SEMANCO Semantic Tools for Carbon Reduction in Urban Planning

SEMANCO

Deliverable 3.1
Report on the Accessible Energy Data

Revision: 6
Due date: 2012-08-31 (m12)
Submission date: 2012-09-21
Lead contractor: POLITO

Dissemination level		
PU	Public	x
PP	Restricted to other program participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Deliverable Administration & Summary					
No & name	**D3.1 Report on the accessible energy data**				
Status	Final		**Due**	m12	**Date**	2012-09-20
Author(s)	Vincenzo Corrado (POLITO), Ilaria Ballarini (POLITO)				
Editor	Vincenzo Corrado (POLITO), Ilaria Ballarini (POLITO)				
DoW	Identify the characteristics of the data stored in the data repositories identified in T.2.1 including access type (open data initiative) and data availability. Define access mechanisms and protocols to access the heterogeneous data sources identified in T.2.1 for each case study applying standards of semantic communication protocols (e.g. REST, Linked Data, Web Service, SPARQL). Identify data sets which need to be structured and stored in dedicated databases.				
Comments					

Document history				
V	**Date**	**Author**	**Description**	
1	2012-08-06	Vincenzo Corrado (POLITO), Ilaria Ballarini (POLITO)	First version available on the SharePoint	
2	2012-08-07	Leandro Madrazo (FUNITEC)	Comment and revisions on the first version	
3	2012-09-10	Vincenzo Corrado (POLITO), Ilaria Ballarini (POLITO)	Second version available on the SharePoint	
4	2012-09-14	Vincenzo Corrado (POLITO), Ilaria Ballarini (POLITO)	Final editing and proof reading. This version has been sent to the internal reviewers (Alvaro Sicilia, FUNITEC, and Andreas Nolle, HAS)	
5	2012-09-18	Martin Carpenter (UoT)	English proof-reading	
6	2012-09-20	Vincenzo Corrado (POLITO), Ilaria Ballarini (POLITO)	Final version	

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EXECUTIVE SUMMARY

Introduction

The document summarises the work done and the results achieved in Task 3.1 *Providing access to distributed energy data repositories* carried out within Work Package 3 *Energy data modelling*.

Task 3.1 has a key role in the project development because it is the connection node between Task 2.1 and Tasks 3.2 and 3.3. The interrelationships between these tasks are as follows: Task 2.1 provided the data of the three case studies (North Harbour, Newcastle-upon-Tyne and Manresa) while in Task 3.1 these data were identified, collected and classified. The outputs from Task 3.1 will form the basis for the semantic modeling which will be carried out in Tasks 3.2 and 3.3. Moreover, Task 3.1 forms the basis for the development of T3.4 which is directly linked to WP4 – *Semantic Energy Information Framework*. In fact, Task 3.1 also analysed the technical features of the different data sources.

Consequently, Task 3.1 deals with the following items: *a)* the methodology to present and classify the characteristics of data used for energy and environmental analyses at different scales, *b)* the data fields necessary to describe data in a detailed and complete way, *c)* the information to be provided on the data sources with reference to availability and technical accessibility.

Task 3.1 had a further impact on the "Use case" methodology (described in detail in D1.8) through: *a)* the identification of input data to fulfil the "Activity" goal in the "Use case", *b)* the data characterisation which provided both a terminology and definitions by technical standards which will be useful for the subsequent semantic modeling of data, *c)* the technical analysis of the access mechanisms to data sources.

Characteristics of data

The modelling of ontological data has to be developed through a common and shared terminology. The definitions of terms and their conceptualisation are provided by the literature, and specifically by the international technical standards, which supply the correct terminology, the descriptions and, if applicable, the symbols and the units of the defined quantities.

Because of the different origin and the wide numerical quantity of data necessary to develop an energy and environmental analysis at different scales, it was found necessary to collect data and classify them in categories. The following data categories were defined: *energy data*, *energy cost data*, *climatic data*, *environmental data*, *building technical data*, *legislative constraints*, *geographical data*, *land and buildings registry data*, *urban planning data*, *socio-economic data*, *demographic data*. A description of each category of data and the identification of sub-categories, where applicable, was developed. This, together with the main data that can be referred to each category or sub-category, is listed below.

- **Energy data**: this category includes data referring to energy quantities. The main data types in the category are: *auxiliary energy, CO_2 emission coefficient, CO_2 emissions, delivered energy, energy demand (or energy required), energy supply, exported energy, final energy (or energy used), primary energy, produced renewable thermal/electric power/energy, RES coverage*.

- **Energy cost data**: this category includes both *energy costs* and *investment costs*. The energy cost expresses the cost of each energy carrier, to which some of the previous energy data could refer. It could be the cost of the consumed energy, or the cost of the energy savings due to retrofit actions on the existing building stock, or the cost of the

produced/exported energy. The investment cost might, for instance, refer to new constructions or to energy refurbishment actions.

- **Climatic data**: this category includes the datasets that define the climatic conditions of a given geographical area. The main climatic data are: *air temperature*, *diffuse solar irradiance*, *direct solar irradiance*, *global solar irradiance*, *gust wind speed*, *mixing ratio*, *rainfall total*, *reference wind speed*, *relative humidity*, *solar declination*, *solar irradiance*, *solar irradiation*, *water vapour pressure*, *wind direction*, *wind speed*. Some of these quantities could be also referred to either a mean value, a minimum value, or a maximum value.

- **Environmental data**: this category includes all the data that refer to the principal air pollutants in the urban area. The principal pollutants are: *total suspended particulate matter*, *sulphur dioxide*, *nitrogen dioxide*, *carbon monoxide*, *ozone*, *lead*.

- **Building technical data**: this category can be subdivided in several sub-categories, due to the wide range of data covered. The *building general data* sub-category includes the following data: *building age*, *building typology*, *conservation state*, etc. The *building use* sub-category includes the following data: *building use*, *crowding index*, *occupancy profile*, *percentage of occupation*, *indoor air temperature (space heating)*, *indoor air temperature (cooling)*, *air exchange rate*, *internal heat gains*, etc. The *building external surroundings* sub-category includes the following data: *ground ρ-value*, *ground α-value*, *external obstructions*, etc. The *building geometry* sub-category includes the following data: *floor area*, *volume*, *height*, *orientation*, *thermal envelope area*, *number of complete storeys*, *number of apartments*, *shape factor*, *compactness ratio*, *building coordinates*, etc. The *building construction* sub-category includes the following data: *type of <component>*, *number of <components>*, *<component> orientation*, *<component> adjoining space*, *<component> dimensions*, *<component> area*, *<component> percentage*, *<component> thickness*, *<component> U-value*, etc. The *technical building systems* sub-category includes the following data: *type of system*, *type of subsystem*, *thermal/electrical power installed*, *efficiency*, *energy source*, *energy carrier*, etc.

- **Legislative constraints**: this category includes the data concerning legislative requirements specifying standards by which either new constructions or retrofits of existing buildings must abide. The legislative constraints refer to some quantities and parameters already described in the "energy data" and "building technical data" categories.

- **Geographical data**: this category refers to data included in the "Geographic Information System" (GIS). The delivered information by the GIS is usually classified in: *geometric data*, *topologic data*, *informative data*. Due to the different nature of the information provided by the GIS and the high quantity of data delivered by the system, the geographical data for each case study of SEMANCO are provided and classified through an identification code, which summarises different types of data. Then, the single data items, according to the topic, are split and classified in the relative data categories.

- **Land and buildings registry data**: this category includes the data referring to the cadastre, for different scales or levels of analysis. Examples of the data of general interests to a wide user community, that are usually considered part of the cadastre, can be divided into the following sub-categories: *land parcels*, *land tenure*, *land value*. The *land parcels* sub-category includes: *location*, *boundaries*, *coordinates*, *total surface*, *built surface*, etc. The *land tenure* sub-category includes: *property rights*, *ownership*, *leases*, *property regime*, etc. The *land value* sub-category includes: *land quality*, *land classification*, *economic value*, *tax value*, *value of improvements*,

etc. The registry data of buildings is considered a parallel category of the land registry data and includes the following information: *number of buildings*, *cadastral reference*, *cadastral area*, *cadastral rooms*, *graphic information*, *owner*, etc.

- **Urban planning data**: traditionally the data for urban planning came from the land register's land category or the building register's major usage. However, urban land data also consider, for instance, the *land use* (e.g. building land, or no-building land) and the *area of activity* data. Other data used in urban planning could be: *planned buildings*, *planned communication ways*, *planned public facilities and utilities*, etc.

- **Socio-economic data**: this category includes overall basic social and economic data. The *housing* sub-category considers: *occupancy status*, *number of rooms*, *number of occupants*, *type of ownership*, *property price*, *social rented*, *private rented*, *rental*, *rental free*, etc. The *families and households* sub-category includes: *number of nuclear families*, *size of nuclear family*, *type of nuclear family*, *number of households*, *size of household*, *type of household*, etc. The *economic activity* sub-category includes: *employment*, *unemployment*, *occupations*, *earnings*, *hours worked*, etc. The *income and poverty* sub-category includes: *income*, *poverty*, etc.

- **Demographic data**: this category includes overall basic data on population characteristics. The *population* sub-category includes the following data: *size*, *gender*, *age*, *birth date*, *density*, *origin*, *nationality*, *religion*, *language*, etc. The *learning and education* sub-category includes: *learning level*, *education level*, etc.

Each datum belonging to a different category can be described in a detailed way by means of data fields. Each of the following fields is applicable to all the presented data: *category*, *name*, *long name*, *description*, *reference*, *format*, *source*, *owner*, *author*, *access type*, *availability*, *reliability*, *relevance for the purpose*.

Other data fields should be provided in order to detail the characteristics of the available data. These data fields are specific to some types of data and cannot be applied to all the datasets due to the particular nature of the supplied information. The specific data fields are the following: *symbol*, *unit*, *geographical area*, *scale*, *way of determination*, *way of aggregation*, *temporal scale*, *temporal range*, *validity conditions*.

According to the described methodology, the available data from each case study of SEMANCO was collected and classified in data tables. These tables are shown in Appendix A.

Technical accessibility of data

The technical availability and accessibility of the data sources were checked. A standard information package is used to collect and represent information on data availability and accessibility.

The following general fields are used to classify the necessary information about the characteristics of the data sources: *name*, *long name*, *description*, *author*, *contact*, *URL*, *domain*, *tags*, *number items*, *date range*, *data availability*, *license*, *reuse options*, *format*, *access type*.

If there is an ontology access type, the following information should also be provided: *ontology schema file*, *RDF/XML data file*, *SPARQL endpoint*, *SPARQL graph name*.

If there is a web services access type, the following information should also be provided: *web service URL*, *web service WSDL*.

If there is a database access type, the following information should also be provided: *provider*, *database structure*.

The technical information of the case study data sources, described in accordance with this

standard information package, is shown in Appendix B.

Conclusions

The present deliverable, carried out in Task 3.1 of Work Package 3, contributes to the development of SEMANCO project because it: *a)* presents a methodology for classifying and characterising data by means of a shared terminology to be used in the subsequent processes of semantic modeling and building ontologies (identifying concepts and the relationships between data) and *b)* allows for the collection of the information about how data can be accessed on a technical level, thus enabling them to be used in the subsequent energy and environmental analyses.

This report has an impact both in the subsequent Tasks of WP3 (T3.2, T3.3 and T3.4) and for the development of WP4. As regards the demonstration, deliverable 3.1 contributes to the "Use case" methodology through the use of the identified "data names" both in the "Activity" tables and in the "Standard Tables" where the relationships among concepts will be established.

Due to the high quantity of distinct data types and their heterogeneous origin, the data listed in this report should not be considered exhaustive. More data could be added for each category and/or sub-category if they become available, for instance as a result of considering additional case study scenarios.

1 INTRODUCTION

1.1 Purpose and target group

The objective of SEMANCO is the design, implementation and evaluation of a semantic based energy information framework and a set of tools for energy and environmental assessment at building and urban scales. The tools will enable stakeholders to make informed decisions regarding the energy performance and cost effectiveness of different design and planning alternatives at the local, district and regional scales.

The case study scenarios cover three different geographical areas (Spain, United Kingdom, Denmark) and different scales (from the building level to the urban scale) allowing for the verification the impact and the effectiveness of these tools under a range of differing conditions.

SEMANCO's approach to developing and integrating ICT tools to reduce CO_2 emissions is based on four interrelated components (Figure 1):

-   Supporting access to distributed and heterogeneous sources of energy data and energy related data, and analysis of these sources.

-   Semantic modelling of energy data, according to EU energy and ontological standards.

-   Integrated tools, that access and update the semantically modelled data, based on new and existing IT solutions for decision making in the development of CO_2 reduction strategies.

-   Requirements analysis to ensure that the tools and CO_2 reduction strategies developed address real world problems, within the SEMANCO demonstration cases and throughout the EU.
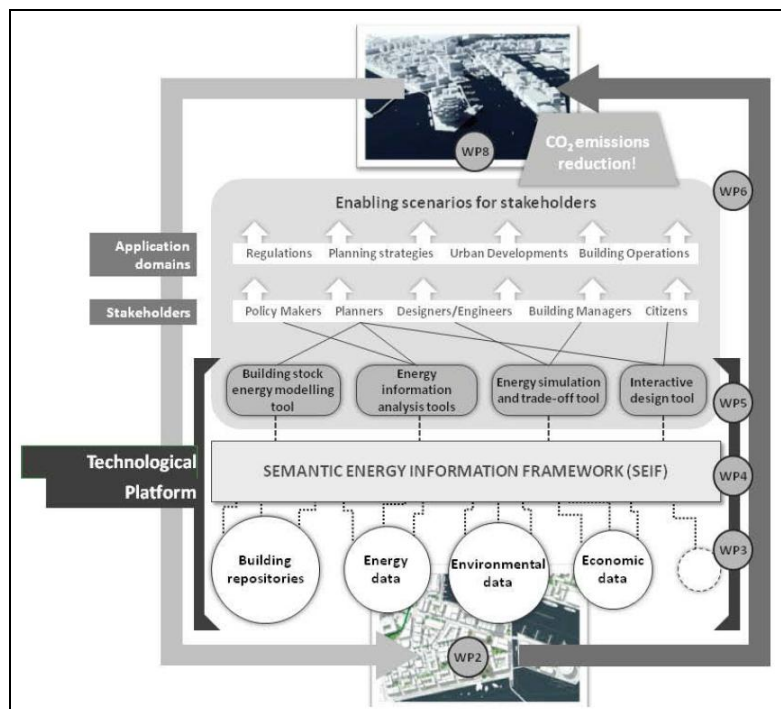
Figure 1. Methodological approach of SEMANCO[1]

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[1] Annex I- *Description of the Work*, Part B, p. 3.

