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District Information Modeling and Management for Energy Reduction

DIMMER

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WP3	**CLICKS AND LINKS**

User Community Portal Available

D3.2.4

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REVISION HISTORY

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ABBREVIATIONS

| Acronym	Full name
DIM	District Information Model
GIS	Geographic Information System
API	Application Programming Interface
GUI	Graphical User Interface

EXECUTIVE SUMMARY

This document describes the results of task T3.2 which is the DIMMER Community portal and the Community tool. The Community portal is a site where the public can read, learn, share and discuss energy efficiency and other DIMMER related topics. The community tool is a tool developed for the DIMMER users (Public Administrators, Building Estate manager, Energy professionals) with the goal to engage the building residents/visitors by displaying DIMMER data with them. One innovative part of this Community portal is the incorporation of DIMMER data using DIMMER components (e.g. middleware, the Context Awareness Framework, Ontologies etc.) thus adding a new layer of complexity and creating a communication channel between experts (target users) and the public.

The Community portal is available at http://www.dimmerproject.eu/community-portal/.

This is the fourth and last iteration task T3.2
- Initial Specification of User Community Portal: (D3.2.1, month 12)
- Updated Specification of User Community Portal: (D3.2.2, month 24)
- First Version of User Community Portal available.: (D3.2.3, month 30)
- **User Community Portal available: (D3.2.4, month 36)**

This document starts with a summary of the task objectives, previous documents and updates since the last deliverable. *Section 2* presents the final service layer, describing every service used in the Community tool. *Section 3* describes and shows the final Community portal and the last section concludes the document.
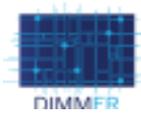
INTRODUCTION

Since this document is the first public document for this task, this section will shortly summarize the task T3.2 objectives and the previous deliverables (D3.2.1, D3.2.2 and D3.2.3).

1.1. Task objectives

In short, task 3.2's objective is to create a web based platform that contains:

Requirement	Application
A public community portal, to foster community based activity among users	Community
A tool for energy profiling of districts	Dashboard
A tool for energy profiling of buildings	Benchmarking tool
A way to create discussion groups	Community
A way to get feedback from users	Community

Table 1: Task 3.2 requirements

The result of T3.2 consists of three applications that target different task requirements, as shown in Table 1 the Benchmarking tool focuses on energy profiling of buildings, while the Dashboard focuses on energy profiling at district level, leaving the Community portal to handle the community, groups and user feedback.

Since the target users selected during the second year of the project, did not include the public in general or the building/district residents, the focus of the community portal was directed to create a tool for the target users (public administrators, building estate managers and energy professionals) to communicate with the public. This way it was still possible to reach the community goals for T3.2. This community tool is a WordPress plugin that visualizes DIMMER data. To show this prototype a community portal was integrated in with the project website where members can register, interact with each other and also with groups discussing DIMMER related topics. There are both public groups available to anyone and private groups only available to members invited to the group by the manager. These private groups are where the Community tool is visualized.

1.2. Previous deliverables

D3.2.1 focused on the initial specification and requirement list for task 3.2 taking into account input data, collaboration with other work packages, users and possible results. D3.2.2 describes the updated specification, where a lot of work was done with narrowing down the number of target users and creating scenarios around the final three target user groups. The new requirements steered the application development and three applications where specified: The Benchmarking tool, the Dashboard and the Community tool. The latest deliverable, D3.2.3, focused on the first version of the Community portal, the other applications where mentioned in this deliverable but described in more detail in deliverable (D3.1.2). The Community tool is related to the Benchmarking tool through the service layer which is further described in section 2.

1.3. Updates

Since D3.2.3, there have been two major updates to the Community portal. The first being the merge of the DIMMER project website and the DIMMER Community portal, this means that the Community portal is now part of the project site which makes it easier for the users to read about DIMMER and participate by joining the Community. The second major update is a new tool called the DIMMER Definitions, this tool allows the users to lookup DIMMER terms and concepts they may find hard to understand or are simply curious to learn more about, it uses the semantic framework which is described in the next section. The Community tool has also been updated as the Benchmarking services where updated and it no longer uses the GIS services since the same service used in the Community tool could be provided by the Benchmarking services, this change

was made as an optimization strategy. Other updates include a new current weather feature and a more user friendly GUI with additional descriptions and tooltips and visual indicator.

