PROJECT PERIODIC REPORT

Grant Agreement number: 607183

Project acronym: DECUMANUS

Project title: Development and Consolidation of Geospatial Sustainability Services for Adaptation and Climate Change Urban Impacts

Funding Scheme:

Date of latest version of Annex I against which the assessment will be made:

Periodic report: **1st** ☐ **2nd** X **3rd** ☐ **4th** ☐

Period covered: **from 01st December 2014 to 31th May 2016**

Name, title and organisation of the scientific representative of the project's coordinator[1]:

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

Declaration by the scientific representative of the project coordinator

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) [3]:

  X has fully achieved its objectives and technical goals for the period;

  ❑ has achieved most of its objectives and technical goals for the period with relatively minor deviations.

  ❑ has failed to achieve critical objectives and/or is not at all on schedule.

- The public website, if applicable:

  X is up to date

  ☐ is not up to date

- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 3.2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: Julia Pecci-López

Date: 02 / September / 2016

For most of the projects, the signature of this declaration could be done directly via the IT reporting tool through an adapted IT mechanism and in that case, no signed paper form needs to be sent

[3] If either of these boxes below is ticked, the report should reflect these and any remedial actions taken.

3.1 Publishable summary

Summary of the action context and its objectives

DECUMANUS had a principal objective to develop and consolidate a set of sustainable services that allows city managers to incorporate geo-spatial products and geo-information services in their climate and environmental change strategies to support the sustainable management of the cities of Europe. The specification of the service portfolio and service sustainability had been based upon the strong engagement of the city users throughout project development and their commitment in relation to the validation activities. The project has been built upon previous research and development results and GMES products, generated by the project partners and others entities, supported by full users engagement with the project partner cities, and externally via the Stakeholder Board, and finally, underpinned by rigorous sustainability assessment and business case.

DECUMANUS portfolio of information services addresses the key political concerns for Europe's cities including climate change impacts, monitoring of land-use development and urban sprawl, assessment of urban energy efficiency and securing healthy urban environments for all citizens including the vulnerable young and increasingly ageing population of Europe, specified as follows:

- Urban Climate Atlas (temperature / wind / humidity / precipitation / air pollution / energy balance / impact assessment);
- Land Monitoring (Urban Atlas change detection / green cover fraction / urban ecosystem);
- Energy Efficiency (hotspots / insulation / solar panels / light mapping)
- Citizen Health (forecast of health impact according with different scenarios)
- Water Quality (chlorophyll, turbidity, CDOM, Tª, etc)

All these products can be accessed and manage using the Decumanus Geoportal demostrator, and advances portal with analytics capabilities.

Nodaway, it can be stated that DECUMANUS has fulfilled theirs objectives and that it has successfully entered in a commercial phase. Its philosophy is already participating in the Urban Management market, in free competition with existing ideas, services and visions of the market. Last trends technology inclusion to fulfil users' needs from different points of view has been crucial to achieve this success. In this way, final DECUMANUS services can be now connected with Internet of Thinks works, Smart cities solutions, Big Data Analysis, and exploitation.

Another remarkable aspect of the results of the project is that also private companies have been engaged in the DECUMANUS framework, covering new market niches and promoting innovation in WO urban products applications.

Finally, private and public institutions have allowed the Decumanus Consortium to create innovative and highly technology downstream services. These downstream services have been demonstrated using some demo uses cases developed during the last months of the project and especially after the final Workshop in Madrid.

During the project, several European Directives have been studied in indeed for several countries, including the implementation at local level of most of them:

- Directive 2012/27/EU of the European parliament and of the council of 25 October 2012 for Energy Efficiency Directive;
- Directive 2009/28/CE of the European Parliament and the Council, 23th April 2009 for the promotion of the use of energy from renewable sources;
- European Energy Strategy 20-20-20 and the Roadmap 2030-2050;
- European Directive 2010/31/UE for Zero emissions buildings;
- European Directive 2012/27/UE –Article 4 and 5 for rehabilitation of buildings;
- European Directive 2008/50 and 2004/107 about Air Quality;
- Municipalities Urban planning and strategies for mitigation and adaptation of the cities for mitigation and adaptation to the climate change.

These directives and plans have been the main driver of the products and dowstream services final and future definitions.

The original portfolio was grouped into 2 levels: Basic (or Strategic) and Premium Services. First level devoted to citizen level information publicly available over the web and with aims of self-sustainability in future years. The second level is devoted to services for city managers as requested and defined by them because their sustainability is subject to commercial operations for public administration and/or private sector.

An advanced Geoportal with analytics capacities has been developed. This Geoportal was defined to satisfiy the users needs regarding products and services accessibility and exploitation requirements.

The project objectives in terms of services definition and downstream service fostering has been achieved and even overcome, creating a solid layer for downstream services development with high commercial opportunities. This fact has be possible thanks to the inclusion of technological improvements that make possible the immediate connections with Internet of Thinks (IoT), Social media impact and Big Data exploitation and applications, not forgetting the Smart cities solutions, in which platforms, Decumanus products could be included almost by default.

Three opened workshops were developed during this second pahse of the project: Milan (18-19th March 2015), Antwerpen (12-13th November 2015) and a Final Workshop in Madrid city (19-20 th May 2016), all of the hosted by the corresponding city users participating in the project.

Work performed during the reporting period and main results achieved so far

To summary, the technical objectives of this second part of the project were:

- Define Premium services together with city users
- Implement the selected products
- Develop a project advances Geoportal, with high technological challenges
- Make users and stakeholders test the results
- Develop a proper business model and work in the corresponding agreement between partners of the consortium
- develop scientific dissemination
- Start commercial actions in the segments with more potentiality in this moment: energy efficiency, Health impact and

To select the best products to be developed during the second phase of the project, and according with the methodology developed to involve city users in this definition, it was opened a consultation to the 5 city users participating in the project. These results helped to define the most successful products and services.

Finally, seven DECUMANUS services has been defined and the activity of the second year has been focused on the following Premium Level services development:

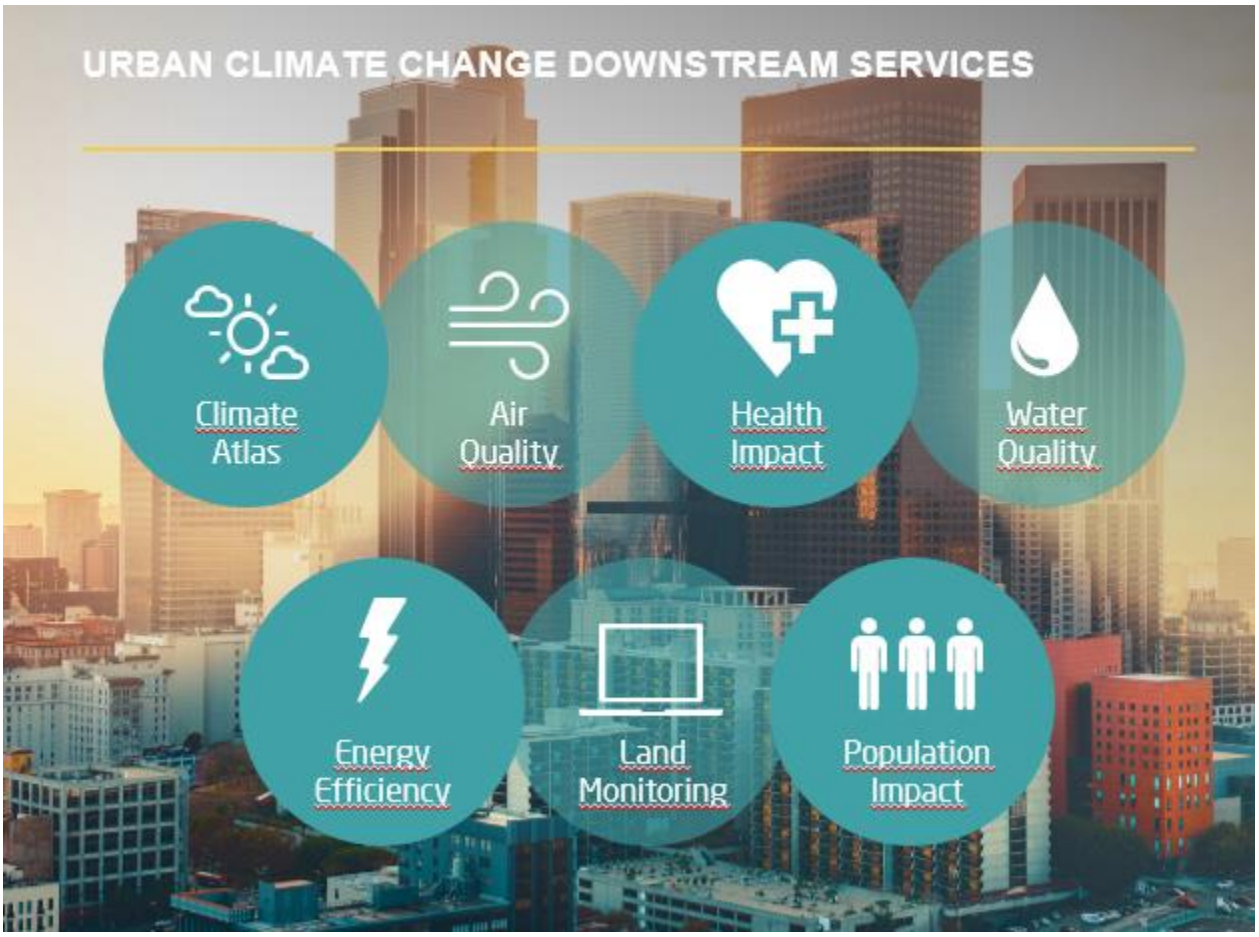


Figure 1: DECUMANUS final services (Basic and Premium mode)

