic exploration of the earth resources, earthquake rupture and dynamics, and seismic risk. **Michel Bouchon (ISTerre-UMR 5275)** is a renowned seismologist. His long lasting collaboration with KOERI that brought important new results in seismology (e.g. observation of supershear rupture and of the nucleation phase

of 1999 Izmit earthquake). He will contribute to high-resolution seismic studies (WP4), notably as leader of Task 3 (near field fault zone monitoring).
Jean Schmittbuhl (IPGS-UMR 7516), is Directeur de Recherche at CNRS. His research is in the fields of experimental and numerical rock mechanics, and the multi-scale physics of geological processes. He is the author of more than 80 publications. His expertise relevant to the current project is in earthquake nucleation and rupture, earthquake triggering, fault interactions, and aftershock studies.
Anne Deschamps (IUEM-UMR 6538) is a researcher in CNRS and involved in the study of tectonic and eustatic deformations, using different techniques, including geodesy, and will contribute to multi-parameter data analysis in WP8 and data integration in WP3.

13-INERIS

The National Institute of Industrial Environment and Risks (INERIS) is a public research institute whose mission is to provide expertise, scientific and technical assistance to the French Ministry for the Environment, with a staff of 600 persons. Through its Ground and Underground Risk Division, INERIS has facilities and multidisciplinary competences in geotechnical engineering, geology, rock and soil mechanics, geophysics. INERIS covers expertise, research and services related to geohazards and risk assessment studies related to mines, quarries, rock slopes, landslides, cliffs, tunnels, underground storage facilities, reservoirs, dams and engineered geostructures. Furthermore INERIS runs the 24h/7d e.cenaris observational and monitoring center operating numerous local and sub-regional multi-parametric monitoring systems applied to ground failure geohazards and engineered structures rated at risks. INERIS has experience in participating and managing large international projects.

KEY RESEARCHERS INVOLVED IN MARsite
Pascal Bigarré is currently Delegate Director of the ground and underground risks division. As an expert in geohazards related to ground failures and geological instabilities, he leads the CENARIS monitoring center at INERIS in charge of sensors and early warning systems development, deployment of observation and monitoring arrays along with multi-parametric data analysis and research project related to cavities, mines, landslides, rockslopes, underground reservoirs and engineered geostructures. These last few years he has been leading or involved in different regional (GISOS), national (ANR SLAM) and FEDER / FP7 European projects (FONTIS, I2M) dealing with geohazard assessment studies, risk management strategies and monitoring projects applied to the mitigation of natural and industrial risks.
Stella Coccia (PhD, MSc) is a research engineer at INERIS. She is an expert in local seismic site effects. She first worked as freelance geologist in various Italian geological firms. She gained operative and practical experience in supervising geotechnical boreholes and Seismic Refraction and MASW investigations. She carried out a PhD thesis in Applied Seismology at University of Bari about dynamic response of a landslide prone slope area to seismic shaking. She analysed accelerometric data, acquired by a local network, and data derived from microtremor recordings. She gained operative experience in running accelerometric stations and in performing microtremor measurements both with techniques using tri-axial single station sensors (HVNR) and with geophones arrays (ReMi). As a final step of her PhD she went to LGIT of Grenoble to model the dynamic response of an Italian landslide using numerical SEM.

Auxane CHERKAOUI As an engineer specialized in geology and civil engineering, she currently leads hazard assessment studies related to hydrology and ground stability issues, including the elaboration of risk management plans and the problems caused by ground and underground undulations. She carries out different studies about natural risk management for landslides, for instance thanks to cost-benefit approaches. She also conducts analysis on past collapses feedback in order to improve the risk prevention and the knowledge of the phenomena involved. She has ever participated in European projects such as FP7 and RFCS.

14-AMRA

AMRA S.c.a r.l. is an entirely public, non-profit Company. It was formed in 2005, as a result of an EU funded project. The leading partner of AMRA Scarl is the University of Naples “Federico II”, the other partners being four public Universities, CNR, INGV, the Zoological Station “Anton Dohrn”. AMRA operates in the fields of natural and anthropogenic risk assessment and mitigation. AMRA owns the ISNET EEW network installed in Irpinia and other large innovative instrumentations. Early warning methods for natural hazards and quantitative probabilistic multi-risk assessment are his core activities.
AMRA operates in close partnership with the National Department of Civil Protection and the Regional Civil Protection. AMRA has been involved in several EU FP6 projects. It was coordinator of the **NARAS (**Natural Risk Assessment) Project, which contributed to the diffusion of early warning methods in Europe and issued guidelines for multiple-hazard and multi risk assessment. It was promoter and member of the management team of the **SAFER** (Seismic Early Warning For Europe) Project. AMRA is currently involved in several FP7 Projects. It is coordinating the **REAKT** (Towards real-time earthquake risk reduction) project and the **CLUVA** (CLimate change and Urban Vulnerability in Africa**).** Among the others, it is partner of the following projects: **SYNER-G** (Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain); **SAFELAND** (Living with Landslide Risk in Europe)**; GEISER** (Geothermal Engineering Integrating Mitigation of Induced Seismicity in Reservoirs); **MATRIX** (New Multi-HAzard and MulTi-RIsK Assessment MethodS for Europe)**; NERA** (Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation)**.**

KEY RESEARCHERS INVOLVED IN MARsite
Aldo Zollo, leader of the Early Warning sector of AMRA. Professor of Seismology, University of Naples “Federico II” and he is an expert in computational and observational aspects of earthquake source and seismic wave propagation in heterogeneous media. During last decade he has leaded and/ been in charge of the scientific coordination of many research projects funded by EU and Italian funding agencies. Author of more than 120 articles on international journal, he has an h-index of 24 (2010) He has been Editor of Journal of Geophysical Research and of Geophysical Research Letters for the Solid Earth Section.
Paolo Gasparini President and Scientific Director of AMRA. He is Professor Emeritus of Geophysics at the University of Napoli Federico II. He has been scientific coordinator of several EU and NASA projects. He is the scientific coordinator of the EC FP7 REAKT project. Author of more than 100 papers and 50 books on geophysical methods, volcanology and seismology.
Gaetano Festa, researcher in Seismology at the Departmento of Physics, University of Naples "Federico II", his research activities involve numerical modelling of the seismic wave field and of the propagation of fault rupture

15-EUROPEAN-MEDITERRANEAN SEISMOLOGICAL CENTRE (EMSC)

The European-Mediterranean Seismological Centre (EMSC, http://www.emsc-csem.org) is a scientific non-profit international NGO created in 1975 to provide rapid earthquake information at the Euro-Med and global scales. It federates 84 institutes and observatories from 55 countries as members and is funded mainly through research projects. The EMSC offers a unique source of information for international authorities in order to meet society's needs for protection and enhance scientific progress, improve general information, while providing a back-up information service to national seismological institutes. Its website is ranked among the top 35 000 most visited sites (source www.alexa.com). Earthquake information is sent via email, SMS, or fax, within 20-25 minutes of the earthquake occurrence. Over 9 000 users including civil protection agencies, rescue teams, and individual citizens have registered to use this free service. The EMSC also collects data from observatories and institutes to publish the Euro-Med seismology reference bulletin. It plays a key role in the integration of the scientific community, particularly through the development and participation in major IT and infrastructure projects (e.g. the EC projects NERIES, NERA) in collaboration with ORFEUS. It hosts the European seismological portal (www.seismicportal.eu) which provides a single access point for earthquake data and services ranging from broadband and accelerometric waveform data, to historical event data and tomographic maps.

In order to develop and explain the key role that individuals can play as witnesses to seismic events, the EMSC has lately developed social networking on Twitter, Facebook and Google+. The Centre uses those social media to interact with citizens, inform them about earthquakes, share important projects, collect information and ask for opinions. With 1150 followers on Twitter and 810 fans on Facebook after only 3 months, the EMSC develops durable links with the public. Finally, it has developed partnerships with the private sector to support this field, such as DigitalElement, the leader in IP location solutions. It has won the 2007 IRIS prize of the French Ministry of Environment on risk information and awareness for original research. EMSC will be leading WP11 in MARsite.

KEY RESEARCHERS INVOLVED IN MARsite

Rémy Bossu: Seismologist, in charge of the EMSC, initiator of Citizen Seismology developments, Participation/management of many EC-projects (NERA, NERIES, SAFER, EERWEM, PREVIEW)

Laurent Frobert: 15 years' experience in IT (Java, webservices, backend systems...) in diverse sectors: tourism, finance, internet publishing, and telecommunication.

Gilles Mazet-Roux: Geophysicist, 10 years' experience in rapid earthquake information and data analysis.

Frédéric Roussel: Webmaster, in charge of technological developments and implementation of EMSC websites.

Stéphanie Godey: Seismology engineer, 10 years' experience in seismology. Her main task is the production of the Euro-Med Bulletin.

Santhi Véloupoulé: Communications project manager, 4 years' experience in international Corporate Communications.

16-EUROPEAN SPACE AGENCY (ESA)

ESRIN, the ESA EO centre located in Italy, is responsible for collecting, storing and distributing EO satellite data. Major EO activities today are related to the exploitation of the

ERS missions (ERS-1: '91 - 2000, ERS-2: launched in '96) and Envisat (launched early '02). ESA actively supports projects aimed at optimising the accessibility and use of these data. Examples of relevant ESA-funded EO Programmes are the Data User, the Marked Development and the GMES (Global Monitoring for Environment and Security) Service Element Programme. Through these programmes and via participation to EC-funded projects, ESA has obtained excellent contacts with the EU Earth science and EO user community. ESA is also active in promotion of relevant technology (Grid, digital libraries, portals, web-services) for various space-related applications, including Earth science & EO.

KEY RESEARCHERS INVOLVED IN MARsite

Roberto Cossu, working in ESA since 2005, has been working in several projects dealing with different aspects of EO applications and related innovation technologies. For the last few years, he has been contributed to the ESA participation in the development and utilization of Grid, Open GIS, emerging Web-based and e-collaboration technologies for EO and environmental applications throughout ESA and EC-funded projects. In the ESA participation to EC FP6 and FP7 activities, he has been in charge of the ESA contribution (as work package and task leader) to: the Grid support action for Earth Science – DEGREE; Collaborative Working Environment - Collaboration@Rural, GENESI-DR. He is currently Project Director Project GENESI-DEC (Ground European Network for Earth Science Interoperations - Digital Earth Communities). He has published many papers in various international journals and conferences.