The present project deliverable, D3.1 – *Report on the accessible energy data*, has been developed within Work Package 3 (WP3) – *Energy data modeling* – of SEMANCO project. Work Package 3 concerns both the first and the second component of the previous list and is composed of the following four tasks:

- T3.1 – *Providing access to distributed energy data repositories,*

- T3.2 – *Structuring available data according to energy standards,*

- T3.3 – *Structuring contextual data according to standards,*

- T3.4 – *Ontology Repository and Data migration to OWL format.*

In particular, D3.1 summarises the work done and the results achieved in Task 3.1. This Task has the following objectives:

- defining the characteristics of the data stored in the data repositories identified in T2.1 including access type (open data initiative) and data availability,

- defining access mechanisms and protocols to access the heterogeneous data sources for each case study applying standards of semantic communication protocols, and

- identifying data sets which need to be structured and stored in dedicated databases.

The "data" and the "data source" concepts are the *keywords* of Task 3.1. Both the concepts are contextualised within the three case studies of SEMANCO, Manresa (Spain), Newcastle-upon-Tyne (United Kingdom) and North Harbour (Denmark).

The data sources for each case study were previously identified in Task 2.1 *Case study design* and listed in Deliverable 2.1 *Report of the case studies and analysis*. Task 3.1 has a key role in the project development because it is the connection node between Task 2.1 and Tasks 3.2 and 3.3. In fact, the data sources described in D2.1 for the three case studies provided data; these data have been identified, collected and classified in T3.1; this operation is the basis for the semantic modeling which will be carried out in T3.2 and T3.3, in line and in close connection with T2.2 *Strategies and indicators for data modelling and data analysis*.

Moreover, Task 3.1 is the basis for the development of T3.4, directly linked to WP4 – *Semantic Energy Information Framework*. In fact, T3.1 also analysed the technical features of the different data sources.

Thus, Task 3.1 had a double goal in the project overview: 1) to analyse the available data and classify them according to a categorisation that will be taken into account during the ontological modeling, because it is based on the uniformity of terminology and definitions, 2) to analyse the data sources and to check their availability and the mechanisms needed to access them.

Consequently, deliverable 3.1 deals with the following items:

- the methodology to present and classify the characteristic of data used for energy and environmental analyses at different scales,

- the data fields necessary to describe data in a detailed and complete way,

- the information to be provided on the data sources with reference to their availability and their technical accessibility.

The collected data of each case study have been classified and characterised according to the presented methodology and they are shown in Appendix A.

The technical information of the case studies data sources is provided in Appendix B.

1.2 Contribution of partners

This report is the result of the collaborative work done in Task 3.1. The following project partners have been involved: POLITO, FUNITEC, CIMNE, HAS, Ramboll, and FORUM. Deliverable 3.1 has been elaborated by POLITO, which is the leader both of Task 3.1 and of the entire WP3.

The information on data and data sources have been provided by the partners responsible of the case studies: RAMBOLL for North Harbour (Denmark), NEA and UoT for Newcastle-upon-Tyne (United Kingdom), and CIMNE and FORUM for Manresa (Spain).

Section 3, dealing with the technical information of the data sources, has been developed together with FUNITEC, which has provided the template of the standard information package (data source fields).

Detailed reviews of the deliverable 3.1 were conducted by Álvaro Sicilia (FUNITEC) and Andreas Nolle (HAS) and the final version of the report was proofread by Martin Carpenter (UoT).

1.3 Relations to other activities in the project

The SEMANCO project methodology was described in Section B1.3 of the DoW and visualized in the diagram of Figure 2. Deliverable 1.8 – *Project Methodology (1)* – is aimed at presenting the methodology which has been developed to integrate the tasks carried out in the different work packages.
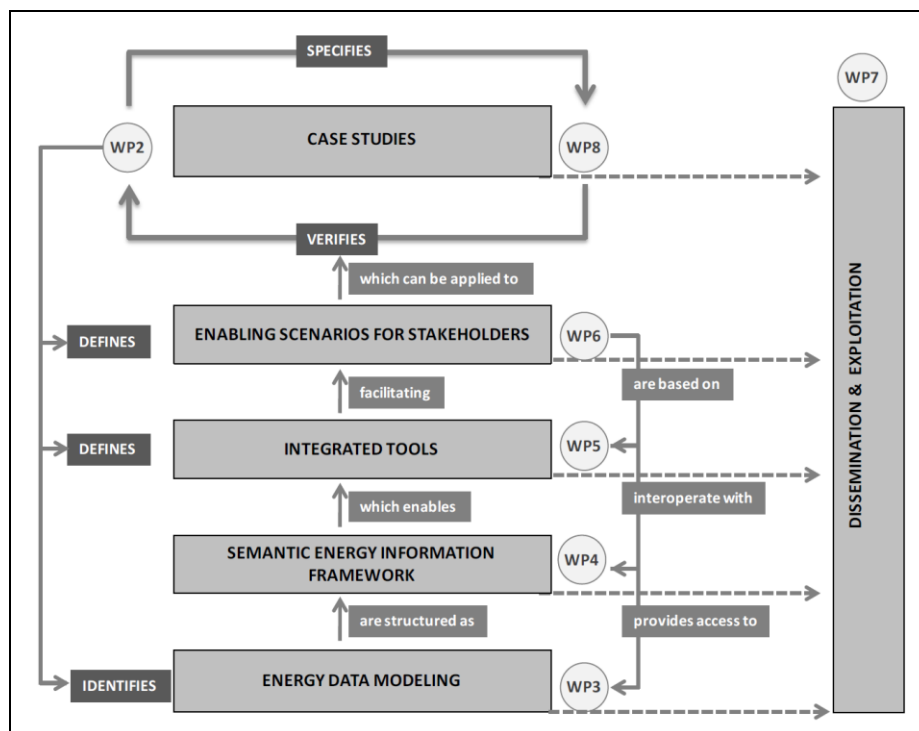
Figure 2. Structure of the work packages of SEMANCO and their interrelationships[2]

With reference to D1.8, even though the original work plan structure remains valid (see Figure 2), it has undergone some developments as a result of its implementation during the first year of the project. Essentially, we have moved from following a linear approach to technological development to a network of connections between the different project

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[2] DoW, Part B, p. 26.

components. This approach has been found to be necessary due to the need for simultaneous development within the different WPs, their tasks and their related deliverables:

- The first iteration begins with the case study descriptions in WP2, about the specification of the tools required in the case of studies, at different geographical scales.

- The available data sources (WP3) are the precondition for the ontology design (WP4). In particular, the analysis of data and data sources are provided in the present report (D3.1), while the ontological modeling specifications will concern the subsequent deliverables of WP3.

- The semantic data is used by the tools (WP5).

- A methodology is provided to facilitate their use in the different application realms (WP6).

- The iteration ends up with the implementation in WP8.

The simultaneous development of the different work packages and their tasks is accompanied by the simultaneous elaboration of the related deliverables. In fact, the present D3.1 is carried out at the same time with the following deliverables:

- D2.2 - *Strategies and indicators for data modelling and data analysis*, which identifies benchmarks and baselines for the different performance indicators for monitoring the low carbon emissions in each case study, the desired targets and the planning strategies to achieve them.

- D2.3 - *Impact evaluation*, which provides strategies which will enable to verify the impact of the integrated tools and associated methodologies which will be then applied in WP 8 in three yearly cycles.

- D6.4 - *Knowledge management system*, which has the aim to improve the interaction efficiency between the work packages and as time progresses, between the components developed in the work packages. It is based on the development of a "Knowledge management system" (Wikimedia-Software).

- D8.1 - *Implementation plan development*, which provides a detailed implementation plan for each case study scenario including measurement parameters, indicators of success, contingency plans and key control points in the process.

As described in D1.8, ontologies are at the core of the SEMANCO project. Building an ontology necessarily requires the integration of domains, of data, of tools, of users, of stakeholders, etc. The process of building an ontology therefore demands a multiple view approach of the different dimensions of the project development in order that the different components involved can be integrated. To facilitate the integration of the different areas of the project, a methodology based on Use Cases has been adopted. A Use Case is the bond connecting the tasks carried out in the different WPs. It also provides the bridge between the WPs and the demonstration scenarios.

A Case Study refers to the delimitation of the research scope to some geographic locations and what they convey in terms of problem definition, stakeholders, methods and so on. A Use Case, on the other hand, delimits a specific research problem which can be circumscribed to one or several case studies. The Use Case is as a frame which encapsulates data, service and actors, as well as their interrelationships in order to achieve a strategic goal concerning carbon reduction. Use Cases can be defined as single entities or as being part of a network of use cases. Each Use Case is composed of a network of Activities which need to be performed to fulfil the goal of the Use Case. Some of the Activities are shared by several Use Cases.
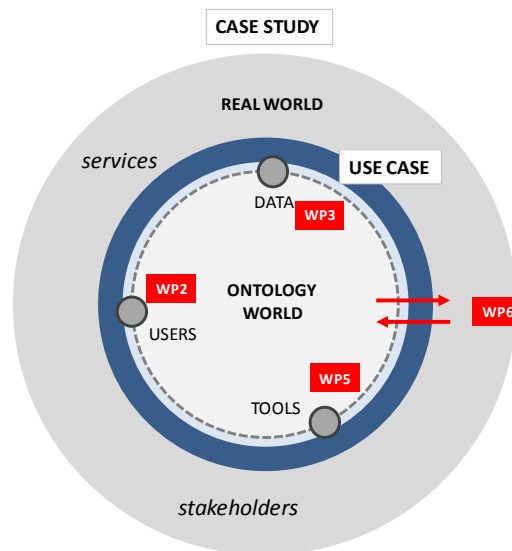
Figure 3. Integration of Case Studies and Use Cases in the development of the ontology[3]

As highlighted in Figure 3, the Use Case methodology connects the different WPs. Thus, it deals also with WP3 concerning data and their involvement in the ontological modeling. In particular, the role of WP3 in the Use Case methodology regards the following issues:

- the identification of input data to fulfil the Activity goal in the Use Case,

- the semantic modeling of energy data and energy related data according to technical standards,

- the check of the technical accessibility of data sources to develop the Ontology Repository.
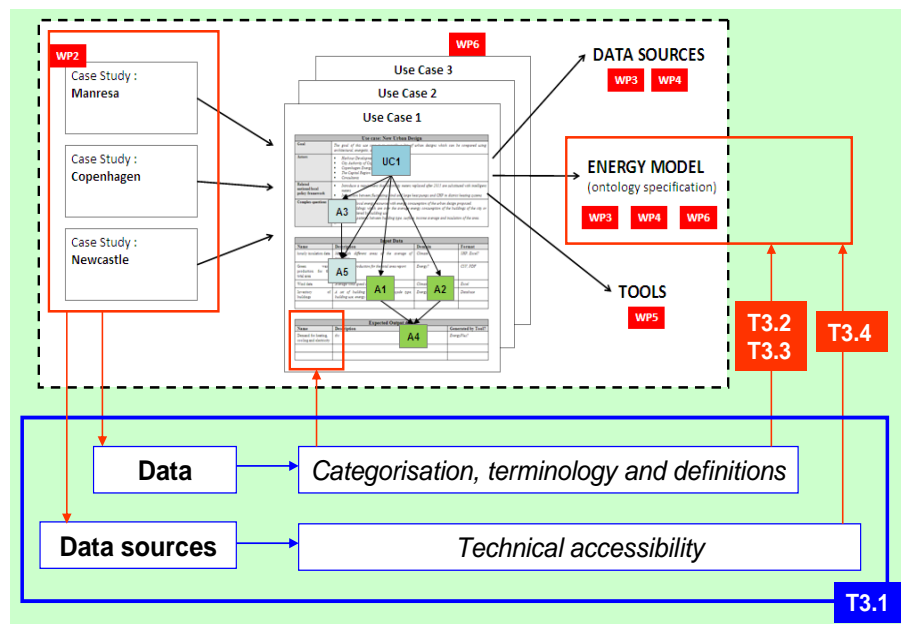
Figure 4. The role of T3.1 in the Use case methodology

In WP3, the role of Task 3.1 in the Use Case methodology is to put the basis for the development of the above three listed issues. In fact, as shown in Figure 4, Task 3.1 concerns data and data sources derived from WP2 (case studies analysis) and follows a double route:

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[3] D1.8, *Project Methodology (1)*.

- the data characterisation, providing terminology and definitions by technical standards,

- the data sources information, providing a technical analysis of the mechanisms used to access data.

The former will affect both the Activities tables, through the use of the same terminology in the "input data" section name (see Figure 5), and the semantic modeling of data, concerning the subsequent Tasks 3.2 and 3.3, through the development of the Standard Tables to which the Activity issues are referred (see Figure 6).

The latter will affect also the semantic modeling of data, but regarding the technical accessibility of data sources for the development of Task 3.4.

Input Data

Name	Description	Domain	Format
Public building energy consumption	Real or billed monthly data of public buildings, from an Internet Energy Information System (SIE)	Energy consumption	SQL database
Energy consumption of public building	Hourly and quartly data of energy consumption, weather data, Tindoor, and Temperature and flow data of HVAC system, for around 75 public housing	Energy consumption	SQL database
Technical data of refurbished buildings	All technical and plot data from technical projects of around 5 blocks of public housing rebuilded or refurbished in the case study area (casc antic)	Technical data of buildings	CAD, and .doc, .xls files
Energy legal requirements of new buildings	Ratio (kWh/m2, TnCO2/m2) and technical specifications for new housing buildings according to Energy code in Spain (simplified)	Energy legal requirements of new buildings	.xls
Technical data of new buildings	Geometrical and technical data of some new private housing, public housing and public buildings public housing buildings in the cases studies (two new urban planning for SEMANCO validation)	Technical data buildings	CAD, and .doc, .xls files, and .shp files
GIS data			

Expected Output data

Name	Description	Generated by Tool?

Figure 5. Example of Input Data table and Expected Output Data table of the Activity template

Name					Description	Referenc
Building					construction as a whole, including its envelope and all technical building systems, for which energy is used to condition the indoor climate, to provide domestic hot water and illumination and other services related to the use of the building	EN 15603
has	space				enclosed space within a building	ANSI/ASHRAE
	has	use				
		has	occupancy			
			has	profile of use		
			has	building management		
			has	…		
			has	…		
	is	conditioned space			heated and/or cooled space	EN 15603 EN ISO 137
		has	cs_geometry			
		has	cs_envelope		the exterior plus semi-exterior portions of a building (separing conditioned space from external environment or from unconditioned space)	ANSI/ASHRAE
		has	cs_building structure			
		has	internal heat source		occupants, appliances such as domestic appliances, office equipment, etc.	EN ISO 137

Figure 6. Example of a Standard Table linked to the Activity issues

2 CHARACTERISTICS OF DATA

2.1 Categories of data

Ontological data modelling requires a common and shared terminology. The definitions of terms and their conceptualisation are provided by the literature, and specifically by the international technical standards, which supply the correct terminology, the descriptions and, if applicable, the symbols of the defined quantities.

Because of the different origin and the wide numerical quantity of data necessary to develop an energy and environmental analysis at different geographical scales, it is necessary to collect data and classify them in categories. There is a lack of references and standards at urban scale that establish the data categories and the information necessary for their description. For this reason, the data categories and the information package (data fields) were defined from the heterogeneous information provided in the data sets of the SEMANCO case studies. The defined categories were applied to classify and collocate the available data relating to each case study.

The following data categories were identified:

- energy data,

- energy cost data,

- climatic data,

- environmental data,

- building technical data,

- legislative constraints,

- geographical data,

- land and buildings registry data,

- urban planning data,

- socio-economic data,

- demographic data.