The products defined and developed for the second phase of the project (Premium Serivces) are listed below:

- **Urban Climate Atlas**:
    - Total Precipitation
    - Temperature
    - Heat Waves
    - Pedestrian Wind and Thermal Comfort
    - Daily Max & Min Temperature
    - Tropical Nights
    - Summer Days
    - Energy fluxes
- **Air Quality:**
    - Sulphur Dioxide (SO2)
    - Nitrogen Dioxide (NO2)
    - Nitrogen Monosxide (NO)
    - Carbon Monoxide (CO)
    - Ozone (O3)
    - Particle Matter 10mm (PM10)
    - EC
    - Annual number of exceedances EU directive(Total)
    - Non-attainment grid cells EU directive

- **Health impact**:
    - Changes in Respiratory Hospital Admissions (%)
    - Changes in Cardiovascular Hospital Admissions (%)
    - Changes in Respiratory Hospital Admissions (%)
    - Increase in Mortality – All causes (%)
    - Increase in Mortality – Cardiovascular causes (%)
    - Increase in Mortality – Respiratory causes (%)
    - Increase in Mortality +65 years – All causes (%)
    - Increase in Mortality +65 years – Cardiovascular causes (%)
    - Increase in Mortality +65 years – Respiratory causes (%)
    - Changes in mortality – All causes (%)
    - Changes in mortality – All Cardiovascular causes (%)
    - Changes in mortality – All Respiratory causes (%)
    - Exposure variables:
        - O3, PM10, NO2, EC
        - Heat waves, Apparent temperature
    - Mortality and morbidity economical cost

- **Land Monitoring**:

- Potential Green Roof Mapping
- Current green roof and status
- Tree Location and Canopy Mapping

- **City Energy Efficiency**:
  - Termography: using aerial flights
  - Heat loss Light emission: ISS data and aerial flight
  - Light emission: aerial data
  - Photovoltaic potential map and CO2 saving (photovoltaics)

- **Water Quality:** Premium products have not been finally developed, although algorithms and have been established and tested indirectly for VHR satellites and Sentinel data. These works will continuous under other internal R+D activities.

- **Population impact:**
  - Population distribution: day/night
  - Simulation of some disaster events: Flood scenarios simulation for Helsinki.

The original portfolio was grouped into 2 levels: Basic (or Strategic) and Premium Services. First level devoted to citizen level information publicly available over the web and with aims of self-sustainability in future years. The second level is devoted to services for city mangers as requested and defined by them because their sustainability is subject to commercial operations for public administration and/or private sector.

Nevertheless, as it has been mentioned before, the most important impact of the project have been the high number of potential downstream services currently identified and under commercial prospection and even development.

In order to address the user requirements definition adequately two workshops have been organized in Milan, Antwerp and a final event in Madrid, in all cases with the support of high-level representatives of the organizing city. A Stakeholder Board has been collaborating in order to give advice about the utility and applications of Premium services.

An economic model and a business plan for Premium services has been developed and validated. These documents have served to address the marketing activity of the product and the commercial effort in the first phase of the project.

DECUMANUS has demonstrated a clear potential to significantly enhance the operation and capacities of urban planning in relation to the assessment and management of climate related and other environmental variables at the local level. It has in fact, demonstrating, an clear impact on the service chain of the targeted community, providing the basis for a significant uptake of the service products, and thereby create the conditions for self-sustaining development.

During the first phase a basic Geoportal for visualization of products were developed; however, during the second phase, learning from users opinions during the phase I, it was decided to transform this mere viewer of data into a Geoportal with advanced analysis capacities. In this way, customers and

users will be able to exploit all the complexity of the data in an easy way without having the GIS knowledge or additional software tools. The Decuamnus advanced Georpotal is accessible in :

URL: http://13.69.188.58/decumanus

User: decumanus

Password: decumanus_2016

The technology under this Geoportal will allow the immediate connection with Internet of Thinks applications, Big Data exploitation techniques and Social media data, and this is one of the key points of the current and future downstream services derived from DECUMANUS.

In addition to this, a website address of the project is www.decumanus-fp7.eu . This site content updated information about the project objectives and status, examples of the products, promotional leaflets, Scientifics publications and has a restricted partners section.

Finally, a strong dissemination and commercial effort have been carried out by project partners, especially during the last months of the project. This effort include European activities and outside Europe prospectives.

Expected final results and their potential impact and use (including the socio-economic impact and the wider societal implications)

DECUMANUS proposal was submitted under the "Stimulating development of downstream services and service evolution" topic for EO services.
In this regards, the projects has fully achieve this objective. A relevant number of potential downstream services, not only concerning Smart cities and public adminsintrtions, but other applications more related with private companies interests, have been identified an, in particular cases, demonstrated thought use cases in the final stage of the project.

Premium Services include datasets, indicators, models, etc. developed and specified according to substantial engagement with the local planning communities and/or the use of local information. Thus, the services have been provided on demand.

One of the main challenges have been how to introduce the services in the typical workflow of a city particular department, or how to do it, involving the whole administration. Development of demonstration cases and downstream services have faced this challenge with considerable success.
From the beginning, DECUMANUS has indeed the clear potential to significantly enhance the operations and capacities of urban planning in relation to the assessment and management of climate related and other environmental variables at the local level. As a result, these project products have had a considerable impact on the service chain of the targeted community, and have provided the basis for significant uptake of the service products, and thereby created the conditions for self-sustaining development services delivery.

The final activities of the project have demonstrated the potential successful impact of Decumanus products and services, under their current definition, on the following sectors:

- Public administration - Monitoring, updating and implementing of Directives and legislation at National and local level.
- Public administration - Smart cities: creating new services for citizens adn new relationship between citizens (including private sector) and administration

- Private sector: improving the knowledge about their current and potential customer, improvement the efficiency of their services, locating their potential new customers and creaing new valuable services (new business) or new business models.
- Citizens: getting information about climate change impact in theirs lifes, knowing what the related policies consist on.

3.2 Core of the report for the period: Project objectives, work progress and achievements, project management.

At the end of the Period 1, and due to the delay in the products development and evaluation by the users, it was requested a project extension of 3 months. This extension was accepted under the condition of a proposed Project Recovery Plan implementation. This extension only affected to the finalisation of the project, not to the budget or to the DoW content (except for the inclusion).

It is important to highly that, finally, the project has developed more products and services that the ones described in the original DoW and that several success real uses cases have been developed at the end of this Period 2: Energy efficiency, Health impact, Roof potential, solar panel potential.

3.2.1 Project objectives for the period 2

The main objective of the Premium Services phase was to include datasets, indicators, models, etc developed and specified on the basis active engagement with the local planning communities and/or the use of local information. DECUMANUS has tried to bridge the gap between the EO sector and spatial/urban planning by:

- specifically addressing the needs and the potential of EO methods and data for diverse stakeholders dealing with urban and regional planning and management;
- Providing tailored products, services and access mechanisms.
- Undertaking the inclusion in technical and administrative usages of the city users
- Creating real downstream services demonstrators that show in a clear way the usage and applications of the DECUMANUS products.

In this framework, DECUMANUS has developed targeted EO-based indicators and services that can be provided on an operational basis, in a constant quality and based on a transparent cost models. According to these goals, the progress beyond the state-of-the-art has come more in terms of the warranty of operational, inclusion in the current technological trends, cost-efficient and user-oriented methods than in terms of innovative algorithms.

All of the objectives were fully achieved during this Period 2, and the delayed accumulated for the First period was also recovered.

3.2.2 Work progress and achievements during the period.

WP number	WP1	WP title	Users and business model						Start /End	M1-27	
Participant	**UWE**	EUR	INR	DLR	UPM	RBKC	MIL	ANT	HSY	GEO	CWA
Planned PM	16	2	6	2	2	5	4	3	3	3,46	2
Real PM	12,63	1,51	2,66	8,2	2	1,65	0,59	3,96	4,15	3,5	0

Objectives and progresses

This work package is the starting point of the project and provide basis for the development of specific features in the service products. Due to innovative nature of DECUMANUS service products a lot of engagement with end users (city partners) was required to get full understanding of these products and apply it in local city context. In general, significant work is completed in this work package and reported per task as below:

Task 1.1 User engagement and User feedback monitoring (UWE). For this task, UWE set up an online content management system - Redmine - http://decumanus.cccs.uwe.ac.uk/redmine This system is officially being used as communication medium between DECUMANUS project partners. Moreover, the Lync system was also provided to support teleconferencing activitie and a website was developed to perform validation activities. All of this has also been reported in D1.1 – User Engagement and Feedback Monitoring Report.

Task 1.2 User requirements (UWE). As per DoW, the CoReS requirements method was adopted and city users were engaged to define requirements for premium service products. D1.3 – User Requirements Definition (II) was also delivered.

Task 1.3 Service definition The development of this WP has consisted of the following tasks:

- Gathering of the user requirements from WP1.2: Requirements were gathered from forms, interviews and conversations, Workshops and bibliography.
- Collection of Service Specifications from previous experiences. Identifyng and taking into account also the current Directives and national legislations, which have been considered crucial in this project.
- Generation of final Service Specifications: analyzing the more interesting applications on the base of the demand and the European Directive in play with more promising commercial success and the existing technological trends.
- Definition of the system requirements on the base of the previous point
- Full definition of Premium Level Services
- Update of system requirements: according with new products developed , not initially considered and (i.e UPM ad hoc product for Health impact for Milan city)

Deliverables and Milestones

D1.1 User Engagement and Feedback Monitoring Report – M(30).