Pierre-Philippe Mathieu, is an Earth Observation Applications Engineer in the Earth Observation Science & Applications Department of the European Space Agency in ESRIN (Frascati, Italy) since 2003. For the last 15 years, he has been working in the field of environmental modelling, Earth System Science, Weather Risk Management and remote sensing applications. He is quite experienced in managing R&D and industrial projects. And in working with a variety of users, including public & private organisations, development banks, policy makers and scientists. He has a degree in mechanical engineering and M.Sc from University of Liege (Belgium), a Ph.D. in oceanography from the University of Louvain (Belgium), and a Management degree from the University of Reading Business School (UK)

17-UNIVERSITY OF PAVIA

The University of Pavia (UNIPV) is one of the oldest Universities in Europe, and celebrated in 2011 the 650th anniversary of its foundation. The Engineering School of UNIPV has been ranked the best in Italy in the last national surveys for medium-sized universities, and includes the Telecommunications and Remote Sensing Laboratory leaded by Prof. Paolo Gamba.

KEY RESEARCHERS INVOLVED IN MARsite

Paolo Gamba is leading the TLC & RS Lab at the University of Pavia. Since January 2009 he serves as Editor-in-Chief of the IEEE Geoscience and Remote Sensing Letters. He also served as Technical Co-Chair of the 2010 IEEE Geoscience and Remote Sensing Symposium, Honolulu, Hawaii, July 2010. He has been the organizer and Technical Chair of the biennial GRSS/ISPRS Joint Workshops on "Remote Sensing and Data Fusion over Urban Areas" since 2001. He published more than 90 papers on this subject in international peer-review journals and book chapters.

Gianni Lisini is a specialist of time series analysis and SAR/optical image processing. He collaborated to different projects funded by EU, ESA and the Italian Space Agency, and recently managed the UNIPV contribution to the ESA Round Robin for the Extraction of urban areas from SAR data.

18-IFSTTAR

The French Institute of Sciences and Technology for Transport, Development and Networks (IFSTTAR) was created on January 1st 2011 from the merging of INRETS and LCPC. Both institutes have a long-standing recognition in both France and abroad in the area of transportation, infrastructures, natural hazards/risks and urban engineering. IFSTTAR is a French State-owned research Institute under the authority of the Ministry for Higher Education and Research and the Ministry of Ecology, Sustainable Development, Transport and Housing. A great number of IFSTTAR research projects are carried out within a European framework, through programmes of the European Union or actions carried out directly by several laboratories.
The different activities of the Department of Geotechnical Engineering, Environment and Risks are the following: characterization of soils and rocks, soil-structure interactions, landslides and earthquakes, flooding, water and soil pollution, urban hydrology.
In the field of earthquake engineering and seismology, IFSTTAR is a leader of the French Accelerometric Network (http://www-rap.obs.ujf-grenoble.fr/). It also operates several large experimental facilities such as an earthquake simulator on a geotechnical centrifuge and develops various numerical approaches (BEM, FEM, FDM) to estimate the seismic ground motion and to investigate soil-structure interaction (e.g. http://www.cesar-lcpc.com/).

KEY RESEARCHERS INVOLVED IN MARsite
Jean-François Semblat is Head of the Earthquakes and Vibrations Group in the Department of Geotechnical Engineering, Environment and Risks at IFSTTAR (University Paris-East, France) and Professor at Ecole Polytechnique (Palaiseau, France). He has published over 150 technical papers in journals and conferences. He has recently published, with Alain Pecker, a book on “Waves and Vibrations in Soils” (IUSS Press).The main fields of interest of Jean-François Semblat are engineering seismology, earthquake geotechnical engineering and numerical modelling. His research topics deal with seismic site effects in alluvial deposits and dynamic soil-structure interaction at small and large scales. Jean-François Semblat is on the editorial board of the International Journal of Geomechanics (ASCE), ISRN Soil Science as well as European Journal of Environmental and Civil Engineering. He is vice-president of the French Association for Earthquake Eng., member of TC203 (Earthquake Geotechnical Engineering) of the ISSMGE and member of the Scientific Committee of the French Society for Soil Mechanics and Geotechnical Engineering.
Luca Lenti, Ph.D., is a researcher at the French institute for science and technology for transport, development and networks (IFSTTAR). He has 9 years of experience in the field of Natural Hazards focusing his research on the numerical modelling of seismic and vibration propagation, nonlinear soil behaviour, seismic site effects, landslides and soil-structure interaction. He has co-authored several scientific publications on these topics since 2005.
Céline Bourdeau, Ph.D., is a researcher at the French institute for science and technology for transport, development and networks (IFSTTAR). She has 5 years of experience in the numerical modelling of geotechnical objects, in particular landslides. She has participated in a NATO project focusing on earthquake-induced landslides and site effects assessment in Central Asia in collaboration with Belgian and Kirghize scientists. Her current research topic also includes the monitoring of unstable slopes with innovative systems (remote sensing, data integration and data fusion, etc).

19-GURALP Systems (SME)

Over the last 26 years, **Guralp Systems Ltd** has contributed to seismology and to the study of earthquakes with every large range of product portfolio and research and developments projects. Guralp systems currently employ 94 people with 28 engineering staff with degrees in seismology, physics, cybernetics and electromechanical engineering. The engineering personnel and the existing product range sets Guralp systems to carry out research and development in the field of "Implementing design and manufacturing of a deep multidisciplinary complete digital borehole seismic station". Past Projects incorporating Guralp systems Borehole seismometers has been used in Projects Such as SAFOD, Japan Trench, Antarctica and many more.

KEY RESEARCHERS INVOLVED IN MARsite

Cansun Guralp is the founder of the Guralp Systems Limited (GSL). He got his PhD degree at the University of Reading in Instrument Physics and Sybernetics. His PhD thesis is on the design of borehole seismometers. He is awarded with "Queens Award for Export, 1999".

Samim Ada is a geophysical engineer and the representative of Guralp Systems Limited in Turkey. He was involved some important projects on nationwide instrumentation; Establishment of National Seismological Network Project, Establishment of National Strong Ground Motion Network Project, Istanbul Early Warning and Rapid Response Project, 1995 and Marmara Ocean Bottom Observatory, 2010.

20-DAIMAR srl

DAIMAR, spin-off of CNR (National Council of Researches), is a company that carries out R&D activities to set up new products, processes and services in the field of natural sciences, engineering and physics. The company has a staff with considerable experience in the use of data processing software such as MatLab, LabView, and Visual C/C++ and owns laboratories with advanced equipment for testing and development of electronic devices. The most relevant job in electronic design has mainly dealt with marine sensors such as piezoelectric transducers, high-output impedance driver, hydrophones. The company has developed, in this regard, considerable know-how in marine applications, with the planning and prototype assembling and tests of new systems for data acquisition and processing of acoustic and ultrasonic data. Applications of the R&D products have been carried out in marine environment for the assessment of noise pollution produced both by human activities, maritime traffic or natural sources, besides studies for the evaluation of marine pelagic biomass by acoustic methods. DAIMAR is always working close to Research Institutions, promoting ideas exchange in order to achieve the highest levels of the state of the art for scientific instrumentation, always applying knowledge gained in academia. In 2010 the company started the filing process for seven new patents. DAIMAR staff currently consists of eight high professional level units.

KEY RESEARCHERS INVOLVED IN MARsite

Marco Zora, Degree in physics. Head of the Laboratory for Innovation and Technology Transfer of IAMC-CNR U.O.S. (Institute for the coastal marine environment of CNR) Capo Granitola (TP). Founding member of DAIMAR SME. Coordinator of electronic design and submarine prototypes development. Specialists in the design of electronic instrumentation for marine acoustic applications. Hardware and Software Design of multi-parameter data acquisition systems.

21-SARMAP s.a.

SARMAP, currently having 10 employees, is a owners-managed high-tech company (SME), founded in January 1998 as spin-off of the University of Zurich to provide consulting services, algorithms and software development and applications in the domain of Earth Observation, particularly airborne and space-borne SAR (Synthetic Aperture Radar) data processing, interferometry and polarimetry. Areas of expertise include:

- Software development and Capacity Building
- Land Displacements measurement
- Digital Elevation Model generation
- Agriculture and Food Security
- Forestry

In the past 13 years, sarmap has been involved in around 80 projects, of which approximately 2/3 on algorithms/products/services development for the European Space Agency. The remaining 1/3 focused on the developments of innovative remote sensing products/services for the World Bank, JAXA (Japanese Space Agency), EC Joint Research Centre, private sector (insurance sector in primis), and CTI (in collaboration with EPFL and ETH). Furthermore, sarmap develops SARscape®, a sarmap proprietary software for the processing of airborne and space-borne SAR data, an internationally recognized and leading processing tool integrated in ENVI® and world-wide commercialized by EXELIS VIS (formerly ITT VIS).

KEY RESEARCHERS INVOLVED IN MARsite

Paolo Pasquali received the M.Sc. (1990) and Ph.D. (1995) in electrical engineering and remote sensing respectively, Politecnico di Milano in the domain of SAR processing and interferometry. He is co-founder and Technical Director of sarmap. Remote sensing specialist with particular expertise in SAR and InSAR processing, polarimetry, and Remote Sensing applications. Experience with different space-borne and airborne sensors, software development for focusing, Interferometry, Differential Interferometry and Interferometric Stacking, generation of Digital Elevation Models and Land Displacement, geocoding, radiometric calibration, 3D reconstruction, polarimetry and extraction of thematic information. Dr. Pasquali is principal and co-investigator of several ESA and EC projects. Since 2003 he is teaching as Visiting Professor at the University of Trento. Dr. Pasquali will be responsible for sarmap contributions to WPs 3.5.

Alessio Cantone received the M.Sc. (2004) in Telecommunication and Remote Sensing, University of Trento, in the domain of Remote Sensing image processing and classification. Since 2005 he is Remote Sensing specialist at sarmap s.a., responsible for the development of algorithms and software tools for SAR processing for the SARscape processing environment. A. Cantone will be responsible for sarmap contributions to WP 3.6.

