Deliverable D.9.024

Six-Monthly Progress Report 4

WP 9 – Financial and administrative management

T.9.1 - Administrative Project Management

Revision: Final

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REVISION HISTORY AND STATEMENT OF ORIGINALITY

Revision History

Revision	Date	Author	Organisation	Description
1.0	15.01.16	SP	GraphiTech	First Draft
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Statement of originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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Acronyms

WP	Work Package
MM	Man months
PC	Project Coordinator
PO	Project officer
DoW	Description of Work

1 Introduction

After the completion of all the works and deliverables related to work packages 1 *"Definition of requirements and system analysis"* and 2 "*Forest information collection*", the fourth period of the SLOPE project has mainly focused on the completion of some pending deliverables for work package 3 *"Complex Machine Systems"*, namely:

- D.3.02 *"RFID tag test"*;
- D.3.05 "*Intelligent truck"*;
- D.3.09 *"Reverse engineering of the head processor for virtual model, simulation and integration design"*;

These deliverables reflect the status of advancements of the slope machines, consisting in the finalization of the intelligent processor head design and the purchase of all the required hardware for the planned modifications, the finalization of the truck system and the RFID tag instruments. Additional details are provided in section 5.1.

The tasks of work package 4 *"Multi-Sensor Model-based quality control of mountain forest production"* have all started around month 6. Although deliverables D.4.01 to D.4.06 have been completed and submitted with task 4.06 "Implementation of the log/biomass grading system" the only one still active, a lot of work has still to be done due to the unexpected time required for the selection and purchase of hardware components. For this reason, only deliverable:

- D.4.07 *"Estimation of log/biomass quality by external tree shape analysis"*

Has been submitted and deliverable D.4.08 to D.4.10 are still under development in a draft stage. Their finalization is planned between April and May right before the testing on the field. More details are provided in section 5.2.

Regarding work package 5 *"Forest information System Development"*, besides some minor adjustments on the FIS, a remarkable effort has been spent in the platforms for real-time controlling of operations and on the middle to long term optimization and strategic planning. Due to this effort, essential for the integration success, deliverable 5.02 *"Real time supply chain control module of the FIS"* is in a delay of three months. More details about the performed activities are reported in section 5.3.

Work package 6 *"System integration"* has been subject to a significant amount of work especially by partners **MHG**, **Treemetrics**, **Itene** and **GraphiTech**. Following the integration plan described in D.6.01 *"Definition of the integration steps"*, two

integration and validation rounds out of the planned 3 have been performed, with the addition of new 3D planning tool features and database data. At the same time partners **MHG** and **Treemetrics** have worked on their on-the-field mobile applications which are now connected to the database and can access and edit tree and stand data. The activities related to task 6.03 *"Second integration – Forest Management"* are in a small delay but partner **MHG** is working on a software component (connector) to handle communication and synchronization among partners' databases to speed up the integration. Deliverable D.6.041 *"SLOPE System Techno-Economic Evaluation Report I"* is still ongoing and will be completed in February due to an unexpected difficulty in the cost estimates. Besides these delays the consortium is confident to complete the integrations on time and has prepared a dense remedial action plan to be followed.

The real pilot demonstrations foreseen in spring and autumn 2016 are the main objective of work package 7 *"Piloting the SLOPE demonstrator"*. Deliverable:

- D.7.02 *"Protocol for the experimental design of demonstration activities"*

Provides a detailed evaluation protocol to be followed for every aspect of the forest production workflow. The real trials, originally planned in task 7.3 at month 19, will be performed starting at month 29 due to aforementioned sensors and design delays, when the prototype will be sent back in the Trentino region from **Compolab** premises.

Additionally, to these activities, the project has continuously ensured a comprehensive range of dissemination activities to guarantee openness to a wider community from the very first stages of the project. The most important showcase for the project is its website (http://www.slopeproject.eu/), constantly updated with all the relevant information, including related events. From the website it is possible to get access to information on the project, its activities, and its partners. It is also possible to download project deliverables as well as PR material which has been enriched with posters a new brochure and an infographic about the project. Another important achievement of the consortium and in particular of **GraphiTech** has been the featuring of the 3D harvesting planning tool on the project showcase of the CesiumJS middleware (http://cesiumjs.org/demos/3DHarvestingPlanner.html), an open source virtual globe used as foundation technology for the visualization system and the publication of a new press release.

Furthermore, the Web 2.0 communication channels have been constantly updated to ensure potential stakeholders' involvement in the project. These include a LinkedIn group, a Facebook page, a Twitter micro blog and a YouTube channel. These Web 2.0 tools allow reaching a large community of stakeholders by ensuring prompt dissemination of relevant information through a variety of

media channels, including news releases, videos, and webinars, to name but a few.

The consortium has been also active through a number of dissemination activities including scientific publications, meetings, organization of SLOPE-branded events as well as presentations of the project to national or international conferences. Further details will be introduced in Section 3.

2 Achievements and Personnel use per WP

The first section of this report shows the effort of each member of the consortium with the exception of partner **KESLA** which has withdrawn from the project and has been replaced by partner **Compolab**. The report covers the period from the 1st July to the 31th of December 2015 and details the actual effort and the planned one, highlighting in a third table the global effort balance (underspending or overspending of Man Months).

2.1 Project Effort

The following tables represent the effort planned in the DoW (Table 1), followed by the table that presents the effort that partners have charged within the reporting period that corresponds also to the global timeframe. A third table presents the difference between the planned and the charged man months (Table 3). The balance has been calculated subtracting the charged man months from the planned ones. The cells with a negative sign indicate that the effort charged was more than the one originally planned, and vice versa. The percentage of completion at report time is included below each WP. All these tables have been divided according to the partners' short names and WPs of the project, while the empty cells are those where no man months have been planned or charged.

It is important to notice that the reporting period planned effort has been subject to changes due to the approved amendment and the inclusion of partner **Compolab** within the consortium.

Partner Name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total
GRAPHITECH	9,50	17,50	4,00	3,00	9,00	22,00	7,00	3,00	11,00	**86,00**
CNR	7,00	7,00	18,50	24,00	11,00	5,00	10,00	3,80	0,50	**86,80**
KESLA										**-**
COASTWAY	4,00	11,00			2,00		4,00	2,00	0,50	**23,50**
MHG	6,50		2,50	1,00	24,50	5,00	11,00	2,00	0,50	**53,00**
BOKU	3,50	5,00	4,00	16,00	3,50	3,50	15,50	4,50	0,50	**56,00**
FLYBY	4,00	19,00		3,00	3,00	3,00	4,00	2,00	0,50	**38,50**
GREIFENBERG	4,00		20,00	2,50		2,50	9,50	2,00	0,50	**41,00**
TREEMETRICS	4,00	10,00	3,00	5,00	12,00	5,00	7,50	2,00	0,50	**49,00**
ITENE	7,00	6,00	9,00		12,00	7,00	7,00	6,50	0,50	**55,00**
COMPOLAB			23,00	5,50		4,00	3,00	1,50	0,50	**37,50**
	49,50	**75,50**	**84,00**	**60,00**	**77,00**	**57,00**	**78,50**	**29,30**	**15,50**	**526,30**