D1.3 User requirements definition (II)

WP number	WP 2	WP title	Technology Enhancement and Production					Start / End		
Participant	UWE	EUR	INR	**DLR**	UPM	RBKC	MIL	ANT	HSY	GEO	CWA
Planned PM	0	32,5	36	24	12	0	0	0	0	10,37	0
Real PM	0	18,28	20,45	8,2	0,08	0	0	0	0	2,3	0

Objectives and progresses

WP2 is dedicated to "Technology Enhancement and Production" and aims at the generation of the products identified - together with the city partners - as most suitable to support the management and implementation of their climate and environmental change adaptation strategies.

The main goal of WP2 during the first phase of the DECUMANUS project was the production of the basic services.

WP2 fulfilled all the initial objectives, since all the expected basic services have been generated in accordance with the user requirements. For all different Tasks, existing processing techniques have been consistently improved or novel ones have been designed which go beyond the current state-of-the art. Moreover, some of them are already at a pre-operational stage, which means that they can also be employed to derive the corresponding basic services for other European cities (in addition to those already investigated in the project) with minimum or no additional effort.

It is worth noting that all the service providers (DLR, GeoVille, Eurosense, UPM and Indra) strongly and continuously interacted with the city partners, which are generally all pleasantly surprised by the possible use of the derived EO-based data. In this framework, it is expected that yet the DECUMANUS basic services can make a strong and effective contribution to current adaptation strategies.

In this framework, the following products have been generated and delivered to the city partners:

Task 2.1 - City climate/air quality models

UPM has implemented a climate and air quality-modelling tool, which allows to study the impacts of global climate over the cities up to very high spatial resolution (i.e., 50 meters). Results from the simulation have been used for the Urban Climate Change Atlas and Citizen Health services (WP4) during the PREMIUM phase of the DECUMANUS. UPM has used several numerical models to explicitly represent atmospheric circulation at all scales necessary for a comprehensive study of the climate impacts. With the model chain and nesting, a full dynamical downscaling has been

achieved from global climate scale to 50 meters resolutions within urban canopy models. The Weather Research Forecasting and Chemical (WRF/Chem) model has been employed as Regional Climate Model to dynamical downscale from 1º spatial resolution (global scale) to 1 km of spatial resolution (local scale) using the WRF-Chem Europe scale model outputs as boundary for the 5 km spatial resolution domains. Finally, CFD simulations have been developed to get meteorological results and energy fluxes at 50 m spatial resolution taking into account the 3D buildings. The approach is portable because the model architecture and equations are universally applicable and requires only minor adjustments of its parameters to suit local conditions and local input data. This approach, however, has high computational cost.

Task 2.2 - Land indicators and urban morphology

Two services have been implemented by DLR within T2.2. On the one hand, the *current and potential green roof mapping* service has been developed in response to the requirements from the partner cities of Antwerp, Helsinki, Milan and the RBKC. In particular, it allows automatically identifying actual green roofs and determining which roofs can be potentially converted into green roofs (along with the corresponding expected impact) by jointly using airborne /satellite color-infrared (CIR) imagery and LiDAR height data. On the other hand, *tree location and canopy mapping* service has been implemented in response to specific requisites of the municipalities of Helsinki and the RBKC for supporting their urban green policies. Specifically, all the vegetated areas are first identified by the analysis of the NDVI calculated from airborne CIR data; then, the tree canopy is delineated accounting for LiDAR height information and finally a tree location is set in correspondence of the highest peak of its crown.

Monitoring green roofs and urban trees is of great use for urban planners to properly design effective climate-change adaptation and mitigation strategies. Nevertheless, such activities have been so far solely carried out by means of in situ surveys or photointerpretation of very high-resolution airborne imagery, thus being very costly both in terms of money and time. On the contrary, the implemented services are almost fully automatic as the support of an operator is mainly requested only at the end of the processing chain to visually check the results. This represents a great advantage (i.e., lower costs and shorter time) and, especially, allows an easy and straightforward update once provided with new suitable input data. As regards green roofs, it is worth highlighting that a reliable knowledge of their location is essential to properly plan activities for checking their actual status; indeed, related economic incentives (e.g., reduction in storm water fees) shall be terminated in the case a green roof is not correctly maintained. In this context, the relevance of a relatively easy update as that offered by the developed service is even greater. Moreover, so far no study addressed the identification of potential green roofs and their impact, which is instead of valuable support to target subventions in areas that would more benefit from their installation. Concerning urban tree monitoring, in several cities it occurs that no or incomplete inventories (e.g., just including public ones) are available directly at the municipality. Furthermore, these are often compiled by volunteers, hence without suitable quality control practices. In this context, the advantages of the offered service are clear, since it implements a standardized procedure, which can be effectively applied to study areas of any size. Moreover, the resulting tree register allows identifying where there is a higher need for planting new ones and enhances the ability to educate the public and decision makers about their

importance.

Task 2.3 - Efficiency energy data

Derived from the DECUMANUS cities' needs, a list of service specifications for the premium services were defined. From these specifications, EUROSENSE developed specific services in the three identified energy components, namely heat loss from buildings, night-time light emission and photovoltaic potential.

To detect heat loss from buildings, night-time aerial surveys have been conducted on Helsinki and Antwerp. By collecting in-situ data, and among them a large number of questionnaires filled-in by citizens, the thermal data have been calibrated to show the heat loss from each building. By using a developed interpretation key, citizens are then able to verify the quality of their roof insulation (from very badly insulated to very well insulated). This service is a powerful tool for the cities in their strategy to reduce energy losses from building heating and to encourage good insulation practices.

Concerning night-time light emission, two services have been developed from two different input data: aerial data and ISS photographs. In parallel with thermography data, light emission data were measured during the aerial survey over Antwerp. By collecting luminance data on the ground, a map of absolute values of luminance was created. By comparing these values with luminance standards, over-exposed areas and thus areas of potential energy savings are detected. The high resolution of the product (15cm) enables to make very detailed diagnoses (at a street light scale). In comparison, the broader resolution of the ISS night-time photographs (10-50m) does not allow the same level of analyses. However, an interesting and cheaper alternative can be used as evidence-based policy support for large-scale retrofitting campaigns like the replacement of old street lamps by LED technologies. A light emission map based on an ISS photograph was created for the RBKC.

Finally, the photovoltaic potential on building roofs was assessed using a geometric model which calculates, for each grid pixel, the solar irradiance using a detailed DSM (50cm) as input. The model takes into account the daily and annual cycles of solar angle, the average monthly climatological conditions at the location (cloudiness) and the shadows casted by neighbouring objects such as trees and adjacent buildings. By applying criteria for the installation of solar panels on the roofs, the potential annual electricity yield and the corresponding CO_2 savings are assessed by building roof. Such a service was delivered to Helsinki, Antwerp, Madrid and the RBKC.

Task 2.4 – Population Impact Assessment

The Local Service developed by GeoVille analyses the impact of climate change scenarios for the day-time population that is the number of people in an area during normal business hours, in high resolution (building block level). The calculation is based on a variety of locally-provided input data concerning commuting, work place, or place of study. The results are ready-to-use, easy-to-understand visualizations of the daytime population distribution, which are web accessible and delivered in GIS ready formats. In a second step, the results were then further combined with information on environmental threats and climate change risks such as flood risk datasets, or outcomes of urban climate models, to derive the exposure of the population. The Local Service was developed for the Metropolitan Area of Helsinki and the City of Milan.

Deliverables and Milestones

D2.3 - Urban climate modelling system (II) and **D2.4 - Urban air quality modelling system (II)**: These deliverables drafted by UPM describe the conceptual and technological development of the urban air quality modelling system and include examples of the raw data, which have been used for the services. Both deliverables were slightly delayed; specifically, the original submission deadline scheduled for M22 was shifted to M25 after the approval of the recovery plan. The small deviation was due to computing requirements and user requirements. Indeed, more hours than scheduled were needed because additional work was included and the discussions with the end users were longer than expected, especially in the Milan case, were special user requirements were set up to simulate the city Action Plans to improve the future air quality.

D2.6 - Land indicators and urban morphology products (II): This deliverable drafted by DLR provides a detailed overview of the novel techniques developed for generating the services supporting urban green monitoring developed in the context of T2.2. According to the approved recovery plan, it has been delivered on time at the end of M25.

D2.8 - Energy efficiency data (II): This deliverable drafted by EUROSENSE describes the conceptual and technological development of the Energy efficiency data premium services. Because of the bad meteorological conditions, the aerial survey over Antwerp was executed late in the winter season (28th February and 1st March 2016), which was not expected. The delivery of the report was accordingly delayed to M28 (March 2016).

D2.10 – Population Impact Assessment (II): This deliverable drafted by GeoVille provides a detailed overview of the technical development of the population impact assessment services. It describes the model and shows results for the cities of Helsinki and Milan. According to the approved recovery plan, it has been delivered on time at the end of M24.

WP number	WP3	WP title	Service Development					Start / End		
Participant	UWE	EUR	**IND**	DLR	UPM	RB KC	MIL	ANT	HSY	GEO	CWA
Planned PM	4	8,5	36	6	2	0	0	0	0	0	0
Real PM	1,82	3,82	34,22	8,2	0,08	0	0	0	0	0	0

Objectives and progresses

T3.1- Concept of use: This task have two main objectives: to engage with end users and establish clear understanding of context in which end users interact and use application services and to identify the overall process followed by end users to interact and use application services.

T3.2.- Service Architecture. The goal of this WP is to describe in full detail the production chain needed for all Premium Services, individually and as a whole.

T3.3.- Data fusion.

T3.4.- Interoperability and in-situ data assimilation. This task has been devoted to the generation of a framework and the definition of guidelines for the integration and assimilation of geo-spatial and statistical data sets in the context of the proposed Premium services.