Stefano Monaco received the M.Sc. (1992) in Computer Science, University of Milano. Between 1992 and 1999 he has been Software Engineer at Etnoteam spa, Milano. Since 1999 he is Senior Software Engineer at sarmap s.a. Responsible of the development of operational and COTS software tools for SAR processing (SARscape) as well as for airborne SAR flight path planning and management. S. Monaco will participate to sarmap contributions to WP 3.5 add 3.6.

Paolo Riccardi received the B.Sc. (2009) in Telecommunication, University of Pavia, in the domain of Remote Sensing image processing. Since 2010 he is Remote Sensing specialist at sarmap s.a., working in several research and operational projects related with exploitation of SAR data for different Interferometric and Interferometric Stacking applications. P. Riccardi will participate to sarmap contributions to WP 3.5 add 3.6.

Massimo Barbieri received the M.Sc. (1992) in Geology, University of Roma. Between 1994 and 1997 he has been Technical consultant for EURIMAGE at the European Space Agency (ESA-ESRIN, Frascati, Italy). Between 1997 and 2002 he has been employed by Serco at the European Space Agency (ESA-ESRIN, Frascati, Italy), in the ERS Data Utilisation Section (APP/AE) as Remote Sensing Applications Specialist. Since 2002 he is Senior Remote Sensing Specialist at Sarmap s.a., responsible of Project management and SAR application development. M. Barbieri will participate to Sarmap contributions to WP 3.5 add 3.6.

WP & D #	WP Lead & Tasks	PM	1 KOERI	2 GFZ	3 TUBITAK	4 IFREMER	5 INGV	6 IU	7 KOU	8 ITU	9 CNR	10 BRGM	11 EUCENTRE	12 CNRS	13 INERIS	14 AMRA	15 EMSC	16 ESA	17 UNIPV	18 IFSTTAR	19 GURALP	20 DAIMAR	21 SARMAP
WP1	**1**		22.0																				
D1.1	Tasks 1 & 3	2.0	2.0																				
D1.2	Tasks 1 & 3	2.0	2.0																				
D1.3	Tasks 1 & 3	6.0	6.0																				
D1.4	Tasks 1 & 3	4.0	4.0																				
D1.5	Tasks 1 & 3	4.0	4.0																				
D1.6	Tasks 1 & 3	4.0	4.0																				
WP2	**5**		10.0	2.0	29.0	6.0	16.0		12.0														
D2.1	Tasks 1,3 & 4	23.0	4.0	1.0	8.0	3.0	4.0		3.0														
D2.2	Task 2	15.0		1.0	7.0		4.0		3.0														
D2.3	Task 1	16.0	2.0		7.0		4.0		3.0														
D2.4	Tasks 1 & 4	21.0	4.0		7.0	3.0	4.0		3.0														
WP3	**3**		5.0	9.0	24.5		20.0	12.0		2.0	21.0	5.0											24.0
D3.1	Task 1	18.5	1.0		16.5					1.0													
D3.2	Task 2	9.0					1.0				6.0	2.0											
D3.3	Task 2	7.0					1.0				5.0	1.0											
D3.4	Task 2	7.0					1.0				5.0	1.0											
D3.5	Task 2	7.0					1.0				5.0	1.0											
D3.6	Task 3	17.0	3.0				14.0																
D3.7	Task 4	17.0	0.5	5.0	4.0		1.0	6.0		0.5													
D3.8	Task 4	16.0	0.5	4.0	4.0		1.0	6.0		0.5													
D3.9	Task 5	5.0																					5.0
D3.10	Task 5	5.0																					5.0
D3.11	Task 6	5.0																					5.0
D3.12	Task 6	5.0																					5.0
D3.13	Task 6	4.0																					4.0
WP4	**6**		17.0	27.0	4.0			52.0						14.5							36.0		
D4.1	Task 1	78.0		6.0				36.0													36.0		
D4.2	Task 2	23.0		15.0				8.0															
D4.3	Task 3	19.5	3.0					8.0						8.5									
D4.4	Task 4	10.0	3.5	3.0	2.0									1.5									
D4.5	Task 4	10.0	3.5	3.0	2.0									1.5									
D4.6	Task 5	10.0	7.0											3.0									
WP5	**1**		25.0	9.0	10.0		16.0	13.0				10.0											
D5.1	Task 1	20.0	2.0		10.0			8.0															
D5.2	Task 2	21.0	2.0	3.0			10.0	5.0				1.0											
D5.3	Task 3	4.5	2.0				0.5					2.0											
D5.4	Task 3	4.5	2.0				0.5					2.0											
D5.5	Task 3	4.5	2.0				0.5					2.0											
D5.6	Task 4	7.5	3.0	3.0			0.5					1.0											
D5.7	Task 4	7.5	3.0	3.0			0.5					1.0											
D5.8	Tasks 5 & 6	13.5	9.0				3.5					1.0											
WP6	**13**				7.0		5.0	7.0		2.0	4.0				11.1				16.0	3.5			
D6.1	Task 1.a	21.1			4.0		3.0			1.0	2.0				3.1				8.0				
D6.2	Task 1.b	19.0			3.0		2.0			1.0	2.0				3.0				8.0				
D6.3	Task 2.a & 2b	15.5						7.0							5.0					3.5			
WP7	**8**		4.0			1.0	10.0			36.0	8.0			4.0									
D7.1	Task 1	42.0								36.0	2.0			4.0									
D7.2	Task 2	9.0	2.0			0.5	4.0				2.0												
D7.3	Task 2	6.0	1.0			0.3	3.0				2.0												
D7.4	Task 2	6.0	1.0			0.2	3.0				2.0												
WP8	**4**		15.0			13.0	20.0			3.0	4.0			5.0								24.0	
D8.1	Task 1	19.0	2.0			4.0	8.0			1.0	4.0												
D8.2	Task 2	16.0	9.0			3.0	2.0			1.0				1.0									
D8.3	Task 3	11.0	2.0			3.0	2.0							4.0									
D8.4	Task 4	38.0	2.0			3.0	8.0			1.0												24.0	
WP9	**1**		22.0	9.0	2.0			6.0					5.0		1.4	11.0							
D9.1	Task 1	22.0	10.0	9.0	2.0								1.0										
D9.2	Task 2	7.4	6.0												1.4								
D9.3	Task 3	23.0	6.0					6.0								11.0							
D9.4	Task 4	4.0											4.0										
WP10	**10**		3.0		5.0		4.0					10.0						13.0					
D10.1	Task 1	5.0	1.0		2.0		1.0					1.0											
D10.2	Task 1	8.0	2.0		3.0		2.0					1.0											
D10.3	Task 2	9.0					1.0					8.0											
D10.4	Task 3	13.0																13.0					
WP11	**15**		1.0														15.0						
D11.1	Task 1	1.0															1.0						
D11.2	Task 1	3.0															3.0						
D11.3	Task 1	3.0															3.0						
D11.4	Task 1	7.0	1.0														6.0						
D11.5	Task1	2.0															2.0						

Figure 8: Chart showing partner vs WP-Task-Deliverable-PM Relationship (See Part A – WT2 for cross-check).

B 2.3 Consortium as a whole

The MARsite Consortium brings together 18 major European research institutions, of international scientific and technical renown, and 3 SMEs. The consortium is very balanced, both in terms of specialities and in terms of distribution between EU-countries, EU-supported international organizations and Turkish national institutions.

A Consortium Agreement has been drafted with reference to the simplified FP7 Model Consortium Agreement (DESCA 3.0) and will be signed by all partners. It will set the structure of the consortium and the responsibilities of all of its members in relation to the undertaking of the project's activities, as well as the relationship of the Consortium with the European Commission. It will also cover all legal issues relating to roles and responsibilities of the partners, project management, end User role, ownership, commercial rights, data sharing and distribution, exploitation and dissemination of the project results, confidentiality and intellectual property rights. The Consortium Agreement is linked to MS1: Kick-off Meeting.

The consortium gathers:

- 5 academic, research institutions from Turkey, known for their active involvement in natural hazards mitigation: KOERI, TUBITAK, IU, KOU and ITU. In addition, major actors in risk prevention, mitigation and preparedness in Turkey are associated as end-users of the project outputs, namely: Istanbul Metropolitan Municipality, Earthquake Risk Management and Urban Development Department of Istanbul Metropolitan Municipality and Provincial Disaster and Emergency Management Directorate of the Istanbul Governorship (ISTANBUL-AFAD)
- 12 public institutions from the EU: GFZ from Germany; INGV, CNR(ISMAR-IREA), AMRA, UNIPV and EUCENTRE from Italy; CNRS, BRGM, IFREMER, INERIS, IFSTTAR and EMSC from France, also Universita Degli Studi Di Roma "La Sapienza" from Italy as a Third Party.
- 1 international organization: ESA
- 3 SMEs from the UK, Italy and Switzerland.

There was no change in the consortium composition since the submission of the final version of the proposal. However, Universita Degli Studi Di Roma "La Sapienza" was added as Third Party affiliated to Partner 18 (IFSTTAR).

There are no third country participants in this consortium and none of this project's beneficiaries requesting EU funding are based outside the EU Member and Associated states and is not in the list of "International Cooperation Partner Countries".

The total amount requested from EU in terms of SME(s) contribution equals to an amount of 906,306 €, which corresponds to %15.19; justifying Clause 6-Paragraph 13 of the Negotiation Mandate.

The consortium is organized in such a way that it will maximize its efficiency for meeting the objectives of the call and develop a fully integrated conceptual approach based: i) on the collaboration with existing monitoring networks and international initiatives; ii) on the development of new instrumentation such as in-situ sensors; iii) and on the aggregation of space and ground-based observations (including from subsurface), and geophysical monitoring.

The project consortium and organization in WPs will contribute to establishing comprehensive natural hazards observatories through a cross-cutting approach:

- The WPs are intimately interconnected, as they represent the building blocks of a value chain from observations to end users, which can be linked together and applied to the phases of the risk management cycle relevant for the Marmara region.
- For practical purposes, the different work packages have been designed to be stand-alone, so that the objectives of each WP can be met independently.
- Most individual partners are involved in different work packages, in order to ensure the communication and coordination between the WPs.

- Each partner will bring to the project its specific experience and know-how in its own field of expertise, for the benefit of the project, and also for the benefit of natural hazard mitigation in general.
- The leaders of the 11 different work packages have been distributed among 9 different partners, based on their internationally-recognized expertise.