In the following subsections, a description of each category and the identification of sub-categories, if applicable, are reported. The main data that can be referred to each category or sub-category are described. A definition, the symbol and the unit, if applicable, are provided from international or European technical standards or other international references.

2.1.1 Energy data

The "energy data" category includes the data referred to the energy quantities. The main energy data with their definitions are listed as follows. If the definition is taken or derived from an international and/or European technical standard, the reference is reported.

- **Auxiliary energy**: electrical energy used by technical building systems for heating, cooling, ventilation and/or domestic water to support energy transformation to satisfy energy needs (ISO TR 16344, CEN/TR 15615, EN 15603).

- **CO_2 emission coefficient**: for a given energy carrier, quantity of CO_2 emitted to the atmosphere per unit of delivered energy (ISO TR 16344, CEN/TR 15615, EN 15603).

- **CO_2 emissions**: quantity of CO_2 emitted to the atmosphere (derived from the "CO_2 emission coefficient" definition).

- **Delivered energy**: energy, expressed per energy carrier, supplied to the technical building systems through the system boundary, to satisfy the uses taken into account (heating, cooling, ventilation, domestic hot water, lighting, appliances etc.) or to produce electricity (ISO TR 16344, EN 15603).

- **Energy demand (or energy required)**: total energy required to achieve the building performance and comfort over a given period of time including HVAC, lighting, occupancy, domestic hot water …etc) (ISO TR 16344); requirement for energy consumption of energy source(s) by an energy using system at a given instant or averaged over any designated interval of time (ISO/IEC CD 13273).

- **Energy supply**: amount of energy delivered to meet an energy demand at a given instant or averaged over any designated interval of time (ISO/IEC CD 13273).

- **Exported energy**: energy, expressed per energy carrier, delivered by the technical building systems through the system boundary and used outside the system boundary (ISO TR 16344, EN 15603).

- **Final energy (or energy used)**: energy as received by an energy using system (ISO/IEC CD 13273); the total purchased energy (fossil, electric) excluding renewables consumed to achieve the required building performance and comfort over a given period of time (ISO TR 16344).

- **Primary energy**: energy that has not been subjected to any conversion or transformation process. For a building, it is the energy used to produce the energy delivered to the building. It is calculated from the delivered and exported amounts of energy carriers, using conversion factors (ISO/IEC CD 13273, ISO TR 16344, EN 15603).

- **Produced renewable thermal/electrical power/energy**: thermal/electrical power/energy produced by technical building systems using renewable energy sources, which are not depleted by extraction, such as:

   a. solar energy (thermal),

   b. solar energy (photovoltaic),

   c. wind,

   d. water power,

   e. renewed biomass (derived from ISO TR 16344).

- **RES coverage**: or renewable energy sources coverage, it is the ratio of the energy demand covered by renewable energy sources to the total energy required by an energy service.

The units of the energy quantities could be [J] or [Wh]. Instead, the thermal/electrical power is expressed in [W]. The energy quantities could be also provided normalised on parameters, such as for instance [m^2] or [m^3]. The CO_2 emissions are reported in a weight unit (e.g. [kg$_{CO2}$] or [g$_{CO2}$]), or normalised on an energy quantity, i.e. in the case of the CO_2 emission coefficient.

2.1.2 Energy cost data

The "energy cost data" category includes the data of:

- **energy cost**, with reference to the cost of the consumed energy, or the cost of the energy savings due to retrofit actions on the building stock, or the cost of produced/exported

energy,

- **investment cost**, with reference to the cost for erecting new buildings and/or installing new systems, or the cost for applying energy refurbishment measures on existing buildings and systems.

The **energy cost** is expressed as the cost of each energy carrier (e.g. energy cost - natural gas, energy cost - electricity, etc.), to which the following terms of the "energy data" category, for instance, can refer:

- auxiliary energy (the energy carrier is only electricity),

- delivered energy,

- energy supply,

- exported energy,

- produced renewable thermal/electrical power/energy.

With reference to the **investment cost**, it can refer to, for instance:

- new constructions,

- refurbishment actions.

2.1.3 Climatic data

The "climatic data" category includes the datasets that define the climatic conditions of a given geographical area. The main climatic data are listed in the following. The definitions, the symbols and the units are provided by the technical standard EN ISO 15927-1.

- **Air temperature** (θ): the unit is [°C].

- **Diffuse solar irradiance** ($G_{s,d}$): irradiance generated by the reception of scattered solar radiation from the full sky hemisphere on a horizontal plane, with the exception of that solid angle which is used to measure the direct solar irradiance. The unit is [W/m^2].

- **Direct solar irradiance** ($G_{s,b}$): irradiance generated by the reception of solar radiation on a horizontal plane from a conical angle which surrounds concentrically the apparent solar disk. The unit is [W/m^2].

- **Global solar irradiance** ($G_{s,g}$): irradiance generated by reception of solar radiation from the full hemisphere on a horizontal plane. The unit is [W/m^2].

- **Gust wind speed** ($\hat{v}$): greatest instantaneous wind speed observed during the period over which the mean is calculated. The unit is [m/s].

- **Mixing ratio** (x): ratio of the mass of water vapour to the mass of dry air with which the water vapour is associated. The unit is [g/kg].

- **Rainfall total** (R): or equivalent amount of melted solid precipitation. The unit is [mm].

- **Reference wind speed** ($\bar{v}_r$): wind speed measured at a height of 10 m above ground level in open country without nearby obstacles. The unit is [m/s].

- **Relative humidity** (φ): ratio of the vapour pressure of moist air to the vapour pressure it would have if it were saturated. The unit is [-].

- **Solar declination** (δ_s): the angle between the equatorial plane and the straight line joining the centre of the earth and the sun. The unit is [°].

- **Solar irradiance (G_s):** radiation power per area generated by the reception of solar radiation on a plane of any tilt and orientation. The unit is [W/m^2].

- **Solar irradiation (H_s):** radiant energy per area received on a surface of defined inclination and orientation during a given period of time. The unit is [MJ/m^2].

- **Water vapour pressure (p):** part of the total atmospheric pressure exerted by water vapour. The unit is [hPa].

- **Wind direction (D):** the wind direction is measured clockwise from North.

- **Wind speed (v):** the unit is [m/s].

Some of these quantities could be also referred to either:

        a.   a mean value (e.g. mean air temperature), or

        b.   a minimum value (e.g. minimum air temperature), or

        c.   a maximum value (e.g. maximum air temperature).

2.1.4 Environmental data

The "environmental data" category includes all the data referred to the principal air pollutants in the urban area. There are six principal, or "criteria" pollutants regulated by the US-EPA and most countries in the world. The following six pollutants can be included into the "environmental data" category, as stated by Daly & Zannetti, 2007.

- **Total suspended particulate matter (TSP)**, with additional subcategories of particles smaller then 10 μm in diameter (PM$_{10}$), and particles smaller than 2.5 μm in diameter (PM$_{2.5}$). PM can exist in solid or liquid form, and includes smoke, dust, aerosols, metallic oxides, and pollen. Sources of PM include combustion, factories, construction, demolition, agricultural activities, motor vehicles, and wood burning. Inhalation of enough PM over time increases the risk of chronic respiratory disease.

- **Sulphur dioxide (SO$_2$)**. This compound is colourless, but has a suffocating, pungent odour. The primary source of SO$_2$ is the combustion of sulphur-containing fuels (e.g., oil and coal). Exposure to SO$_2$ can cause the irritation of lung tissues and can damage health and materials.

- **Nitrogen oxides (NO and NO$_2$)**. NO$_2$ is a reddish-brown gas with a sharp odour. The primary source of this gas is vehicle traffic, and it plays a role in the formation of tropospheric ozone. Large concentrations can reduce visibility and increase the risk of acute and chronic respiratory disease.

- **Carbon monoxide (CO)**. This odourless, colourless gas is formed from the incomplete combustion of fuels. Thus, the largest source of CO today is motor vehicles. Inhalation of CO reduces the amount of oxygen in the bloodstream, and high concentrations can lead to headaches, dizziness, unconsciousness, and death.

- **Ozone (O$_3$)**. Tropospheric ("low-level") ozone is a secondary pollutant formed when sunlight causes photochemical reactions involving NO$_X$ and VOCs. Automobiles are the largest source of VOCs necessary for these reactions. Ozone concentrations tend to peak in the afternoon, and can cause eye irritation, aggravation of respiratory diseases, and damage to plants and animals.

- **Lead (Pb)**. The largest source of Pb in the atmosphere has been from leaded gasoline combustion, but with the gradual elimination worldwide of lead in gasoline, air Pb levels have decreased considerably. Other airborne sources include combustion of solid waste, coal, and oils, emissions from iron and steel production and lead smelters,

and tobacco smoke. Exposure to Pb can affect the blood, kidneys, and nervous, immune, cardiovascular, and reproductive systems.

2.1.5 Building technical data

The "building technical data" category can be subdivided in more sub-categories, due to the wide range of data covered by it. The following sub-categories could be taken into account:

- *building general data,*
- *building use,*
- *building external surroundings,*
- *building geometry,*
- *building construction,*
- *technical building systems,*

The *building general data* sub-category includes the following data:

- building age,
- building typology,
- conservation state,
- etc.

The *building use* sub-category includes the following data:

- building use,
- crowding index,
- occupancy profile,
- percentage of occupation,
- indoor air temperature (space heating),
- indoor air temperature (cooling),
- air exchange rate,
- internal heat gains,
- etc.

As far as building use is concerned, Directive 2010/31/EU of the European Parliament and of the Council on 19 may 2010 on the energy performance of buildings (EPBD Recast) provides a classification of the major building uses, such as:

- single-family houses of different types,
- apartment blocks,
- offices,
- educational buildings,
- hospitals,
- hotels and restaurants,
- sports facilities,
- wholesale and retail trade services buildings,
- other types of energy-consuming buildings.

Other building use classifications will be taken into account, for instance from other international standard references, with particular consideration given to those addressing a specific part of the case studies.

The *building external surroundings* sub-category includes the data defining the external context (surroundings) of the building. The principal data of this sub-category are the following:

- ground ρ-value,

- ground α-value,

- external obstructions,

- etc.

The *building geometry* sub-category includes the dimensional data of the building. The principal data of this sub-category are the followings:

- floor area:

    o gross floor area:

        ▪ conditioned gross floor area,

        ▪ unconditioned gross floor area,

    o net floor area:

        ▪ conditioned net floor area,

        ▪ unconditioned net floor area,

- volume:

    o gross volume:

        ▪ conditioned gross volume,

        ▪ unconditioned gross volume,

    o net volume:

        ▪ conditioned net volume,

        ▪ unconditioned net volume,

- height,

- orientation,

- thermal envelope area:

    o thermal envelope area – external dimension,

    o thermal envelope area – internal dimension,

    o thermal envelope area – overall internal dimension,

- number of complete storeys,

- number of apartments,

- shape factor,

- compactness ratio,

- building coordinates (this offers an alternative to the calculation of the geometric data),

- etc.

The *building construction* sub-category is referred to the following building components:

- wall,
- roof,
- ceiling,
- floor,
- door,
- window,
- skylight,
- glass,
- overhang,
- fin,
- internal partitions,
- building structure,
- other components (e.g. chimneys, flues, etc.),
- etc.

For each building component, the principal data are the followings:

- type of <component>,
- number of <components>,
- <component> orientation,
- <component> adjoining space,
- <component> dimensions,
- <component> area,
- <component> percentage,
- <component> thickness,
- <component> insulation,
- <component> insulation thickness,
- <component> U-value,
- <component> α-value (only for the opaque building components),
- <component> g-value (only for the fenestration),
- <component> F_{sh}-value (only for the fenestration),
- <component> percentage draught proofing,
- etc.

The *technical building systems* sub-category includes the data on the technical systems of the building. They refer to different energy services, which are classified by technical standard EN 15603 as follows:

- space heating,

- cooling and dehumidification,

- domestic hot water,

- ventilation and humidification,

- lighting,

- other services (e.g. electrical appliances, …).

For each technical system, the principal data are the followings:

- type of technical system,

- type of subsystem, such as:

    o emission,

    o control,

    o distribution,

    o storage,

    o generation (e.g. boiler, heat pump, thermal solar plant, photovoltaic, etc.)

- thermal/electrical power installed,

- efficiency,

- energy source,

- energy carrier,

- etc.

2.1.6 Legislative constraints

The "legislative constraints" category includes the data fixed as requirements by legislation. These requirements are usually applied to new constructions or to retrofit actions of existing buildings. The legislative constraints refer to some data names already described in the following categories:

- "energy data" category (e.g. primary energy, CO_2 emissions, etc.),

- "building technical data" category (e.g. wall U-value, efficiency - space heating, etc.),

- etc.

2.1.7 Geographical data

The "geographical data" category refers to data included in the "Geographic Information System" (GIS). The GIS is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. The delivered information by the GIS is usually classified in terms of:

- *geometric data*, relative to the cartographic representation of the objects represented, such as the shape (point, line, polygon), the size and location;

- *topologic data*, related to the mutual relations between objects (connection, adjacency, inclusion, etc ...);

- *informative data*, about the data (numerical, text, etc. ...) associated with each object.

Due to the different nature of the information provided by the GIS and the high quantity of data delivered by the system, the geographical data for each case study of SEMANCO are provided and classified through an identification code, which summarises different types of information. Then, the single data items, according to the topic, are split and classified in the

relative data categories.

2.1.8 Land and buildings registry data

The "land and buildings registry data" category includes the data referring to the cadastre, for different scales or levels of analysis, i.e. from the territorial level to the building scale.

The definition of the registry or cadastre is provided by the International Federation of Surveyors (FIG) in the "Statement on the Cadastre" (1994). A cadastre is defined as "normally a parcel based, and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection".

Examples of the data of general interests to a wide user community, that are usually considered part of the cadastre, could be divided in the following sub-categories:

- *land parcels,*

- *land tenure,*

- *land value.*

The *land parcels* sub-category includes, for instance, the following data:

- location,

- boundaries,

- coordinates,

- total surface,

- built surface,

- etc.

The *land tenure* sub-category includes, for instance, the following data:

- property rights,

- ownership,

- leases,

- property regime,

- etc.

The *land value* sub-category includes, for instance, the following data:

- land quality,

- land classification (e.g. urban land, rural land, etc.),

- economic value,

- tax value,

- value of improvements,

- etc.

Other information can also be connected to land parcels through the unique parcel identifiers

and through cadastral index maps. Such information includes:

- buildings and other improvements,

- agricultural data (land capability classifications, land use),

- forestry data,

- utilities (e.g. water, electricity, communications),

- fisheries (noting individuals holding rights in inland and coastal waters),

- environmental quality (particularly for site-specific analysis and monitoring),

- demography (population statistics, consumer marketing data, etc.).

For the purpose of Task 3.1 and taking into account the development and the objectives of WP3, some of the listed items have been considered to fall into other categories of data, for example, "utilities" in the "urban planning data" category (see section 2.1.9), "environmental quality" in the "environmental data" category (see section 2.1.4), "demography" in the "demographic data" category (see 2.1.11).