T 3.5.- Integration and Verification – This task was thought with 2 specifics objectives:

- To perform a thorough verification of the services as they have been produced in order to evaluate their quality and to confirm that the results follow the specifications previously: this task has not been realised in a formal way, although it has been made visually, in an informal way witout follow any previously established method.
- It is a second purpose to integrate the services in the web portal by implementing new webmap services for each one of the Basic Services in order for the data be provided through a viewer and through the web for GIS software applications: since the webmpa service (Geoportal) has been partially defined and implemented, it not exit yet any complete integration/verification.

Deliverables and Milestones

D3.1 - Service Usage Process Models (I) – M4. Successfully uploaded on M4

D3.3 - Service Architecture (I) – M10 . This is an empty document: the work has resulted delayed and no relevant content can be reported.

D3.5 – Data fusion (I) M10. This document was successfully delivered on M10. Possible future modifications are foreseen. The final version of the input data and tools and

transformations library of the DECUMANUS project is also presented in another document which is also part of Deliverable 3.5 Data fusion (I): D3 5 – Data fusion (I)_Library. It was separated from this report in order to facilitate its use by the readers

D3.7 - Interoperability and in-situ data assimilation guidelines (I) – M10. Basic services: Definition and description of relevant (geospatial) data types and data sets and concept of the corresponding assimilation procedures for synergetic analysis and product generation.

D3.9- Verification checklist – M6 and M10: this document has been send as preliminary, but it will be possibly modified in the next weeks to include more parameters to review and describe a better methodology for this verification.

D3.10- Services verification – M10 and M22:

- Milestones: MS5 – Integration of Basic services – M10– not achieved

WP number	WP4	WP title	Services demonstration					Start / End	M11-M27		
Participant	UWE	EUR	**IND**	DLR	UPM	RB KC	MIL	ANT	HSY	GEO	CWA
Planned PM	0	13	21	3	12	0	0	0	0	3,4	0
Real PM	0	11,9	21, 4	3,31	12,38	0	0	0	0	2,3	0

Objectives and progresses

For the Premium products, the Geoportal established a Analytic tool that allow to extract statistics tables, graph and maps form each of the Premium products, according with different administrative units.

T4.1.- Urban Climate Atlas Service:
UPM was responsible for the production of the climatic parameters (temperature, wind, humidity, etc.) and Geoville of the impact assessment products. All these products will be integrated and distributed to users by Indra and the UPM. UPM developed a portal to show all the products in jpg format. All the products were sent in original format to the interested partner for theirs evaluation.
The main tasks carried out are listed below:
Data were collected of data for the selected demonstration cities: Milan, Madrid and Kensington and Chelsea. After that algorithms enhanced in WP2.1 and WP2.4 were applied and implementation.

Professor. Roberto San José has been interacting very closely with each of the City Users, especially Milan, to assure that the product are understandable from the technical and thematic point of view.

In this case, Milan users shared with each of the partners a simple toolbox to extract some statistics from all UPM data (4.1 and 4.4) using ESRI software.

Finally, more than 90 products, requiring 2.600.000 CPU hours were produced, resulting in Monthly and Yearly temporal resolution data for 2030, 2050 and 2100, which physically were more than 200.000 gif and geotiff images.

The list of final product is showed following:

- Total Precipitation (Total, mm)
- Temperature (Avg ,ºC)
- Heat waves (Number of days)
- Pedestrian Wind and Thermal Comfort
- Humidex (Number of days with humidex>25)
- Daily Maximum Temperature (Avg, ºC)
- Daily Minimum Temperature (Avg, ºC)
- Precipitation Events (Number of days)
- Summer Days (Number of days)
- Tropical Nights (Number of days)
- Energy fluxes group
    - Downward Ground Heat Flux (Avg, W/m2)

- Upward Sensible Heat Flux at the surface (Avg, W/m2)
- Upward Latent Heat Flux at the surface (Avg, W/m2)
- Surface Runoff (Avg, mm)
- Underground Runoff (Avg mm)
- Canopy Water Evaporation (Avg, W/m2)
- Direct Soil Evaporation (Avg, W/m2)
- Total Plant Transpiration (Avg, W/m2)
- Downward Short Wave Radiation (Avg, W/m2)

T.4.2.- Land monitoring:
DLR was responsible partner for the provision of the Land monitoring service products. The main tasks carried out are listed below.

- green roof map;
- potential green roof map;
- potential green-roof impact;
- tree location map;
- tree canopy map.

Statistical assessment of results, expresses by city were made for the report and showed in al related presentations. Statistics were a very good indicator of policies results and possible future policies implementation methods. In addition, final Geoportal implemented allowed the statistics and it graphic representation.

	total roofs	**green roofs**		**potential green roofs**	
Antwerp	178908	1139	[0.64%]	104570	[58.45%]
Milan	213078	4396	[2.06%]	54794	[25.71%]
RBKC	39471	576	[1.46%]	18943	[47.99%]
Greater Helsinki	263980	315	[0.12%]	121802	[46.14%]

It could be remarked 2 of the uses cases extracted during this project:

- *Antwerp:* In 10/2016 the municipality will launch the *Zoom in on your roof* website where people can look to the potential on their roof for insulation, sun power and green roofs based on DECUMANUS products;

- *RBKC:* The Project Manager of the Schools Capital Programme wants to assess each school's suitability for adaptations that could reduce energy costs and reduce CO2 emissions (→ potential green roof product will be used);
- *Helsinki:* the generated products are of key importance for supporting ongoing public discussions about green roofs (especially, the potential green roof layer for understanding up to which scale they can provide benefits);

T4.3.- City energy efficiency:

EUROSENSE was responsible for the provision of the Energy efficiency service products. It has been followed the same methodology that in the previous products. In this case, the transformation of energy into moneys save or money invested has resulted very interested. Several use case were extracted from these products. Particular interest has showed the city of Antwerpen and the city of Madrid.

Several use cases were developed during the project thanks to the collaboration of the city users:

- Antwerp: development of the platform “Zoom on your roof” to enable each citizen to check the roof insulation quality of their house

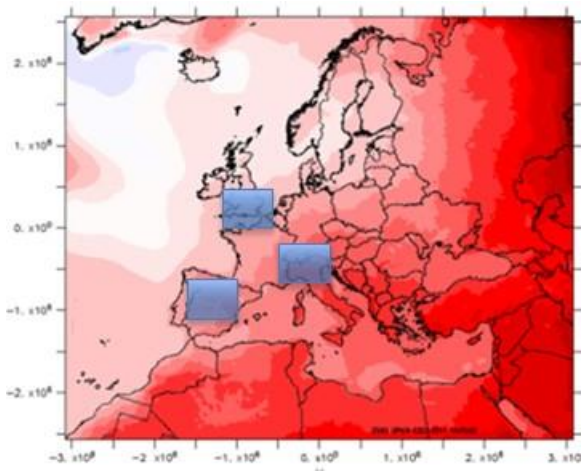
-
- Helsinki: still in development; use of the experience in Antwerp for the development of such a platform.
- City scale analysis and comparison between cities: for cities as different as Antwerp, Helsinki and Madrid, rooftop installed solar panels could cover between 14% to 30% of yearly electricity consumption

T4.4.- Citizen health:

The objective of this WP was to develop a health impact system taking into account the air pollution concentrations and meteorological variables as a consequence of the potential climate change under different climate scenarios (IPCC).
The list of product finally produced is showed following:

- Air quality concentrations: SO2, NO2, NO, CO, O3, PM10, EC, C6H6 (ug/m3)
- Annual number of exceedances EU directive(Total)
- Non-attainment grid cells EU directive
- Health outcomes:
- Changes in Respiratory Hospital Admissions (%)
- Changes in Cardiovascular Hospital Admissions (%)
- Changes in Respiratory Hospital Admissions (%)
- Increase in Mortality – All causes (%)
- Increase in Mortality – Cardiovascular causes (%)
- Increase in Mortality – Respiratory causes (%)
- Increase in Mortality +65 years – All causes (%)
- Increase in Mortality +65 years – Cardiovascular causes (%)
- Increase in Mortality +65 years – Respiratory causes (%)
- Changes in mortality – All causes (%)
- Changes in mortality – All Cardiovascular causes (%)
- Changes in mortality – All Respiratory causes (%)
- Exposure variables:
  - O3, PM10, NO2, EC
  - Heat waves, Apparent temperature
- Mortality and morbidity economical cost

All these products were elaborated for the 3 named cities in a geographical domain of 1x1 km and 50m pixel resolution.

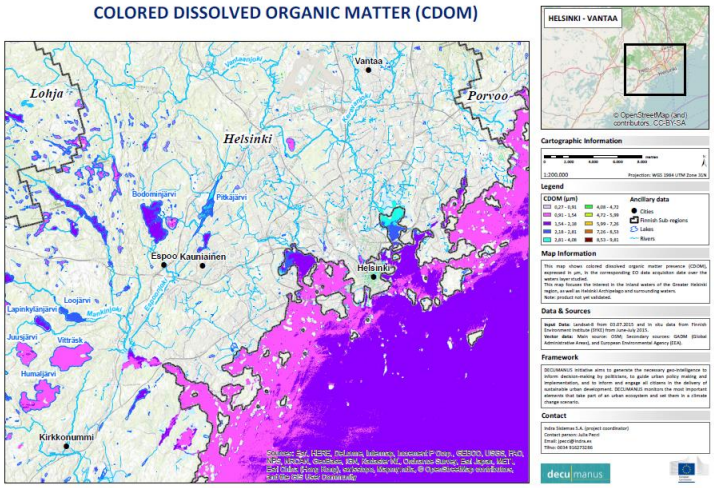


Additional products were developed in this phase, since Milan authorities expressed theirs interest in the additional PREMIUM services in order to complete an effort that they have tried to do in assessing pollution related Health impact. Milan users proposed to UPM to develop the following scenarios to complement and support the city “Sustainable Urban Mobility Plan” (SUMP or PUMS):

1. *Business As Usual (BAU):* Non specific actions to reduce local emission sources.
2. *Action Plans Implementation (API):* Specific actions to reduce traffic and emissions for residential combustion. In this case, new frame conditions associated specifically with the PUMS programme were considered to run the health impact models.