Table 1: Planned Effort

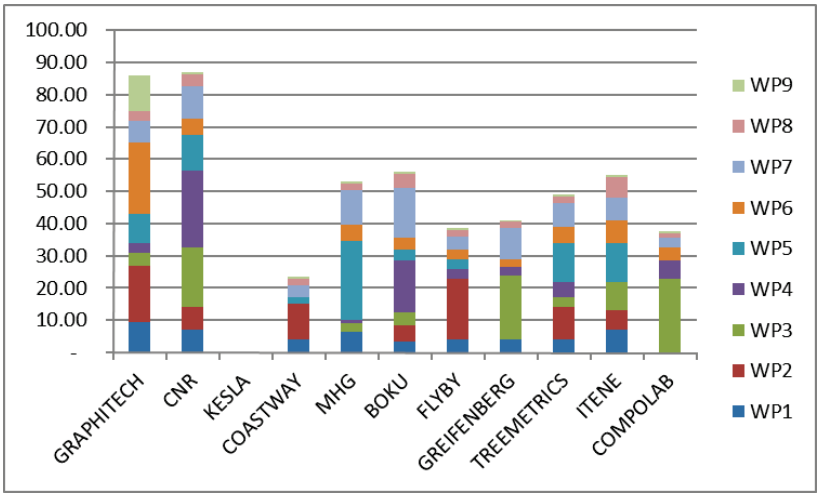

Figure 1: Planned Effort

Partner Name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total
GRAPHITECH	9,34	14,72	1,36	0,82	6,68	11,10	0,46	2,90	8,52	**55,90**
CNR	9,03	1,72	18,30	21,51	3,94	0,35	1,67	2,32	0,39	**59,22**
KESLA	0,52	-	0,59	-	-	-	-	-	-	**1,11**
COASTWAY	4,00	11,00	-	-	2,00	-	3,74	1,14	0,50	**22,38**
MHG	9,45	0,45	0,25	1,00	43,30	8,35	0,90	1,15	1,35	**66,20**
BOKU	2,35	5,57	4,07	14,81	2,46	0,05	14,33	1,37	0,67	**45,67**
FLYBY	4,13	21,48	-	2,46	3,96	4,62	3,69	2,08	0,50	**42,91**
GREIFENBERG	4,36	1,07	17,55	0,44	-	0,10	0,90	0,69	0,48	**25,58**
TREEMETRICS	4,00	10,00	3,00	5,35	7,10	2,25	1,95	0,90	0,35	**34,90**
ITENE	6,65	6,34	9,38	-	1,36	2,13	0,41	1,85	0,09	**28,21**
COMPOLAB	-	-	27,44	5,00	-	1,60	1,00	-	0,30	**35,34**
	53,83	**72,35**	**81,93**	**51,40**	**70,79**	**30,54**	**29,04**	**14,39**	**13,15**	**417,42**

Table 2: Effort charged within the whole project duration

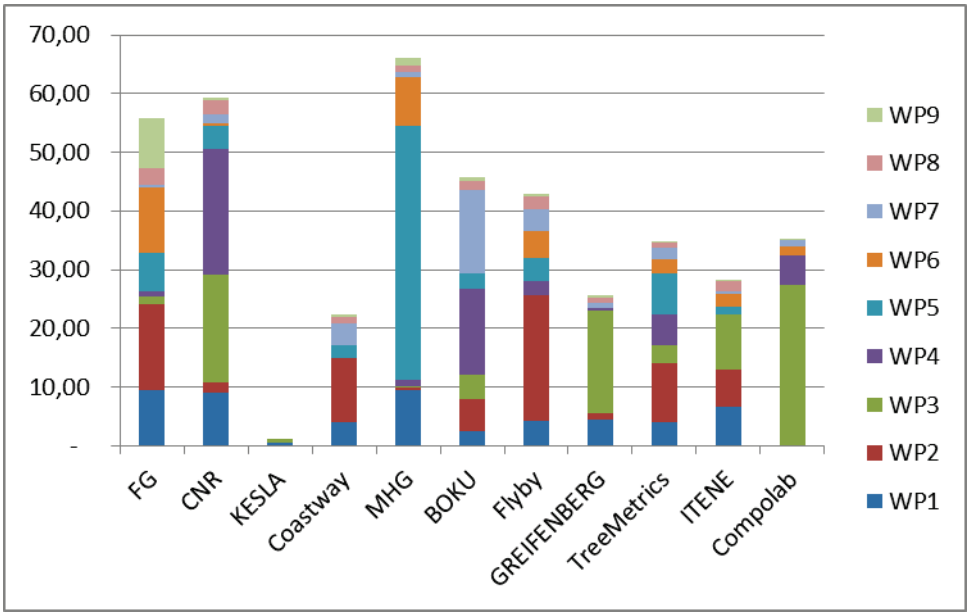

Figure 2: Charged Effort

Partner Name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total
GRAPHITECH	0,16	2,78	2,64	2,18	2,32	10,90	6,54	0,10	2,48	**30,10**
CNR	-2,03	5,28	0,20	2,49	7,06	4,65	8,33	1,48	0,11	**27,58**
KESLA	-0,52	-	-0,59	-	-	-	-	-	-	**-1,11**
COASTWAY	-	-	-	-	-	-	0,26	0,87	-	**1,13**
MHG	-2,95	-0,45	2,25	-	-18,8	-3,35	10,10	0,85	-0,85	**-13,20**
BOKU	1,15	-0,57	-0,07	1,19	1,04	3,45	1,17	3,13	-0,17	**10,33**
FLYBY	-0,13	-2,48	-	0,54	-0,96	-1,62	0,31	-0,08	-	**-4,41**
GREIFENBERG	-0,36	-1,07	2,45	2,06	-	2,40	8,60	1,31	0,02	**15,42**
TREEMETRICS	-	-	-	-0,35	4,90	2,75	5,55	1,10	0,15	**14,10**
ITENE	0,35	-0,34	-0,38	-	10,64	4,87	6,59	4,65	0,41	**26,79**
COMPOLAB	-	-	-4,44	0,50	-	2,40	2,00	1,50	0,20	**2,16**
	-4,33	**3,15**	**2,07**	**8,60**	**6,21**	**26,46**	**49,46**	**14,91**	**2,35**	**108,88**

Table 3: Effort balance (remaining MM = planned - charged)

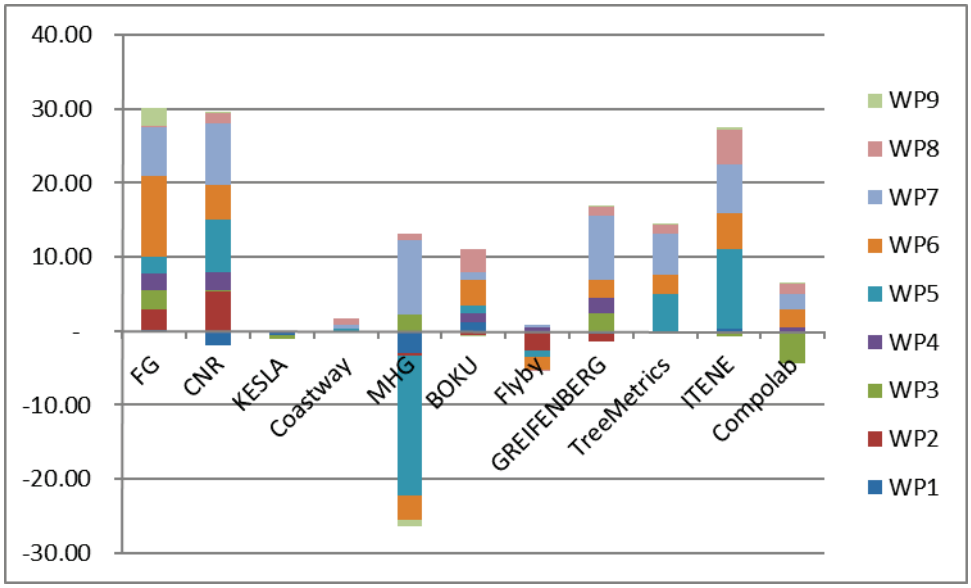

Figure 3: Effort Balance

2.2 Effort Evaluation

This reporting period covered the main activities of work packages 3, 4, 5 and 6. Work packages 1 and 2 are now completed and only a small amount of effort has been charged for the completion of WP2 by **GraphiTech**, **Treemetrics**, **FlyBy** and **Boku**. The acquisition of the forest data from on-the-field surveys has been completed on all the pilot areas with the majority of the outcome stored on the forest information system and the production of the following deliverables:

- D.2.01 “Remote sensing data analysis”
- D.2.02 “Remote sensing data analysis”
- D.2.03 “TLS data and analysis”
- D.2.04 “Harvest simulation tool based on 3D forest model”
- D.2.05 “Road and logistic simulation module”

Concerning work package 3 within this period, the effort charged has been very high, especially from partners **Compolab**, **Greifenberg** and **CNR**. This effort is justified by the amount of work done for the finalization of the processor head design and the build of the prototypes, which at the time of writing were still under development. This situation does not constitute an issue at the moment as the closure of the work package is planned at month 25, but some months of delay, especially for the completion of the processor head need to be considered. Currently the following deliverables have been completed:

- D.3.01 “Portable RFID tag reader/programmer”
- D.3.02 “RFID tag test”

- D.3.05 “Intelligent truck”
- D.3.08 “Requirement analysis and market analysis and Purchase of the head processor”
- D.3.09 “Reverse engineering of the head processor for virtual model, simulation and integration design”

While deliverable D.3.03 “Intelligent cable-crane carriage”, due at month 23 is in a slight delay due to the late arrival of the single board computer to read CAN bus and RFID tag data.