As far as the buildings are concerned, their data are included in the "building technical data" category for the data concerning the building geometry, the use, the construction and thermal systems characteristics. The registry data of buildings is instead considered a parallel category of the land registry data in the present section. The principal *building registry data* could be considered the followings:

- number of buildings,

- cadastral reference,

- cadastral area,

- cadastral rooms,

- graphic information,

- owner,

- etc.

2.1.9 Urban planning data

According to what stated by Koh (2001), traditionally the data for urban planning come from the land register's land category or the building register's major usage. However, urban land data also consider, for instance, the **land use** (e.g. building land, or no-building land) and the **area of activity** data. The area of activity could be classified according to the ISIC (International Standard Industrial Classification of All Economic Activities), which provides more accurate and scientific land use information than the data from the land register.

A standard terminology is provided by the ISIC. The structure of the ISIC classification is very wide; the main fields of the structure are the followings:

- A – Agriculture, hunting and forestry

- B – Fishing

- C – Mining and quarrying

- D – Manufacturing

- E – Electricity, gas and water supply

- F – Construction

- G – Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and

household goods

- H – Hotels and restaurants

- I – Transport, storage and communications

- J – Financial intermediation

- K – Real estate, renting and business activities

- L – Public administration and defence; compulsory social security

- M – Education

- N – Health and social work

- O – Other community, social and personal service activities

- P – Private households with employed persons

- Q – Extra-territorial organisations and bodies

Other urban planning data types could be identified:

- planned buildings (with information on buildable volume and heights, etc.),

- planned communication ways (e.g. roads, streets, etc.),

- planned public facilities and utilities.

2.1.10 Socio-economic data

The "socio-economic data" category includes overall basic social and economic data. A classification of socio-economic data is provided by the United Nation Statistics Division, under the section "Demographic and social topics". The "socio-economic data" category will include only the social topics, so that the following principal sub-categories can be identified:

- *housing*,

- *families and households*,

- *economic activity*,

- *income and poverty*.

The following data can be included under the *housing* sub-category:

- occupancy status,

- number of rooms,

- number of occupants,

- type of ownership (e.g. owns outright, owns with a mortgage or loan, shared ownership, etc.),

- property price,

- social rented (e.g. general, from Local Authority, other, etc.),

- private rented (e.g. general, landlord or letting agency, employer of a household member, relative or friend of a household member, other, etc.),

- rental,

- rental free,

- etc.

The following data can be included under the *families and households* sub-category:

- number of nuclear families,

- size of nuclear family,

- type of nuclear family,

- number of households,

- size of household,

- type of household.

The following data can be included under the *economic activity* sub-category:

- employment,

- unemployment,

- occupations,

- earnings,

- hours worked.

The following data can be included under the *income and poverty* sub-category:

- income,

- poverty (e.g. fuel poverty).

2.1.11 Demographic data

The "demographic data" category includes overall basic data on population characteristics. Together with the socio-economic data, a classification of demographic data is provided by the United Nation Statistics Division, under the section "Demographic and social topics". The "demographic data" category will include only the general topics on population, so that the following principal sub-categories can be identified:

- *population*,

- *learning and education*.

The following data can be included under the *population* sub-category:

- size,

- gender,

- age,

- birth date,

- density,

- origin,

- nationality,

- religion,

- language,

- etc.

The following data can be included under the *learning and education* sub-category:

- learning level,

- education level,

- etc.

2.2 Data fields

2.2.1 Common data fields

The data listed in Section 2.1 according to the different categories can be described in a detailed way by means of data fields. Each of the following fields is applicable to all of the presented data.

- **Category**: This is the main category of the datum, as presented in Section 2.1. The following categories have been identified: "energy data", "energy cost data", "climatic data", "environmental data", "building technical data", "legislative constraints", "geographical data", "land and buildings registry data", "urban planning data", "socio-economic data", "demographic data".

- **Name**: This is the name of the datum. The main data have been presented in Section 2.1 for each category. For each datum, a name has been provided. For example, the following data names have been reported for the "energy data" category: "auxiliary energy", "CO_2 emission coefficient", "CO_2 emissions", "delivered energy", etc.

- **Long name**: This is the long name of the datum, which provides a specification. This field is free, no conventional terminology should be used for the data specification. For example, referring to the "CO_2 emission coefficient" the following long name could be provided: "CO_2 emission coefficients for different energy carriers".

- **Description**: This is the free textual description of the datum, i.e. a sort of note to be provided in order to detail the information delivered by the datum.

- **Reference**: This is the standard reference in which the datum is defined, e.g. a technical standard, national regulations, etc.

- **Format**: This is the format of the data file, e.g. ".xls", ".csv", ".doc", ".pdf", ".dwg", ".dxf", etc.

- **Source**: This is the name of the source that includes the datum. The same name of the source should be also provided in the template of Section 3.1.1 concerning the information on the technical accessibility of the data source.

- **Owner**: This is the person or the institution that has ownership of the datum (e.g. Meteorological Agency, Government, Municipality, etc.).

- **Author**: This is the person or the institution that produced the datum, not necessarily coincident with the owner of the datum (e.g. University, Research Institute, etc.).

- **Access type**: This is the way in which the datum might be accessed (e.g. web, by email, export from …, etc.).

- **Availability**: This represents the level at which it is possible to access the datum (e.g. public, private with license …, etc.).

- **Reliability**: This represents the trustworthiness level of the datum (e.g. high, medium, low).

- **Relevance for the purpose**: This represents the significance level of the datum for the purpose of the project (e.g. high, medium, low).

2.2.2 Specific data fields

Other data fields should be provided in order to detail the characteristics of the available data. These data fields are specific of some types of data and they cannot be applied to all the

datasets due to the particular supplied information.

The specific data fields are the following:

- **Symbol**: This is the symbol of the datum, to be usually provided by technical standards (e.g. "θ" for "air temperature", "v" for "wind speed", etc.).

- **Unit**: This is the unit for numerical data (e.g. [kg_{CO2}/kWh] for "CO_2 emission coefficient", [m^3] for "volume", [$W/(m^2K)$] for "<component> U-value", etc.).

- **Geographical area**: This is the geographical area to which the datum refers. It could be a country, a region, a city … (e.g. Spain, Catalunia, Manresa ...).

- **Scale**: This is the scale level in the geographical area to which the datum refers (e.g. micro, meso, macro, or building, neighbourhood, municipality, region …).

- **Way of determination**: This is the way applied to determine the datum (e.g. measured, calculated, statistical …).

- **Way of aggregation**: This represents the type of aggregation used to provide the datum, starting from a different amount of available data (e.g. "no aggregation", if the datum is not the result of an aggregation of data; "sum", if the datum results from an addition of data; "percentage", if the datum represent a percentage on a total value; "average", if the datum is the mean value of data).

- **Temporal scale**: For data related to a period, this represents the temporal scale to which the datum refers (e.g. annual, seasonal, monthly, daily, hourly …).

- **Temporal range**: This represents the temporal range to which the datum refers (e.g. <year>, from <year> to <year>, from <month-year> to <month-year>, etc.).

- **Validity conditions**: Only for legislative constraints, the field represents the conditions in which legislative constraints can be applied (e.g. existent building to be refurbished, future construction, etc.).

For each of the analysed data in Section 2.1, a correspondence between the data and the specific data fields that could be applied is highlighted from Table 1 to Table 9, according to the different data categories.

Among the data categories, the "legislative constraints" are not reported because they already refer to data included in other categories (e.g. "energy data", "building technical data"). They inherit the fields of the associated data, plus the "validity conditions" field.

Additionally the "geographical data" category is not reported due to the high amount of data and related information that are delivered by the GIS and which cannot feasibly be classified here.

Table 1. Specific data fields for the data included in the "energy data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Energy data	-	Auxiliary energy	x	x	x	x	x	x	x	x
		CO_2 emission coefficient	x	x	x	x	x	x		x
		CO_2 emissions	x	x	x	x	x	x	x	x

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
		Delivered energy	x	x	x	x	x	x	x	x
		Energy demand (or energy required)	x	x	x	x	x	x	x	x
		Energy supply	x	x	x	x	x	x	x	x
		Exported energy	x	x	x	x	x	x	x	x
		Final energy (or energy used)	x	x	x	x	x	x	x	x
		Primary energy	x	x	x	x	x	x	x	x
		Produced renewable thermal/electrical power/energy	x	x	x	x	x	x	x	x
		RES coverage	x	x	x	x	x	x	x	x
		…								

For each energy data, three more fields are provided:

- **Energy service**: related to the services provided by the technical building systems and by appliances to provide the indoor climate condition, illumination and other services related to the use of the building (e.g. space heating, cooling and dehumidification, domestic hot water, etc.).

- **Energy carrier**: substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes (e.g. electricity, natural gas, etc.).

- **Energy source**: source from which useful energy can be extracted or recovered either directly or by means of a conversion or transformation process (e.g. wind, sun, etc.).

Table 2. Specific data fields for the data included in the "energy cost data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Energy cost data	-	Energy cost	x	x	x	x	x	x	x	x
		Investment cost	x	x	x	x	x	x		x
		…								

Table 3. Specific data fields for the data included in the "climatic data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Climatic data	-	Air temperature	x	x	x	x	x	x	x	x
		Diffuse solar irradiance	x	x	x	x	x	x	x	x
		Direct solar irradiance	x	x	x	x	x	x	x	x
		Global solar irradiance	x	x	x	x	x	x	x	x
		Gust wind speed	x	x	x	x	x	x	x	x
		Mixing ratio	x	x	x	x	x	x	x	x
		Rainfall total	x	x	x	x	x	x	x	x
		Reference wind speed	x	x	x	x	x	x	x	x
		Relative humidity	x	x	x	x	x	x	x	x
		Solar declination	x	x	x	x	x	x	x	x
		Solar irradiance	x	x	x	x	x	x	x	x
		Solar irradiation	x	x	x	x	x	x	x	x
		Water vapour pressure	x	x	x	x	x	x	x	x
		Wind direction	x	x	x	x	x	x	x	x
		Wind speed	x	x	x	x	x	x	x	x
		…								

Table 4. Specific data fields for the data included in the "environment data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Environmental data	-	Total suspended particulate matter	x	x	x	x	x	x	x	x
		Sulphur dioxide	x	x	x	x	x	x	x	x
		Nitrogen oxides	x	x	x	x	x	x	x	x
		Carbon monoxide	x	x	x	x	x	x	x	x
		Ozone	x	x	x	x	x	x	x	x
		Lead	x	x	x	x	x	x	x	x
		…								

Table 5. Specific data fields for the data included in the "building technical data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Building technical data	*Building general data*	Building age			x	x	x	x		x
		Building typology			x	x	x	x		
		Conservation state			x	x		x		x
		…								
	Building use	Building use			x	x	x	x		x
		Crowding index	x	x	x	x	x	x	x	x
		Occupancy profile			x	x	x	x	x	x
		Percentage of occupation		x	x	x	x	x	x	x
		Indoor air temperature (space heating)	x	x	x	x	x	x	x	x
		Indoor air temperature (cooling)	x	x	x	x	x	x	x	x
		Air exchange rate	x	x	x	x	x	x	x	x
		Internal heat gains	x	x	x	x	x	x	x	x
		…								
	Building external surroundings	Ground ρ-value	x	x	x	x	x	x	x	x
		Ground α-value	x	x	x	x	x	x	x	x
		External obstructions			x	x		x		x
		…								
	Building geometry	Floor area	x	x	x	x	x	x		x
		Volume	x	x	x	x	x	x		x
		Height	x	x	x	x	x	x		x
		Orientation	x	x	x	x	x	x		x
		Thermal envelope area	x	x	x	x	x	x		x
		Number of complete storeys			x	x	x	x		x
		Number of apartments			x	x	x	x		x
		Shape factor	x	x	x	x	x	x		x
		Compactness ratio	x	x	x	x	x	x		x
		Building coordinates			x	x	x	x		x
		…								
	Building construction	Type of <component>			x	x		x		x
		Number of <components>			x	x	x	x		x

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
		<Component> orientation		x	x	x		x		x
		<Component> adjoining space			x	x		x		x
		<Component> dimensions		x	x	x	x	x		x
		<Component> area	x	x	x	x	x	x		x
		<Component> percentage		x	x	x	x	x		x
		<Component> thickness	x	x	x	x	x	x		x
		<Component> insulation			x	x		x		x
		<Component> insulation thickness	x	x	x	x	x	x		x
		<Component> U-value	x	x	x	x	x	x		x
		<Component> α-value	x	x	x	x	x	x		x
		<Component> g-value	x	x	x	x	x	x		x
		<Component> F_{sh}-value	x	x	x	x	x	x		x
		<Component> percentage draught proofing		x	x	x	x	x		x
		…								
	Technical building systems	Type of system			x	x		x		x
		Type of subsystem			x	x		x		x
		Thermal/electrical power installed	x	x	x	x	x	x		x
		Efficiency	x	x	x	x	x	x	x	x
		Energy source			x	x		x		x
		Energy carrier			x	x		x		x
		…								

Table 6. Specific data fields for the data included in the "land and buildings registry data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Land and buildings registry data	*Land parcels*	Location			x	x		x		x
		Boundaries			x	x		x		x
		Coordinates			x	x	x	x		x
		Total surface	x	x	x	x	x	x		x
		Built surface	x	x	x	x	x	x		x

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
		…								
	Land tenure	Property rights			x	x		x		x
		Ownership			x	x		x		x
		Leases			x	x		x		x
		Property regime			x	x		x		x
		…								
	Land value	Land quality			x	x		x		x
		Land classification			x	x		x		x
		Economic value		x	x	x	x	x		x
		Tax value		x	x	x	x	x		x
		Value of improvements		x	x	x	x	x		x
		…								
	Building registry data	Number of buildings			x	x	x	x		x
		Cadastral reference			x	x		x		x
		Cadastral area	x	x	x	x	x	x		x
		Cadastral rooms			x	x	x	x		x
		Graphic information			x	x		x		x
		Owner			x	x		x		x
		…								

Table 7. Specific data fields for the data included in the "urban planning data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Urban planning data	-	Land use			x	x		x		x
		Area of activity			x	x		x		x
		Planned buildings			x	x		x		x
		Planned communication ways			x	x		x		x
		Planned public facilities and utilities			x	x		x		x
		…								

Table 8. Specific data fields for the data included in the "socio-economic data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Socio-economic data	*Housing*	Occupancy status			x	x	x	x		x
		Number of rooms			x	x	x	x		x
		Number of occupants			x	x	x	x		x
		Type of ownership			x	x	x	x		x
		Property price		x	x	x	x	x		x
		Social rented			x	x	x	x		x
		Private rented			x	x	x	x		x
		Rental		x	x	x	x	x	x	x
		Rental free			x	x	x	x		x
		…								
	Families and households	Number of nuclear families			x	x	x	x		x
		Size of nuclear family			x	x	x	x		x
		Type of nuclear family			x	x	x	x		x
		Number of households			x	x	x	x		x
		Size of household			x	x	x	x		x
		Type of household			x	x	x	x		x
		…								
	Economic activity	Employment			x	x	x	x		x
		Unemployment			x	x	x	x		x
		Occupations			x	x	x	x		x
		Earnings		x	x	x	x	x		x
		Hours worked			x	x	x	x		x
		…								
	Income and poverty	Income		x	x	x	x	x		x
		Poverty			x	x	x	x		x
		…								

Table 9. Specific data fields for the data included in the "demographic data" category

Category	Sub-category	Data (Name)	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Demographic data	*Population*	Size			x	x	x	x		x
		Gender			x	x	x	x		x
		Age			x	x	x	x		x
		Birth date			x	x	x	x		x
		Density		x	x	x	x	x		x
		Origin			x	x	x	x		x
		Nationality			x	x	x	x		x
		Religion			x	x	x	x		x
		Language			x	x	x	x		x
		…								
	Learning and education	Learning level			x	x	x	x		x
		Education level			x	x	x	x		x
		…								

Having defined the data categories, the main data names, the applicable definitions (Section 2.1.) and the common and specific data fields useful to detail the description of the data (Section 2.2), the available data of each case study of SEMANCO were collected and classified into the data tables shown in Appendix A.