• KOERI will lead WP1 (project coordination), as well as WP5 (real-time and quasi-real time earthquake and tsunami hazard monitoring) and WP9 (early warning and development of the real-time shake and loss information). These responsibilities are naturally assigned to KOERI, due to the internationally-renowned experience of KOERI in the field of permanent monitoring and early-warning systems. Partnership within WP5 and WP9 include: TUBITAK, INGV, GFZ, IU, EUCENTRE and BRGM.

• INGV, a major institution in the field of natural hazards monitoring in Europe, will coordinate WP2 (land-based, long-term multi-disciplinary, continuous monitoring), in partnership with KOERI, TUBITAK, IFREMER and KOU.

• TUBITAK, the leading research institution in Turkey, operates a multi-parameter, land and space-based monitoring network in the Marmara Region. Hence, TUBITAK will naturally lead WP3 (Long-term continuous geodetic monitoring of crustal deformation), in partnership with KOERI, GFZ, CNR-ISMAR, ITU, BRGM, IU, SARMAP and CNRS.

• IU, an institution highly involved in the establishment of early warning and rapid response systems in Turkey, will coordinate WP4 (establishment of borehole observation and high resolution seismic studies in the Marmara Sea area), in partnership with KOERI, GFZ, CNRS, TUBITAK and GURALP.

• INERIS, a French public institution specialized in natural and industrial risks, including landslides hazards, will lead WP6 (earthquake induced landslide hazard in the Marmara Region), in partnership with IFSTTAR, UNIPV, CNR-Ismar, IU, TUBITAK, ITU and INGV.

• ITU has conducted geological investigations of the Marmara seafloor since 1999 to investigate the earthquake and tsunami hazard potential of the submarine structures. ITU will lead WP7 (re-evaluation of the seismo-tectonics of the Marmara Region), in partnership with CNRS, CNR-ISMAR, KOERI, INGV, IFREMER.

• IFREMER, the French institution for marine research, has a unique experience in seafloor monitoring. IFREMER will lead WP8 (seafloor monitoring using cabled and autonomous, multi-parameter submarine instrumentation), in partnership with INGV, KOERI, CNRS, ITU, CNR-ISMAR and DAIMAR.

• BRGM, the French public institution providing R&D and expertise for public policies, decision making and citizen information in different fields of earth sciences, will coordinate WP10 (data integration), in partnership with ESA, INGV, KOERI and TUBITAK.

• EMSC, as a non-profit international NGO and a unique source of information for international authorities in order to meet society's needs for protection and enhance scientific progress and improve general information, will coordinate WP11 (dissemination) supported by KOERI by the input from other WPs.

Sub-contracting

CNRS (Partner 12) will subcontract for the implementation and support of software for automated processing of seismological data for a total amount of 26,000 €. Use of state of the art automatic picking, event detection and location algorithms and software in MARsite will greatly increase the efficiency and productivity of data processing for microseismicity studies, in particular for treatment of the Ocean Bottom Seismometer data acquired in WP8. Comparable systems for global scales as well as regional seismological networks have been developed. Examples are the automated, real-time systems for earthquake and tsunami early-warning used by Irpinia Seismic Network in Naples (http://www.rissclab.unina.it) and INGV-Rome (http://s3.rm.ingv.it/warning/warning.html). A subcontractor with technical expertise and experience with the required software for automated processing of seismological data can complete the tasks without supervision and within the very limited budget and time available. If these tasks were undertaken within a beneficiary (for example, by a post-doc or student), the cost-price and time necessary to realize the work (this will for instance include the supervision of post-doc or student) would be much higher. These advantages compensate for the profit made by the so-called subcontractor and will allow CNRS/CEREGE to concentrate on core tasks of the project, namely the understanding of the micro-seismicity patterns, of their variability, and their correlation with other parameters provided by the marine time series (e.g.: fluid emissions).

The choice for the subcontractor will follow Article II.7 of Annex II in accordance with the FP7 financial guidelines and will be related to rules for awarding contracts according to the principles of best value for money (best price quality ratio), transparency and equal treatment. The company will be chosen following the public procurement rules applying to CNRS; it will be informed that it can be audited by the Commission and that intellectual property rights that may be generated will revert to the Consortium. Besides, all software and algorithms used in the subcontracting will be open-source and freely available.

The main subcontractor tasks are to assemble and modify, as necessary, existing automatic picking, event detection and location algorithms and software so that they are applicable to the Ocean Bottom Seismometer data acquired in WP8. The primary goals are:

1) use the OBS data to generate a catalogue of absolute, micro-seismic locations for events in the area of the OBS sites,

2) perform absolute re-locations in a 3D model (to be provided by other participants in the project), and

3) to enable and provide plotting an visualization tools for the data and locations.

Additional goals, time and data quality permitting, are:

1) to enable relative event location using the automatic, OBS pick data, and
2) to enable relative event location using cross-correlation data (to be provided by other participants in the project) from the OBS waveforms.

The subcontractor will contribute to Deliverable D8.4, Report on high-resolution micro-earthquake characterization using OBS data and improved velocity, 3D model [Month 12]; and, to Deliverable D8.5, Synthesis report on spectral and statistical analysis of marine multi-parameter time series: [Month 34]

Considering the limited budget available, the subcontractor should already have existing experience with and access to software and algorithmic tools necessary for the completion of the task. There should be minimal modification to existing software and algorithms or development of new codes, such modification or development will primarily concern support for data input and output formats and visualization tools as required within the project.

INERIS (Partner 13) plans to subcontract a Turkish company for technical assistance to the field work and support related to the temporary (around 1 year) installation, maintenance and of mobile local seismic stations dedicated to the site effect characterization on selected potential landslide spots inside the western on-shore area to be studied. This will require specific technical site preparation to set up the measuring equipment on each spot in safe conditions, as well as periodic checking of those stations. Obviously, presence of local technicians and workers is required in the aim of reducing the costs, and provide administrative assistance to get necessary local authorizations whenever needed. The detailed strategy of mobility of those stations for a correct and satisfactory sampling of the studied area will be adapted along with time depending of amount and quality of the data set and its results before changing to the next configuration.

The subcontractor will contribute to Deliverable D6.2 [Month 24] for a total cost of 5,023 €.

The choice for the subcontractor follows *Article II.7 of Annex II* in accordance with the FP7 financial guidelines and is related to rules for awarding contracts according to the principles of best value for money (best price quality ratio), transparency and equal treatment. The local company will be chosen following the public procurement rules applying to INERIS; it is informed that it can be audited by the Commission and that intellectual property rights that may be generated will revert to the Consortium.

The main subcontractor tasks will be:
1. technical assistance to the field work related to geophysical investigations, including ground preparation for the implantation and installation of measuring equipment and maintenance during a one year period
2. rental of seismic and environmental equipment, necessary for data acquisition;

The subcontractor will contribute to field work and equipment setting, considering the limited budget available, it is expected to find a local subcontractor having experience in this kind of scientific investigations and seismic installation.

Partner 1 (KOERI), Partner 3 (TUBITAK) and Partner 5 (INGV) will utilize sub-contractors for the purposes financial audit, which amounts to 6000 € per partner.

Partner	Nature of subcontracted work	Amount in EUR
1 - KOERI	Financial Audit	6,000.-
3 - TUBITAK	Financial Audit	6,000.-
5 - INGV	Financial Audit	6,000.-
12 - CNRS	Implementation and support of software for automated processing of seismological data	26,000.-
13 - INERIS	Field work assistance and support	5,023.-
	Total:	49,023.-

Table 3: Nature of subcontracted work and corresponding amount per respective partner.

None of the subcontractors will undertake tasks that represent the core parts of the project foreseen to be undertaken by the project partners.

Affiliated Organizations to Partner 18 requiring the inclusion of Special Clause 10

In MARsite, Universita Degli Studi Di Roma "La Sapienza" will be the affiliated organization to IFSTTAR (Partner 18) and will be responsible for covering two milestones related to Deliverable D6.3 [Month 30] requiring a total amount of 20,000.4 €. The first milestone concerns with the defining of the specific geological and geotechnical features of the studies areas by the contribution of engineering geological expertise specialized in on-shore seismic induced ground effects. This contribution represents a fundamental and basic tool for constructing numerical models to be performed for both seismic site effects evaluation (by IFSTTAR) and for slope-stability analysis (by La Sapienza). The second milestone covered by the subcontractor concerns with the quantifying of the effect of seismic actions in terms of permanent deformations on slopes and/or sliding processes by considering coupled scenarios of geological and hydrogeological conditions by the means of FD nonlinear codes. To this aim, seismic input parameters, geological setting, topography and rheological behavior of the lithologies will be considered in the numerical simulations based on engineering-geological models and on the numerical modeling carried out by IFSTTAR on seismic sites effects. La Sapienza has already a significant experience with numerical modelling of stability of pre-existing and first-activation potential landslides.

The final goals are:

Calibration of back-analyses simulations based on both historical events and available sequences of monitoring records [Month 20].
Definition of correlations laws for permanent expected displacements as a function of the seismic-source/landslide distance considering seismic inputs features and the variability of geometrical and geotechnical parameters inside the slopes [Month 30].
This fact necessitate the inclusion of the Special Clause 10 in the DoW, formulated as the following:

1. The third party given above is linked to IFSTTAR (The French Institute of Sciences and Technology for Transport, Development and Networks)

2. This beneficiary may charge costs incurred by the above-mentioned third parties in carrying out the project, in accordance with the provisions of the grant agreement. These contributions shall not be considered as receipts of the project.

The third parties shall identify the costs to the project mutatis mutandis in accordance with the provisions of part B of Annex II of the grant agreement. Each third party shall charge its eligible costs in accordance with the principles established in Articles II.14 and II.15. The beneficiary shall provide to the Commission:

- an individual financial statement from each third party in the format specified in Form C. These costs shall not be included in the beneficiary’s Form C

- certificates on the financial statements and/or on the methodology from each third party in accordance with the relevant provisions of this grant agreement.

- a summary financial report consolidating the sum of the eligible costs borne by the third parties and the beneficiary, as stated in their individual financial statements, shall be appended to the beneficiary’s Form C.

When submitting reports referred to in Article II.4, the consortium shall identify work performed and resources deployed by each third party linking it to the corresponding beneficiary.

3. The eligibility of the third parties costs charged by the beneficiary is subject to controls and audits of the third parties, in accordance with Articles II.22 and 23.

