



OPTIMISED ENERGY EFFICIENT DESIGN
PLATFORM FOR REFURBISHMENT
AT DISTRICT LEVEL

Optimised Energy Efficient Design Platform for Refurbishment at District Level
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D7.14: Report on Research Cohesion Activities

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Table of Content

Executive Summary	8
1 Introduction	9
1.1 Purpose and target group	9
1.2 Contributions of partners	9
1.3 Relation to other activities in the project	9
2 Research cohesion activities within OptEEmAL	10
3 Collaboration with existing previous projects.....	11
3.1 The OptEEmAL background.....	11
3.2 The OptEEmAL case studies	12
4 Collaboration with on-going projects.....	14
4.1 Workshops and events for Knowledge Exchange	14
4.2 Synergies with Smart City projects and others.....	15
5 Collaboration with platforms and initiatives on EeB	17
6 Conclusions	19



List of Tables

Table 1: Contribution of partners	9
Table 2: Synergies with projects that contributed to the OptEEmAL's background	11
Table 3: Districts from previous projects used within OptEEmAL for validation purposes.....	12
Table 4: Projects funded under the same call.....	14



List of Figures

Figure 1: OptEEemAL dissemination / exploitation model	10
Figure 2: Pre-selected case studies within OptEEemAL	13
Figure 3: Pictures from the OptEEemAL, NEWTREND and ECODISTR-ICT joint workshop under the SP16.....	14
Figure 4: Picture from the OptEEemAL and SWIMing joint workshop under the VoCamp 2016	15



Abbreviations and Acronyms

Acronym	Description
OptEEmAL	Optimised Energy Efficient Design Platform for Refurbishment at District Level
BIM	Building Information Modelling
C&D&E	Communication & Dissemination & Exploitation
CityGML	Geography Markup Language (open data model and XML-based format for the storage and exchange of virtual 3D city models)
EC	European Commission
ECTP	European Construction Technology Platform
EeB PPP	Energy Efficient Buildings Public private Partnership
EIP	European Innovation Partnership
EU	European Union
E+	Energy+
IDST	Integrated Decision Support Tool
IFC	Industry Foundation Classes
SCIS	Smart Cities Information System
SCC	Smart Cities and Communities
TRL	Technology Readiness Level

Executive Summary

The “D7.14: Report on Research Cohesion Activities” provides an overview of those activities taking place within WP7 – “Dissemination, communication, exploitation and market deployment” and other WP’s related to the exchange with other European projects and initiatives.

The document includes both general information on how the project partners’ background included from the beginning collaborations from other existing and ongoing projects as well as the activities undergone for knowledge exchange during the project duration with projects on the same or similar calls.

Specific information has been included to speak about the particular collaboration through the OptEEmAL Case Studies, whose data and information are coming from those gathered and shared with us from other projects.

Finally, the synergies with Smart City projects and others as well as the collaboration with platforms and initiatives on EeB are explored in the final sections of this document.



1 Introduction

1.1 Purpose and target group

The purpose of “D7.14: Report on Research Cohesion Activities” is to report on the Research Cohesion activities that the OptEEmAL project has implemented in order to ensure alignment with the current developments in the fields where OptEEmAL has provided results. This strategy has worked on three pillars, namely:

- Collaboration with existing projects that set the background for OptEEmAL, including projects for validating the results
- Collaboration with on-going similar projects and initiatives including those from the same call, coordination and support actions and SCC projects
- Collaboration with platforms and initiatives that contribute to the sector of energy efficiency in buildings

This collaboration has been coordinated from WP7 but with the collaboration with all the other WPs and activities of the project.

1.2 Contributions of partners

The following Table 1 depicts the main contributions from participant partners in the development of this deliverable.

Table 1: Contribution of partners

Participant short name	Contributions
CAR	Setting up of deliverable
SEZ	Section 5 and deliverable review
All partners	Inputs regarding projects data exchange

1.3 Relation to other activities in the project

The communication, dissemination and exploitation activities of OptEEmAL are strongly related to all project activities, as they promote the project activities, results and developments and focus on their further exploitation. Thus, strong linkages to all project activities, all partners and throughout the entire project constitute a powerful network.

2 Research cohesion activities within OptEEemAL

The objectives of the Communication, Dissemination and Exploitation Plan are to postulate a clear definition and overview of the communication, dissemination and exploitation activities of OptEEemAL, to provide the project partners with clear guidelines and tools for their communication and dissemination activities, to clarify important aspects for the project's communication and dissemination work (e.g. key messages, target audience), to foresee the activities in this respect and the partners' roles and mechanisms within the project.