3 TECHNICAL ACCESSIBILITY OF DATA

In order to develop the Ontology Repository to manage the data sources of the SEMANCO case studies, the technical availability and accessibility of the data sources has been checked.

A standard information package is provided to collect information on data availability and accessibility. Some fields are supplied in order to classify the necessary information about the characteristics of the data sources.

The technical information of the case studies data sources, according to this standard information package, is shown in Appendix B.

3.1 Data source fields

3.1.1 General information

Table 10 provides some fields for collecting general information on each data source.

Table 10. General information on the data source

Field name		Description
Name	*	Data source name
Long name	*	Data source long name
Description	*	Textual description of the data source
Author	*	Person or Organization who maintains and owns the data source
Contact		Contact email, phone or physical address
URL		URL address pointing to the data source or to a public web page

Domain	*	Domain of interest of the data source
Tags		A set of tags which describes the data source, separated by comas
Number items		Approximate size of the data source
Date range		Time period which is covered by the data
Data availability		Update periodicity *e.g. Real time, once per day/week/month/year,...*

License		A legal document giving official permission to do something with the resource
Reuse options		Information about applicable restrictions when the data source is shared or reused

Format	*	Data format *e.g. XML, CSV, PDF, XLS, RDF, JSON, ...*
Access type	*	Ways for retrieving data *e.g. SPARQL, Web Services, database, downloadable files*

* Mandatory field

3.1.2 Ontology access type

Table 11 provides some fields for collecting information on data sources that have an ontology access type.

Table 11. Ontology access type information

Field name	Description
Ontology schema file	OWL file with the ontology schema, could be and URL or a local file.
RDF/XML data file	Direct link to RDF download file

SPARQL endpoint	URL address pointing to the SPARQL endpoint
SPARQL graph name	Named graph in the SPARQL store

3.1.3 Web services access type

Table 12 provides some fields for collecting information on data sources that have a web services access type.

Table 12. Web services access type information

Field name	Description
Web Service URL	URL address pointing to the Web service
Web Service WSDL	WSDL file containing web service method description

3.1.4 Database access type

Table 13 provides some fields for collecting information on data sources that have a database access type.

Table 13. Database access type information

Field name	Description
Provider	Name of the database provider. *e.g. Oracle, SQLServer, MySQL,…*
Database structure	SQL or UML file containing data base structure, could be a part of the whole structure

4 CONCLUSIONS

4.1 Contribution to overall picture

The present deliverable, carried out in Task 3.1 of Work Package 3, contributed to the development of SEMANCO project because:

- it presents a methodology for classifying data and characterises them by means of a shared terminology to be used in the subsequent process of semantic modeling and of building ontologies, as the core of SEMANCO project,

- it allows for the collection of information about the technical access mechanisms to data. This is necessary for extracting and using them in the subsequent energy and environmental analyses which is one of the primary objectives of the SEMANCO project.

4.2 Impact on other WPs and Tasks

Task 3.1 and deliverable 3.1 have the following impacts on the other WPs and tasks of SEMANCO:

- they put forwards the basis for the semantic modeling of Tasks 3.2 and 3.3, which will identify the relationships between data (concepts) starting from the terminology defined within the present report,

- they informed the access to data for the Ontology Repository (Task 3.4) that will be implemented to manage the data sources and is directly linked to the Semantic Energy Information Framework (WP4).

4.3 Contribution to demonstration

The contribution of Task 3.1 and the present deliverable to the demonstration scenarios (see also D8.1) is directly linked to the Use Case methodology.

As the work conducted in Task 3.1 is mainly focused on the establishment of a shared terminology about data, the task impact will concern:

- the use of the identified "data names" in the Activity table as input data for the analysis,

- the use of the same terminology in the Standard Tables where the relationships among concepts (data) will be established.

4.4 Other conclusions and lessons learned

The classification of data followed in this report took into account all the types of available data of the case studies. However, due to the high quantity of data and their heterogeneous origin, the data list for each data category should not be considered exhaustive. More data could be added for each category and/or sub-category if new data become available, for instance if we consider other case study scenarios.

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6 GLOSSARY

Technical standard

A technical standard is an established norm or requirement about technical systems. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices.

A technical standard may be developed privately or unilaterally, for example by a corporation, regulatory body, military, etc. Standards can also be developed by groups such as trade unions, and trade associations. Standards organizations often have more diverse input and usually develop voluntary standards: these might become mandatory if adopted by a government, business contract, etc. The standardization process may be by edict or may involve the formal consensus of technical experts.

There are two main geographic levels concerning the development of technical standards:

- *National*: for example, by National standards organizations (e.g. AENOR – Spain, BSI – U.K., DIN – Germany, UNI – Italy, etc.),

- *International*: for example, by the International Organisation for Standardisation (ISO) or by the European Committee for Standardisation (CEN).

7 APPENDICES

APPENDIX A. Classification of available data of the case studies

This Appendix presents the characteristics of the available data of the case studies, according to the standard classification described in Sections 2.1 and 2.2.

A.1 North Harbour data tables

Table A1. North Harbour - Energy data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Energy service	Energy carrier	Energy source	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Energy demand	Energy use data	Energy use data divided between households and offices		xls			Expert calculations (1)	Export from the LEAP model (5)	Public	High		Q	kWh/m^2	Space heating, cooling, domestic hot water, electrical appliances	Any		Denmark, Copenhagen, North Harbour	Neighbourhood, city, regional, national (meso/macro)	Calculated	No aggregation	Yearly	From 2012 to 2020
Produced renewable electrical power - wind	The exogenous capacity of wind	The data shows the exogenous capacity of wind, and how it evolves over time		xls			Expert calculations (2)	Export from the LEAP model (5)	Public	High		P	MW		Electricity	Wind	Denmark, Copenhagen, North Harbour	Neighbourhood, city, regional, national (meso/macro)	Calculated	Sum	Hourly Yearly	From 2012 to 2030
Produced renewable electrical power – solar energy (photovoltaic)	Exogenous electrical capacity of solar cells	The data shows the exogenous capacity of solar cells, and how it evolves over time		xls			Expert calculations (3)	Export from the LEAP model (5)	Public	High		P	kW		Electricity	Sun	Denmark, Copenhagen, North Harbour	Neighbourhood, city, regional, national (meso/macro)	Calculated	Sum	Hourly Yearly	From 2012 to 2030
Produced renewable thermal power – solar energy (thermal)	Exogenous heat capacity of solar panels	The data shows the exogenous capacity of solar heating panels, and how it evolves over time		xls			Expert calculations (4)	Export from the LEAP model (5)	Public	High		P	MW		Heat	Sun	Denmark, Copenhagen, North Harbour	Neighbourhood, city, regional, national (meso/macro)	Calculated	Sum	Hourly Yearly	From 2012 to 2030
CO_2 emission coefficient	CO_2 emission factors from energy supply	The data shows the emission factors for the following energy supply alternatives: Central district heating, land based solar heating, geothermal heating, and the electricity grid					Local Energy Utility (Copenhagen Energy) and the National Energy Transmission Company (Energinet.dk)						kg $_{CO2}$/ kWh		Heat, electricity		Denmark, Copenhagen, North Harbour	Neighbourhood, city, regional, national (meso/macro)	Measured, calculated	No aggregation	Yearly	From 2012 to 2030

(1) Calculations are based on current and future energy requirements in building codes.
(2) Calculations are based on hourly wind energy production data from existing off-shore wind farm outside the Harbour of Copenhagen called "Middelgrunden".
(3) Calculations are based on assumptions of total available roof area in North Harbour and efficiency of solar cell panels.
(4) Calculations are based on assumptions of total available roof area in North Harbour and efficiency of solar heating panels.
(5) Fore more information on the LEAP model, please visit: http://sei-us.org/software/leap

Table A2. North Harbour – Energy cost data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Energy cost	Energy prices (DKK/GJ)	Energy prices on different energy supply forms		pdf, xls	Danish Energy Agency: Socio-economic prices assumptions	Danish Energy Agency	Government	Web (1)	Public	Medium	High		EUR/MWh	Denmark	Micro, meso, macro	measured, calculated	No aggregation	Yearly	From 2012-2032
Investment cost	Investment cost for energy technologies	Data on standard investment cost in energy technologies		pdf, xls	Danish Energy Agency: Technology data catalogue	Danish Energy Agency	Government	Web (2)	Public	Medium	High		EUR/MW	Denmark	Micro, meso, macro	measured, calculated	No aggregation	Yearly	

(1) http://www.ens.dk/EN-US/INFO/FACTSANDFIGURES/SCENARIOS/ASSUMPTIONS/Sider/Forside.aspx
(2) http://www.ens.dk/EN-US/INFO/FACTSANDFIGURES/SCENARIOS/Sider/TechnologyData.aspx

Table A3. North Harbour – Climatic data table

Name	Long Name	Description (1)	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Air temperature	Dry bulb air temperature	Hourly air temperature data from DRY dataset		.epw, .txt, .csv	Design Reference Year (DRY) DNK_Copenhagen.06 1800_IWEC	Danish Building Research Institute / ASHRAE	Government/ private	Web	Public		Low	θ	°C	Denmark, Copenhagen		measured, calculated	No aggregation	hourly, daily, weekly, monthly, yearly	Reference year
Relative humidity	Relative atmospheric humidity	Hourly relative atmospheric humidity data from DRY dataset		.epw, .txt, .csv	Design Reference Year (DRY) DNK_Copenhagen.06 1800_IWEC	Danish Building Research Institute / ASHRAE	Government/ private	Web	Public		Low	φ	-	Denmark, Copenhagen		measured, calculated	No aggregation	hourly, daily, weekly, monthly, yearly	Reference year
Wind speed	Wind speed	Hourly wind speed data from DRY dataset		.epw, .txt, .csv	Design Reference Year (DRY) DNK_Copenhagen.06 1800_IWEC	Danish Building Research Institute / ASHRAE	Government/ private	Web	Public		Low	v	m/s	Denmark, Copenhagen		measured, calculated	No aggregation	hourly, daily, weekly, monthly, yearly	Reference year
Wind direction	Wind direction	Hourly wind direction data from DRY dataset		.epw, .txt, .csv	Design Reference Year (DRY) DNK_Copenhagen.06 1800_IWEC	Danish Building Research Institute / ASHRAE	Government/ private	Web	Public		Low	D	compass degrees °	Denmark, Copenhagen		measured, calculated	No aggregation	hourly, daily, weekly, monthly, yearly	Reference year
Rainfall total	Precipitation	Hourly precipitation data from DRY dataset		.epw, .txt, .csv	Design Reference Year (DRY) DNK_Copenhagen.06 1800_IWEC	Danish Building Research Institute / ASHRAE	Government/ private	Web	Public		Low	R	mm	Denmark, Copenhagen		measured, calculated	No aggregation	hourly, daily, weekly, monthly, yearly	Reference year
Solar irradiance	Solar radiation	Hourly solar radiation data from DRY dataset		.epw, .txt, .csv	Design Reference Year (DRY) DNK_Copenhagen.06 1800_IWEC	Danish Building Research Institute / ASHRAE	Government/ private	Web	Public		Low	G_s	W/m^2	Denmark, Copenhagen		measured, calculated	No aggregation	hourly, daily, weekly, monthly, yearly	Reference year

(1) Not used in the North Harbour case, but in other cases with simulation of smart grid heating technologies.

Table A4. North Harbour – Building technical data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Gross floor area	Gross floor area for the built environment (1000 m²)	Data describing the gross area for the built environment within categories e.g. households, offices, public buildings in a baseline scenario		xls	Development plans for the area		CPH City & Port Development, Architects	Export from the LEAP model					1000 m²	Denmark, Copenhagen, North Harbour	meso/macro	Calculated	Sum		From 2012-2030
Floor area		Data on total area of build, distributed on dwelling, commercial and cellar. (1)		csv	Land registry - BBR (Building and Dwelling Registry)		Government	Web - Through licensed Land Surveyor Company	Private with license	High	Medium		m²		Denmark	building, neighbourhood, city, region	Measured	Sum		Date of inquiry
Building use		Typology of building uses (1)		csv	Land registry - BBR (Building and Dwelling Registry)		Government	Web - Through licensed Land Surveyor Company	Private with license	Medium	Medium				Denmark	building, neighbourhood, city, region	Measured	No aggregation		Date of inquiry
Energy source – space heating		Energy source used for heating building (1)		csv	Land registry - BBR (Building and Dwelling Registry)		Government	Web - Through licensed Land Surveyor Company	Private with license	Medium	Medium				Denmark	building, neighbourhood, city, region	Measured	No aggregation		Date of inquiry

(1) Not used in the North Harbour case.
(2) http://sei-us.org/software/leap

Table A5. North Harbour – Land and buildings registry data table

Name	Long Name	Description (1)	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Ownership		Details about the different types of property ownership		csv	Land registry - ESR (Property Main Register)		Government	Web - Through licensed Land Surveyor Company	Private with license	High	medium				Denmark	building, neighbourhood, city, region		No aggregation		Date of inquiry
Cadastral area		Details about cadastral area		csv	Land registry - SVUR (National Sales and Valuation Registry)		Government	Web - Through licensed Land Surveyor Company	Private with license	High	medium		m²		Denmark	building, neighbourhood, city, region		No aggregation		Date of inquiry
Number of buildings		Number of buildings on cadastral		csv	Land registry - BBR (Building and Dwelling Registry)		Government	Web - Through licensed Land Surveyor Company	Private with license	High	medium				Denmark	building, neighbourhood, city, region		Sum		Date of inquiry
Coordinates		Address coordinates for each address		csv	Land registry - ADR (Address Registry)		Government	Web - Through licensed Land Surveyor Company	Private with license	Medium	medium		UTM32 coordinates		Denmark	building, neighbourhood, city, region		No aggregation		Date of inquiry

(1) Not used in the North Harbour case.