PUMS
PIANO URBANO
MOBILITÀ SOSTENIBILE
MILANO

During this phase, also Basic products for Water Quality were developed for the five cities, considering harbours, inalnd water reservoirs. This product had few demadn from the users collaborating on the project, but Indra considered it was a products very interesting for the city managers and pr ivate companies and it was in deed the element that it was missign in the original Decumanus proposal.



Deliverables and Milestones

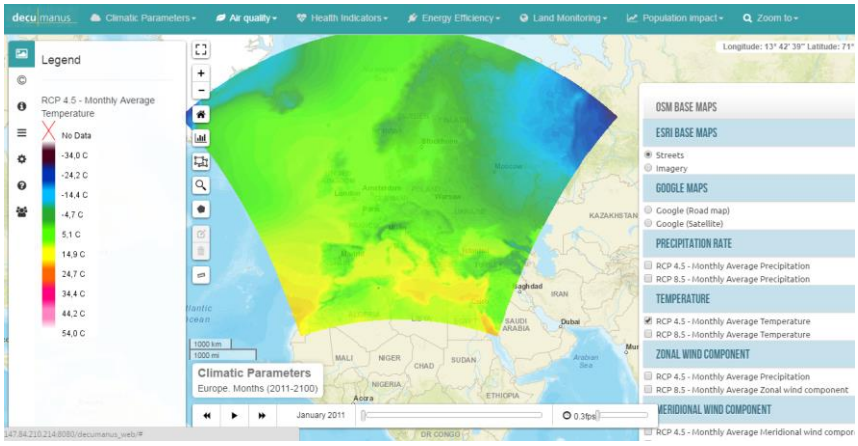
Final deliverables of the WP consist on several Geoportal demonstrator.

1.- Geoportal v1: Georpotal only for visualization of Baisc and Premium products:

URL: http://147.84.210.214:8080/decumanus_web/

User name: webgis

Password: gis2016



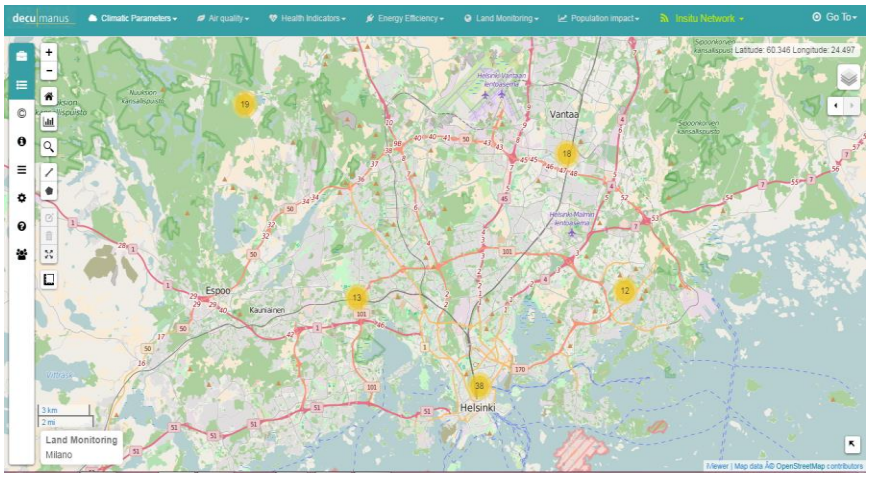
This Georpotal contains more than 25.000 files uploaded.

2.- Geoportal v2 (final): Advance Geoportal with Analytic functionalities.

URL: http://13.69.188.58/decumanus

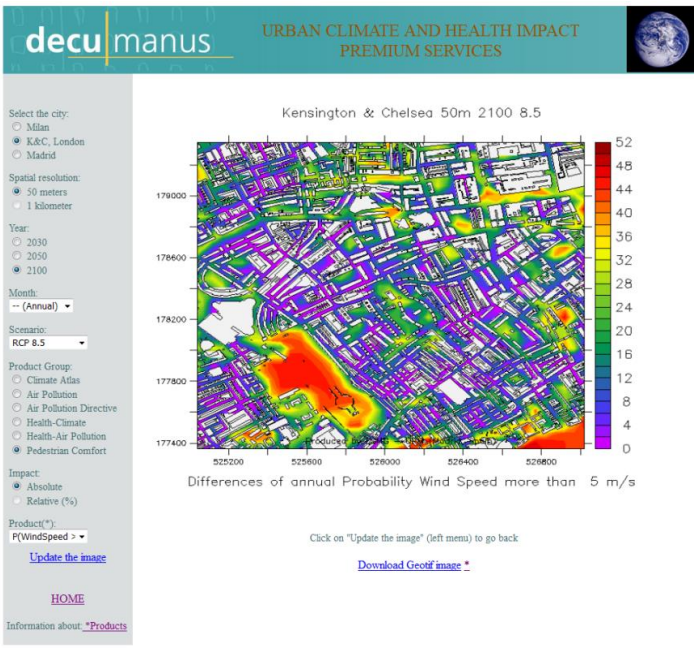
User name: Decumanus

Password: decumanus_2016



3.- Portal for Premium services from UPM: It contains all UPM products, Basic and Premium. It is an ancillary portal.

URL: http://titano.lma.fi.upm.es/decumanus_upm


decu manus
URBAN CLIMATE AND HEALTH IMPACT
PREMIUM SERVICES
Select the city:
Milan
K&C, London
Madrid
Spatial resolution:
50 meters
1 kilometer
Year:
2030
2050
2100
Month:
-- (Annual)
Scenario:
RCP 8.5
Product Group:
Climate Atlas
Air Pollution
Air Pollution Directive
Health-Climate
Health-Air Pollution
Pedestrian Comfort
Impact:
Absolute
Relative (%)
Product(*):
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Kensington & Chelsea 50m 2100 8.5
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525200
525600
526000
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526800
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8
4
0
Differences of annual Probability Wind Speed more than 5 m/s
Click on "Update the image" (left menu) to go back
Download Geotif image *

WP number	WP5	WP title	Validation					Start / End	M11- M24		
Participant	**UWE**	EUR	IND	DLR	UPM	RBKC	MIL	ANT	HSY	GEO	CWA
Planned PM	10	1,5	6	0	2	5	6	5	5	0	10
Real PM	18,7	0,91	3,59	0	2,23	1,65	7,64	3,9	4,15	0	3,35

Objectives and progresses

Task 5.1 Technical validation (UPM)

The objective of the technical validation is making sure the product satisfies the specified requirements at the end of the development phase. Functional tests have been implemented using black box methodology. Also stress and performance tests have been run.

During the strategic phase the Geoportal was the tool uses to offer all the products and it was validated. For Premium services two computer platforms have been validated. The Geoportal developed by Indra which contains products for the services: Land Monitoring, Energy Efficiency and Population Impact Assessment. The Web mapping Tool developed by UPM which contains product for the services: Urban Climate Atlas, Citizen Health Service.

The satisfactory results got from the test ensuring that the final outcomes of the project are inside of the specifications. Results of the performance test gave us the idea that the average response time usually is excellent based on the INSPIRE directive. And the overall performance in stress testing approves good conditions in increases load volume up to 100 users. Great stability of the system is observed without errors during the tests with less than 500 users. The technical solution for the DECUMANUS services seems to work pretty well and no major deficiencies were detected.

Task 5.2 User validation (UWE)

Users were consulted in this task to validate the premium service products. This consultation involved each city partner providing their input through the online website http://decumanus.cccs.uwe.ac.uk/evaluation. Users successfully provided their feedback and D5.4 – User Validation Report (II) was delivered.

Task 5.3 Economic model validation (CWE)

This task has validated the key aspects of the business model:

Collaboration with private actors to act as 'sponsors' to the Decumanus portal including a critical mass of subscribing cities.

Results: The project has been in direct dialog with a number of private actors (Rockwool, Green Roof Industry association, PV industry association, led light manufacturers, Green Building Council (green certification agency for building and city districts), insurance company, finance institutions. They are positive towards the idea of a collaborative business model, however it has not yet resulted in a concrete sponsor contract mainly due to the fact that a critical mass in terms of number of cities associated with

Decumanus has not yet been reached. They are interested however to continue exploring ideas together through new projects and initiatives. In concrete terms, some of the Decumanus partners have jointly submitted a prequalification application for Interreg Baltic Energy efficiency programme, where our private actors will contribute to the project (with 5 Baltic cities involved) by means of in-kind material and information campaigns.

City users.

A broader survey was initiated during the first months of 2016 among other EU cities to get a better picture of the current use of 'maps' and their willingness to subscribe to the Decumanus service platform. Although the response rate was low, the feedback was consistent. None of the cities had assess to green roff maps and less than 25% was currently using any of the Decumanus type services. Finally, more than half of the replies were positive toward a modest yearly subscription fee.

Market exploitation strategies.

The process of developing a common vision for market exploitation has been ongoing during the second half of the project. It has been agreed to go for a light version of collaboration, which means: bilateral sales agreements, free use of Decumanus platform, free use of Decumanus brand. Already there are a number of exploitation activities taken place collectively, some partners, and individually. Very much as an opportunity driven approach.

Deliverables and Milestones

D5.1 Technical validation (I) – M18: The deliverable was submitted by M20
D5.2 Technical validation (II) – M28: The deliverable was submitted by M30
D5.4 User Validation Report (II) – M28 – This deliverable was delayed due to a delay in the delivery of the premium service products. However, it was completed as soon as the products became available and delivered in M30.