The C&D&E plan is based on the OptEEemAL dissemination / exploitation model (see Figure 1). The activities in this regard comprise communication activities (promotion of general information about the project to a wide audience), dissemination activities (promotion of project results and outcomes to a technical audience, also via training activities explaining the developed platform) and exploitation activities (ensuring the further use of the project results, fostering replication).

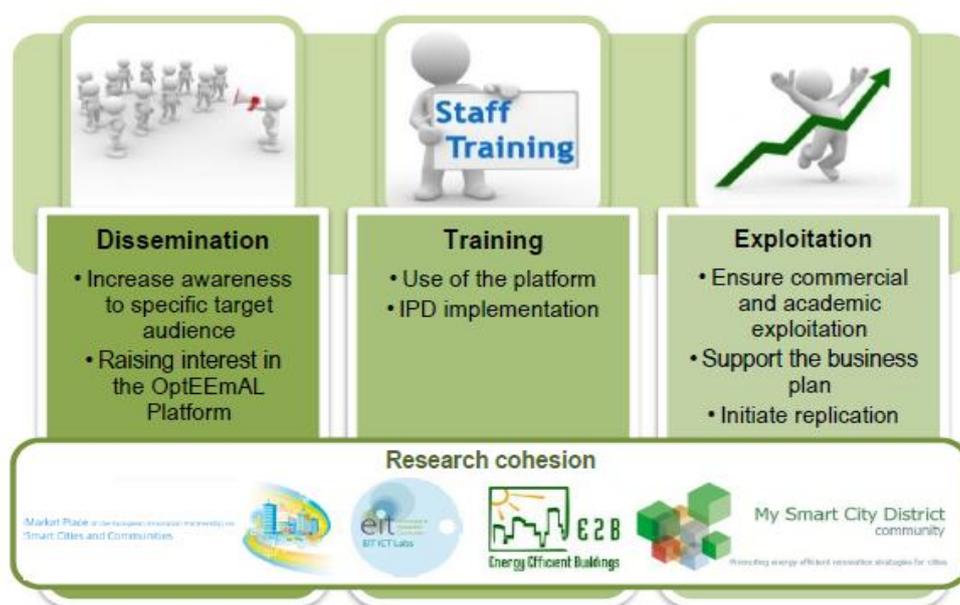


Figure 1: OptEEemAL dissemination / exploitation model

In order to contribute maximising the expected impacts through this C&D&E plan, and to ensure the alignment of the project with already on-going initiatives and project from which can be benefited and to which can contribute, a transversal action on research cohesion supports the project in this matter. To this aim, it is important to highlight that OptEEemAL builds upon existing previous projects where the consortium has developed activities that positioned the OptEEemAL platform at a TRL4. Thus, a strong link with these has been the first basis of this research cohesion activity. These projects also include large demonstration actions whose demonstration sites have been used as case studies for OptEEemAL in order to validate the project's results against simulated and real monitored data of their status pre- and post-interventions.

Secondly, OptEEemAL has bridged with the other projects funded under the same call and also coordination and support actions acting as framework umbrellas for these in order to implement a knowledge exchange activity to ensure technical and scientific alignment with the current developments beyond the state of the art.

Finally, and as third axis, OptEEemAL has created synergies with existing initiatives that work in the field of energy efficiency in buildings (as the EeB PPP) and others as the EIP on Smart Cities and Communities, the Smart Cities Information System or MySmartCityDistrict.

3 Collaboration with existing previous projects

3.1 The OptEEmAL background

The OptEEmAL project was built on the basis of previously existing projects and developments that allowed positioning the OptEEmAL platform at a TRL4 at the beginning of the project and set the basis for the project's developments to position this result at a TRL7 at the end.

The most relevant projects and the main synergies can be found in the table below:

Table 2: Synergies with projects that contributed to the OptEEmAL's background

Project / solution	Involved partners	
FASUDIR	TEC	The project FASUDIR developed a framework to support decision-making when facing energy efficient retrofitting projects. The key result of FASUDIR project was the Integrated Decision Support Tool (IDST), developed to help decision makers to select the best energy retrofitting strategy to increase the sustainability of the whole district. With stakeholder feedback loops and validation in three diverse urban areas, the IDST ensure robustness and applicability in the entire value chain. There is great synergy between FASUDIR and OptEEmAL, both in terms of objectives and processes. Specifically, the KPIs defined in the FASUDIR project have been taken as a reference to select and define the OptEEmAL KPIs. On the other hand, the definition of the district energy model in FASUDIR and the implementation based on the CityGML standard has been used to create the district models of OptEEmAL case studies.
BaaS	CAR, TUC	The project BaaS, coordinated by CARTIF and with the participation of TUC, developed a platform to optimise operation of energy systems in buildings based on a three levels' architecture: data layer, communication middleware and services. The data layer integrated IFC data with dynamic data collected from the monitoring systems, as well as other sources of information to feed the services implemented within the solution. The communications' layer allowed a seamless data flow between the data layer and the optimisation services deployed. Finally, the services' layer implemented fault detection functionalities and optimisation of building operation based on energy performance simulation to predict the building behaviour through changing the operation parameters. There is a strong synergy between BaaS and OptEEmAL as the OptEEmAL architecture and interoperability elements (between IFC and E+) have been built considering the basis developed and tested within BaaS.
PEBBLE	TUC	The PEBBLE (Positive-Energy Buildings through Better Control Decisions) project, coordinated by TUC, explored the topic of dynamic re-configuration of energy management systems based on model-based control design approaches. The knowledge and tools developed within the project have positively contributed to a number of follow-up research and innovation activities, including the BaaS and OptEEmAL projects. Key outputs of the PEBBLE project which placed OptEEmAL on a TRL4 level at the start of the project include: procedures for developing empirically validated models, model-reduction approaches to reduce computational complexity of the energy simulation models, and early work on the aspect of BIM to BEPS interoperability and data transfer. While the context is different (model-based control vs

		retrofitting) some of the requirements have been similar, namely fast-reanalysis capabilities, handling concurrency and data integration aspects, and working with IFC files. Many of the tools developed within WP4 have originated, in primitive versions, within the PEBBLE project. Within OptEEmAL, they have been expanded, adapted to the particular retrofitting context, and further developed to reach a higher maturity level of TRL7 and cover a much wider set of use cases.
SEMANCO	FUNITEC	The SEMANCO project, coordinated by FUNITEC and co-funded by the 7th Framework Programme 2011 – 2014, developed semantic tools to different stakeholders involved in urban planning (architects, engineers, building managers, local administrators, etc.) to make informed decisions to reduce CO ₂ emissions in cities. SEMANCO platform provided access to widely dispersed energy related data, including geographic information, cadastre, economic indicators and consumption. The integrated data – using Semantic Web technology – was analysed using assessment and simulation tools that are adapted specifically to the needs of each case. The ontology (i.e., data model) developed within SEMANCO project has been reused in OptEEmAL to define the District Data Model. Therefore, the concept of having a global ontology to represent the multidimensional perspectives of a building has been borrowed and expanded to a district scale.
KNVCITY	ARG	KNVCITY is a 3D City features analysis software, which helps city planners and municipalities to assess the current situation of a modelled city's infrastructures, solar energy generation potential, allowing the construction and analysis of several city planning scenarios.
NEST	NBK	NEST is a tool developed by NOBATEK that provides functionalities to evaluate environmental indicators of an urban area. This tool has been integrated within OptEEmAL as part of the toolbox to calculate the District Performance Indicators and to perform the evaluation and optimisation services of the platform.

3.2 The OptEEmAL case studies

The OptEEmAL project pre-identified a set of 6 case studies with potential utilisation for the testing and validation purposes of the platform. From these, 4 cases have been used to test the functionalities of the platform both at TRL5 and TRL6 as described within D6.1 and D6.2. The following table summarises these case studies and how OptEEmAL has used them for this purpose:

Table 3: Districts from previous projects used within OptEEmAL for validation purposes

District name	Project	Summary of use within OptEEmAL
Historic city (Santiago de Compostela, Spain)	FASUDIR	The CityGML of the historic city of Santiago de Compostela has been used for validating the IFC-CityGML mapping to cover TRL5 of the project, where the geometry of the existing buildings was used in order to integrate sample IFCs to test these mapping functionalities.
Cuatro de Marzo (Valladolid, Spain)	R2CITIES	The district of Cuatro de Marzo has been extensively used to validate both TRL5 and TRL6 of OptEEmAL where the IFCs, CityGML and other data has been used within the platform to design this district retrofitting project. The simulation and monitoring results from R2CITIES have been used in order to calibrate the models and to improve the quality of the results of the platform.