Table A6. North Harbour – Urban planning data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Planning info		Information about what local development plan is applicable for a given property		csv	Land registry - PLAN (Planning Registry)		Government	Web - Through licensed Land Surveyor Company	Private with licence	Medium	Medium			Denmark	Building, neighbourhood, city, region		No aggregation		Date of inquiry

Table A7. North Harbour – Socio-economic data table

Name	Long Name	Description (1)	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Income	Income for families	Income for families by region, unit, family type and type of income	StatBank Denmark	xls	INDKF11: Income for families by region, unit, family type and type of income; INDKF31: Disposable income by region, unit, family type and income interval	Statistics Denmark	Government	Web	Public	High	Low		DKK/family	Denmark	City, municipality, region, national	By census	No aggregation		Yearly
Number of nuclear families	Number of families	Number of families by region and family type	StatBank Denmark	xls	INDKF11A: Number of families by region and family type	Statistics Denmark	Government	Web	Public	High	Low			Denmark	City, municipality, region, national	By census	Sum		Yearly
Type of nuclear family	Type of families	Number of families by region and family type	StatBank Denmark	xls	INDKF11A: Number of families by region and family type	Statistics Denmark	Government	Web	Public	High	Low			Denmark	City, municipality, region, national	By census	Sum		Yearly
Number of households	Number of households	Households 1 January by region, type of household and size	StatBank Denmark	xls	FAM55N: Households 1 January by region, type of household and size	Statistics Denmark	Government	Web	Public	High	Low			Denmark	Municipality, region, national	By census	Sum		Yearly
Size of household	Size of households	Households 1 January by region, type of household and size	StatBank Denmark	xls	FAM55N: Households 1 January by region, type of household and size	Statistics Denmark	Government	Web	Public	High	Low		persons	Denmark	Municipality, region, national	By census	No aggregation		Yearly
Property price	Property prices	Price index for sales of property (2006=100) by category of real property (month)	StatBank Denmark	xls	EJEN14: Price index for sales of property (2006=100) by category of real property (month)	Statistics Denmark	Government	Web	Public	High	Low			Denmark	Municipality, region, national	By census	No aggregation		Monthly

(1) Not used in the North Harbour case.

Table A8. North Harbour – Demographic data table

Name	Long Name	Description (1)	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Gender	Distribution of gender		StatBank Denmark	xls	FOLK1: Population at the first day of the quater by region, sex, age, marital status, ancestry, country of origin and citizenship	Statistics Denmark	Government	Web	Public	High	Low			Denmark	City, municipality, region, national	Statistics Denmark	By census	Sum	

Name	Long Name	Description (1)	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Birth date	Distribution of birth year		StatBank Denmark	xls	FOLK1: Population at the first day of the quater by region, sex, age, marital status, ancestry, country of origin and citizenship	Statistics Denmark	Government	Web	Public	High	Low		Denmark	City, municipality, region, national	Statistics Denmark	By census	Sum		
Education level	Distribution of education level		StatBank Denmark	xls	KRHFU2: Highest attained education of the population (15-69 year) by region, highest education completed, socioeconomic status, industry, age and sex	Statistics Denmark	Government	Web	Public	High	Low		Denmark	City, municipality, region, national	Statistics Denmark	By census	Sum		
Nationality	Distribution of nationality		StatBank Denmark	xls	FOLK1: Population at the first day of the quater by region, sex, age, marital status, ancestry, country of origin and citizenship	Statistics Denmark	Government	Web	Public	High	Low		Denmark	City, municipality, region, national	Statistics Denmark	By census	Sum		

(1) Not used in the North Harbour case.

A.2 Newcastle-upon-Tyne data tables

Table A9. Newcastle-upon-Tyne - Energy data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Energy service	Energy carrier	Energy source	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Delivered energy - electricity	Ordinary Domestic Electricity Consumption	Numeric value of electricity consumption from standard electricity meters		.xls	DECC	DECC	DECC	Web	Public	High	High		kWh		electricity		Newcastle	LLSOA				
Delivered energy - electricity	Economy 7 Domestic Electricity Consumption	Numeric value of electricity consumption from economy 7 electricity meters		.xls	DECC	DECC	DECC	Web	Public	High	High		kWh		electricity		Newcastle	LLSOA				
Delivered energy - electricity	Average Ordinary Domestic Electricity Consumption	LLSOA Average numeric value of electricity consumption from standard electricity meters		.xls	DECC	DECC	DECC	Web	Public	High	High		kWh		electricity		Newcastle	LLSOA		average		
Delivered energy - electricity	Average Economy 7 Domestic Electricity Consumption	LLSOA Average numeric value of electricity consumption from economy 7 electricity meters		.xls	DECC	DECC	DECC	Web	Public	High	High		kWh		electricity		Newcastle	LLSOA		average		
Delivered energy - gas	Domestic Gas Consumption	Numeric value of gas consumption from standard gas meters		.xls	DECC	DECC	DECC	Web	Public	High	High		kWh		gas		Newcastle	LLSOA				
Delivered energy - gas	Average Domestic Gas Consumption	LLSOA Average of Domestic Gas Consumption		.xls	DECC	DECC	DECC	Web	Public	High	High		kWh		gas		Newcastle	LLSOA		average		

Table A10. Newcastle-upon-Tyne – Climatic data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Wind speed				xls	SAP	BRE	BRE		Public	Medium	High	v	m/s	Newcastle				Monthly	
Wind direction				xls	SAP	BRE	BRE		Public	Medium	High	D	°	Newcastle				Monthly	
Solar declination	Solar declination	Angle of solar declination		xls	SAP	BRE	BRE		Public	Medium	High	δ_s	°	Newcastle				Monthly	
Global solar irradiance	Solar radiation	Solar radiation falling on horizontal surface		xls	SAP	BRE	BRE		Public	Medium	High	$G_{s,g}$		Newcastle				Monthly	

Table A11. Newcastle-upon-Tyne – Building technical data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Floor area	Floor Area	Sum of the areas of all floors of the building		xls	Vector Maps	Ordinance Survey	Government	Web	Private with licence	medium	high		m^2	Newcastle	building				
Height	Height of building	Sum of heights of all the floors		xls	Vector Maps	Landmap	University	Web	Private with licence	medium	high		m	Newcastle	building				
Type of floor	Type of floor of the building	e.g. solid, suspended timber, suspended non timber		xls	RDSAP	BRE	BRE	Document	Public	medium	high			Newcastle	building				
Floor insulation thickness	Thickness of floor insulation	Thickness of floor insulation		xls	RDSAP	BRE	BRE	Document	Public	medium	high		mm	Newcastle	building				
Floor U-value	U Value of the floor	U value of the floor based on type of construction		xls	SAP Tables	BRE	BRE	Document	Public	medium	high		W/(m²K)	Newcastle	building				
Type of wall	Type of wall construction	e.g. granite, sandstone, brick, cob, cavity, etc.		sid	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high			Newcastle	building				
Wall thickness	Thickness of external wall	Thickness of external wall		xls	RDSAP	BRE	BRE	Document	Public	medium	high		mm	Newcastle	building				
Wall insulation	Type of wall insulation	e.g. as built, external, internal, filled cavity, etc.		pdf	EHCS	CLG	Government	Document	Public	high	high			Newcastle	Region				
Wall insulation thickness	Thickness of wall insulation	Thickness of wall insulation		pdf	EHCS	CLG	Government	Document	Public	high	high		mm	Newcastle	Region				
Wall U-value	U value of the wall	U value of the floor based on type of wall		xls	SAP Tables	BRE	BRE	Document	Public	medium	high		W/(m²K)	Newcastle	building				
Roof insulation	Insulation of Roof	Thickness of insulation		pdf	EHCS	CLG	Government	Document	Public	high	high		mm	Newcastle	building				
Ceiling insulation	Insulation of Roof Room	Thickness of insulation		pdf	EHCS	CLG	Government	Document	Public	high	high		mm	Newcastle	building				
Roof U-value	U value of roof insulation	U value based on type		xls	SAP Tables	BRE	BRE	Document	Public	medium	high		W/(m²K)	Newcastle	building				
Ceiling U-value	U value of roof room insulation	U value based on type		xls	SAP Tables	BRE	BRE	Document	Public	medium	high		W/(m²K)	Newcastle	building				
Number of doors	Number of external doors	Total number of external doors		sid	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high			Newcastle	building				
Door U-value	U value of the door	Value in W/m2K		xls	SAP Tables	BRE	BRE	Document	Public	medium	high		W/(m²K)	Newcastle	building				
Window area	Area of Windows	Total area of Windows		sid (1)	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high		m^2	Newcastle	building				

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Type of glass	Type of window glazing	e.g. unknown, double, triple, etc.		sid (1)	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high			Newcastle	building				
Window U-value	U value of the window	U value of the window based on its type		xls	SAP Tables	BRE	BRE	Document	Public	medium	high		$W/(m^2K)$	Newcastle	building				
Window orientation	Direction of the windows	Window facing north, northeast, east, etc.		sid (1)	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high			Newcastle	building				
Window percentage draught proofing	Percentage windows draught proofed	Value between 0 to 100%		sid (1)	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high		%	Newcastle	building				
Number of flues/chimneys	Openings for ventilation	Openings for flues, chimneys, etc.		sid (1)	Rater Maps	Landmap	MIMAS	Web	Private with licence	medium	high			Newcastle	building				
Type of space heating system (main)	Type of main heating system	Main heating system type e.g. open, sealed, etc. and fuel e.g. gas, oil, solid fuel, electric, etc.		pdf	EHCS/HEED	BRE/EST	BRE/EST	Web	Private with licence	medium	high			Newcastle	region				
Type of space heating system (secondary)	Type of secondary heating system	Secondary heating system type e.g. open, sealed, etc. and fuel e.g. gas, oil, solid fuel, electric, etc.		pdf	EHCS/HEED	BRE/EST	BRE/EST	Web	Private with licence	medium	high			Newcastle	region				
Type of control – space heating	Type of heating controls	Type of heating controls e.g. programmers, thermostats, TRV's, etc.		pdf	EHCS/HEED	BRE/EST	BRE/EST	Web	Private with licence	medium	high			Newcastle	region				
Type of domestic hot water system	Type of heating for domestic water	Type e.g. from main/secondary heating, other water heating system, etc. Cylinder size (in litres) and insulation thickness (in mm)		pdf	EHCS/HEED	BRE/EST	BRE/EST	Web	Private with licence	medium	high			Newcastle	region				
Energy carrier – space heating	Type of Fuel	Type of fuel for heating		PDF	HEED/EHCS/ UK Statistics	CLG,DECC	CLG,DECC	Web	Public	High	High				Region			Monthly /Annual	
Energy carrier – lighting	Type of Fuel	Type of fuel for lighting		PDF	HEED/EHCS/ UK Statistics	CLG,DECC	CLG,DECC	Web	Public	High	High				Region			Monthly /Annual	
Thermal solar plant		Type, collector area, efficiency, heat loss coefficient, orientation, tilt and overshading		SID (1)	Landmap	MIMAS		Web	Private with licence	High	High				Region				
Photovoltaic		Type, collector area, efficiency, heat loss coefficient, orientation, tilt and overshading		SID (1)	Landmap	MIMAS		Web	Private with licence	High	High				Region				

(1) SID (Seamless Image Database) is a file format used for large raster graphic images.

Table A12. Newcastle-upon-Tyne – Geographical data table

(Sub-category)	Name (CODE)	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
INFORMATIVE DATA	LSOA Code	Lower Super Output Area Code	Numeric code to represent a lower super outout area.	LSOA	xls	Neighbourhood statistics	ONS	Government	web	Public	High	High		Numeric	England / Newcastle	Neighbourhood / City and Region.	GIS			
	LSOA Name	Lower Super Output Area Name	Lower super output area name	LSOA	xls	Neighbourhood statistics	ONS	Government	web	Public	High	High		Numeric	England / Newcastle	Neighbourhood / City and Region.	GIS			

(Sub-category)	Name (CODE)	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
	MSOA Code	Middle Super Output Area Code	Middle super output area code	MSOA	xls	Neighbourhood statistics	ONS	Government	web	Public	High	High		Numeric	England / Newcastle	Neighbourhood / City and Region.	GIS			
	MSOA Name	Middle Super Output Area Name	Middle super output area name	MSOA	xls	Neighbourhood statistics	ONS	Government	web	Public	High	High		Numeric	England / Newcastle	Neighbourhood / City and Region.	GIS			
	LA Code	Local Authority Name	Local authority code		xls	Neighbourhood statistics	ONS	Government	web	Public	High	High		Numeric	England / Newcastle	Neighbourhood / City and Region.	GIS			
	LA Name	Local Authority Name	Local authority name		xls	Neighbourhood statistics	ONS	Government	web	Public	High	High		Numeric	England / Newcastle	Neighbourhood / City and Region.	GIS			

Table A13. Newcastle-upon-Tyne – Socio-economic data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Fuel poverty		Number of households in fuel poverty		xls	DECC	Department for Energy and Climate Change	Government	Web	Public	High	High			England / Newcastle	LA / LSOA / Region	Statistical		Annual	2010
Fuel poverty		Percentage of households in fuel poverty		xls	DECC	Department for Energy and Climate Change	Government	Web	Public	High	High		%	England / Newcastle / LSOA	LA / LSOA / Region	Statistical	Percentage	Annual	2010
Owns outright	Property Owned Outright	Property Owned Outright by the household		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Owns with a mortgage or loan	Property Owned with Mortgage or Loan	Property Owned with Mortgage or Loan by the household		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Shared ownership	Property with a Shared Ownership	Property shared by multiple households		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Social rented	Social Housing Property	Property provided by social housing		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Social rented (from Local Authority)	Social Housing Property Rented from Council	Property provided by social housing rented from the council		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Social rented (other)	Social Housing Property Rented from Other Sources	Property provided by social housing rented from other sources		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Private rented	Privately Rented Properties	Privately Rented Properties		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Private rented (landlord or letting agency)	Privately Rented Properties from Landlord or letting agency	Privately Rented Properties from Landlord or letting agency		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Private rented (employer of a household member)	Privately Rented Property by Employer of a household member	Privately Rented Property by Employer of a household member		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Private rented (relative or friend of a household member)	Privately Rented Property by Relative or Friend of a household member	Privately Rented Property by Relative or Friend of a household member		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Private rented (other)	Privately Rented Property by Other means	Privately Rented Property by Other means		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				
Rental free	Property occupied without paying any rent	Privately Rented Property by Other means		.xls	ONS	ONS	ONS	Web	Public	High	High			Newcastle	LLSOA				

Table A14. Newcastle-upon-Tyne – Not classified data

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Energy service	Energy carrier	Energy source	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Bath and Showers		Number of rooms with band and/or shower		xls	SAP Tables	BRE	BRE	Document	Public	medium	high						Newcastle	building				
Electricity Meter	Type of electricity meter	Single, Dual, 24-hour and unknown																				
Number of Ordinary Domestic Meters	Number of Ordinary Domestic Meters	Number of Standard Domestic Electricity Meters		.xls	DECC	DECC	DECC	Web	Public	High	High						Newcastle	LLSOA				
Number of Economy 7 Meters	Number of Economy 7 Meters	Number of Economy 7 Electricity Meters		.xls	DECC	DECC	DECC	Web	Public	High	High						Newcastle	LLSOA				
Number of Meters	Number of Domestic Gas Meters	Number of Standard Domestic Gas Meters		.xls	DECC	DECC	DECC	Web	Public	High	High						Newcastle	LLSOA				

A.3 Manresa data tables

Table A15. Manresa - Energy data table

Name	Long Name	Description (1)	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Energy service	Energy carrier	Energy source	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
RES coverage - domestic hot water	RES coverage hot sanitary water	Share of energy carriers (mainly electricity) consumption to heat up sanitary hot water coming from renewable energy sources			user								%									
RES coverage – electrical appliances	RES coverage electricity	Share of electricity produced from renewable energy sources			user								%									

(1) This information can be incorporated by the SEMANCO's platform (i.e. if there is an interface related to the SEIF developed by the project, the data can be entered there by the user) or later on in URSOS (i.e. maybe the SEIF will export data to URSOS and the user will enter the data referred into this software interface and run the calculation there). The user, as a source, is the person that provides data. The user can be anyone (e.g. urban planner, private promoter, politician, etc.).