4. The beneficiary shall retain sole responsibility towards the Union and the other beneficiaries for the third parties linked to it. The beneficiary shall ensure that the third parties abide by the provisions of the grant agreement.

B 2.4 Resources to be committed

5.7% of the MARsite total budget is dedicated to the management (WP1), 92.1% to RTD activities in WP2-10 and 2.2% to Dissemination activities in WP11. Budget partitioning per WPs is shown in Figure 9

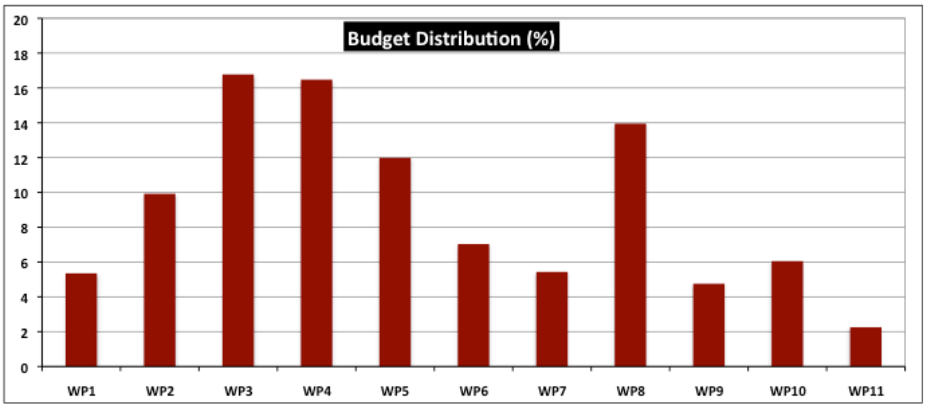

Figure 9: Distribution of Project Budget per WP

In addition to the resources specifically supported under the EC contribution, the MARsite participants will support the research activities with in-kind contributions. In particular this means the engagement of the permanent staff of the participating institutions in conducting the research, and it also signifies the full support of the institutions involved. Furthermore the MARsite participants will make infrastructures, e.g. seismological networks, vessels, available to the project.

KOERI (Partner 1). KOERI infrastructure and personnel will be the main contributors of the MARsite project. A selection of stations from National Earthquake Monitoring Center (NEMC) of KOERI, additional data from the Sea Bottom Observation System at 5 different sites in Marmara Sea and about 200 digital strong motion accelerographs operated by KOERI as dense urban network in and around Istanbul will be at the disposal of MARsite. Tsunami research and modelling studies initiated at the National Tsunami Warning Centre in Turkey established by KOERI will contribute significantly to the goals of the project. The total budget of 1,376,800 € is essential to cover the costs relevant to the installation and maintenance of the new and existing infrastructure and will also cover Project Manager and External Financial Audit within WP1. 20 staff members of NEMC, Earthquake Engineering, Geophysics and Geodesy departments will be dedicated to the success of MARsite. The total RTD (WP2, 3, 4, 5, 7, 8, 9, 10) cost is 956,880 €: 409,000 € is for RTD personnel and 189,050 € for installation/maintenance of the infrastructure. The requested budget for RTD is 717,660 €. The management (WP1) budget is 420,000 €.

GFZ (Partner 2). GFZ will work on the following themes: Improvement of in-situ fluid measurement systems (wp2), geodetic monitoring of crustal deformation (wp3), micro-seismic monitoring of the eastern Marmara seismic gap (wp4), analysis of the response of near-surface geology to earthquake ground motion and its effects on masking source-related information derived from borehole data (wp4), simulation of earthquake/tsunami scenarios for the Marmara Sea region (wp5), improvement of rapid finite source inversion tools (wp5), and the development of new procedures for the real-time estimation of the effective shaking of a building (wp9). Within the frame of the "Plate Boundary Observatory" (PBO) initiative, **GFZ** has massively invested in scientific infrastructure in the Marmara region over the past years. In cooperation with Turkish partners (KOERI and Kocaeli university) GFZ operates (i) a vertical seismic array in Ataköy, Istanbul, (ii) a prototype of a new low-cost seismic early warning system SOSEWIN in Istanbul, (iii) a seismic surface array on the Princess Islands called PIRES, and (iv) a combined seismological and hydrogeological network covering the Armutlu peninsula (ARNET). The total RTD budged is 551,760 € and 413,820 € is requested from EU.

TUBITAK (Partner 3). has wide experience on operating networks of seismology, GPS and geochemistry in different tectonic regimes of Turkey. In this proposed MARsite project, TUBITAK will provide its experience in multi-disciplinary data collection, archiving and processing for multi-disciplinary earthquake research. In order to meet the requirements of the MARsite project, TUBITAK will share its already existing multi-disciplinary monitoring network (42 seismological stations, 21 continuous and 50 GPS survey sites and 35 geochemical monitoring stations) with the MARsite project in the Marmara Region. More than 30 scientists will carry out field studies and laboratory analyses, in addition to data analyses and modelling. As one of the main data suppliers of the Marmara Region, TUBITAK will, also, open its multidisciplinary data archive to the MARsite project from the past (1999's) to the present. The requested TUBITAK budget (736,198.80 € of 981,598.40 €) will be used for the project activities under the support of internal resources (such as laboratory costs, spare parts and improvement of GPS sites for the requirements of the project). Mainly, the budget is necessary to cover the costs of 81.5 PM (414,409 €), travels, audits and consumable costs (batteries, spare parts, computer resources) and the adaptation of the already existing GPS networks infrastructure of TUBITAK to the real-time data transfer needs of the MARsite project (using powerful GPRS modems, extra solar panel arrays and shelters) (195,340 €).

IFREMER (Partner 4). IFREMER will provide to the project autonomous seafloor instruments (10 OBSs, 3 BOBs and 5 piezometers, representing an amount of 1,175 k€) to be deployed at M12, 18 and 24. Complementary funds have been required to ANR, the French funding agency, for increasing the number of OBSs from 10 to 25. The budget required from the project is 248,250 € (EU contribution). The amount will be assigned to WP8 (202,340 k€) and WP2 (45,910 €). For WP8, the budget will cover part of the deployment expenses, e.g.: batteries, equipment maintenance, shipping and customs fees and travel. Ifremer will also contribute to Task4, for the specifications of the new generation of autonomous, seafloor observatories.

INGV (Partner 5). More than 40 scientists and technologists will carry out field and laboratory work as well as data analysis and modelling. INGV, despite the requested budget, will support the project activities with additional resources: 91 man/months are planned to be dedicated to the project (only 61 of which in charge to MARsite), besides the involvement of several kinds of laboratories. The difference of 30 PM is to be considered as an in-kind contribution of INGV as investment for the future, which testifies INGVs interest in carrying out the activities planned in the project, INGV will put its own marine and land infrastructures at the project's disposal (e.g., autonomous seafloor observatories, marine winch, OBSs, in-land automatic stations) and will also provide in kind computational resources through its High Performance Computing facilities. Finally, INGV will put at disposal the SAR database of the studied area, available thanks to TERRAFIRMA project. The total budget of 790,800 € is necessary to cover the costs of 61 man/months (335,500 €), travel, audit and consumable costs(spare parts, batteries, custom and shipping, lab consumables, computing resources, satellite and aerial images) (155,000 €) and indirect costs having INGV the regime at full cost flat rate with 60% overheads (294,300 €). The requested amount is 593,100 €.

IU (Partner 6). IU will lead WP4 and its activities will mainly be related to the establishment of multiparameter borehole system and to the analysis of the related records and the study of the response of near-surface geology to earthquake ground motion and to the modelling of its effects masking the source related information. IU will be also involved in WP2 Task4, WP3 Task4 and Task5, WP5 Task2, WP6 Task2 and WP9 Task1. The Seismology Division of IU will contribute to the project by providing its experience gained during previous EC-funded projects SOSEWIN, PREVIEW, SAFER, and TRANSFER. IU will also contribute by providing its computing facilities and its database. IU will compile and provide the strong motion data that will be used in off-line mode in the way to allow real-time determination. The RTD personnel cost of IU is 247,500 €, and 55,350 € is for RTD infrastructure establishment data analyses. According to the actual indirect cost model, 181,710 € is for indirect RTD costs. 363,420 € of the total 484,560 € budget is requested from EU.

KOU (Partner 7). Since 2002, KOU continuously operates ArNET, a very dense local seismic network (including 6 ground motion stations), implemented in the eastern part of the Sea of Marmara. KOU will provide the ArNET data to the project. KOU will also provide data from its own geothermal pressure monitoring systems. The total RTD cost is 93,000 € and 69,750 € is requested.

ITU (Partner 8). ITU-EMCOL will be responsible for WP7 related to seismotectonics of the region and be involved in tasks related to crustal deformation (WP3), submarine monitoring of geochemical parameters and relation to seismic activity (WP8), and susceptibility mapping of submarine landslides and associated tsunamis (WP 6). Under WP7, the paleoseismological records will be enriched, based on the analysis of seismo-turbidites sampled form the Marmara seafloor. It will provide its field equipement for in-situ sampling as well as its laboratory facilities for the physical and chemical analysis of sediments. For WP8 - Task 3, ITU will provide its research vessel (R/V Yunus) and docking facilities for repeated deployments of autonomous observatories. The total RTD cost of ITU is 253,520 €. 101,000 € will be used for RTD personnel, and 57,450 € is for field equipments, field studies, laboratory works etc. The 190,140 € of the total budget is requested from the EU

CNR (IREA/ISMAR) (Partner 9). CNR will take part to the project with 2 institutes: IREA (Napoli) will be involved in activities related to acquisition/processing of remote-sensing data, and ISMAR (Bologna) will operate in the marine geological/geophysical tasks. IREA will provide its know-how in X-band SAR data processing using the advanced SBAS-

DInSAR technique, requiring a budget of 132.6 k€ to deliver the results at M18, provided that SAR data will be available at M6. ISMAR will contribute to the project by providing R/V Urania free of charge for site-survey, preliminary data analysis, and deployment of seafloor observatories in key-sites along the NAF system within WP8. The budget required by ISMAR (25 k€) will cover part of the ship's operations expenses (customs, transportation/missions, etc.) as well as expenses for participating to project meetings. 131,000 € is the additional budget requested by ISMAR to perform the work foreseen in the project. The total requested EU contributions of CNR is 216,450 € (total budget is 288.6 k€).