Mogel (Eibar, Spain)	ZeNN	The district of Mogel, which was retrofitted within the ZeNN project has been used in order to validate TRL6, as well as to cover some functionalities within TRL5. As above for Cuatro de Marzo, the results obtained in ZeNN (both simulated and monitored) have been used within OptEEemAL for the platform's validation purposes.
Linero (Lund, Sweden)	CITYFIED	The case of Linero finally was not available for the validation purposes and it was replaced with the case of Polhem (which has been also used as demonstration site) where other buildings have been used for validating the project at TRL6.

Below, a map of the pre-selected case studies is shown:



Figure 2: Pre-selected case studies within OptEEemAL

4 Collaboration with on-going projects

4.1 Workshops and events for Knowledge Exchange

As reported within D7.10 (Report on technology watch), there are two projects funded under the same topic as OptEEmAL, which are:

Table 4: Projects funded under the same call

Acronym	Full title	Start	End	Cordis weblink
MODER	Mobilization of innovative design tools for refurbishing of buildings at district level	01.09.2015	01.09.2018	http://cordis.europa.eu/project/rcn/198362_en.html
NewTREND	New integrated methodology and Tools for Retrofit design towards a next generation of ENergy efficient and sustainable buildings and Districts	01.09.2015	01.09.2018	http://cordis.europa.eu/project/rcn/198365_en.html

OptEEmAL has worked towards implementing a collaboration strategy which included these projects, as well as others as ECODISTR-ICT. Under this framework, a common workshop on District Renewal titled "Innovative tools and systems for increased participation in district retrofitting & renovation" was organised within the framework of the Sustainable Places 2016 event celebrated in Anglet (France) in June 2016. In this workshop several partners from the projects OptEEmAL, NEWTREND and ECODISTR-ICT discussed on the generated progresses as well as the problems they had faced.

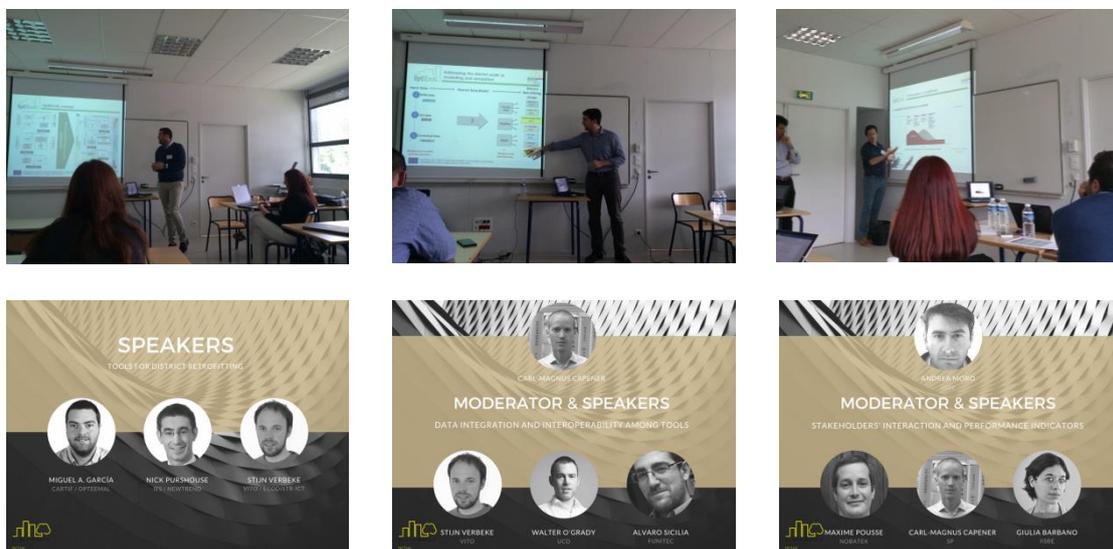


Figure 3: Pictures from the OptEEmAL, NEWTREND and ECODISTR-ICT joint workshop under the SP16