1.4. Dimmer Definitions tool

Sharing a common semantic framework enables the identification of an "agreement" on a common definition and structuring of the identified concepts between people or actors with different skills and expertise in related domains like ICT, energy, or buildings. It also enables a shared understanding of related concepts in the heterogeneous service and systems integrated in the DIMMER platform, e.g., what data a service provides access to. The Semantic Metastore service (further described in section 2.3) is the interface to this underlying information model, used by the services, tools and applications in DIMMER to access domain concepts as well as information on services, information entities and data managed by the DIMMER Platform. One of those tools is the DIMMER Definitions tool that is part of the Community portal and is basically a word index based on DIMMER. For instance, if the user wants to know what a sensor is and how it is defined specifically for DIMMER the user would enter "Sensor" to the definitions tool and get the definition of sensor described in the Semantic Metastore back.

2. FINAL SERVICE LAYER

The Community tool gets its data from the Community tool service, which in turn gathers data from two other services (see Figure 1). The first being the Benchmarking tool service, used to get basic building information as well as the buildings energy consumption (historical and benchmarked). The second is a third party service that provides the current weather for each district (Turin and Manchester). The Definition tool uses the Semantic Metastore service to find the definitions of terms and concepts used in DIMMER. The GIS service provider is no longer used by the Community tool, since the same information could be fetched from the Benchmarking tool service thus optimizing the data gathering process. This section will describe all these services used in the Community tool in more detail.
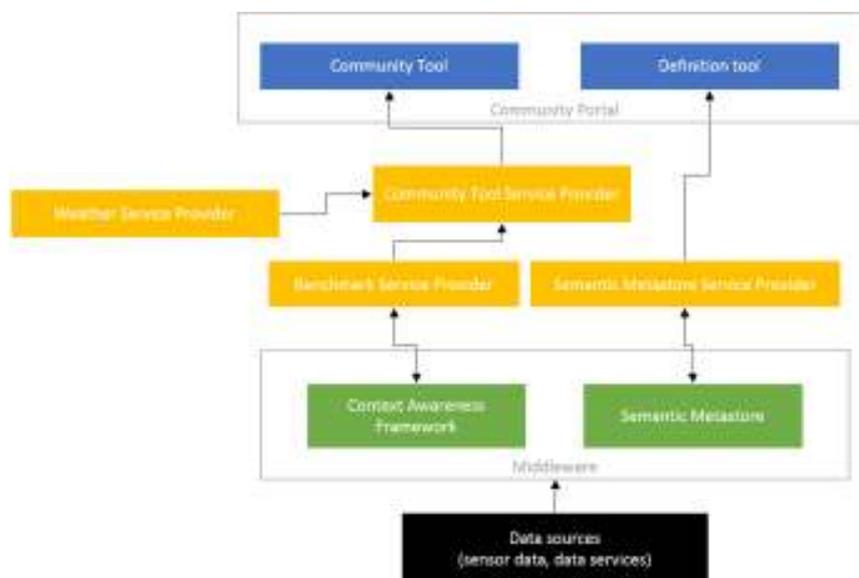

Figure 1: Community tool service architecture

2.1. Final Benchmarking service

The final version of the DIM Context layer for the Benchmark Service Provider exposes five public APIs that can be managed from the configuration panel:
- /buildings: get the list of buildings in the user's scope
- /info: get building information as age of construction, floor area, volume, usage, etc.
- /historical: get the energy consumption of the selected building and the energy consumption of the same building in the last three seasons.
- /benchmark: get the energy consumption of the selected building, the minimum, the average and the maximum energy consumption of the average of virtual buildings, the externa temperature for the selected building.
- /retrofitting: evaluates different refurbishment options towards the improvement of building energy behaviour while having money and CO_2 savings.
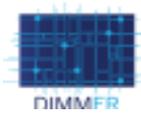
All the above services are managed by the *benchmarkServiceProvider* security system. Therefore, a valid token (obtained by providing CAS credentials) must be provided in the request header according to CAS system (described in D2.2.2). The public APIs are available at the following URL `https://<base_url>/api/building/<:code>/<:service>` in GET method.