Regarding work package 4, started at the same time of the previous one, the major effort has been perfused from **Boku** and **CNR** on laboratory and on-the-field tests for the purchased sensors, to identify the best configuration to be mounted on the processor head. Currently, the only deliverable released in the period is:

- D.4.07 “Estimation of log/biomass quality by external tree shape analysis”

While the other planned documents for the estimation of log quality are still in progress and are expected to be released between February and May 2016 by **CNR**.

For work package 5, started at month 8, the consortium reported a major effort from partners **GraphiTech**, **CNR**, **MHG** and **Treemetrics** for the development of the forest information system platform with a major focus on the functionalities for medium and long term forest optimization and real-time monitoring of operations. The only deliverable planned for this period was D.5.02 “Real time supply chain control module of the FIS” at month 22 but it is still in a draft stage and has not been submitted.

Work package 6, started at month 9 has foreseen a remarkable initial effort from **GraphiTech** for the study on the development and validation strategy reported in D.6.01. After that, works on the integration of the 3D harvesting planner with the slope database and its services, developed by partner **MHG** have quickly proceeded during year 2015 until the current release of the viewer (1.4). This work is reflected in the effort charged on the work package especially by partners **GraphiTech**, **MHG**, **Treemetrics** and **Itene**. The only deliverable planned for this reporting period was D.6.041 “SLOPE System Techno-Economic Evaluation Report I” containing a first estimate of the costs of the slope forest production system. Unfortunately, due to a late selection of the last components (i.e. sensors) the release of the deliverable has been postponed and is planned for February 2016. The amount of resources available should be sufficient for the completion of the system integration.

Work package 7, started at month 13 has seen in this reporting period an intense activity from partner **Boku** for the organization of the Austrian pilot and for the release of the following deliverable:

- D.7.02 "Protocol for the experimental design of demonstration activities"

Developing an experimental design for collecting data to compare both supply chain systems and answering some research questions during the pilot phase. Other partners involved in the work package have been also **CNR**, **Coastway** and **FlyBy**. No other deliverables were planned for the reporting period.

Effort reported on work package 8 has been devoted by the whole consortium to the following activities:

- Official project website and social channels news publications
- Newsletter
- New flyer, posters and infographics
- Dissemination in conferences and other events

With the majority of the effort reported by **Boku** and **FlyBy** while the final work package, requiring almost one fourth of the available man months, has been mainly focused on the administrative and financial aspects of the project.

The following chapters and sections explain in details all the actions performed by each partner divided by project task.

2.3 Deviation in Personnel

The following table presents the deviations, in terms of personnel working on the project, which have to be reported.

ID	Partner	New staff working on the project or change of role of existing staff	Staff not working on the project any longer
1	**GraphiTech**	**Mr. Stefano Penasa** has been added to the project staff of **GraphiTech**.	**Mrs. Ružica Bukša Tezzele** is no longer in charge of the activities of WP8
2	**CNR**	**Dr. Jakub Sandak** is now in charge of Task 4.05. **Dr. Carla Nati** started contributing to the project activity.	**Dr. Mariapaola Riggio** is not any more operative on the project.

Table 4: Staff variations

3 Dissemination of Knowledge

All the partners have been actively engaged in the dissemination campaign, with a major contribution from **CNR, Boku** and **GraphiTech** regarding the scientific dissemination and from **MHG**, **Coastway** and **Treemetrics** for the stakeholder's presentations of the project.

3.1 Meetings with stakeholders, etc.

A variety of meetings are ensuring that a large number of stakeholders are being informed of the project and its results. The list below details each project presentation made by the partners to companies, public administrations, academia, in the last six months:

ID	Partner	Event
1	**MHG**	IT house Silvadata Oy. Presentation of real-time platform/online purchasing & invoicing concepts with matching mobile interfaces to the Finnish forest owners.

Table 5: Meetings with stakeholders

3.2 Workshops attended

Workshops are events ensuring that a large number of stakeholders are being informed of the project and its results. During this semester, the following workshops have been organized.

ID	Partner	Event
1	**MHG**	Invited service provider in Silvadata meeting providing ERP system for Finnish forest management associations (7 participants).
2	**MHG**	Business model/service portfolio planning workshop with Pohjois-Karjala Forest Management Association (4 participants).
3	**Boku**	Technical workshop in conjunction with FORMEC symposium. 04-08 October 2015, Linz (Austria)
4	**Compol ab**	Workshop in San Michele all'Adige with **CNR**, **Boku**, **GraphiTech**

Table 6: Workshops

3.3 Planned events (including meetings)

A number of events, including, but not limited to, project meetings, workshops, conferences etc., has been scheduled by partners to maximize dissemination of the project's results. See the table below.

ID	Partner	Meeting Subject	Participants	Venue	Date
1	**GraphiTech**	Project technical meeting	ALL	Cork, IE	19-21.01.2016
2	**Boku**	Technical Workshop	**Boku**, **CNR**	Tulln, Austria	15-19.02.2016

Table 7: planned events

3.4 Conferences, special sessions, and other co-organized events (incl. liaisons)

Considering the delay on the development of the hardware prototypes the organization of stakeholder meetings has been postponed to the last year of the project but partner **MHG** is already working in the definition of a list of actors interested in the project.

ID	Partner	Event

Table 8: Meetings with stakeholders

Besides the first liaison established with the SmeSpire project (http://www.smespire.eu/) no other liaisons have been established.

ID	Partner	Name of initiative	Short description of the activity

Table 9: Liaisons with other projects

3.5 Participation to conferences

Several conferences were attended by project partners**,** especially the Symposium for forest mechanization (FORMEC 2015) which has seen the participation of **GraphiTech**, **Boku**, **CNR**, **Itene** and **MHG**. The conference has been the perfect

place for the dissemination of the project material, going from oral presentations during the conference to advertisement material (e.g. flyers) during the breaks.

ID	Partner	Event
1	**GraphiTech**	*23th International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision (WSCG) 2015. Pilsen, 19-25 June 2015.*
2	**GraphiTech**	*WEB3D 2015 Conference, Heraklion, Greece, 18-21 June.*
3	**GraphiTech**	*SGEM 2015 International Multidisciplinary GeoConference, Albena Co, Bulgaria. 16-25 June.*
4	**GraphiTech**	*HCII 2015, Human Computer Interaction International 2015, Los Angeles, CA. 2-7 August.*
5	**GraphiTech**	*FORMEC 2015, The forest engineering network, Linz, Austria, 4-8 October.*
6	**GraphiTech**	*Cyberworlds 2015, Sweden, 7-9 October 2015*
7	**CNR**	*Shatis 2015 3rd International Conference on Structural Health Assessment of Timber Structures, 9-11 September 2015*
8	**CNR**	*17th International Conference on Near Infrared Spectroscopy (ICNIRS 2015), Brazil, 18-23 October.*
9	**CNR**	*FORMEC 2015, The forest engineering network, Linz, Austria, 4-8 October.*
10	**Boku**	*FORMEC 2015, The forest engineering network, Linz, Austria, 4-8 October.*
11	**MHG**	*FORMEC 2015, The forest engineering network, Linz, Austria, 4-8 October.*
12	**Itene**	*FORMEC 2015, The forest engineering network, Linz, Austria, 4-8 October.*

Table 10: Participation to conferences

3.6 Papers involving partners

In this reporting period, a high number of publications has been presented on journals and conferences.