Table A16. Manresa – Energy cost data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Energy cost - electricity	Cost of electricity	Cost of electricity for residential consumers		xls	BOE 155/2012 (Offical State Bulletin)	Public	Government	Web	Public	High	Medium		€/kWh	Spain	Household			Monthly	2010-2012
Energy cost - natural gas	Cost of natural gas	Cost of natural gas for residential consumers			BOE 89/2009 (Offical State Bulletin)	Public	Government	Web	Public	High	Medium		€/kWh	Spain	Household			Monthly	2010-2012

Table A17. Manresa – Climatic data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Maximum air temperature	Monthly average maximum temperature	Monthly average maximum temperature of a typical year, obtained from Meteonorm	EPBD	TRY/TMY	Register of Manresa's weather station	Catalonian Government	CIMNE	Exported from climatic databases	Public	High	High	θ_{max}	°C	Manresa		Calculated		Monthly	2000-2012
Minimum air temperature	Monthly average minimum temperature	Monthly average minimum temperature of a typical year, obtained from Meteonorm	EPBD	TRY/TMY	Register of Manresa's weather station	Catalonian Government	CIMNE	Exported from climatic databases	Public	High	High	θ_{min}	°C	Manresa		Calculated		Monthly	2000-2012
Mean global solar irradiance	Monthly average solar radiation	Monthly average solar radiation of a typical year, obtained from Meteonorm	EPBD	TRY/TMY	Register of Manresa's weather station	Catalonian Government	CIMNE	Exported from climatic databases	Public	High	High	$G_{s,g,mn}$	W/m²	Manresa		Calculated		Monthly	2000-2012

Table A18. Manresa – Building technical data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Building typology	Architectonic building typology	Classification of building according to architectonic parameters. In principle, buildings will be classified according to construction age, which will define constructive parameters (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	statistical			
Building coordinates	Footprint of the building	Coordinates of the corners of the building (3)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high			Manresa	Building	GIS			
Height	Height of the building	Height of the building (3)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high		m	Manresa	Building	GIS			
Orientation	Orientation of the building	Orientation of the main façade of the building. Degree with respect to the south (west: 90º, north: 180º, east -90º) (3)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high		° from the south	Manresa	Building	GIS			
Wall U-value	U-value of the walls of the building	U-value of each wall (enclosure) of the building (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		W/(m²·K)	Manresa	Building	Assigned according to typology			
Wall α-value	Absorptance of enclosures of the building	Absorptance of enclosures of the building (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	Assigned according to typology			
Wall area	Area of the walls	Area of each enclosure (wall) of the building (4)			Cadastre	City council	City council	exported from city council data base	public	high	high		m²	Manresa	Building	GIS			
Wall orientation	Orientation of walls of the building	Orientation of each wall of the building (south: 0º, west: 90º, north: 180º, east -90º) (4)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high		° from the south	Manresa	Building	GIS			
Window percentage	Percentage of windows coverage	Percentage of windows coverage with respect to the whole surface of the façades (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	Assigned according to typology			
Window U-value	U-value of windows	U-value of windows the windows of the building (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		W/(m²·K)	Manresa	Building	Assigned according to typology			

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Window g-value	Solar factor of windows	(1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	Assigned according to typology			
Overhang dimensions	Dimensions of windows overhangs	Dimensions according overhangs. The URSOS software uses 6 variables to describe overhangs geometry (2)			user								m						
Window dimensions	Windows dimensions	Dimensions of the windows (height x wide) (2)			user								m						
Roof U-value	U-value of roof	U-value of the roof of the building (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		W/(m^2·K)	Manresa	Building	Assigned according to typology			
Skylight percentage	Percentage of windows or openings in the roof	Percentage of windows or openings in the roof (2)			user								%						
Skylight U-value	U-value of windows or openings in the roof	U-value of windows or openings in the roof (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		W/(m^2·K)	Manresa	Building	Assigned according to typology			
Skylight g-value	Solar factor of windows or openings in the roof	(1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	Assigned according to typology			
Roof α-value	Absorptance of roof	Absorptance of roof (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	Assigned according to typology			
Roof area	Area of the roof	Area of the roof (4)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high		m^2	Manresa	Building	GIS			
Ground α-value	Absorptance of ground	Absorptance of ground (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high			Manresa	Building	Assigned according to typology			
Energy carrier – space heating	Type of heating fuel	Type of fuel used to heat houses, from the following categories: mixed (renewable/fossil), renewable, fossil/electricity (2)			user														
Efficiency - space heating	Efficiency of heating system	Ratio between the usable work (heat produced) over the amount of energy carries spent to produce that heat (2)			user								%						
Energy carrier - cooling	Type of cooling fuel	Type of fuel used to cooling houses, from the following categories: mixed (renewable/fossil), renewable, fossil/electricity (2)			user														
Efficiency - cooling	Efficiency of cooling system	Ratio between the usable work (heat extraction) over the amount of energy carries spent to do that work (2)			user								COP						
Electrical power installed – electrical appliances	Installed power capacity	Power capacity from electric appliances installed in the household (5)		xls	Census and quality of life survey	Catalan Statistics Institute (IDESCAT)	Government + CIMNE	Web	Public	Low	High		kW	Manresa	Neighbourhood	Extrapolation from Catalonian statistics			2006
Building age	Year of the end of the construction	Year in which the building was finished			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High			Manresa	Building				2012
Conservation state	State of the building	Conservation state of the building			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	Low	High			Manresa	Building				2012

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Building use	Main use	Main use of the building			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High			Manresa	Building				2012
Indoor air temperature (space heating)	Comfort temperature in Winter	Comfort temperature in Winter which is defined according to the socio-economic condition of the inhabitants of the building (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		ºC	Manresa	Building	Assigned according to typology			
Indoor air temperature (cooling)	Comfort temperature in Summer	Comfort temperature in Summer which is defined according to the socio-economic condition of the inhabitants of the building (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		ºC	Manresa	Building	Assigned according to typology			
Air exchange rate	Air renewal rate	The percentage of air renewal in the simulated area in one hour (2)		user									$(m^3)/(h\,m^3)$						
Internal heat gains	Internal gains	Energy gains due to occupation and use of electric appliances (2)		user									$kWh/(day \cdot m^2)$						
Percentage of occupation	Percentage of occupation	Percentage of time in which the simulated area is occupied (2)		user															

(1) These data come from a table produced by CIMNE, which classifies buildings according to the age of construction.

(2) This information can be incorporated by the SEMANCO's platform (i.e. if there is an interface related to the SEIF developed by the project, the data can be entered there by the user) or later on in URSOS (i.e. maybe the SEIF will export data to URSOS and the user will enter the data referred into this software interface and run the calculation there). The user, as a source, is the person that provides data. The user can be anyone (e.g. urban planner, private promoter, politician, etc.).

(3) These data are obtained from the geometric characteristic of the building (GIS). These data is used to calculate the conditioned surface and volume.

(4) The data are calculated and obtained from the geometrical characteristics of the building (GIS).

(5) Original data is get from the government statistical institute. But CIMNE will create specific tables for the SEMANCO project.

Table A19. Manresa – Legislative constraints table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range	Validity conditions
CO_2 emissions	Indexes of energy efficiency for buildings qualification	Indexes that reflect the limits of CO_2 emissions per square meter according to the qualification scheme of energy efficiency of buildings		xls	BOE 27/2007	Public	Government	Web	Public	High	High		$kg_{CO2}/year$	Spain	Building				2007-2012	New and existing buildings

Table A20. Manresa – Geographical data table

(Sub-category)	Name (CODE)	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
GEOMETRIC DATA	ORO_03	Orography	Layer with points indicating the height of the ground over the see level		shp	City council GIS	City council	City council	Request to the city council	Public	High	High			Manresa	Building to Municipal	GIS			2011
	CN-CONSTR	Centroids of the constructed polygons	Centroids of the following constructions: General, courtyard, garden, hydrographical element, number of floors		shp	Municipal GIS	City council	City council	Request to the city council	Public	High	High			Manresa	Building	GIS			2011

(Sub-category)	Name (CODE)	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
	LM-CONSTR	Limits of constructions conforming polygons	Limits of the following polygons: Façade, divisions, line of height separations, building under construction, shed, ruins, greenhouse, wall, wall, construction, fence, silo, sport field, industrial chimney, platform, vegetation fence, garden, inner contour of a tank, inner contour of well, inner contour of swimming pool.		shp	Municipal GIS	City council	City council	Request to the city council	Public	High	High			Manresa	Building	GIS			2011
	LN-CONSTR	Constructions and structures of public roads	Lines of the following urban elements: wall, construction: end of sidewalk, pavement change, stairways, sport elements, external contour of a tank, external contour of well, external contour of swimming pool		shp	Municipal GIS	City council	City council	Request to the city council	Public	High	High			Manresa	Building	GIS			2011
	PL-CONSTR	Constructed polygons	Constructed polygons		shp	Municipal GIS	City council	City council	Request to the city council	Public	High	High			Manresa	Building	GIS			2011
	LN-VIESC	Communication ways	Lines of the following communication ways: highways and motorways, roads, pavement change or limit, forestal track, footpath, railway, road drainage, bridge, tunnel, squares and promenades, sidewalk, limits railway		shp	Municipal GIS	City council	City council	Request to the city council	Public	High	High			Manresa	Building	GIS			2011

Table A21. Manresa – Land and buildings registry data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Land quality	Type of land	Type of land according to the following categories: Degraded land, Urban land in the urban area, urban land in the periphery, land reserved for urban development in the urban area, land reserved for urban development on the periphery (1)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high			Manresa	Building	GIS			
Cadastral reference	Cadastral reference	Identification code of the building within the property register (i.e. cadastre)			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High			Manresa	Building				2012
Location	NUMCOD. Code of the postal code	Code specifying the address number			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High			Manresa	Building				2012
Location	DOMCOD. Code of the address (postal code, number of building, floor and number of door)	Code specifying the street of the address			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High			Manresa	Building				2012

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Built surface	Total built surface	Total built surface of the estate. The same for all the premises of the estate			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High		m^2	Manresa	Building				2012
Total surface	Total surface of the building	Total surface of the plot in which the estate is located (the same for all the premises of the estate)			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	High		m^2	Manresa	Building				2012
Land classification	Land classification	Classification of the land: urban or rural			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	Low			Manresa	Building				2012
Property regime	Property regime	Property regime: vertical or horizontal			Land registry (cadastre)	City council	City council	Formal request to the city council	Public with restrictions	High	Low			Manresa	Building				2012

(1) The data are obtained from the cadastre in the GIS database.

Table A22. Manresa – Urban planning data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Planned buildings, public facilities/utilities	Centroids of the planned polygons	Centroids of the following constructions: General, courtyard, garden, hydrographical element, number of floors		shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	High			Manresa	Building	GIS			1997
Planned buildings, public facilities/utilities	Limits of constructions conforming planed polygons	Limits of the following polygons: Façade, divisions, line of height separations, building under construction, shed, ruins, greenhouse, wall, wall, construction, fence, silo, sport field, industrial chimney, platform, vegetation fence, garden, inner contour of a tank, inner contour of well, inner contour of swimming pool.		shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	High			Manresa	Building	GIS			1997
Planned buildings, public facilities/utilities	Constructions and structures of planned public roads	Lines of the following urban elements: wall, construction: end of sidewalk, pavement change, stairways, sport elements, external contour of a tank, external contour of well, external contour of swimming pool		shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	High			Manresa	Building	GIS			1997
Planned buildings, public facilities/utilities	Planned polygons	Constructed polygons		shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	High			Manresa	Building	GIS			1997
Planned communication ways	Planned communication ways	Lines of the following communication ways: highways and motorways, roads, pavement change or limit, forestal track, footpath, railway, road drainage, bridge, tunnel, squares and promenades, sidewalk, limits railway		shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	High			Manresa	Building	GIS			1997
Land use	Soil classification	Classification of the soil according to the Spanish urban law	Decree 1/2010, 3rd of August	shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	Low			Manresa	Neighbourhood	GIS			2012

Table A23. Manresa – Socio-economic data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Income	Income of the household	Income of the all members of the household (1)		xls	Census and quality of life survey	Catalan Statiestics Institute (IDESCAT)	Government + CIMNE	Web	Public	Low	High		€	Manresa	Neighbourhood	Extrapolation from Catalonian statistics			2006
Size of household	Number of people in the household	Number of people inhabiting the household (1)		xls	Census and quality of life survey	Catalan Statiestics Institute (IDESCAT)	Government + CIMNE	Web	Public	Low	High			Manresa	Neighbourhood	Extrapolation from Catalonian statistics			2006
Type of household	Type of household	Type of household according to: one person, single parent household, two families household... (1)		xls	Census and quality of life survey	Catalan Statiestics Institute (IDESCAT)	Government + CIMNE	Web	Public	Low	High			Manresa	Neighbourhood	Extrapolation from Catalonian statistics			2006
(1) Original data is get from the government statistical institute. But CIMNE will create specific tables for the SEMANCO project.																			

Table A24. Manresa – Demographic data table

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
Density	Population density	Number of inhabitants per square kilometre		shp	Municipal GIS	City council	Department of urban planning of the city council	Request to the city council	Public	High	High			Manresa	Neighbourhood	GIS			1997
Origin	Origin of members of the household	Main origin of the members of the household (1)		xls	Census and quality of life survey	Catalan Statistics Institute (IDESCAT)	Government + CIMNE	Web	Public	Low	High			Manresa	Neighbourhood	Extrapolation from Catalonian statistics			2006
Gender	Gender				Municipal register	City council	City council	Request to the municipality	Public under restrictions	Medium /High	High			Manresa	Household	by registry			2012
Birth date	Birth date				Municipal register	City council	City council	Request to the municipality	Public under restrictions	Medium /High	High			Manresa	Household	by registry			2012
Origin	Country of origin				Municipal register	City council	City council	Request to the municipality	Public under restrictions	Medium /High	High			Manresa	Household	by registry			2012
Nationality	Nationality				Municipal register	City council	City council	Request to the municipality	Public under restrictions	Medium /High	Medium			Manresa	Household	by registry			2012
Learning level	Level of studies	Level of studies of the registered person			Municipal register	City council	City council	Request to the municipality	Public under restrictions	Medium /High	Low			Manresa	Household	by registry			2012
(1) Original data is get from the government statistical institute. But CIMNE will create specific tables for the SEMANCO project.																			