BRGM (Partner 10). BRGM's budget for this project is mainly to fund permanent researchers' time in the three WPs in which BRGM will participate (WP3 and WP5) and lead (WP10). In addition, budget is allocated to fund travel for project meetings and for project overheads. BRGM has 356,400 € total budget and requests 267,300 € as EU contribution.

EUCENTRE (Partner 11). EUCENTRE will contribute to MARsite by ensuring effective liaison with GEO and specifically to WP9 through showcasing actions and case studies of GEO Supersites. The EUCENTRE unit includes the coordinator of the GEO Disaster Component C2 "Geohazards Monitoring, Alert, and Risk Assessment". MARsite will benefit from EUCENTRE previous experience,such as: i) the EU FP7 GMES SAFER (2009-2011); ii) the Executive Project for the Italian Civil Protection Department (2008-2014), subproject on the integration of remotely sensed data into the emergency management cycle; iii) the Italian Space Agency project ID2246 (2009-2011) on Imaging And Monitoring With Multitemporal/Multiview COSMO/SkyMed SAR Data; iv) the Italian Space Agency project ID2120 (2009-2011) on COSMO/SkyMed and security of citizens: feasibility of a satellite-based, fast-response system to natural disasters; v) the Italian Space Agency project VULSAR on the integration of remotely sensed data for seismic vulnerability mapping; vi) the German Aerospace Agency project LAN 1240 (2011-2013), Investigation on the use of high-resolution spaceborne radar data for area-based seismic damage estimation in urban areas. The RTD budget will be mostly used for RTD personnel (5PM, 40,000 €). Only 8,600 € is other RTD costs. 58,320 € is requested (the total budget is 77,760 €).

CNRS (Partner 12). CNRS will participate to MARsite, by means of 4 joint research units (JRU) that have been continuously working in the Sea of Marmara for the last 10 years. CEREGE (JRU 7330) will coordinate the CNRS participation and provide its unique knowledge and GIS on the hydro-geological system associated to the submerged fault section within the Sea of Marmara. IPGS/EOST (JRU 7516) and ISTERRE (JRU 5559) will provide their computing facilities and their unique expertise in earthquake nucleation and rupture (observation, modelling); earthquake triggering fault interactions, aftershock studies; development of codes for noise correlation; search and characterization of multiplets, repeating earthquakes and seismic tremors. The total PM is 23.5 in WP4, 7, 8 and the personnel cost is 119,507 €. CNRS budgets 26,000 € for subcontracting and 5,420 € for other direct costs. The total is 225,883,20 € and 169,412.40 € is requested EU contribution.

INERIS (Partner 13). INERIS will provide expertise, scientific and technical assistance to the MARsite Project, which covers research and services related to geohazards and risk assessment studies related to mines, quarries, rock slopes, landslides, cliffs, tunnels, underground storage facilities, reservoirs, dams and engineered geostructures. In addition, INERIS runs the 24h/7d observational and monitoring center operating numerous local and sub-regional multi-parametric monitoring systems applied to ground failure geohazards and engineered structures rated at risks. The experience gained thorugh this activity will be shared with the other project partners. The RTD budget contains 78,542 € for personnel (12.5 PM), 5,023 € for subcontracting and 14,600 k€ for other direct costs. INERIS uses actual indirect cost model (81,234 €). The total budget is 179,399 € and 134,549.25 € is requested.

AMRA (Partner 14). AMRA will contribute to WP9 task 3 concerning the Improvement of the Istanbul Earthquake Rapid Response System. AMRA will provide to the project its know how and expertise for the implementation of the Probabilistic and Evolutionary early warning SysTem **(PRESTo)**, a software platform for regional earthquake early warning that integrates recently developed algorithms for real-time earthquake location and magnitude estimation into a highly configurable and easily portable package. AMRA will also contribute to develop synergies with the EC FP7 REAKT project. The requested amount for AMRA is 74,760 €.

EMSC (Partner 15). EMSC will provide to the project its experience in IT, crowd-sourcing techniques, and rapid earthquake information. With a million visits per month, the EMSC website provides detailed earthquake information and maps, online questionnaires in 32 languages, and picture collection tools. The EMSC has developed the European Seismological Data Portal in collaboration with ORFEUS. In WP11, EMSC will be in charge of Dissemination to the general public through a promotional webpage and will also develop dissemination materials to help in interactions with interested stakeholders in the Marmara Sea region. The EMSC Social networks will be exploited to inform citizens and online communities and communicate on the project. EMSC is responsible from WP11, and has 132,320 € budget for dissemination in “Other” category.

ESA (Partner 16). ESA will provide to the project Earth Observation (EO) products through a geospatial data platform based on GENESI and put in the context of other types of data. ESA will contribute to MARsite WP10 for data provision & integration where it will deliver satellite data and new products, tailored to the needs of the geo-hazard community. ESA has 104 k€ RTD personnel (13 PM) budget and 10 k€ in other direct costs. The total budget is 176,400 € and the requested EU contribution is 132,300 €.

UNIPV (Partner 17). UNIPV will provide to the MARsite Project its computing resources and scientific expertise for the development of algorithms to fuse hyperspectral, multispectral and radar remote sensing data with in situ information, with the objective of remotely monitor landslides. The expertise provided to MARsite is based on many previous research projects, namely: i) the ESA-MOST Dragon 2 Programme (2008-2012) on Urbanization Monitoring in China using ESA and Chinese EO data; ii) the ESA IIMTS (2009-2010) Image Information Mining in long time series of ESA data ; iii) the GEM IDCT (2010-2013) project on data processing tools for global exposure mapping; iv) the FP7 TOLOMEO (2011-2013) Open EO data processing tools for risk assessment. The total budget of UNIPV is 81,080 €. The requested EU contribution equals to an amount of 60,810 €.

IFSTTAR (Parner 18). IFSTTAR will provide to the project its large experimental facilities (such as an earthquake simulator on a geotechnical centrifuge), as well as its expertise in the field of accelerometric networks and in numerical modelling using various approaches (BEM, FEM, FDM) to estimate the seismic ground motion and to investigate soil-structure interaction. The expertise of IFSTTAR will also benefit to the project for the characterization of soils and rocks, landslides and earthquakes, flooding, water and soil pollution, urban hydrology. The total budget of IFSTTAR is 53,892.80 € and requested contribution equals to an amount of 40,419,60 €.

GURALP (Partner 19). GURALP SYSTEMS will provide its world-wide known expertise in the field of seismological monitoring systems and be responsible of deployment of surface microearthquake array and borehole seismometers. GURALP Systems purposes designing and building very wide dynamic range and stable borehole (VBB) broad band seismic sensor, and incorporating designed and manufactured 3D strain meter, tilt-meter, temperature and local hydrostatic pressure measuring devices. GURALP Systems will also be responsible to install all these manufactured devices in a 100m-deep borehole. Requested amount is 374,346 €.

DAIMAR s.r.l. (Partner 20). DAIMAR will provide its expertise with the objective to design a new hardware platform to improve the quality of the collected data and to reduce power consumption in battery-powered applications. DAIMAR will work in close collaboration with INGV and IFREMER sharing know-how and expertise. The final goal of the collaboration is a list of specification, hardware solutions and laboratory tests on prototype components, useful for the future development of autonomous real-time data collection systems, capable of capturing high definition sounds and multi-parameter data type. The total budget required (314,880 €) will cover expenses for skilled personnel (24 Person-months = 168k€), travel costs and customs charges (28,800 €), purchase of new equipment necessary for laboratory work and upgrades of existing instrumentations (61,360 €) and consumables (56,720 €). The requested amount corresponds to 236,160 €.

SARMAP (Partner 21). SARMAP will extend, in the Tasks 5 and 6 of WP3, an operational advanced DInSAR software processing chain to the support of the new GMES Sentinel-1 data and to additional external data sources. Licenses of the software packaged will be provided to members of the consortium for research purposes. The RTD personnel cost is 201,600 €, other costs are 10,400 €, and indirect cost is 182,400 €. The total budget is 394,400 € and 295,800 € is requested for EU contribution.

B3. Impact

B 3.1 Strategic impact

MARsite project is proposed with the aim of assessing and managing using state-of-the-art methods seismic risk at the European level. MARsite will represent a key case study and could qualify as a GEM (Global Earthquake Model) Regional Initiative, thus augmenting efforts in addressing geo-risk at both global and regional levels. Effective coordination between the MARsite consortium, GEO and GEM are ensured by the participation of many of the main national and European institutes and research groups within these initiatives.

The importance of the selected site, Marmara, is evident, as this is one of highest seismic risk region in Europe. The Marmara region (as well as the impact on the near-by mega-city, Istanbul) is in a unique situation where a large earthquake along a plate boundary is anticipated in the near future. We should not forget the 1999 Izmit and Duzce earthquakes nearby. This is comparable to some other big cities in the world, such as Los Angeles and Tokyo. The development of the MARsite project in the Marmara sea region ensures the integration of data from land, sea and space. The processing of this composed data based on sound earth-science research will be an effective tool for mitigating damage from future earthquakes. This will be achieved by monitoring the earthquake hazard through the ground-shaking and forecast maps, short- and long-term earthquake rate forecasting and time-dependent seismic hazard maps to make important risk-mitigation decisions regarding building design, insurance rates, land-use planning, and public-policy issues that need to balance safety and economic and social interests. Time-dependent probabilistic forecasting and seismic hazard maps will be developed for applications of real and quasi real-time mitigation of earthquake risk.

With respect to the call ENV.2012.6.4-2, the MARsite project will proactively link together existing and planned observing systems on- and off-shore and it will support the development of new systems where gaps currently exist. These developments will significantly improve our technical know-how as well as our scientific understanding for monitoring potential geological disasters and they will contribute to the development of relevant European industrial sectors, such as in scientific instrument design and manufacture and remote-sensing. It will promote common technical standards so that data from different instruments can be combined into coherent data sets and addressed toward a unified understanding of the Marmara region. Such combined use of the observations will help further the policies, decisions and actions associated with disaster prevention, preparedness and mitigation in this region. MARsite will develop a portal that will offer Internet access for users seeking data and results relevant to the Marmara region. It will connect users to existing databases and portals and provides reliable, up-to-date and user-friendly information – vital for the work of decision makers, planners and emergency managers to facilitate warning, response and recovery. Of course, MARsite project will be able to link more closely the communication and coordination not only at national but also at the international (global) level for the purpose of disaster risk reduction.