D5.6 Business Model Validation was delivered on time in M30

WP number	WP6	WP title	Project Management					Start / End	M1- M30		
Participant	UWE	EUR	**IND**	DLR	UPM	RBKC	MIL	ANT	HSY	GEO	CWA
Planned PM			10								
Real PM			12,4								

Objectives and progresses

The main actions carried out by Indra for the coordination of the project have ben:

- General Project Management: documentation, meetings , coordination with EC
- Technical management: following techniques, solutions, needs, etc
- Advising bodies, stakeholders, city users and potential customers,
- Dissemination of results; internally, within the company and externally.
- Commercial: dissemination in events and focused meetings Also closing meetings with potential customers, collaborator or advisors

T6.1 - Management [Months: 1-27] **INDRA**

Indra was responsible for the Consortium management activities, as single point of contact between the EC for technical, financial and administrative issues. The Consortium management comprises the next activities:

General activities:

- Acting as interface with EC/REA and the project partners for legal, ethical, financial and administrative issues.
- Management of the Grant Agreement, Consortium Agreement and the Project Management Plan, in collaboration with the Legal department of Indra and in coordination with others legal areas of other services providers.
- Follow-up of IPR issues and Coordination of legal, ethical, financial and administrative management aspects of the project, thanks to its legal department
- Implementing and maintaining of a project-specific database for reporting and controlling, including the adaptation of the structure after changes in the workplan and the consortium.
- Monitoring of the correct accomplish of the Project Management Plan and planning of corrective actions where required. Since the project experimented some delay during the first reporting period, a project Recovery Plan was presented in May 2016 and approved in an Extraordinaryy Review meeting.

Monitoring activities:

- Cost monitoring.
- Follow-up of the ethics and gender issues compliance.

Financial activities:

- Collection and submission of financial statements for each beneficiary and on the methodology and costs relating to financial audits.
- Receipt of all payments made by EC/REA to the coordinator and appropriate distribution of these funds to the partners without unjustified delay.

Organizational activities:

- Organization and chair of the General Assembly meetings, with preparation of agendas and minutes.
- Organization and chair of the Steering Committee meetings, with preparation of agendas and minutes.

Reporting activities:

- Propose and disseminate templates for progress, management reports and other management activities.
- Collection of contributions from partners in order to elaborate and submit the Progress Reports.
- Collection of contributions from partners in order to elaborate and submit the Genders Aspects

Reports
Deliverables and Milestones
D6.1 Project Management D6.2 Progress Report Year 2 D6.3 Gender Aspects in DECUMANUS V1 D6.4 Gender Aspects in DECUMANUS V2

WP number	WP7	WP title	Technical Management					Start / End	M1- M30	
Participant	UWE	EUR	**IND**	DLR	UPM	RBKC	MIL	ANT	HSY	GEO	CWA
Planned PM		0,5	10								
Real PM		0,29	2,41								

Objectives and progresses

The technical management:
• Coordination, monitoring and control of the technical activities throughout regular meetings, teleconferences and e-mails interchanging
• Ensuring technical consistency of the project including it complementarities with other GMES services and other related projects.
• Development of specific deliverables
Technical management of the project have resulted quite complex due to the diversity and quantity of products developed and the diversity of end users profiles. In adition to this, the new GEoprotal have been a big challenge since it started in a very late stage of the project, once the requirements and the objectives were clearly defined.

Several important delays and technical risks have been managed in different moments the project, some times with success but sometimes not.

Deliverables and Milestones

D7.1 Evolution and Trends of Future Sensors Needs in Climate Change Urban Services Report (M30).

This report collects the main future sensors and trends that could allow the improvement of the Decumanus products and that for sure we will have to use if we want to be updated

WP number	WP8	WP title	External Coordination					Start / End		
Participant	**UWE**	EUR	IND	DLR	UPM	RBKC	MIL	ANT	HSY	GEO	CWA
Planned PM	0	1,5	12	0	0	0	0	0	0	6,24	14
Real PM	2,93	0	8,97	0	2,4	0	0	0	0	2,5	8,19

Objectives and progresses

This WP deals with the external view of the project: - Interaction with other stakeholders in the fields of Local Information Systems and Earth Observation - Dissemination of the project activities - Business modelling of the services .

T8.1 - Coordination with other bodies and activities [Months: 1-27]

This task aims to perform networking activities and establish collaboration and enhanced communication with external projects, initiatives and entities, which are related to the DECUMANUS project. DECUMANUS project partners during the second reporting period are collectively engaged in a wide variety of RTD projects that span both domains of environmental management and technological development. These various projects, and associated agencies and initiatives define a rich environment of RTD development, at both pan-European and member state levels, that contributes to the delivery of DECUMANUS objectives, and the impact that arises from the project, and which offer substantial opportunity for future development of smart city governance solutions. This task and the activities reported here form part of a wider DECUMANUS initiative of external engagement driven by associated tasks of WP8 External Coordination, including Task 8.2 Stakeholder Board Management, and Task 8.3 Dissemination and Communication. These activities are reported in relevant task deliverables including Stakeholder Board Management reports (1-3) (Months 2, 13 and 25), as well as Dissemination Reports (Preliminary and Final) (Months 14 and 27).

T8.2 - Stakeholder board management [Months: 1-27]

During the second project period stakeholder engagement was promoted via workshop held in conjunction with the DECUMANUS consortium meeting hosted by the Comune di Milano, on 16-17 March 2015 (M16), and subsequently, in partnership with CEMR and EUROCITIES pan-European city networks, with a broader coalition of smart city governance project partners, focussed in the month 24 stakeholder dialogue workshop, hosted by Antwerp Municipality on November 12-13 2015. The starting point for these workshops is the recognition that integrated and participatory forms of urban governance of the cities and regions of Europe are universally identified as crucial to the economic recovery and sustainable development of Europe and its cities. In this respect, the workshops provided a forum for discussion of the opportunities for the development of more effective integrated urban development strategies, based on assessment of user requirements for the deployment of specific ICT tools and methodologies.

T8.3 - Dissemination and communication [Months: 1-27]

Dissemination activities support goals of the project exploitation, as well as adequate dissemination of the project results. The project conducted and supported numerous targeted dissemination activities, e.g. participation to meetings dealing with communication and promotion activities in the cities involved in the project, and spreading of the obtained results. Products and services are demonstrated and made available to the local users through the WebGIS. All project partners have taken, in addition, an active role in spreading the news about DECUMANUS in their own communities and countries. This is a very effective way of producing a multiplier effect. Partners can use existing lines of communications and their own reputation to raise awareness, and thereby stimulate new and perhaps unexpected contacts with potential end users.

T8.4 - Economic model demonstration and sustainability [Months: 3-17]

The economic model was developed throughout the project for both strategic and premium services, in a business perspective, and are part of the same packages to be offered to the city customers.
Task 8.4 has completed three main activities: (a) development of business model and business plan (b) market analysis, and (c) developing common vision for service providers towards market exploitation.

All activities have been completed and reported only limited by the following issues:

- Water services - not included in the market analysis due to delay in the production;
- DECUMANUS service platform - delay in the finalisation so only conceptually considered.

Deliverables and Milestones

D8.2: Stakeholder board management report (II) [month 13]

In spring 2015 the stakeholder board met for the second time in the context of the Milano DECUMANUS consortium meeting, to review the progress of the previous year of project activity in the development, application and evaluation of the DECUMANUS strategic products. D8.2 focused on this Milano stakeholder meeting describing the nature of engagement with the consortium as a whole over two days, together with an overview of the service provider presentations, and finally specification of the range of questions identified by the service providers that offered one basis for stakeholder discussion and engagement during the meeting. The report concludes with the recommendations of the stakeholders prepared following the meeting that lays foundation for the continuing work of DECUMANUS over the coming period in which the DECUMANUS local products were developed and evaluated. During this time, further support for application development is provided, and issues concerning networking, dissemination and exploitation became increasingly prominent.

D8.3: Stakeholder board management report (III) [month 25]

This report provides an overview of the engagement of DECUMANUS project partners with the wider community of urban governance stakeholders in regard to the core objectives of the project and their evolution during the final period of the project (April 2015 - May 2016). This period was notable for highly effective extension of stakeholder engagement beyond the focus on communication with both European and local levels, developed in the previous period of the project. The Antwerp stakeholder workshop (November 12-13 2015) aimed to provide a bridge and channel of communication between the sometimes

fragmented worlds of smart cities governance research and innovation, supporting the development of a common understanding of integration potentials between EU FP7 and Horizon 2020, Copernicus and Space call related projects. In this regard, a central purpose of the workshop was review of the contributions made by DECUMANUS to the development of an integrated urban management enabled by smart city ICT investment, and set within the context of open governance. The dialogue workshop was structured in 2 sessions addressing a variety of questions as follows:

Session 1 – Stakeholder Briefing - Strategic and Local Services (Day 1) - How do we advance towards an integrated urban governance in the most effective way? What indicators tools and methodologies do we need to support this integrated approach?

Session 2 - Stakeholder Feedback - Strategic and Local Services (Day 2) – How can the outputs of DECUMANUS best meet the requirements of city planners and planning scenarios? What are the intelligence gaps that can guide future research and innovation priorities?

D8.4: Report on coordination with other initiatives [month 27]

The deliverable provides an overview of DECUMANUS coordination with other bodies and activities in accordance with the provisions of Task 8.1, as specified in D 8.4, and locates DECUMANUS in the context of the broad range of pan-European research and innovation addressing the challenges of smart city governance. The fragmentation of much of this effort is recognized, and clustering of research activity is identified as a major opportunity to support product development, based on novel collaboration and strategic partnership.
The deliverable also presents the principal dimensions of the Brussels Cluster Workshop, March 2016 in which DECUMANUS and associated smart city governance projects were reviewed in the context of planning scenarios, to identify synergies and development potentials. The results of the focus group discussions undertaken during the Brussels Cluster Workshop provide new understanding of stakeholder requirements for future smart city tool development, and some conclusions are offered regarding the outputs of the Cluster Workshop, and the opportunities for future DECUMANUS Cluster Workshops, supporting further strategic partnership and product development.