ID	Partner	Type of publication	Title	Authors	Other reference information
1	**GraphiTech**	Paper	WebGL virtual globe for efficient forest production planning in	F. Prandi, G. Panizzoni, D. Magliocchetti, F. Devigili, R. de Amicis	20th International Conference on 3D Web Technology

			mountainous area		(Web 3D 2015). Heraklion, Crete, Greece. June 2015.
2	**Graph iTech**	Paper	GIS tools for forest production optimization in mountainous areas: the SLOPE project	D. Magliocchetti, G. Panizzoni, F. Prandi, R. De Amicis.	15th International Multidisciplinary Scientific Geoconference (SGEM 2015). Albena, Bulgaria, June 2015.
3	**Graph iTech**	Paper	GeoPeeling Lens: Deformation - Based Technique for Exploratory Data Analysis	Debiasi A., Simoes B., De Amicis R.	International Conferences in Central Europe on Computer Graphics, Visualization and Computer Vision (WSCG)2015. Pilsen, 19-25 June 2015.
4	**Graph iTech**	Short Paper	Interactive Virtual Planning Tools for Sustainable Forest Production in Mountain Areas	G. Panizzoni, D. Magliocchetti, F. Prandi, R. De Amicis.	Human Computer Interaction International (HCII 2015). Los Angeles, USA, August 2015.
5	**CNR**	Journal Article	Survival Test of RFID UHF Tags in Timber Harvesting Operations	G. Picchi, M. Kühmaier, J. De Dios Diaz	Croatian Journal of Forest Engineering 36-2, p. 165-174
6	**CNR**	Paper	An alternative way of determining mechanical properties of wood by means of cutting forces.	Jakub Sandak, Kazimierz Orlowski Tomasz Ochrymiuk, Anna Sandak, Mariapaola Riggio	Proceedings of Shatis 2015 3rd International Conference on Structural Health Assessment of

			Journal of Heritage Conservation, (Wiadomosci Konserwatorskie)		Timber Structures
7	**CNR**	Paper	NIR as a toll for determination of log/biomass quality index in mountain forests – SLOPE project approach	Anna Sandak, Jakub Sandak, Katharina Böhm	17th International Conference on Near Infrared Spectroscopy (ICNIRS 2015), Brazil
8	**CNR**	Journal Article	Estimation of physical and mechanical properties of timber members in service by means of infrared spectroscopy.	Anna Sandak, Jakub Sandak, Mariapaola Riggio	Construction and Building Materials 101(2): 1197-1205
9	**CNR**	Journal Article	Multivariate analysis of multi-sensor data for assessment of timber structures: principles and applications.	Jakub Sandak, Anna Sandak, Mariapaola Riggio	Construction and Building Materials 101(2): 1172-1180
10	**CNR**	Journal Article	Application of imaging techniques for detection of defects, damage and decay in timber structures on-site.	Mariapaola Riggio, Jakub Sandak, Steffen Franke	Construction and Building Materials 101(2): 1241–1252
11	**CNR**	Paper	Evaluation of RFID UHF tags for electronic marking of standing trees	Gianni Picchi, Martin Kühmaier, Juan De Dios Diaz	FORMEC 2015 conference, Linz 4-8 October, Austria.

Table 11: Publications from partners

3.7 Other Presentations

In this second project period one posters and a press release have been produced to disseminate the project to a wide audience of research centres and potential stakeholders.

ID	Partner	Publications
1	**Boku**	Press release: Kühmaier, M. (2014): Forschung für die Praxis. Forstzeitung, 09/14, 4-4; ISSN 1012-4667.
2	**Coastway**	Unmanned Aircraft Association of Ireland: discussion on the use of Drones in Forestry mapping and Agriculture, Enda Nolan to present the Slope Project.
3	**GraphiTech**	Poster presentation at the European Data Forum 2015, Luxembourg, 16-17 November 2015.

Table 12: Other publications

4 Performance Monitoring

This section provides a description in quantitative form of how the partners have contributed, within this reporting period, to the performance indicators as set out in the DoW.

ID	WP	Objectives	KPI Expected Results	Additional Details
1	2-3	**To formalize a model-based operational planning system for mountain areas**	Time and cost reduction in on field set-up for harvesting operations	The data acquisition performed within work package 2 helped partners **Treemetrics**, **Coastways** and **FlyBy** in the creation of operational models to be followed for the optimization of manual and semiautomatic procedures required to generate the project datasets. A preliminary list of costs will be reported in deliverable D.6.04.1 "SLOPE System Techno-Economic Evaluation Report I"
2	2-3	**To provide data for the Digital Forest Model**	Number of Data collected and ingested	**Flyby, Coastway** and **Treemetrics** already worked together to create a digital forest model of the surveyed area following the procedures described above, going from Digital Surface Model to accurate 3D model reconstruction of trees. Currently, all the pilot areas have been surveyed and their digital models are almost completed. **GraphiTech** has improved the digital forest model inside the 3D Modelling for harvesting planning by providing additional graphical features and connecting the system to the underlying forest information system.
3	3	**To integrate novel intelligent systems in harvesting machines operating in mountain areas**	Increasing the amount of information recorded from the harvesting machines	**Compolab** has finalized the design of the processor head taking in account all the sensors required by partner **CNR** and their cabling to stream data to the industrial pc installed on the harvesting machine. **Greifenberg** worked on the cable carriage system to install RFID tag

				reader and a recording system for the data passing through the CAN Bus. **GraphiTech** worked on the software system to be executed by a single board computer to be installed on the cable carriage. **Itene** tested its truck sensor system and the data upload on the forest information system. **CNR** tested and identified the best RFID tag model for the forest production process.
4	3-4	**To measure characteristics (quality indicators) and guarantee traceability of the harvested material**	Number of quality indicators developed	Partner **Treemetrics** defined a process to estimate the log/biomass quality based on external tree shape analysis, reported in deliverable D.4.07. Partner **CNR** is working on quality indicators based on NIR spectroscopy, hyperspectral imaging, stress wave measurements and cutting process. Results are expected in the first months of 2016. Currently all the measurement protocols have been defined and the indices are parameters are going to be released in the first months of 2016.
5	3-4	**To perform full traceability of wood assortments (including biomass)**	Number of data collected and ingested, supported by a reliability indicator (% of non-traced elements).	Partner **Istituto Technologico** has provided its solution for real-time tracking of logs which has been reported in deliverable D.3.05 “Intelligent truck”.
6	4	**To deliver a multi-sensor model-based quality control system for mountain forest production**	Improvement of quality control, better classification performances	Partner **CNR** has worked with **Compolab** for the design of the processor head modifications which are currently being implemented. Additionally, **CNR** has validated the hyperspectral camera with **Boku** and determined the optimal MicroNIR sensor configuration based in its technical drawings.

7	5	**To support mid/long term forest management**	Economic analysis of the benefits related to an improved forest harvest and road management plan compared with the common systems.	Partner **MHG** is currently working on the platform for long-term forest optimization.
8	5	**To integrate and validate the developed systems in real-life scenarios.**	Number of harvesting demonstration areas in real scenarios.	All the pilot testing with machines will be performed in spring and autumn in Italian and Austrian locations. Before this phase testing on the software components is planned on a monthly basis as described in D.6.01 "System Integration and Validation Plan".
9	6-7	**To ensure robustness and reliability of the developed systems**	Number of hectares of forest harvested, and techno-economic comparison with traditional methods.	N/A
10	1-7-8	**Involvement of experts from different dept. of forest admin**	Number of experts involved during the requirements analysis and pilot testing phase	Partner **CNR** has involved to the SLOPE project Trentino Forest rangers and Forest Service of the Autonomous Province of Trento. A similar involvement has been done by partner **Boku** on the Austrian territory.
11	1-7-8	**Involvement of professionals from private companies**	Number of professionals involved during the requirements analysis and pilot testing phase	N/A
12	All	**Involvement of scientist.**	Number of scientist involved during the project	N/A
13	8	**Scientific and commercial**	Number of scientific	1 Abstract by **Boku and CNR** 1 Abstract by **CNR**

		visibility	publications related to SLOPE	2 Posters, 1 Short paper and 3 full paper by **GraphiTech** 1 Journal article and 3 full papers by **CNR**
14	8	**Openness activities**	Number of workshops organized, technical experts engaged within the project's wide community, companies involved in openness activities	1 Technical workshop in conjunction with FORMEC symposium with more than 200 participants.

Table 13: Key performance indicators

5 Description of Activities

5.1 WP 3 - Integration of novel intelligent harvesting systems operating in mountain areas

The objective of this work package, started at month 6, is to set up the machines and tools required to create an intelligent interaction among all the operators involved in forest harvesting in steep terrain. The main activity performed in work package 3 has been devoted to complete the design and start the build of the processor head as well as the finalization of the cable carriage enhancements. This final design has been discussed at **Compolab** premises in November. More details are provided in the next subsections.