Following the GEO concept of Supersites, the idea of facilitating "Retrieval, integration and systematic access to remote sensing & in-situ data in selected regional areas exposed to geological threats (“Supersites”)", the MARsite should have the most remarkable impact from the point of view of seismic hazard/risk and could be a reference site, as the latest (8^{th})

Plenary session of GEO was held in Istanbul in November 2011. The data integration and dissemination portal will cover the following data and outcomes of the MARsite project:

- Geodetic monitoring of 4D deformations in order to understand earthquake cycle processes, to develop probabilistic earthquake forecasting models and to constrain the seismic hazard models in the Marmara region;
- High resolution data acquired by a new generation deep multidisciplinary complete digital borehole seismic station;
- Rapid and quantitative ShakeMap scheme by implementing finite-source descriptions and calibrating with multiple geodetic/seismic data;
- Characterization of activated and reactivated Deep-seated Gravitational Slope Deformations (DGSD) determined through the integration of geological and geomorphological analyses with high-resolution DInSAR;
- Knowledge on the distribution of active structures in the Marmara Region and the amount of motion they localize;
- Geophysical, seismological, physical and geochemical data from automatic sea-floor devices (e.g. OBS, Piezometers, acoustic station and multidisciplinary SN4-type observatory) including data from periodical cruises for water column sampling and laboratory analyses, for seafloor degassing measurements; and
- Results on earthquake early-warning (EW) and rapid-response systems in the Marmara Region (Istanbul) with the addition of a pilot landslide monitoring and EW system and introduction of new space technologies for monitoring and assessment of vulnerabilities.

Therefore, MARsite will surely have an important impact on the regional response for seismic risk prevention, but also plays a scientific/technical significant role as a European supersite.

There is a clear need for public-private partnerships in this field, as the observation material and analysis techniques become more and more sophisticated (and thus expensive), and also the socio-economic impact of seismic risk (especially the impact that will be caused by a large earthquake) become a worldwide concern. Without excluding other possibilities of public-private collaborations, we will be able to enhance this aspect. The direct outcome of this project (hazard assessment and risk prevention) could be useful for industrial domains and public policy makers in this region, where the impact of a European collaborative project is evident.

MARsite will have an impact that is much greater than the sum of its parts. This is because the coherent collection, analysis and dissemination of the wide range of data types on all aspects of the geohazards (earthquakes, landslides and tsunamis) cycles from many different instruments that is envisioned in this project will enable a step change in understanding in hazard and risk in the Marmara region. This dramatic improvement in understanding will not be possible without concentrating efforts on a single supersite and without bringing together all of these different data sources to create a synergy, where each overlapping piece of information reinforces another. The vast majority of previous studies on earthquake processes in the Marmara region have looked at simply a handful (or often fewer) of different aspects and, thereby, have had, at best, a partial, and in some cases a false, view of the tectonic cycle. MARsite will provide an opportunity to gain a fuller view of this cycle. Although, obviously, this project concentrates its efforts on a relatively small part of north-western Turkey, its scientific and technical impacts will go far beyond this region since the scientific findings are likely to be applicable to other seismically-active areas in Europe and beyond and its technical developments (e.g. new instrumentation and processing techniques) will be able to be used globally. In addition, the MARsite's impact will go far beyond the project's consortium through, e.g., scientific papers, newspaper articles for the wider public, guidance and information for end-users (e.g. risk mangers), but also thanks to the planned dissemination of the collected raw and processed data through easy-to-use and interoperable web portals. The impact of this project will last far beyond the three years of its duration.

B 3.2 Plan for the use and dissemination of foreground

MARsite has a dedicated WP (WP-11) concerning the dissemination of the project results to a wider community in general. The single task of this WP will be in charge of dissemination to the general public through, for example, printed brochures and the project website and also the development of dissemination materials to help in interactions with interested stakeholders in the Marmara Sea region, e.g. the Istanbul municipality. WP 11 will be responsible for the analysis of the target users and production of a communication plan for the dissemination and public outreach strategy of MARsite. It will produce educational material in English and Turkish on themes of the MarSite project to increase public awareness of the results and a short video targeting a wide public audience will also be created. Existing capabilities of the WP-11 Leader "The European-Mediterranean Seismological Centre (EMSC, http://www.emsc-csem.org)" will ensure that project results and outcomes survive and be exploited beyond the project lifetime. EMSC federates 84 institutes and observatories from 55 countries as members and is funded mainly through research projects. And offers a unique source of information for international authorities in order to meet society's needs for protection and enhance scientific progress, improve general information, while providing a back-up information service to national seismological institutes. Its website is ranked among the top 35 000 most visited sites (source www.alexa.com). Earthquake information is sent via email, SMS, or fax, within 20-25 minutes of the earthquake occurrence. Over 9 000 users including civil protection agencies, rescue teams, and individual citizens have registered to use this free service. The EMSC also collects data from observatories and institutes to publish the Euro-Med seismology reference bulletin. It plays a key role in the integration of the scientific community, particularly through the development and participation in major IT and infrastructure projects (e.g. the EC projects NERIES, NERA) in collaboration with ORFEUS. It hosts the European seismological portal (www.seismicportal.eu) which provides a single access point for earthquake data and services ranging from broadband and accelerometric waveform data, to historical event data and tomographic maps.

In order to develop and explain the key role that individuals can play as witnesses to seismic events, the EMSC has lately developed social networking on Twitter, Facebook and Google+. The Centre uses those social media to interact with citizens, inform them about earthquakes, share important projects, collect information and ask for opinions. With 1150 followers on Twitter and 810 fans on Facebook after only 3 months, the EMSC develops durable links with the public.

There are two main focuses of dissemination and exploitation of the outcomes of our project: 1) transferring improved knowledge of the Marmara Sea's geophysical system to the wider scientific community and 2) transferring the conclusions reached on seismic and related hazards to stakeholders and decision makers in the Marmara Sea region (e.g. Istanbul).

The first of these aims will be accomplished through classic means: the publication of high-quality scientific articles in international journals and the presentation at international conferences and workshops of the main results. In addition, through the means of easy-to-use website using international standards for data access, interested researchers will have access to the data underlying the scientific results, thereby allowing additional work to be accomplished outside of the project consortium and in the future.

To accomplish the second of these aims, members of the consortium (particularly the Turkish partners) will liaise with relevant stakeholders and decision makers (e.g. the Istanbul municipality) to make the results and conclusions known and understandable to them and to help them in considering their implications for earthquake risk reduction in the vicinity. The Turkish partners already have close contact with the relevant authorities through on going initiatives. These will be strengthened through this project. To date we have received confirmation letters from three end-users (see below). These letters show the interest of end-users in the MARsite project and the potential impact it will have on risk mitigation in the Marmara region, in particular in Istanbul. During the project we will seek to develop relationships with other potential end-users to disseminate the results of the project as widely and as well as possible. Moreover, representatives of the Consortium will be available –upon request by the European Commission- to participate in meetings (up to two meetings per year) where the project objectives and outcomes (of a public nature) will be presented in the perspective of contributing to common approaches and sharing best practices.

Our main objectives with respect to dissemination are the following:

- To raise awareness and ensure effective widespread dissemination and exploitation of the project research and results;
- To promote intra-consortium and wider integration and collaboration in undertaking the project and achieving project deliverables;
- To facilitate strong and effective involvement of multi-stakeholders throughout the project;
- To ensure that project deliverables meet the needs of Istanbul and adjacent communities and to promote effective and widespread application of the conclusions; and
- To provide a continuing resource for researchers and stakeholders concerning the Marmara Sea beyond the completion of MARsite.

For scientific/technologic dissemination, we should not forget that the Second European Conference on Earthquake Engineering and Seismology will be held in Istanbul in 2014, for which KOERI is the local host. This will be the ideal occasion to discuss all the topics about the MARsite and to discuss further the scientific topics and engineering applications.

Any dissemination activities and publications in the project, including the project website will
(i) specify that the project has received Community research funding and
(ii) display the European emblem. When displayed in association with a logo, the European emblem will be given appropriate prominence.»

(2) «All publications will include the following statement (from GA art. II.30.4): "The research leading to these results has received funding from the European Community's Seventh Framework Programme under Grant Agreement No. 308417 (MARsite)."»

Kandilli Observatory and Earthquake Research Institute (KOERI), as the oldest Earth Observatory in Turkey established in 1868, has been a key element of earth science and natural hazards related policy making process. The institute is a primary actor of the Natural Disaster Insurance Related Policies and plays the most important role in the National Earthquake Action Plan 2023, addressing the needs of the country for earthquake mitigation activities. Istanbul as a mega city with 13 million people inhabitants are exposed to natural and environmental and hazard as has to cope with the ensuing risks. In this connection, Istanbul Metropolitan Municipality, Earthquake Risk Management and Urban Development Department of Istanbul Metropolitan Municipality, Provincial Disaster and Emergency Management Directorate of the Istanbul Governorship (ISTANBUL AFAD) are identified as the end-users of MARsite project. Their requirements and expectations are, hence, closely integrated into the project and they will be regularly informed by the PC on the progress of MARsite and invited to participate to the relevant meetings. These public institutions will also provide the support required for logistical purposes during the implementation of the project. A "Declaration of Support" has been officially received from these entities are provided in Section 6 “End-user commitment letters”. MARsite deliverables will provide a comprehesive understanding of the multi-disciplinary hazard assessment for the region and hence will contribute to develop disaster mitigation policy and strategies based on multidisciplinary research activities in marsite. The project will provide decision makers with newly found timely knowledge for its implementation to the current regulations and develop new regulations. It will also be a driving force for the organisation of newly developed disaster education programs in order to increase disaster awareness in Marmara region. Deliverable 11.2 “Analysis of the target users and production of a communication plan for the dissemination and public outreach strategy of MARsite” will formulate the foundation to define concrete activities activities directly referring to environmental policy results. Midterm Review Workshop foreseen at M18 and the Project Final Meeting will be especially targeting the policy makers, not limited to Marmara Region, and the Project Final Report will include sound description of required policy improvements based on MARsite results as a “policy brief”.