The following cURL[1] commands are provided as example:

```
Create a granted token (TGT)

$> curl -X POST -H "Content-Type: application/x-www-form-urlencoded" \
-d 'username=<USERNAME>&password=<PASSWORD>' \ "https://dimmer.fit.fraunhofer.de/cas/v1/tickets"

Response Code 201
Location: https://dimmer.fit.fraunhofer.de/cas/v1/tickets/TGT-92-
VSOaXAeL7rBgTBhqrxi5RflkcHl7gFMR22qQYT5k9SrzvhlJgc-dimmer.fit.fraunhofer.de
```

Figure 2: Benchmark Service Provider, create a granted token

```
Create a service token (ST)

$> curl -X POST -H "Content-Type: application/x-www-form-urlencoded" \
-d 'service=benchmarkServiceProvider' \ "https://dimmer.fit.fraunhofer.de/cas/v1/tickets/TGT-92-
VSOaXAeL7rBgTBhqrxi5RflkcHl7gFMR22qQYT5k9SrzvhlJgc-dimmer.fit.fraunhofer.de"

Response Code 200
Body: ST-95-ggiTvLabfaBquhpJGYzR-dimmer.fit.fraunhofer.de
```

Figure 3: Benchmark Service Provider, create a service token

```
Get building's list

$> curl -X GET -H "X-Auth-Token: ST-95-ggiTvLabfaBquhpJGYzR-dimmer.fit.fraunhofer.de"
"https://dimmer.dappolonia-innovation.com /api/buildings"

Response Code 200
Body:
[
  {
    "_id": "571f379e77f0a80c71a497dd",
    "name": "Turin Smart City Directorate",
    "case_name": "ITC11-04",
    "code": "8263cc97-f7d3-4a70-a2c4-d7564507e2f8",
    "policy": {
      "improvement": false,
      "behaviour": false,
      "energy": false,
      "building": true
```

---

[1] https://curl.haxx.se/

```
    }
  },
  {
    "_id": "5742ca59101c9f6c463b386a",
    "name": "Politecnico University Campus",
    "case_name": "ITC11-01",
    "code": "25499d9f-5b7f-4534-a933-bcb7e4384642",
    "policy": {
      "improvement": false,
      "behaviour": false,
      "energy": false,
      "building": true
    }
  },
  {
    "_id": "561687c63c08345c29177323",
    "name": "Primary school M. Coppino",
    "case_name": "ITC11-02",
    "code": "aff28511-2885-47c7-8ea6-19861b611ff6",
    "policy": {
      "improvement": false,
      "behaviour": false,
      "energy": false,
      "building": true
    }
  },...
]
```

Figure 4: Benchmark Service Provider, get buildings list

Get building information

```
$> curl -X GET -H "X-Auth-Token: ST-95-ggiTvLabfaBquhpJGYzR-dimmer.fit.fraunhofer.de"
"https://dimmer.dappolonia-innovation.com /api/building/25499d9f-5b7f-4534-a933-bcb7e4384642/info"
```

```
Response Code 200
Body:
{
  "code": "25499d9f-5b7f-4534-a933-bcb7e4384642",
  "name": "Politecnico University Campus",
  "case_name": "ITC11-01",
  "img": "/img/buildings/ITC11-01.jpg",
  "policy": {
```

```
    "building": true,
    "energy": false,
    "behaviour": false,
    "improvement": false
  },
  "description": "The main campus was inaugurated in November 1958, and the buildings cover an area
of more then 315.000 square meters.",
  "vb": {
    "age": {
      "max": 2015,
      "min": 1900
    },
    "storey": {
      "max": 10,
      "min": 1
    },
    "area": {
      "max": 10000,
      "min": 100
    },
    "volume": {
      "max": 15000,
      "min": 1000
    },
    "use": [],
    "typology": [],
    "destination": []
  },
  "parameters": {
    "age_construction": "1958",
    "floor_area": "8020",
    "storey": "2",
    "supply_system": "District heating System",
    "use": "Educational building",
    "site": "Turin, 29, Corso Duca degli Abruzzi"
  }
}
```