A strong cooperation with the CSA SWIMing was implemented during the first year of the project, which led to contributing to the VoCamps that have been organised by this project, as well as to the utilisation of the BIM*Q tool, developed by AEC3 within the project, for the collection of data requirements, which OptEEmAL has adopted to identify and capture its requirements for the platform. In this sense a relevant collaboration was conducted under the VoCamp event 2016, which included a workshop on "Interoperable data models for Building's Life Cycle Energy Management Processes" organised jointly by the two projects OptEEmAL and SWIMing in London from October 13th to 14th, 2016. The workshop brought together experts in the area of interoperable data models

for supporting energy efficient processes during the operational stage of a building's life cycle. The goals of the workshop were to explore different data domains of relevance to energy efficient building design and operation, including occupancy (activity and comfort), building products and devices, building control and communications, measurement data and also geolocation and data related to the building's external environment (e.g. weather, district, energy tariffs), and thermal simulation modelling. Approximately 40 participants discussed topics related to linked data and presented their own data and ontologies during the VoCamp. In this collaborative event the research done within OptEEmAL was presented as one of the use cases and different partners participated representing the project: Leandro Madrazo from FUNITEC held a presentation on “Energy information systems for buildings and cities: a quest for a systemic approach” and presented work that included the OptEEmAL concept, and Alvaro Sicilia (FUNITEC) and Kyriakos Katsigarakis (TUC) presented the data model and the technical approach of the OptEEmAL project.



Figure 4: Picture from the OptEEmAL and SWIMing joint workshop under the VoCamp 2016

4.2 Synergies with Smart City projects and others

This section gathers the synergies explored among other EU projects, mainly the smart city projects and energy related activities.

The coordinator and partners are active in various other Smart City and energy-related projects and where thus able to support the communication and dissemination of the OptEEmAL project through mailings, social media and other communication channels.

The OptEEmAL project activities, such as the trainings, conferences (Barcelona and Valladolid) and other activities as well as information on the demo sites, have been published and promoted through the **newsletters** of Smart Cities Information System (SCIS), Smart Cities and Communities (SCC) and mySMARTLife newsletters since 2018. A selection shows:

- The OptEEmAL event at the Smart City Expo on November 14th - 15th, 2018 in Barcelona, Spain, which hosted over 20.000 visitors from more than 700 cities, has been promoted by other EU projects in the SCIS newsletter ([edition October 2018](#)) and social media activities (mySMARTLife, SCIS, Triangulum, SmartEnCity) and featured as a guest speaker Mikko Martikka, a representative of mySMARTLife Lighthouse City Helsinki. He gave a presentation on “Open energy data: a new framework for better energy retrofit solutions”.
- The OptEEmAL project and achievements have been presented at the 6th Women4Energy Conference on December 7th, 2018, where over 60 research and industry professionals from at least 12 countries came together to exchange on the topic of “Energy in Smart Cities”. In the afternoon session “New Trends in Energy Efficient Buildings in Smart Cities”, OptEEmAL was presented and promotion materials were given out to the conference participants.
- The OptEEmAL Final Conference featured guest speakers from relevant stakeholders and multipliers, i.e. Emilio M. Mitre from the Green Building Council in Spain and Arnaut Andrews

representing the Nottingham City Council and Energiesprong UK. Additionally, a news article on the OptEEmAL Final Conference appeared in SCIS Newsletter ([edition February 2019](#))

- The first and second OptEEmAL videos and the OptEEmAL final booklet have been promoted in the SCIS newsletters ([edition October 2018](#), [edition February 2019](#))

These events have also been promoted in the **Enterprise Europe Sector Groups** “Sustainable Construction” and “Intelligent Energy” by fellow SEZ colleagues.

Social media activities, especially on Twitter channels, have shown a great support not only by the project partners and organisations, but also by other Smart City projects such as SmartENCity, Triangulum, mySMARTLife, SCIS and REMOURBAN in the form of likes and retweets. Further, OptEEmAL is followed on Twitter EU projects such as [OPTIMA](#), [TREATMENT ITN](#), [NEWBITS](#), ROSIN, [INHERIT](#), [ATIproject](#), [BIMEET](#), HEART Project, [DRIMPAC](#), CloudPerfect, [Snap4City](#), ExcEED, P2ENDURE, INSITER, Hycool , GEOFIT, [ReCO2ST](#), ABRACADABRA, Area 21, TransAID, HOLISDER, [SynchroniCity](#), ENGINECY, INTENSSS PA, [HYBUILD](#), TEMPO, and many others.

SEZ has also published OptEEmAL press releases on Cordis Wire, a website by the European Commission informing about the results of the EU’s research and innovation framework programmes ([press release on OptEEmAL Conference at Smart City Expo](#), [press release on OptEEmAL Final Conference](#)).



5 Collaboration with platforms and initiatives on EeB

As foreseen the OptEEmAL project partners attended various events as described above between September 2016 and February 2018 and were able to establish contacts with many EU funded project coordinators and partners. This helped to set a basis on the relation among projects, learn from each other and promote technological progress.