Moreover, MARsite will adopt Advancing GEOSS Data Sharing Principles and will incorporate related GEOSS strategic targets defined as “Provide a shared, easily accessible, timely, sustained stream of comprehensive data of documented quality, as well as metadata and information products, for informed decision making….” in GEOSS Strategic Targets - Document 12 (Rev,1), page 8.

The high level Data Sharing Principles represents on of the foundations for GEOSS, and their effective yet flexible implementation remains a major challenge. MARSite will be a good chance to experiment their application. The 10-year implementation plan sets out the GEOSS Data Sharing Principles:

- There will be **full and open exchange** of data, metadata and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation
    - MARSite partners will actively share their data among themselves, through suitable tools such as the shared repository on the project web site, and will experiment and tune the data sharing models and interfaces that will potentially be used for data sharing at large within the GEO Supersite iniziative

- All shared data, metadata and products will be made available with minimum time delay and at minimum cost;
    - This is consitent with the statement above. Data sharing mechanism will naturally be set up in such a way to minimize delay and cost to the user.

- All shared data, metadata and products being free of charge or no more than cost of reproduction will be encouraged for research and education.
    - Where applicable (some of the data may not be redistributable to third parties at this stage), selected datasets will be offered to the scientific community with the long-term aim of making them recognized benchmarks for processing algorithms and methods.
    - To encourage the use of such datasets, they will be used in the partners' scientific publications and their availability advertised on scientific and seminal papers, and at conferences.

These principles applied to MARsite products will lead to develop disaster mitigation policy and strategies based on multidisciplinary research activities in MARsite through the continuous involvement of policy makers in the project lifetime. The process and the results will provide decision makers with newly found timely knowledge for its implementation to the current regulations and contribute to the development of new regulations. A concrete outcome will be the organization of newly developed disaster education programs supported with the multi-language educational material produced in WP11 in order to increase disaster awareness in Marmara region.

MARsite will also adhere to Special Clause 39 on "Open Access", applicable to the FP7 Model Grant Agreement for the Implementation of the Seventh Framework Programmes of the European Union and EURATOM which specifically addresses the following point;

> i-MARsite will deposit an electronic copy of the published version or the final manuscript accepted for publication of a scientific publication relating to foreground published before or after the final report on a dedicated section of the MARsite web portal.

MARsite will ensure that this electronic copy becomes freely and electronically available to anyone through this repository:

- immediately if the scientific publication is published "open access", i.e. if an electronic version is also available free of charge via the publisher, or
- within 6 months of publication.

A table with with detailed reference of the project's contribution to the GEO Work plan 2012-2015 and in particular the leads and contributions to the tasks is given below:

GEO WP 2012-2015 Tasks and Components				Most closely related MARSite WPs	
	Task	**Component**	**Lead**	**WP**	**Title**
INFRA-STRUCTURE	IN-01 Earth Observing Systems	C1 Development, Maintenance and Coordination of Surface-based Observing Networks (insitu and airborne)	EEA (tim.haigh@eea.europa.eu)	WP3/4	Long-term Continuous Geodetic Monitoring of Crustal Deformation / Establishment of Borehole Observation System and High Resolution Seismic Studies in the Marmara Sea
	IN-01	C3 Promotion and Coordination across Surface-based and Space-based Observing Systems Leads	USA (NOAA, john.calder@noaa.gov)	WP2/10	Land based Long-term multi-disciplinary continuous monitoring / Data integration and dissemination
	Task	**Component**	**Lead**	**WP**	**Title**
INSTITUTIONS AND DEVELOPMENT	ID-02 Developing Institutional and Individual Capacity	C1 Institutional Development	South Africa (DST, Umvoto, andiswa@umvoto.com)		
	ID-02	C2 Individual Development	Brazil (INPE, hilcea@dpi.inpe.br),		
	ID-04 Building a User-Driven GEOSS	C2 Outreach and Awareness Raising	IEEE (ells@uwaterloo.ca)		
	Task	**Component**	**Lead**	**WP**	**Title**
GEOSS SBA Disasters	DI-01 DI-01 Informing Risk Management and Disaster Reduction	C2 Geohazards Monitoring, Alert, and Risk Assessment	Italy (EUCENTRE, fabio.dellacqua@eucentre.it)	WP 5-8	Real- and quasi-real-time Earthquake &Tsunami Hazard Monitoring / Earthquake-Induced Landslide Hazard in Marmara / Re-evaluation of the seismo-tectonics of the Marmara Region / Monitoring seismicity and fluid activity near the fault using cabled and autonomous seafloor instrumentation
	DI-01	C5 Regional End-to-End Pilots	Canada (CSA, guy.seguin@asc-csa.gc.ca),	WP9	Early Warning and Development of the Real-time shake and loss information
Community of Practice	Geohazards				

Table 4: MARSite links with GEO WP 2012-2015

In addition, MARsite will adhere to Special Clause 29 "Access Rights to Foreground for Policy Purposes and Transfer of Ownership of Foreground" applicable to the FP7 Model Grant Agreement for the Implementation of the Seventh Framework Programmes of the European Union and EURATOM, which specifically addresses the following points;

i- The Project should ensure that protocols and plans for data collection and storage are in line with Data Policy of the European Union.

ii- The European Union Institutions and Bodies shall enjoy access rights to foreground for the purpose of developing, implementing and monitoring environmental policies. Such access rights shall be granted by the beneficiary concerned on a royalty-free basis.

iii- Where foreground will no longer be used by the beneficiary nor transferred, the beneficiary concerned will inform the Commission. In such case, the Commission may request the transfer of ownership of such foreground to the European Union. Such transfer shall be made free of charge and without restrictions on use and dissemination.

Intellectual Property Rights (IPR) provisions applicable in the Seventh Framework Programme (FP7) of the European Community for research, technological development and demonstration activities provided in the "Guide to Intellectual Property Rules for FP7 projects" are adopted by MARsite. MARsite will not act in contradiction with (or will follow) the rules laid down in Annex II of the GA

B4. Gender aspects

Gender Impact Assessment of the specific programs of the 5th Framework Programme, published by the European Commission in 2002, provides a foundational framework to MARsite Consortium. This framework is further supported by the Toolkit "Gender in EU-funded research", published in 2009, which clearly states that gender roles and identities play a crucial role in sustainable management and in all human activities. Moreover, it also emphasizes the fact that in the area of natural hazards the poorest are the most vulnerable, thus women with their lower income are disproportionally affected. Additionally, cultural, societal and economic constraints may restrict women's adequate responses and their access to warning systems and relief. MARsite, targeting a complex and integrated earth observation in one of the Earth's earthquake prone areas with a history of devastating earthquakes will ensure that necessary preparedness and mitigation activities would be prioritized, thus the research will address both women's and men's needs. One of the strategic goals of the European Commission is improving women's participation in research. **MARsite coordinator, as a very good example of a successful female scientist**, will serve the aims of this strategy. MARsite coordinator is ready to act as a major contributor to awareness-raising and information actions to encourage research institutions to analyse the situation of their female researchers, identifying obstacles to women's equal participation and positive steps to promote participation. Moreover, equal participation of men and women in research teams at all levels will be a high priority in MARsite. Gender Equality Performance will be assessed through an online tool from "Business Link; UK Government's online resource for businesses, available at http://www.businesslink.gov.uk/bdotg/action/layer?topicId=1080834416. This tool will help MARsite identify where the working practices could be changed to ensure that men and women are treated fairly and have equal opportunities during the project.

ANNEX I: END USER DECLARATION OF SUPPORT LETTERS

END-USER COMMITMENT LETTER

Istanbul Metropolitan Municipality

Department of Earthquake Risk Management and Urban Development

Directorate of Earthquake and Ground Analysis

Sarachane, Istanbul, TURKEY

To Whom It May Concern:

This document certifies that Istanbul Metropolitan Municipality (IMM) will act as end-user of the Bogazici University, Kandilli Observatory and Earthquake Research Institute (KOERI) in the proposed MarSite project if it is funded by European Commission. IMM assures to collaborate with KOERI and implement the project results.

Yours Sincerely,

Mahmut Bas

Directorate of Earthquake and Ground Analysis

T.C.
ISTANBUL METROPOLITAN MUNICIPALITY
Department of Earthquake Risk Management and Urban Development
Directorate of Earthquake and Ground Analysis

SAYI : M.34.1.İBB.0.34.70.730.06.02/ 07/02/2012
KONU: MarSite Project's End User

END-USER LETTER OF COMMITMENT

Ref: 03/02/2012 date and B.30.2.BÜN.0.46.00.00-041.02-152 number article of KOERI.

To Whom It May Concern;

This document certifies that the Earthquake Risk Management and Urban Development Department of Istanbul Metropolitan Municipality will act as end-user to the proposed MarSite project.

This would entail participation to the relevant activities of the project and consideration of the project results, in line with our departmental mandate and tasks.

Yours Sincerely,

Semih TURHAN, Department Head
Istanbul Metropolitan Municipality
Department of Earthquake Risk Management and Urban Development
Istanbul, TURKEY

END-USER LETTER OF COMMITMENT

February 2, 2012

To Whom It May Concern;

This document certifies that the Provincial Disaster and Emergency Management Directorate of the Istanbul Governorship will act as end-user to the proposed MarSite project.
This would entail participation to the relevant activities of the project and consideration of the project results, in line with our departmental mandate and tasks.

Yours Sincerely,

Gökay Atilla BOSTAN,
Director of Provincial Disaster and Emergency Management
Governorship of İstanbul
Istanbul, TURKEY

Hikmet ÇAKMAK
Deputy Governor
Governorship of İstanbul
Istanbul, TURKEY

SON KULLANICI TAAHHÜT MEKTUBU

2 Şubat 2012

İlgili kişinin dikkatine;

İşbu belge İstanbul Valiliği İl Afet Acil Durum Müdürlüğü'nün teklifi sunulan MARSite projesinde son kullanıcı olarak belirlenmiş olduğunu tasdik eder.
Bu durum, kurum mevzuatına aykırı olmamak kaydıyla, projenin ilgili aktivitelerine katılımı ve proje çıktılarının kurum tarafından da kullanılacağını deklare eder.

Saygılarımla,

Gökay Atilla BOSTAN
İl Afet ve Acil Durum Müdürü
İstanbul Valiliği
İstanbul, TURKİYE

Hikmet ÇAKMAK
Vali Yardımcısı
İstanbul Valiliği
İstanbul, TURKİYE