Table A25. Manresa – Not classified data

Name	Long Name	Description	Reference	Format	Source	Owner	Author	Access type	Availability	Reliability	Relevance for the purpose	Symbol	Unit	Geographical area	Scale	Way of determination	Way of aggregation	Temporal scale	Temporal range
U-value ground	U-value of the ground	U-value of the ground where the building is located (1)		xls	Building typologies table	CIMNE	CIMNE	web	public	medium	high		W/(m²·K)	Manresa	Building	Assigned according to typology			
Area of ground	Area of the ground	Area of the ground where the building is located (3)		shp	Cadastre	City council	City council	exported from city council data base	public	high	high		m²	Manresa	Building	GIS			
Water flow reduction	Water flow reduction systems	Whether there are water flow reduction systems (2)			user														
Separation drinkable-grey water	Separation drinkable and grey water	Whether the building has a system to separate drinkable and grey water (2)			user											statistical			
Percentage of household with night cross ventilation	Percentage of household with possibilities of cross ventilation	Percentage of household with possibilities of cross ventilation (2)			user								%						
Percentage households with cross ventilation at 90º	Percentage households with possibility of cross ventilation at 90º	Percentage households with possibility of cross ventilation at 90º (2)			user								%						

(1) These data come from a table produced by CIMNE, which classifies buildings according to the age of construction.
(2) This information can be incorporated by the SEMANCO's platform (i.e. if there is an interface related to the SEIF developed by the project, the data can be entered there by the user) or later on in URSOS (i.e. maybe the SEIF will export data to URSOS and the user will enter the data referred into this software interface and run the calculation there). The user, as a source, is the person that provides data. The user can be anyone (e.g. urban planner, private promoter, politician, etc.).
(3) The data are calculated and obtained from the geometrical characteristics of the building (GIS).

APPENDIX B. Available data sources of the case studies

This Appendix presents the characteristics of the available data sources of the case studies, providing information according to Section 3.

B.1 North Harbour data source tables

Table B1. North Harbour – Data source table 1

Field name		Description
Name	*	Expert input value
Long name	*	Expert input value from architects and city planners.
Description	*	Development company partly owned by the state and the municipality of Copenhagen and responsible for the North Harbour project.
Author	*	CPH City & Port Development
Contact		Nordre Toldbod 7 Postboks 2083 DK-1013 Copemhagen K T: +45 3376 9800
URL		http://www.byoghavn.dk/ByOgHavn/OmByoghavn.aspx

Domain	*	Building technical data
Tags		
Number items		Approximate size of the data source
Date range		From 2012 to 2070
Data availability		

License		
Reuse options		

Format	*	XLS
Access type	*	Manual input

Table B2. North Harbour – Data source table 2

Field name		Description
Name	*	Expert input value
Long name	*	Expert input value from Ramøll Energy planning and production
Description	*	Ramboll was the technical advisor that elaborated the energy scenarios for the North Harbour project.
Author	*	Expert calculation based on current and future energy requirements in building codes
Contact		Ramboll Energy planning and production Hannemanns Allé 53 DK-2300 Copenhagen S
URL		http://www.ramboll.com/services/energy%20and%20climate/energy-strategy-and-planning

Domain	*	Energy data
Tags		
Number items		Approximate size of the data source
Date range		From 2012 to 2020
Data availability		

License		
Reuse options		

Format	*	XLS
Access type	*	Manual input

Table B3. North Harbour – Data source table 3

Field name		*Description*
Name	*	Expert input value
Long name	*	Expert input value from Ramboll
Description	*	Ramboll was the technical advisor that elaborated the energy scenarios for the North Harbour project.
Author	*	Expert calculations based on hourly wind energy production data from existing offshore wind farm outside Copenhagen (Middelgrunden)
Contact		Ramboll Energy planning and production Hannemanns Allé 53 DK-2300 Copenhagen S
URL		http://www.ramboll.com/services/energy%20and%20climate/energy-strategy-and-planning

Domain	*	Energy data
Tags		
Number items		
Date range		From 2012 to 2030
Data availability		

License		
Reuse options		

Format	*	XLS
Access type	*	Manual input

Table B4. North Harbour – Data source table 4

Field name		*Description*
Name	*	Expert input value
Long name	*	Expert input value from Ramboll
Description	*	Ramboll was the technical advisor that elaborated the energy scenarios for the North Harbour project.
Author	*	Expert calculations based on assumptions of total available roof area in North Harbour, efficiency of solar cell panels and local solar irradiation
Contact		Ramboll Energy planning and production Hannemanns Allé 53 DK-2300 Copenhagen S
URL		http://www.ramboll.com/services/energy%20and%20climate/energy-strategy-and-planning

Domain	*	Energy data
Tags		
Number items		

Date range		From 2012 to 2030
Data availability		

License		
Reuse options		

Format	*	XLS
Access type	*	Manual input

Table B5. North Harbour – Data source table 5

Field name		*Description*
Name	*	Copenhagen Energy and Energinet.dk
Long name	*	Copenhagen Energy and Energinet.dk environmental reports
Description	*	The local energy utility (Copenhagen Energy) is thought to supply the North Harbour with low temperature district heating. The National Transmission Company (Energinet.dk) or system operator are responsible for the overall energy system (electricity and natural gas) and elaborated yearly environmental reports.
Author	*	Local Energy Utility (Copenhagen Energy) and the National Transmission Company (Energinet.dk)
Contact		Københavns Energi A/S (Copenhagen Energy) Ørestads Boulevard 35 DK-2300 København S Phone: 3395 3395 Telefax: 3395 2020 E-mail: ke@ke.dk Energinet.dk Tonne Kjærsvej 65 DK-7000 Fredericia Phone: +45 70 10 22 44
URL		http://www.ke.dk/portal/page/portal/Miljoe_klima/Spar_i_virksomheden/milj ødeklaration%202010?page=750 http://energinet.dk/EN/Sider/default.aspx

Domain	*	Energy data
Tags		
Number items		
Date range		From 2012
Data availability		

License		
Reuse options		

Format	*	XLS
Access type	*	Web

Table B6. North Harbour – Data source table 6

Field name		Description
Name	*	Danish Energy Agency
Long name	*	Danish Energy Agency socio-economic assumptions
Description	*	The Danish Energy Agency has as a public authority a number of energy related tasks, hereof projection of energy prices and cost for the use in socio-economic analyses of energy projects etc.
Author	*	Danish Energy Agency
Contact		Danish Energy Agency Amaliegade 44 DK-1256 Copenhagen K
URL		http://www.ens.dk/en-us/Sider/forside.aspx

Domain	*	Energy cost data
Tags		
Number items		
Date range		From 2012 to 2030
Data availability		

License		
Reuse options		

Format	*	XLS
Access type	*	Web

B.2 Newcastle-upon-Tyne data source tables

Table B7. Newcastle-upon-Tyne – Data source table 1

Field name		Description
Name	*	ECHS
Long name	*	English House Condition Survey
Description	*	Describes the conditions of surveyed houses in England
Author	*	Communities and Local Government
Contact		
URL		http://www.communities.gov.uk/housing/housingresearch/housingsurveys/englishhousingsurvey/ehspublications/

Domain	*	Building Technical Data
Tags		
Number items		
Date range		
Data availability		

License		
Reuse options		

Format	*	PDF
Access type	*	Downloading from website

Table B8. Newcastle-upon-Tyne – Data source table 2

Field name		Description
Name	*	SAP Tables
Long name	*	Standard Assessment Procedure Tables
Description	*	Provides values for Climate and Building Technical Data
Author	*	Building Research Establishment
Contact		
URL		www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf

Domain	*	Climatic Data / Building Technical Data
Tags		
Number items		
Date range		
Data availability		

License		
Reuse options		

Format	*	PDF
Access type	*	Downloading from website

Table B9. Newcastle-upon-Tyne – Data source table 3

Field name		Description
Name	*	RdSAP
Long name	*	Reduced Data Standard Assessment Procedure
Description	*	Provides default values for existing dwellings where detailed assessment is not possible
Author	*	Building Research Establishment
Contact		
URL		www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf

Domain	*	Building Technical Data
Tags		
Number items		
Date range		
Data availability		

License		
Reuse options		

Format	*	PDF
Access type	*	Downloading from website

Table B10. Newcastle-upon-Tyne – Data source table 4

Field name		Description
Name	*	Vector Maps
Long name	*	Vector Maps
Description	*	Polygon maps providing information on building height and footprint
Author	*	Ordinance Survey / Landmap
Contact		
URL		www.landmap.ac.uk

Domain	*	Building Technical Data
Tags		
Number items		
Date range		
Data availability		

License		
Reuse options		

Format	*	Shapefile converted into XLS
Access type	*	Downloading from website

Table B11. Newcastle-upon-Tyne – Data source table 5

Field name		Description
Name	*	Vector Maps
Long name	*	Vector Maps
Description	*	Polygon maps providing information on building height and footprint
Author	*	Ordinance Survey / Landmap
Contact		
URL		www.landmap.ac.uk

Domain	*	Building Technical Data
Tags		
Number items		
Date range		
Data availability		

License		
Reuse options		

Format	*	SID
Access type	*	Downloading from website

Table B12. Newcastle-upon-Tyne – Data source table 6

Field name		Description
Name	*	NeSS
Long name	*	Neighbourhood Statistics
Description	*	Database of various demographic statistics for UK
Author	*	Office of National Statistics
Contact		
URL		http://www.neighbourhood.statistics.gov.uk/

Domain	*	Socio Economic Data
Tags		
Number items		
Date range		
Data availability		

License		

Reuse options		

Format	*	Excel
Access type	*	Downloading from website

Table B13. Newcastle-upon-Tyne – Data source table 7

Field name		*Description*
Name	*	DECC
Long name	*	Department of Energy and Climate Change
Description	*	Energy consumption and fuel poverty data
Author	*	Department of Energy and Climate Change
Contact		
URL		http://www.decc.gov.uk/

Domain	*	Socio Economic Data / Energy Data
Tags		
Number items		
Date range		
Data availability		

License		
Reuse options		

Format	*	Excel
Access type	*	Downloading from website

B.3 Manresa data source tables

Table B14. Manresa – Data source table 1

Field name		*Description*
Name	*	City Council GIS
Long name	*	Geographic Information System of the municipality of Manresa
Description	*	Provides many data geographically positioned in the area of the city, organized by layers.
Author	*	City Council
Contact		938782300 , xnaval@ajmanresa.cat, Plaça Major, 1 Manresa
URL		www.ajmanresa.cat

Domain	*	Geographical, geometric, and urban planning data
Tags		
Number items		
Date range		
Data availability		

License		Requires a signed agreement. In progress.
Reuse options		

Format	*	SHP
Access type	*	Provided by the City Council after a formal request

Table B15. Manresa – Data source table 2

Field name		Description
Name	*	Land registry
Long name	*	Land and buildings registry of the city (cadaster)
Description	*	Provides data regarding the land and the buildings raised in each plot. Year of construction, uses, built surface, …
Author	*	City Council
Contact		938782300 , xnaval@ajmanresa.cat, Plaça Major, 1 Manresa
URL		www.ajmanresa.cat

Domain	*	Actual, existing land and buildings.
Tags		
Number items		
Date range		2010
Data availability		Once a year

License		Public access
Reuse options		

Format	*	SHP
Access type	*	Provided by City Council after a formal request

Table B16. Manresa – Data source table 3

Field name		Description
Name	*	Municipal register
Long name	*	Municipal register of inhabitants in the city
Description	*	Provides demographic data of all inhabitants registered, including its location.
Author	*	City Council
Contact		938782300 , ajmanresa@ajmanresa.cat , Plaça Major, 1 Manresa
URL		www.ajmanresa.cat

Domain	*	Demographical data.
Tags		
Number items		
Date range		2011
Data availability		Once a year

License		Requires a signed agreement. In progress.
Reuse options		

Format	*	XLS
Access type	*	Provided by the City Council

Table B17. Manresa – Data source table 4

Field name		Description
Name	*	Register of Manresa weather's station
Long name	*	Register of Manresa weather's station
Description	*	Provides precise climatic data, focused in the city of Manresa. The source will be created by CIMNE using external public databases.
Author	*	CIMNE
Contact		

URL		

Domain	*	Climatic data
Tags		
Number items		
Date range		
Data availability		Every fifteen minutes

License		No need
Reuse options		

Format	*	TRY/TMI
Access type	*	Data exported from public climatic databases

Table B18. Manresa – Data source table 5

Field name		*Description*
Name	*	Energy cost
Long name	*	Energy cost of each energy carrier
Description	*	Table created by CIMNE with the cost for each energy carrier, extracted from the Official State Bulletin of Spain. This publication describes the cost of the main energy carriers.
Author	*	CIMNE
Contact		
URL		

Domain	*	Energy cost data.
Tags		
Number items		
Date range		Actual
Data availability		No periodicity

License		No need
Reuse options		

Format	*	XLS
Access type	*	Table generated from public information (BOE)

Table B19. Manresa – Data source table 6

Field name		*Description*
Name	*	Legislative constraints
Long name	*	Legislative constraints regarding energy efficiency in buildings
Description	*	Table created by CIMNE with the constraints extracted from Official State Bulletin of Spain. This publication describes the legislative constraints regarding energy efficiency in buildings (Technical Code of Edification).
Author	*	CIMNE
Contact		
URL		

Domain	*	Legislative constraints data
Tags		
Number items		
Date range		Actual
Data availability		No periodicity

License		No need
Reuse options		

Format	*	XLS
Access type	*	Table generated from public information (BOE)

Table B20. Manresa – Data source table 7

Field name		*Description*
Name	*	Income
Long name	*	Income of families, grouped by neighbourhoods
Description	*	Table created by CIMNE, with the information extracted from the quality of life survey from the Catalan Statistics Institute (IDESCAT)
Author	*	CIMNE
Contact		
URL		

Domain	*	Socio-economic data
Tags		
Number items		
Date range		
Data availability		

License		No need
Reuse options		

Format	*	XLS
Access type	*	Table generated from public information (IDESCAT)

Table B21. Manresa – Data source table 8

Field name		*Description*
Name	*	Time uses
Long name	*	Time uses of inhabitants
Description	*	Table created by CIMNE, with the information extracted from the time uses survey from the Catalan Statistics Institute (IDESCAT)
Author	*	CIMNE
Contact		
URL		

Domain	*	Socio-economic data
Tags		
Number items		
Date range		
Data availability		

License		No need
Reuse options		

Format	*	XLS
Access type	*	Table generated from public information (IDESCAT)

Table B22. Manresa – Data source table 9

Field name		Description
Name	*	Building typologies
Long name	*	Table of building typologies
Description	*	This table contains information about the different typologies of buildings in the city of Manresa, and its characteristics
Author	*	FORUM + City Council
Contact		
URL		

Domain	*	Building technical data
Tags		
Number items		
Date range		2012
Data availability		

License		No need
Reuse options		

Format	*	XLS
Access type	*	Provided by FORUM