5.1.1 Task 3.1 - Intelligent tree marking and felling/hauling

The objective of the task coordinated by partner **CNR** was to develop a system allowing the marking and tracking of trees and of logs along the whole processing chain. More in details, the completion of the task has seen a major focus on the testing of RFID devices and tags on operational scenarios within the forest. Results have been reported in the corresponding deliverable. More in details:

- **CNR,** in the frame of D.3.02 "RFID tags testing", performed a scouting activity to identify a suitable stand of *Picea abies* ready to be harvested, with at least a non-valuable tree to be used for samples production. Once identified and obtained the owner's permission, trees were felled and processed for the production of fresh (maximum moisture) logs of pre-defined dimensions (diameter and length). These samples have then been used for testing the dielectric properties of moist wood and its capacity to reduce RFID readability. Logs were gradually dried in oven, repeating RFID reading under the same conditions with different moisture content of logs, from maximum water content to oven dry. Deliverable 3.02 included also the complete tool set for electronic tree marking testing in the forest (Montesover).
- **Greifenberg** participated in a meeting with **CNR** in order to identify the best equipment to support foresters during the marking phase. Additionally, remote meeting was organised in order to finalize the IT equipment related to Tag Reader/programmer.
- **Boku** was involved in the preparation of the field survey for intelligent tree marking with TLS, documenting conventional and improved tree marking methods. Additionally, a concept for a publication about forest inventory and tree marking was developed as well as a literature review

about forest inventory and tree marking. Measurements and data analysis for tree marking at the Austrian demo site was also prepared

- **Treemetrics** was mainly involved in the development and adaptation of the **Treemetrics** field app to be integrated with the SLOPE solution. The planned development work was completed and testing has been conducted on the Montesover site.
- **Itene** was involved in an in-depth analysis of different tag models to identify the most suitable one for the project. Different contacts with providers of RFID tags where done. A new RFID tag design has been done in agreement with **Compolab** and **CNR** partners and has been commissioned to the most suitable provider. The RFID roll was designed to work for both manual and processor head tagging. Finally, development and inputs for D.3.02 and D.3.06 were done and a review of D.3.02 was performed.

5.1.2 Task 3.2 -Processor head selection, purchase and re-engineering of the SLOPE system component

This task, led by **Compolab** is related to the design and development of the technical modifications on the processor head that will be used by the operators during the tree felling operation. More in details:

- **Compolab** worked on reverse engineering activities on the purchased processor head. An analysis of the mechanical 3D model realization and hydraulic schemes was performed with the drafting of deliverable 3.09.

5.1.3 Task 3.3 - Intelligent Cable crane

The objective of the task, led by **Greifenberg** was to improve the cable crane system. After the first months of analysis on the system requirements, their technical office carried out the development of the new choker, interacting with the carriage system with some modifications to support an external RFID antenna and a single board microcomputer. A stud of the corridor design for the harvesting operations and of the best placement of the new sensors has been performed by partners **Boku** and **CNR**. More in details:

- **Boku** collected data for the cable corridor design during harvesting operations. In addition, they were involved in evaluating the requirements and the technical data for the cable yarding operations in Austria, and the cable line for the harvesting operations in Annaberg (Austrian demo site) was defined. The cable corridor was calculated and **Boku** worked also on the reviewing of the cable line design and on a literature review about cable tension. A review of D.3.03 was also performed.

- **Greifenberg** worked on the building of components, analysis, trials and equipment for the carriage Tecno, the chockers and the rope launcher. **Greifenberg** worked on the collection of data and steps of integration for the review meeting presentation held in Brussels, attended a meeting with **CNR** in San Michele together with its software expert, to find solutions for the interface between Tecno Carriage and the other equipment of the project supply chain (RFID antenna and Wi-Fi connection with the industrial pc mounted on the harvesting machine). **Greifenberg** worked also on testing and on field activities for the Automatic Chokers and the Rope Launcher, to be finalized within the end of November.
- **CNR** conducted studies on the most suitable placement of the on the field Wi-Fi within the structure of the TECNO carriage. Data transfer scheme and protocols were discussed especially for the communication between the TECNO PLC CAN bus and the single board computer with the selection of the in-process parameters to be transferred to the SLOPE control system. **CNR**, in collaboration with **Greifenberg**, defined the technical characteristics required for the RFID reader to be installed on the carriage. Interactions with the manufacturers were managed directly up to the selection of a specific, most suitable model. The optimal location of the antenna and reader on the carriage was studied, taking in account readability issues as well as protection and effectiveness of the antenna during commercial forest operations.

5.1.4 Task 3.4 - intelligent processor head

Task 3.4 lead by **KESLA** has been managed by partner **Compolab** after their withdrawal from the project. After the completion of the enhanced processor head design, the production and purchase of the required components for the prototype has been started and is planned to be completed in the first months of 2016. More in details:

- **CNR** worked on the implementation of the Wi-Fi data transfer on the side of the master PC installed on the harvesting machine. Further determination of technical details regarding sensor placement on the processor head in collaboration with **Compolab** was performed. The optimal layout of the processor head was thoroughly discussed with the involved partners considering positions and characteristics of the sensors. For most of them, the effectiveness of the proposed position was tested in laboratory conditions, simulating the operative environment of the processor head as much as possible. The layout and characteristics of the RFID marker and the deployed RFID tags rolls was also studied and assessed.
- **Boku** contributed mainly in the evaluation of D.3.09.

- **Compolab** was mainly involved in the design of novel processor head. Main works have been related to cutting forces evaluation system and stress wave propagation system. Analysis on RFID tags positioning system was also carried on. The following activities were also pursued: design of the RFID tags positioning system; design of stress wave system; design of cutting forces evaluation system; design of the scan bar. Finally, COTS components have been ordered and the 2D drawing for custom parts and modification on processor head has been drafted.
- **Greifenberg** provided advice, support and consulting to **CNR** and **Compolab** to calibrate the system and test the functionality of components in the supply chain. They worked on supporting activities for the D.3.09 in project and manufacturing activities aiming to realize the full interoperability among the system and equipment. In particular, they have been drawing technical details for the hydraulic parts required by **Compolab** for the Processor Head modifications. Finally, they worked with **CNR** to support the calibration the system and the testing of the functionality of the processor head.
- **GraphiTech** conducted an analysis of the list of purchased sensors.
- **Itene** was mainly involved in the integration of the RFID module to include in the processor head. The RFID reader CAEN A528BDK was purchased and sent to **Compolab**. Different contacts and conversations took place in order to define the RFID tags to be introduced in the processor.

5.1.5 Task 3.5 – Intelligent transport truck

Task 3.5 lead by **Itene** and started at month 12 was aimed at adding intelligence to the transport vehicles for timber and biomass within the project scenario, providing real-time position, weight and fuel consumption for route and costs optimization. The task has been completed with the development of a prototype described in *D.3.05 Intelligent Truck.* Further details are reported below.

- **Istituto Technologico** was mainly involved in the truck data integration into the SLOPE platform and the finalization and optimization of the *itruck* user interface. The software has been programmed in python, running on a single board Linux machine and includes standalone test options, communications with SLOPE central database and manual qID RFID reader integration. Lab tests were performed for optimization purposes and the results will be presented in the technical meeting of January.

5.1.6 Task 3.6 - Data management back-up

Task 3.6 lead by **CNR** started at month 14 and was aimed at the definition of the technical solutions for the storage of data from on-the-field sensors on the

industrial pc, installed on the harvesting machine. Details about the performed work are provided in the following list:

- **Istituto Technologico** had contacts with **CNR** to pass info regarding RPI python code.
- **CNR** had a working group visit at GRE premises in order to define algorithms of the data acquisition from the cable crane, selection of suitable electronic equipment and to present the data flow details including data transfer protocols.
- **Greifenberg** mainly contributed in supporting partners in charge for the developing of the structures of data, both to be transmitted via 3G and stored for further use in the FIS and developing the software for communication of the cable crane and central computer.
- **Compolab** collaborated with other partners in the definition of the main components of the data management back-up system.

5.1.7 Task 3.7 – Scientific coordination

In order to ensure scientific quality and functionality of the technical components of the project**, GraphiTech** has performed several coordination activities to review deliverable D.3.09 and draft the first version of the SLOPE technical meeting agenda. In addition, the hardware integration was monitored and contacts were kept with the task leaders. The Banana Pro was ordered and set up for the activity of recording and transmission of the CAN bus data from the cable carriage to the industrial PC mounted on the processor head. **GraphiTech** also participated in a meeting with partner **Compolab** in Livorno.