Figure 5: Benchmark Service Provider, get building information

```
Get building historical energy consumptions benchmarking
```

```
$> curl -X GET -H "X-Auth-Token: ST-95-ggiTvLabfaBquhpJGYzR-dimmer.fit.fraunhofer.de"
"https://dimmer.dappolonia-innovation.com /api/building/25499d9f-5b7f-4534-a933-
bcb7e4384642/historical"
```

```
Response Code 200

Body:

[
  {
    "start": "2015-09-30T22:00:00.000Z",
    "end": "2016-04-30T22:00:00.000Z",
    "dd": 2137,
    "values": [
      {
        "start": "2015-09-30T22:00:00.000Z",
        "end": "2015-10-31T23:00:00.000Z",
        "value": 22450000
      },
      {
        "start": "2015-10-31T23:00:00.000Z",
        "end": "2015-11-30T23:00:00.000Z",
        "value": 28160000
      },
      ...
      {
        "start": "2016-03-31T22:00:00.000Z",
        "end": "2016-04-30T22:00:00.000Z",
        "value": 21930000
      }
    ]
  },
  {
    "start": "2014-09-30T22:00:00.000Z",
    "end": "2015-04-30T22:00:00.000Z",
    "dd": 2111,
    "values": [
      {
        "start": "2014-09-30T22:00:00.000Z",
        "end": "2014-10-31T23:00:00.000Z",
        "value": 23070000
      },
      {
        "start": "2014-10-31T23:00:00.000Z",
```
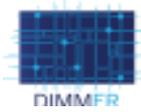
```
      "end": "2014-11-30T23:00:00.000Z",
      "value": 20420000
    },
    ...
    {
      "start": "2015-03-31T22:00:00.000Z",
      "end": "2015-04-30T22:00:00.000Z",
      "value": 17860000
    }
  ]
},
{
  "start": "2013-09-30T22:00:00.000Z",
  "end": "2014-04-30T22:00:00.000Z",
  "dd": 2493,
  "values": [
    {
      "start": "2013-09-30T22:00:00.000Z",
      "end": "2013-10-31T23:00:00.000Z",
      "value": 0
    },
    {
      "start": "2013-10-31T23:00:00.000Z",
      "end": "2013-11-30T23:00:00.000Z",
      "value": 0
    },
    ...
     {
      "start": "2014-03-31T22:00:00.000Z",
      "end": "2014-04-30T22:00:00.000Z",
      "value": 30980000
    }
  ]
}
]
```

Figure 6: Benchmark Service Provider, get building historical data

**Get building energy consumptions benchmarking: Virtual Building vs My Building**

```
$> curl -X GET -H "X-Auth-Token: ST-95-ggiTvLabfaBquhpJGYzR-dimmer.fit.fraunhofer.de"
"https://dimmer.dappolonia-innovation.com /api/building/25499d9f-5b7f-4534-a933-
bcb7e4384642/benchmark"
```

```
Response Code 200

Body:

{

  "me": [

    {

      "start": "2015-09-30T22:00:00.000Z",

      "end": "2015-10-31T23:00:00.000Z",

      "value": 22450000

    },

    {

      "start": "2015-10-31T23:00:00.000Z",

      "end": "2015-11-30T23:00:00.000Z",

      "value": 28160000

    },

    ...

    {

      "start": "2016-03-31T22:00:00.000Z",

      "end": "2016-04-30T22:00:00.000Z",

      "value": 21930000

    }

  ],

  "vb": [

    {

      "start": "2015-09-30T22:00:00.000Z",

      "end": "2015-10-31T23:00:00.000Z",

      "value": {

        "min": 3767000,

        "max": 155430000,

        "avg": 15984838

      }

    },

    {

      "start": "2015-10-31T23:00:00.000Z",

      "end": "2015-11-30T23:00:00.000Z",

      "value": {

        "min": 7823000,

        "max": 216280000,

        "avg": 26685351

      }

    },

    ...
```

```
    {
      "start": "2016-03-31T22:00:00.000Z",
      "end": "2016-04-30T22:00:00.000Z",
      "value": {
        "min": 1564000,
        "max": 140060000,
        "avg": 11593811
      }
    }
  ]
}
```