One of the events that allows having contacts with many EU funded project coordinators is the annual EeB PPP impact workshop, organized by the EC and the EeB PPP, aimed at gathering the on-going projects as a mechanism to ensure knowledge transfer and improve impacts of the energy efficient related projects.

The Public-Private Partnership on Energy-efficient Buildings (EeB PPP) was launched in December 2008 under the European Economic Recovery Plan to attract a high industrial participation and help innovate the building sector. Under the EU framework programme Horizon 2020, the PPP on Energy-efficient Buildings has continued working with the aim to develop affordable breakthrough technologies and solutions at building and district scale, facilitating the road towards future smart cities.¹

As mentioned, events as the annual EeB PPP impact workshop, organized by the EC and the EeB PPP, to which the OptEEmAL project has been always committed to attend, have been used as facilitator to make fruitful contacts with other EU funded projects representatives. In the 2016 edition it was held in April in Brussels and OptEEmAL was represented by the project coordinator, enabling to have some first conversations.

For the 2017 edition, the OptEEmAL project was one of the four European projects having been selected to run a dedicated presentation at this year's "Impact Workshop of the Energy Efficient Buildings cPPP" in Brussels. The results of different EU funded research and innovation projects in the field of the Energy-efficient Buildings (EeB cPPP) were presented in one general and three parallel sessions organized by the ECTP E2B Committee. The event was attended by the project coordinators and partners selected of each funded project. The presentation was held by CARTIF as coordinator, on 16 May 2017 within Session 4 "ICT, BIM/Data & Interoperability", and also participated on the yearly Impact Workshop for the three contractual Public-Private Partnerships (cPPPs) organised by the European Commission that took place on 17 May 2017.

These two events jointly with the others in this line have served as platforms to exchange information on technologies, the field promote the OptEEmAL project and exchange and collaboration around energy efficiency topics and technologies. All those participations have been also committed to be used as facilitator to make fruitful contacts with other EU funded projects representatives at different levels.

Another initiative OptEEmAL has been linked to is the Smart Cities Information System (SCIS).

In October 2015, the EU Smart Cities Information System (SCIS) organised a Coordinators Meeting in which the OptEEmAL Project Coordinator took part to present several projects in which CARTIF was involved at the moment (among them, OptEEmAL) as a continuation of the fruitful collaboration that has been established with this project. SCIS is an EU initiative aimed at collecting information through key performance indicators of Smart City projects under implementation (or that have finalised their implementation). CARTIF, through its energy efficient and smart cities projects actively participates in this platform, both contributing to the definition of the indicators' framework and feeding the platform with real data from the demonstration projects under implementation (some of them being case studies of OptEEmAL).

¹ http://ec.europa.eu/research/industrial_technologies/energy-efficient-buildings_en.html

In this sense, there have been strong synergies between OptEEmAL and SCIS, where the indicators' framework developed by this platform has been part of the basis to develop the OptEEmAL District Performance Indicators list. This continuous collaboration between OptEEmAL and SCIS allowed a mutual benefit for both projects, and the steps of collaborations implemented stated the basis of a fruitful collaboration to ensure that OptEEmAL was fully aligned with real district scale retrofitting projects and with the needs and aims of the stakeholders involved in the process.



6 Conclusions

Along the OptEEmAL project duration, many efforts have been done in order to ensure the alignment of the project with the current developments in the fields where OptEEmAL has provided results

The three main approaches followed (collaboration with existing projects, collaboration with on-going similar projects and initiatives and collaboration with platforms and initiatives that contribute to the sector of energy efficiency in buildings) have led to a fruitful knowledge exchange.

This document has provided an overview of those activities taking place within WP7 and other WP's related to such knowledge exchange and information sharing during the project duration with projects, platforms&initiatives and other stakeholders.

All the activities included in this document have helped the project to be benefited and to contribute to the research cohesion among different initiatives in this matter. We have to remark here again that OptEEmAL builds upon existing previous projects where the different consortium partners have developed activities that positioned the OptEEmAL platform at a TRL4 being this the first basis of the research cohesion activity explained in this document, that have continued with the inclusion of demonstration actions from other projects being used as case studies for validation in OptEEmAL project.

OptEEmAL has bridged with the other projects funded under the same call and also coordination and support actions acting as framework umbrellas for these in order to implement a knowledge exchange activity to ensure technical and scientific alignment with the current developments beyond the state of the art.

Finally, OptEEmAL has created synergies with existing initiatives that work in the field of energy efficiency in buildings (as the EeB PPP) or the Smart Cities Information System.