5.2 WP 4 - Multi-sensor model-based quality control of mountain forest production

This work package coordinated by **CNR** and started at month 6, aims at the definition of a methodological basis for the development of a semi-automated and real-time grading system for the forest production. Achieving this goal requires an extensive testing and tuning of different sensors within the laboratory and on the field, to ensure an optimal definition of thresholds and measurements for the final log grading. During this reporting period the main effort of work package 4 has been devoted to the definition and final purchase of the hardware required for sensors and on the testing of the near-infrared and hyperspectral sensors in both field and laboratory. More details about each single task activity are provided in the following sections.

5.2.1 *Task 4.1 - Data mining and model integration of stand quality indicators from on-field survey for the determination of the tree "3D quality index"*

The task 4.1 led by **Treemetrics**, aimed at the evaluation of the effectiveness/reliability of quality indicators for single and combined parameters related to external characteristics of standing trees, such as tree height, diameter, stem taper, straightness, sweep and lean, branchiness, branch length, thickness and dimension of the live crown.

- **GraphiTech** evaluated the last survey performed by partner **Treemetrics**, and performed an evaluation of the 3D index.
- **CNR** was mainly involved in the assessment of quality characteristics for the expected timber assortments, together with an analysis of market value, leading to the relative weight in the internal database and software analysis for value recovery (optimal bucking). Local quality and shape models for standing trees were gathered from national studies. The most appropriates for the purposes of the project were discussed and analysed in collaboration with **Treemetrics**.

5.2.2 *Task 4.2 - Evaluation of near infrared (NIR) spectroscopy as a tool for determination of log/biomass quality index in mountain forests*

Task 4.2 lead by **CNR** focused on a feasibility study for NIR spectroscopy for the evaluation of bio-resources for harvesting. The activity included development and validation of chemo-metric algorithms to be adopted for the prediction of intrinsic quality indicators. These models have been tested on real data with results reported on D.4.03 "*Establishing NIR measurement protocol*". Additional details about the task are provided below:

- **Boku** evaluated data on HSI and NIR measurements and attended the SLOPE technical meeting in San Michele (Italy).
- **CNR** performed the first trials for determination of optimal MicroNIR sensor configuration before arrival of equipment on the base of technical drawings and previous tests. Studies on the effect of wood moisture variation on the NIR spectra were performed on the laboratory equipment and experimental data used for calibration model development and further calibration transfer. A trail for the chemometric models transfer between different laboratory instruments was performed in collaboration with **Boku**. Further on, testing of the MicroNIR in various configurations was performed. A concept for the chemometric models transfer between different laboratory instruments was discussed in collaboration with **Boku**. A presentation of the results was given during ICNIRS in Brazil.

5.2.3 Task 4.3 - Evaluation of hyperspectral imaging (HI) for the determination of log/biomass "HI quality index"

Task 4.3 led by **Boku** had among its goals the evaluation of the effectiveness of the hyperspectral imaging for the characterization of bio-resources along the harvesting chain. Results have been reported in deliverable D.4.04 *"Establishing hyperspectral imaging measurement protocol"* while, additional details are reported below.

- **CNR** worked on the validation of the VIS-NIR hyperspectral camera, performed with selected samples developing a simple chemometric model for qualitative analysis of spectra.
- **Boku** was mainly involved in presenting and discussing results during the mid-term review meeting in Brussels. Data on hyperspectral imaging and measurement surface roughness of wood were evaluated, making HSI re-measurements of selected samples. Furthermore, new data evaluation software (Evince, Umbio) were tested. Resin by a NIR and HSI data comparison was analysed, as well as different deficits. **Boku** participated also to the SLOPE WP technical meeting in San Michele (Italy) and evaluated HSI hypercube data with PLS toolbox.

5.2.4 Task 4.4 - Data mining and model integration of log/biomass quality indicators from stress-wave (SW) measurements, for the determination of the "SW quality index"

Task 4.4 lead by **CNR** aimed at optimizing the process of log/bio-mass analysis through stress-wave acoustic measurements, compare them against a model and define a stress-wave quality index. Within this task an acoustic based measurement protocol has been defined and reported in the corresponding deliverable D.4.05. The implementation of the acoustic analysis is still ongoing and managed by partner **Compolab** with the consultancy of **CNR**. More in details:

- **Compolab** was mainly involved in analysing the best suitable sensors for SW quality index and in defining the tri-axial and mono-axial accelerometers.

5.2.5 Task 4.5 - Evaluation of cutting process (CP) for the determination of log/biomass "CP quality index"

Task 4.5 led by **CNR** had among its main goals the development of a novel automatic system for estimation of a quality index based on the cutting resistance of wood during the processing phase. The recorded cutting forces are related to specific wood properties like fracture toughness and shear modulus. This predicted index has been the component of the inputs to determine the final log quality index. Results of this study are summarized in deliverable D.4.06

"Establishing cutting power measurement protocol" and details about involved partners' activities are provided below:

- **CNR** was involved in the original experimental set-up for the determination of the material characteristics (fracture toughness and shear yield stress) which was developed in collaboration with Technical University of Gdansk. The results of the research were presented on the final COST FP1101 meeting and SHATS 2015 conference.
- **Compolab** was mainly involved in the analysis of the best suitable sensors for CP quality index. A definition of load cells and hydraulic pressure sensor for debranching forces estimation was also performed, as well as an estimation of hydraulic pressure and flow sensors for chain saw energy. Finally, there was a definition of the best solution for cutting forces estimation (taking into strong account reliability). The sensors for delimbing forces estimation and for energy consumption of chainsaw cutting process were also defined.

5.2.6 Task 4.6 - Implementation of the log/biomass grading system

Task 4.6 lead by **CNR** aims at the development of a prediction model that is able to combine the entire quality index collected within the other tasks of work package 4 and produce a final quality index for the log/biomass that is being processed. **CNR** contributed trough the further development of the data fusion strategy by means of multi-sensor integration. Preliminary software tools in collaboration with visiting scientist were also developed and concepts for the multi-sensor integration were discussed with the project partners (e.g. GRE, COM, **Greifenberg**, **Compolab** and **GraphiTech**).

5.2.7 Task 4.7 Scientific Coordination

In order to ensure scientific quality and functionality of the technical components of the project**, GraphiTech** has performed several coordination activities to monitor and review the work package 4. More in details, **GraphiTech** worked on the coordination of the remote calls with the partners and the drafting of the following reports, as well as the review of the work package deliverables. In addition, **GraphiTech** attended the WP4 workshop on multi-spectral analysis at IVALSA premises and a meeting in Livorno with **Greifenberg**, **CNR** and **Compolab**.

5.3 WP 5 - Forest information system development

The work package 5 coordinated by **MHG** and started at month 8 is devoted to the development of the mountain forest information system. It is currently storing all the data related to the harvesting process and interconnecting all the services available among the partners, creating a unique entry point for all the wood

processing operations to the several involved actors (planners, logistic operators, brokers, end-users, forest owners). The main effort spent on this work package has been devoted to the refinement of the 3D Client software to cope with the real-time control of operations, the revision of the database and the development of the middle to long term optimization systems. Additional details are provided in the following sections.

5.3.1 Task 5.1 Database to support novel inventory data content

Task 5.1 lead by **MHG** aimed at the design, build and operation of the database to store all the data involved within the wood processing chain envisioned in the project and interconnect it with the already available services from the consortium partners. The database has been carefully explained within deliverable D.5.01 "Inventory Module of the FIS" and the activities reported below are just a small set of modifications due to integration needs:

- **GraphiTech** was involved in the revision of the database schema.
- **Treemetrics** assisted in the further refinement of database structures in addition to reviewing documentation.