D8.5: Preliminary Dissemination Report [month 14]

The preliminary version of dissemination report was delivered in month 10 and provided a first overview on planned and performed dissemination and communication activities, and the impact of these activities.

The impact of the dissemination activities is assessed in relation to the impact objectives and defined by a conceptual frame in which common solutions are applicable to cities throughout Europe, and at all levels of governance. The framework of impact objectives outlined above defines a broad spectrum of stakeholder interests in the DECUMANUS products that in turn defines dissemination objectives for the project, and the means by which the effectiveness of the dissemination activities must be judged. A substantial effort promoted via a wide range of dissemination activities (website, publications, promotional material and activities, social media, as well as events and workshop participation), supported by collaboration with other EU projects, and engagement with the project Stakeholder Board, have permitted access to a diversity of stakeholders representatives from both user and development communities. In doing so the project claimed effective targeting and communication in relation to all project impact objectives. This stakeholder engagement facilitated by project dissemination activity also generates multiplier effects enhancing impact whereby, for example, city network members of the Stakeholder Board communicate the project outputs via their substantial pan-European networks of city urban planning agencies.

D8.6: Final Dissemination Report [month 27]

The final version of the dissemination report was delivered according to the new schedule in month 30 and provides a focus on exploitation activities appropriate to the final stages of the project as follows:

Indra, Eurosense, DLR, GeoVille, CWare and UWE are planning to actively pursue the further development and marketing of the developed and demonstrated services, based on a marketing strategy which aims at maximizing the service awareness of potential new customers:

- Communique on DECUMANUS the developed tools and solutions plus project brochure distributed to contact persons in all European cities;
- Dedicated promotion campaign via email (including informational flyer and service offerings) and follow up phone calls to known (customer database) city administrations and relevant public authorities;
- Strategic collaborations with sector specific industry to promote DECUMANUS tools via their website;
- Commercial website to be launched describing products and advantages. Acting as a key contact point for potential customers for offering free demonstration subscription;
- Marketing articles and dedicated advertising in sector specific journals/magazines;
- Promotion via presentations and promotional material at sector specific trade shows and conferences;
- Dedicated meetings with potential customers.

D8.8: Economic Model (II) [month 17]

Final version with a description of the most viable sustainable business models and an outline of the corresponding business strategy/ the business plan [month 17], was delivered according to the new schedule in M22.

Figure 2: DECUMANUS official brochure

3.2.3 Project management during the period.

Here and after, the requested issues in regards, the project management during the Second Reporting period are summarised:

- Consortium management tasks and achievements:
- Problems which have occurred and how they were solved or envisaged solution.
  The main problems related with the management of the project are enumerated:
  - ✓ Differences in the involving level of each of the partners: answering time was different between them and even requested difference level of coordinator and WP leader implication to get the user´s answers.

- ✓ Heterogeneity of users requirements
- ✓ Changes in the scope of some of the tasks: mainly for the Geoportal: initially it was a reusing of the in home existing technology, but finally, it has become an innovative and competitive tools with crucial role in the whole Decumanus services: Geoportal with analytical tools.

These problems related with users understanding and implications has been managed appeared already in the first phase of the project, however, in the second part has produced a low impact (on the contrary that in the first phase). In this phase, users are already habituated to these products, the nomenclature, the characteristics and the way of exploring and exploiting them.

List of project meetings, dates and venues. In order to maintain all the partners updated in the project, resolve doubts and reinforce the engagement of all the partners in the project, a regular Teleconference day has been established for the first Thursday of each month. All the partners are invited to this Teleconference, and agenda is normally sent before the Teleconference and meeting minutes are distributed after that (if necessary).

Also bilateral phone conversations between Indra and other partners have been usual with the aims of commenting/explaining the products, transmitting recommendations, resolve doubts, comments ideas, etc. A list of actions is defined after each Teleconference a there is a monitoring of the execution of these activities.

Here below there is a list of main management teleconferences and meetings; dissemination and commercial meetings, events and teleconferences are considered in the corresponding WPs.

Teleconferences	**Dates**	**Attendees**
Regular Telconferences		
	05/02/15	All partners invited
	12/05/15	
	11/06/15	
	09/07/15	
	03/09/15	
	08/10/15	
	05/11/15	
	10/12/15	
	14/01/16	
	04/02/16	
	09/03/16	
Bilateral/Trilateral Teleconferences	Diverse dates along	Technical, dissemination, commercial and coordination purposes, preparation of events presnetations, according with needs.
Commercial Decumanus common vision	17/07/16	DLR, Geoville, UPM, Cware, Indra, Eurosense.
Meetings		
Decumanus common	02/02/16	Meeting in Wemmel (Eurosense

vision		facilities): Indra, Eurosense, Cware, Geoville, DLR
Bilateral meetings	Diverse dates	Partners with users for potential commercial activities
Users workshops (*)		
Milan	16-17/03/15	All partners and stakeholders
Antwerpen	12-13/11/15	All partners and stakeholders
Madrid	19-20/05/16	All partners and stakeholders

Table 1: List of main Teleconferences and meetings related with project coordination.

Figure 3: Decumanus final Workshop in Cibles Palace, Madrid, 20th May 2016

Changes in the consortium: the consortium has experimented no change during the project life.

3.3 Deliverables and milestones tables.

All the planned deliverables have been delivered via ECAS system, although some of them has been advanced via e-mail, due to technical problems with the electronica submission system. The following tables shows the documents as described in the DoW and delivery date (e-mail or ECAS system):

Del.no.	Deliverable name	WP nº	Lead beneficiary	Dissemination level	Delivery date
	Users and business model				
D1.1	User engagement and feedback monitoring report	WP1.1	UWE	PU	M30
D1.2	User requirements definition (I)	WP1.2	UWE	PU	M3
D1.3	User requirements definition (II)	WP1.2	UWE	PU	M15
D1.4	Service Specifications (I)	WP1.3	Indra	PU	M3
D1.5	Service Definition (I)	WP1.3	Indra	PU	M3
D1.6	System requirements (I)	WP1.3	Indra	PU	M3
D1.7	Service Specifications (II)	WP1.3	Indra	PU	M15

D1.8	Service Definition (II)	WP1.3	Indra	PU	M15
	Technology enhancement and production				
D2.1	Urban climate modelling system (I)	WP2.1	UPM	PU	M10
D2.2	Urban air quality modelling system (I)	WP2.1	UPM	PU	M10
D2.3	Urban climate modelling system (II)	WP2.1	UPM	PP	M22
D2.4	Urban air quality modelling system (II)	WP2.1	UPM	PP	M22
D2.5	Land indicators and urban morphology products (I).	WP2.2	DLR	PU	M10
D2.6	Land indicators and urban morphology products (II).	WP2.2	DLR	PP	M22
D2.7	Energy efficiency data (I).	WP2.3	Eurosense	PU	M10
D2.8	Energy efficiency data (II).	WP2.3	Eurosense	PP	M22
D2.9	Population impact assessment (I)	WP2.4	Geoville	PU	M10
D2.10	Population impact assessment (II)	WP2.4	Geoville	PP	M22
	Service development			**PU**	
D3.1	Service Usage Process Models (I).	WP3.1	UWE	PU	M4
D3.2	Service Usage Process Models (II).	WP3.1	UWE	PP	M16
D3.3	Service Architecture (I)	WP3.2	Indra	PU	M10
D3.4	Service Architecture (II)	WP3.2	Indra	PP	M22
D3.5	Data fusion (I)	WP3.3	Eurosense	PU	M10
D3.6	Data fusion (II)	WP3.3	Eurosense	PP	M22
D3.7	Interoperability and in-situ data assimilation guidelines (I)	WP3.4	DLR	PU	M22
D3.8	Interoperability and in-situ data assimilation guidelines (II)	WP3.4	DLR	PP	M22
D3.9	Verification Checklist.	WP3.5	Indra	PU	M6
D3.10	Services Verification (I)	WP3.5	Indra	PU	M10
D3.11	Services Verification (II)	WP3.5	Indra	PU	M22
	Services demonstration				
D4.1	Urban Climate Atlas Service (I)	WP4.1	Indra	PU	M22
D4.2	Urban Climate Atlas Service (II)	WP4.1	Indra	PU	M27
D4.3	Land monitoring report(I)	WP4.2	DLR	PU	M22
D4.4	Land monitoring report(II)	WP4.2	DLR	PU	M27
D4.5	City energy efficiency (I)	WP4.3	Eurosense	PU	M22
D4.6	City energy efficiency (II)	WP4.3	Eurosense	PU	M30
D4.7	Health impact service(I)	WP4.4	UPM	PU	M22
D4.8	Health impact service(II)	WP4.4	UPM	PU	M30
	Validation				
D5.1	Technical validation (I)	WP5.1	UPM	PU	M12
D5.2	Technical validation (II)	WP5.1	UPM	PU	M24
D5.3	User Evaluation Report (I).	WP5.2	UWE	PU	M12
D5.4	User Evaluation Report (II).	WP5.2	UWE	PU	M24
D5.5	Validation report Economic Model – Basic services	WP5.3	Cware	PU	M14
D5.6	Validation report Economic Model – All services	WP5.3	Cware	PU	M30
	Project Management				