5.3.2 Task 5.2 Platform for near real-time control of operations

Task 5.2 lead by **Treemetrics** aimed at the development of a system for near real-time control of operations based on the database of task 5.1, to provide planning information, storage optimizations, advanced reporting, taking into account critical conditions in the forest like: network availability, rough conditions, etc.At the time of writing, the development of the platform is still ongoing. More details are provided in the following list:

- **GraphiTech** participated in a telco with partner **Treemetrics** and mainly contributed to the development of the Slope client and the feature of the rope launcher. They also contributed to the development of the app for real-time planning and to the client technological implementation of the graphical components for near real-time control of operations. They were also involved in the SLOPE compound terrain service implementation to support multi-resolution terrains at the same time
- **Treemetrics** worked to establish the architecture and workflow with the other partners for this task. They also modified the field application in order to support a tree level view. In addition, they explored the possibilities of connecting the field application to the SLOPE database, and the options for the harvest management application. Further development of the application mentioned in task 3.1 has been conducted under this Task.
- **CNR** mainly worked on the quality indexes to be implemented in the near real-time platform, which were adapted to the real time system. The

information provided by the RFID tags and transferred through the platform was defined with the involved partners.

5.3.3 Task 5.3 Online purchasing/invoicing of industrial timber and biomass

Task 5.3 lead by **MHG** and started at month 19 is focused on the development of a system for online purchasing and selling of wood products (timber and biomass), allowing identification and tracking of materials, negotiation, bidding, analysis and pre-selling procedures. The activities of this task are reported below:

- **MHG** focused on programming apps for real time communication between forest owners and buyers.

5.3.4 Task 5.4 Long term optimization; strategic *planning*

Task 5.4 lead by **Boku** and started at month 18 is focused on the development of a forest information system for short term timber supply management based on marked demands. This process requires a selection of the best roads to be used accordingly with available resources (i.e. trucks, workforce, etc.) minimizing storages and evaluating biodiversity and forest integrity impacts through a set of indicators. Details about the task are provided in the following list:

- **Boku** was mainly involved in reviewing models for short-term optimization in timber harvesting.
- **MHG** contributed with additional input for mobile app development to be integrated with the FIS as decided in July Telco. Through this, near real-time documentation of timber and feedstock storages can take place. **MHG** is currently testing a hybrid solution in parallel of a native Android app on that purpose.
- **GraphiTech** was involved in the model for optimization and in the related remote calls.

5.3.5 Task 5.5 Mid-long term optimization, strategic and tactical planning

Task 5.5 lead by **MHG** and started at month 18 is focused on all the aspects related to the planning of forest operations on a longer timeframe. This implies a set of instruments to define optimal allocation of harvesting operations in a decade to meet the demanded wood volume. Activities performed on this task are reported below:

- **Flyby** started to study and analyse which information was relevant for the long time planning and management of the forest. In particular, on how the information extracted from satellite imagery of the forest could be used to improve the forest management. They also analysed the modality to support the quality of management plans.

- **Boku** was mainly involved in reviewing models for mid-long-term optimization in timber harvesting.

5.3.6 Task 5.6 Scientific Coordination

In order to ensure scientific quality and functionality of the technical components of the project**, GraphiTech** has performed some coordination activities to monitor and review the work package 5. Moreover, **GraphiTech** attended the FORMEC 2015 symposium to present the forest information system and the monitoring and planning tools created within the slope project. Additional details are provided below.

- **GraphiTech** was involved in the participation to the FORMEC 2015 conference and the preparation of related slides, brochures, travel arrangements, etc. A visit of the pilot test site of Annaberg in Austria was made. **GraphiTech** also contributed to the extension of the paper for the GMOD Journal and to the preparation of Forest information system dissemination material. Finally, they were involved in the monitoring of Task 5.2 and the general coordination of WP5 including the verification of progresses.
- **Coastway** worked alongside slope partners to coordinate the implementation of phase two of testing and the inclusion of Multispectral imagery for scientific investigation of species, and presented to the consortium on site in Austria how the survey technology works.

5.4 WP 6 - System Integration

The goals of this work package, led by **GraphiTech** are the achievement of a complete integration of the different elements composing the project platform. The work on WP6 has continued as planned with the extension of the 3D harvesting planning tool to the version 1.3. New features have been added like multiple language support, a rope launcher simulator and a reporting tool to name but a few. The integration with the Slope web services has been completed for authentication and workspace loading/saving feature and is currently focused on the visualization of date provided by the entire consortium which has required some small changes on the FIS database. Overall, the system integration is proceeding as expected with a slight delay on task 6.03 that is going to be solved in the next months. Details about the work done are provided in the next sections.

5.4.1 Task 6.1 Definition of the integration steps

Task 6.1 lead by **GraphiTech** aimed at the definition of the integration steps to be actuated to create the final SLOPE platform and how to validate it, in both laboratory and on-field conditions. This integration strategy presented at the mid-term review meeting is explained in details within deliverable D.6.01 "System Integration and Validation Plan". The reported activities constitute only small efforts for the finalization of the deliverable.

- **CNR** provided its contribution in Skype meeting and preparatory actions for D 6.01.

5.4.2 Task 6.2 First Integration – Forest inventory & harvesting systems

The work performed by **GraphiTech**, leader of this task, within this reporting period has been devoted to the evolution of the 3D Modelling for harvesting planning tool and to the coordination of the integration activities with regular conference calls. The tool evolved in its interface and functionalities by being progressively integrated with the Slope web services. A first effort has been made for the coordination of the integration activities of mobile, intelligent track and processor head systems. More details are provided below.

- **GraphiTech** was involved in many activities concerning the evolution of the Slope platform: workspace save and loading; platform optimization and bug fixing; upload and publication of **Boku**, Treemetrics datasets, fixing re-projection issues; automatic generation multi-language legend generation from maps; code minimization and optimization; dataset upload and exposition; report creation and download; dataset automatic importer; rope launcher interface and cableway optimization. **GraphiTech** contributed to the mid-term review meeting and to the technology planning of GeoBrowser3D, the technology behind the Slope viewer. **GraphiTech** participated to the Fed4FIRE "GENI Research Experiment Summit" (FGRE 2015), the HCI International 2015 where a poster was presented, the FORMEC 2015 Symposium, the NATO CAX Forum Conference. Finally, they worked on the 3D harvesting planner integration with the forest information system.
- **Itene** developed the test case for the intelligent truck to describe how to review the operation of the solution, and contacted **MHG** to better define integration of iTruck data into the SLOPE platform. A new table was defined and tested.
- **Flyby** supported partner **GraphiTech** in the creation of the test environment, in particular the integration of the forest model system.
- **MHG** collaborated closely with **GraphiTech**, **Treemetrics**, **CNR-Ivalsa** and **Itene** in the integration process.

- **CNR** was mainly involved in the participation to meetings for first integration process and organization of the task.
- **Compolab** cooperated with other partners in the definition of scenario for demos.

5.4.3 Task 6.3 Second integration – Forest management

Task 6.03 lead by **MHG** and started at month 21 has among its objectives the integration of on-the-field data into the forest management system together with qualitative and quantitative analysis results coming from WP4. This task implies the development of a set of connectors between FIS, **MHG** and **Treemetrics** data models. More details about the activities are reported in the following list:

- **Itene** provided assistance for the components integration.
- **Treemetrics** completed the integration of the field data collected in November with the slope system.

5.4.4 Task 6.4 Third integration - System validation

Task 6.04 lead by **GraphiTech** has not started, yet.

5.4.5 Task 6.5 Scientific coordination

The last reporting period has seen a remarkable effort from partner **GraphiTech** in the coordination activities, going from meeting organization to monitoring conference calls. More in details:

- **GraphiTech** was mainly involved in the activities of coordination with emails planning and checking of deliverable deadlines.

5.5 WP7 - Piloting the SLOPE demonstrator

The work package 7, led by **Boku** and started at month 13 is responsible for the definition of the evaluation methodologies of the developed prototypes as well as the organization of the real demonstrations on-the-field. The first task, responsible for the definition of the testing methodology has been completed and presented at the mid-term report meeting with its results disseminated through the deliverable D.7.01 “Protocol for the definition of evaluation methodology”. Information about the other tasks is reported in the next subsections.

5.5.1 Task 7.2 Preparation and deployment of demonstrators

Task 7.02 led by **CNR,** started at month 16 and ended at month 19. Its main goals have been the preparation of the demonstration activities to evaluate the technical and economic performance of the slope forest surveying systems as well as the software capabilities of the slope tools for the simulation, monitoring and

management of wood resources. A protocol for these activities has been defined and reported in deliverable D.7.02 "Protocol for the experimental design of demonstration activities". A description of the performed activities is reported below.

- **Greifenberg** provided advice to the partner in charge for the analysis of the requirements of the equipment (chockers, rope launcher, Tecno carriage) for the organization of the pilots. Finally, they attended a meeting and an on-site survey with **Boku**, **CNR**, **Itene**, **MHG** and **Coastway** in Austria, on the slope demo area, to check the feasibility of the terrain conditions for the installation of the cable line for the pilots.
- **Boku** prepared and evaluated D.7.02, including literature review and analysing business process models. In addition, they also ordered RINEX data for UAV post-processing.
- **Flyby** participated in the definition of the demonstration activities and analysed the type of information that remote sensing data can supply for the demonstration, in order to prove how remotely sensed data can be an important component of the system.
- **CNR** further prepared the demo site in Montesover (D.7.02) by marking additional trees along the cable line, identifying the cable yarder landing area and the potential storage areas for the operative aspects of the demo. The new town mayor and technical secretary were met in order to ensure that an appropriate and collaborative forest company would have been chosen for harvesting the forest parcel selected as pilot for SLOPE project. A document, specifying the requirements and the importance of such choice was prepared and submitted to the attention of the Sover town hall assembly. The deliverable document was prepared in its final version and distributed among partners requesting contributions on the specific aspects related to each partner. All feedbacks were collected and used for the preparation of the final version of the deliverable, submitted to the coordinator for final evaluation.
- **GraphiTech** mainly contributed to the preparation of D.7.02 and reviewed its final version. It also worked on the data verification for the pilot in Austria, and on the preparation of the meeting agenda.
- **Coastway** prepared a methodology to be included in the demonstration.

5.5.2 Task 7.3 Trials and validation cycle

Task 7.03 lead by **Boku** and started at month 19 is the core of the testing of the Slope project solutions. Due to the delays on the design of the processor head and on the purchase of the required hardware components, this task is expected to be performed extensively between spring and fall 2016, with a remarkable effort on the improvement and tuning of the systems in a relatively short time frame.

Besides this situation for which the consortium is proactively planning a remedial action plan, a set of activities reported in the following list has been performed.

- **Boku** prepared the demonstration activities in Annaberg, and supported **Coastway** in the organisation of the field survey. Furthermore, a field survey including a field trip to Annaberg was organized with a focus on the analysis of the forest stock. Finally, **Boku** supported **Treemetrics** during their TLS survey in Annaberg.
- **Coastway** carried out trials on calibration of equipment in the field on Multispectral, RGB Cameras and RTK Drones.

5.5.3 Task 7.4 Training on the job

Task 7.04 lead by **CNR** and started at month 24, aims at the transfer of knowledge, skills and competences built during the project, to stakeholders and on-the-field workers. At the time of writing, only the following partners have worked on this task:

- **Coastway** demonstrated to the Consortium how to operate the survey of Forestry.
- **Flyby** started to define the strategy to train the users in the use of the information derived by remote sensed data.

5.6 WP 8 - Openness with other activities, dissemination and exploitation of results

This work package, coordinated by **Itene**, is focused on the dissemination and exploitation of the progress results. The work performed on WP8 by the entire consortium has been devoted to the participation to international conferences and to the submission of new dissemination contents to the SLOPE official website, social media channels (YouTube, Facebook, twitter) and featuring on other online websites.

5.6.1 Task 8.1 – Dissemination planning and publications of results

This task contains all the dissemination activities performed by the partners during the reporting period and detailed in chapter 3, in particular: dissemination posters, technical articles, events, conference attendance and newsletters. Regarding these items, the second and third newsletter have been completed and sent, a new flyer has been created and printed, and a roll-up has been produced as well as an infographics and a dissemination poster.

- **GraphiTech** contributed to the preparation of news and videos, the review of D.8.02.2 as well as preparation of multimedia data. **GraphiTech**

was also in charge of the updating of news on the social media channels before and after the mid-term review meeting, the participation to Web3D 2015 conference and the Slope presentation at the European Data Forum 2015. **GraphiTech** attended the HCII 2015 Conference, presented the project at the NATO CAX Forum 2015 and a poster at the European Data Forum 2015. Quality checks for D.8.022 were also performed. **GraphiTech** was involved in the publication of new brochures and infographics on the project website and in the promotion of new dissemination material.

- **CNR** provided editorial activity of a state-of-the-art report on NDT and SDT techniques for wood/timber assessment, which was published on a special issue of the Construction and Building Materials Journal. Results of the project related to RFID technology were gathered in an ISI publication and proceeding of the FORMEC conference. Two studies were brought as oral presentations at the FORMEC 2015 international conference.
- **MHG** participated also in forest-day event in Hollola (Finland) exhibiting real-time operation solutions for forest owners, foresters, authorities and contractors on the 24th of October which saw the participation of over 50 visitors. **MHG** was also meeting director of North Karelia Forest Management Association on 8th of December regarding real-time management and mobile solution platform.
- **Boku** prepared the technical workshop in Linz, and drafted an article for the world forestry conference blog. A literature review about forest inventory and tree marking was also performed.
- **Coastway** presented the Slope project to the University of Limerick and the National State Forestry department of Ireland in October 2015.
- **Itene** developed deliverable D.8.1, presented the results in the review meeting and took care of the development of the press release. They also gave assistance for the FORMEC workshop.

5.6.2 Task 8.2 – Exploitation and business planning -IPR & licensing policies

Task 8.2 lead by **MHG** has not started, yet. However, some effort has already been reported and is detailed within the following list:

- **GraphiTech** monitored calls for tenders as possible ways of exploitation, and prepared a demo of the project.
- **MHG** participated in event in Helsinki presenting real-time platform/online “purchasing & invoicing” concept with matching mobile interfaces per stakeholder to Finnish forest owners associations (IT house Silvadata Oy).

- **Flyby** started to study a possible common strategy for the exploration of the Slope results, in particular the use of the methodologies developed through the exploitation of remote sensed data.

5.6.3 Task 8.3 – Contribution to standardisation

Task 8.3 lead by **CNR** and started at month 19 has, among its major goals, the update and development of standards based on the research advancements of the slope project. From a practical point of view this means the elaboration of a set of recommendations to be proposed to the most suitable standardization technical committees. At the time of writing no effort has been spent on the task.

5.6.4 Task 8.4 – Industrial Advisory Board

This task lead by **MHG** started on month six to work on the involvement of industrial partners inside the consortium, with the constitution of an advisory board. In this reporting period, the following activities have been carried out.

- **GraphiTech** worked, in collaboration with partner **CNR**, on the preparation of the Advisory Board and developed principles on building an effective Advisory Committee.
- **Coastway** continue with the development of a training manual for the advisory board.
- **Boku** conducted a research for members for the Industrial Advisory Board.

5.7 WP 9 - Financial and administrative management

The main objective of work package 9, coordinated by **GraphiTech**, is to ensure that the project goals and objectives are met in compliance with the project work plan. The main effort within this work package has been devoted the finalization of the reports provided at the mid-term review especially the financial figures and the mid-term report.

5.7.1 Task 9.1 – Administrative project management

Within this task, led by **GraphiTech**, all the consortium partners have worked on the reporting done on a bimonthly basis for both financial and technical progresses. More specifically:

- **GraphiTech** worked on the annual cost claim and the data preparation for NEF contributing to the Project quality control with communication with partners. In addition, **GraphiTech** was involved in the check of BMR and SLOPE Form C, in the drafting of the financial report and in updating the cost claim file, checking the costs and the man months. Finally, the

corrections and clarifications of issues arising from the request of the Commission, concerning RP1 cost claim, were performed.

- **MHG** worked on the reporting of activities and internal management of different tasks and multiple work packages in the Slope project.
- **Boku** contributed in preparing the bi-monthly report and in collecting and analysing data for the mid-term review.
- **Itene** was mainly involved with the preparation and attendance to the review meeting in Brussels on 2 July 2015.
- **All involved partners:** redaction of the reports.

5.7.2 Task 9.2 – Project coordination

Within this task are considered all the actions performed in order to manage the project consortium. In particular, during this reporting period **GraphiTech** was involved in the review of claimed costs, the organization of the project meeting planned at month 24, the definition of documents and solutions for project issues concerning the hardware for the prototype. The coordinator has been involved within the management of all these situations.