D6.1	Progress Management Plan	WP6.1	Indra	PU	M12
D6.2	Progress Report Year 2	WP6.1	Indra	PU	M30
D6.3	Gender Aspects in DECUMANUS V1	WP6.1	Indra	PU	M12
D6.4	Gender Aspects in DECUMANUS V2	WP6.1	Indra	PU	M30
D7.1	Evolution and Trends of Future Sensors Needs in Climate Change Urban Services Report	WP6.2		PU	M30
D8.1	Stakeholder board management report (I)	WP6.4	UWE	PU	M2
D8.2	Stakeholder board management report (II)	WP6.4	UWE	PU	M13
D8.3	Stakeholder board management report (III)	WP6.4	UWE	PU	M25
D8.4	Report on coordination with other initiatives	WP6.3	UWE	PU	M30
D8.5	Preliminary Dissemination Report	WP6.5	Geoville	PU	M14
D8.6	Final Dissemination Report	WP6.5	Geoville	PU	M30
D8.7	Economic model (I)	WP1.4	Cware	PU	M5
D8.8	Economic model (II)	WP1.4	Cware	PP	M30

Table 2. List of deliverables status for the Period 1

Milestones

TABLE 2. MILESTONES							
Milestone number	Milestone name	Work package nº	Lead beneficiary	Delivery date	Achieved or not	Actual / Forecast achievement date	Comments
MS1	User requirements BS	WP1	Indra	M3	Yes	28/02/2014	Completion of user requirements and service specification (Basic services)
MS2	User requirements PS	WP1	UWE	M15	Yes	30/05/2015	Completion of user requirements and service specification (Premium services)
MS3	Economic model completion	WP1	Cware	M17	Yes	31/03/2015	Economic model completion (Premium services)
MS4	Tools completion BS	WP2	DLR	M10	Yes	15/01/2015	Tools completion (Basic services)
MS5	Integration of basic services	WP3	Indra	M10	Yes	30/04/2015	Integration of basic services
MS6	Tools completion PS	WP2	DLR	M22	Yes	31/05/2016	Tools completion (Premium services)
MS7	Integration of premium services	WP3	Indra	M22	Yes	31/05/2016	Integration of premium services
MS8	User and technical validation BS	WP5	UWE	M12	Yes	28/02/2015	User and technical validation (basic services)
MS9	User and technical validation PS	WP5	UWE	M24	Yes	31/08/2016	User and technical validation (premium services)
MS10	Economic model validation	WP5	UWE	M27	Yes	31/05/2016	Economic model validation (Premium services)

3.4 Explanation of the use of the resources and financial statements.

The following tables summary the costs and efforts as stated in the DoW and as real figures for the first period:

Participant number in this project[11]	Participant short name	Fund. %[12]	Ind. costs[13]	Estimated eligible costs (whole duration of the project)					Total Receipts	Requested EU contribution
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D		
1	INDRA	50.0	F	503,760.00	110,880.00	132,600.00	64,800.00	812,040.00	0.00	504,720.00
2	DLR	75.0	A	403,902.00	38,560.50	0.00	0.00	442,462.50	0.00	322,206.75
3	UWE	75.0	T	308,160.00	0.00	0.00	51,360.00	359,520.00	0.00	282,480.00
4	UPM	75.0	A	178,259.00	113,706.00	0.00	22,738.00	314,703.00	0.00	213,285.00
5	RBKC	75.0	T	105,600.00	0.00	0.00	0.00	105,600.00	0.00	79,200.00
6	MIL	75.0	T	84,025.10	0.00	0.00	0.00	84,025.10	0.00	51,955.65
7	ANT	75.0	T	88,000.00	0.00	0.00	0.00	88,000.00	0.00	66,000.00
8	HSY	75.0	T	104,000.00	0.00	0.00	0.00	104,000.00	0.00	78,000.00
9	EUR	75.0	T	417,060.90	115,764.80	0.00	6,840.00	539,665.70	0.00	377,518.00
10	GEO	75.0	A	153,357.00	36,163.00	0.00	103,138.00	292,658.00	0.00	236,237.25
11	CWE	75.0	S	230,400.00	0.00	0.00	18,400.00	248,800.00	0.00	191,200.00
Total				2,576,524.00	415,074.30	132,600.00	267,276.00	3,391,474.30	0.00	2,402,802.65

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

Table 3: distribution of eligible costs between partners according to the DoW and for the whole project.

2nd Period Justification										
Project Number		DECUMANUS								
Participant number in this project	Participant short name	Fund. %	Ind. Costs	Estimated eligible costs (whole duration of the project)					Max. EC contribution	Requested
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D		
1	INDRA	50%	F	335.911,00	109.586,69	90.887,99	45.418,21	581.803,89	359.055,05	359.055,05
2	DLR	75%	A	250.306,85	32.283,89	0,00	0,00	282.590,74	203.872,09	203.872,09
3	UWE	75%	T	266.668,05	0,00	0,00	34.437,28	301.105,33	234.438,31	234.438,31
4	UPM	75%	A	37.753,74	102.836,92	0,00	-10.614,18	129.976,48	69.120,05	69.120,05
5	RBKC	75%	T	34.260,80	0,00	0,00	0,00	34.260,80	25.695,60	25.695,60
6	MIL	75%	T	42.220,18	0,00	0,00	0,00	42.220,18	27.547,92	27.547,92
7	ANT	75%	T	42.175,48	0,00	0,00	0,00	42.175,48	31.631,61	31.631,61
8	HSY	75%	T	60.085,28	0,00	0,00	0,00	60.085,28	45.063,96	45.063,96
9	EUR	75%	T	212.022,72	103.436,03	2.500,00	6.353,52	324.312,27	219.853,85	219.853,85
10	GEO	75%	A	89.599,98	22.305,81	0,00	42.757,27	154.663,06	121.110,15	121.110,15
11	CWE	75%	S	42.212,22	0,00	0,00	99.669,60	141.881,82	131.328,77	131.328,77
			0	**1.413.216,30**	**370.449,34**	**93.387,99**	**218.021,70**	**2.095.075,33**	**1.468.717,36**	**1.468.717,36**

Table 4: distribution of justified and requested cost for the Period 2

Participant number	Participant name	Total cost (Form C Periods 1+2)	Total Estimated Cost (DoW)	Difference
1	INDRA	846.666,66	812.040,00	34.626,66
2	DLR	430.449,65	442.462,50	-12.012,85
3	UWE	353.132,56	359.520,00	-6.387,44
4	UPM	264.062,24	314.703,00	-50.640,76
5	RBKC	83.901,40	105.600,00	-21.698,60
6	MIL	69.403,35	84.025,10	-14.621,75
7	ANT	81.635,38	88.000,00	-6.364,62
8	HSY	103.311,30	104.000,00	-688,70
9	EUR	547.814,70	539.665,70	8.149,00
10	GEO	315.444,27	292.658,00	22.786,27
11	CWE	224.011,82	248.800,00	-24.788,18
	TOTAL	**3.319.833,33**	**3.391.474,30**	**-71.640,97**

Table 5: Comparison of total estimated cost (DoW) versus Justified cost (Form C of the period 1 and Period 2)

Participant number	Participant name	Requested cost (Form C 1+2)	Total EU contribution (DoW)	Difference
1	INDRA	513.516,06	504.720,00	8.796,06
2	DLR	314.251,89	322.206,75	-7.954,86
3	UWE	273.668,73	282.480,00	-8.811,27
4	UPM	176.481,70	213.285,00	-36.803,30
5	RBKC	62.926,05	79.200,00	-16.273,95
6	MIL	43.333,82	51.955,65	-8.621,83
7	ANT	61.226,54	66.000,00	-4.773,46
8	HSY	77.483,48	78.000,00	-516,52
9	EUR	384.709,41	377.518,00	7.191,41
10	GEO	253.933,94	236.237,25	17.696,69
11	CWE	192.926,27	191.200,00	1.726,27
	TOTAL	**2.354.457,89**	**2.402.802,65**	**-48.344,76**

Table 6: Comparison of total requested budget (DoW) versus Justified cost (Form C of the period 1 and Period 2)

Real Period 2										
Beneficiary nu	**Beneficiary**	**WP1**	**WP2**	**WP3**	**WP4**	**WP5**	**WP6**	**WP7**	**WP8**	**Total per beneficiary**
1	INDRA	2,66	20,45	34,22	21,54	3,59	12,40	2,41	8,97	106,24
2	DLR	8,20	8,20	8,20	3,31					27,92
3	UWE	12,63		1,82		18,77			2,93	36,15
4	UPM	2,00	0,08	0,08	12,38	2,23			2,40	19,17
5	RBKC	1,65				1,65				3,3
6	MIL	0,59				7,64				8,23
7	ANT	3,96								3,96
8	HSY	4,15				4,15				8,3
9	EUR	1,51	18,28	3,83	11,90	0,91		0,29		36,72
10	GEO	3,50	2,30		2,30				2,50	10,6
11	CWE					3,35			8,19	11,54
	Total	**40,85**	**49,31**	**48,15**	**51,43**	**42,29**	**12,40**	**2,70**	**24,99**	**272,13**

Table 7: Real distribution of efforts between partners and WPs for the Second Reporting Period

Total PM				
Beneficiary number	**Beneficiary name**	**Form C (Period 1+2)**	**Total DoW**	**Difference**
1	INDRA	149,14	137	12,14
2	DLR	41,61	35	6,61
3	UWE	47,79	35	12,79
4	UPM	28,67	31	-2,33
5	RBKC	7,9	10	-2,1
6	MIL	14,63	4	10,63
7	ANT	7,77	8	-0,23
8	HSY	14,6	8	6,6
9	EUR	63,57	60,5	3,07
10	GEO	21,8	23,53	-1,73
11	CWE	17,77	26,00	-8,23
	Total	**415,25**	**384,03**	**31,22**

Table 8: final distribution of costs: first period plus second period