Figure 7: Benchmark Service Provider, get building energy consumption benchmark

Evaluates different refurbishment options for the selected building

```
$> curl -X GET -H "X-Auth-Token: ST-95-ggiTvLabfaBquhpJGYzR-dimmer.fit.fraunhofer.de"
"https://dimmer.dappolonia-innovation.com /api/building/25499d9f-5b7f-4534-a933-
bcb7e4384642/retrofitting?scenario[]=window&scenario[]=roof&scenario[]=wall"
```

```
Response Code 200
Body:
{
  "current": {
    "q": 147530000,
    "roof": 45692276,
    "window": 86262420,
    "wall": 15575304
  },
  "saving": {
    "q": 41607966,
    "roof": 9024385,
    "window": 28270273,
    "wall": 4313308,
    "s": 71.8
  },
  "gg": 212,
  "dd": 2137,
  "c": 9.07
}
```

Figure 8: Benchmark Service Provider, evaluate refurbishment options
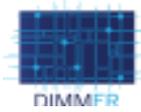
2.2. Final Community tool service

The final Community tool service is a Windows Communication Foundation (WCF)[2] service with three web endpoints:
- /CasValidation: verifies the users' CAS credentials (see Figure 9)
- /GetUser: returns the DIMMER user based on the Community user id (see Figure 10). For this application two users where created, one simulating a Manchester user responsible for the Manchester buildings and one simulating a Turin user responsible for the Turin buildings
- /GetCommunityData: returns a specific buildings data to be visualized by the Community tool (see Figure 11)

This endpoint is used to verify that the user has access to the DIMMER data in the same way that the Benchmarking service (see Figure 2).

```
CAS Validation

$> curl -X POST -H "Content-Type: application/x-www-form-urlencoded" \
-d 'username=<USERNAME>&password=<PASSWORD>' \
"http://cnetdimmer002.cloudapp.net/communityservice/Service1.svc/CasValidation"

Response Code 200

{
    "CasValidationResult": true
}
```

Figure 9: CasValidation Service

This endpoint is used to map the users' DIMMER buildings in the Community tool settings (see Figure 17).

```
Get user

$> curl -X GET -H "http://cnetdimmer002.cloudapp.net/communityservice/Service1.svc/GetUser?id=1"

Response Code 200
Body:
{
   dimmerId: 1,
   communityId: 1,
   email: "vivian.esquivias@cnet.se",
   city: null,
   buildings: [
   {
     id: 59023,
     name: "Primary School Coppino",
     code: "aff28511-2885-47c7-8ea6-19861b611ff6",
     case_name: "ITC11-02"
   },
```

---

[2] WCF, https://msdn.microsoft.com/en-us/library/ms731082(v=vs.110).aspx
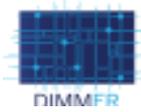
```
    {
      id: 9935,
      name: "Kindergarten Braccini",
      code: "81d1b3e0-8ba2-422f-a27e-91075fae063a",
      case_name: "ITC11-03"
    },
    {
      id: 534847,
      name: "Politecnico University Campus",
      code: "",
      case_name: ""
    },
    {
      id: 34,
      name: "Manchester Museum",
      code: "",
      case_name: ""
    },
    {
      id: 3,
      name: "Ferranti Building",
      code: "",
      case_name: ""
    },
    {
      id: 4,
      name: "The Mill",
      code: "",
      case_name: ""
    },
    {
      id: 13,
      name: "MBS West",
      code: "",
      case_name: ""
    }
  ]
}
```

Figure 10: GetUser service

This endpoint is used to create the charts in the groups pages that uses the Community tool, see Figure 20.
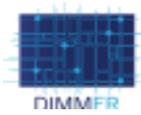
Get Community Data

```
$> curl -X GET -H
"http://cnetdimmer002.cloudapp.net/communityservice/Service1.svc/GetCommunityData?dimmerId=39&type=Si
ngle&buildingId=534847&info=1&trend=1&monthly=1&compared=1"
```

```
Response Code 200
Body:
{
    info: {
        name: null,
        height: 0,
        squaremeters: 0,
        address: null,
        typology: null,
        contructionperiod: null,
        energytype: null
    },
    trend: {
        consumption: {
        value: 19447,
        unit: "kWh",
        trend: "UP"
    },
    co2: {
        value: 258.6451,
        unit: "kgCO2e",
        trend: "UP"
    },
    temperature: {
        value: 27.98,
        unit: "°C",
        trend: "UP"
    }
},
monthly: {
    xData: [
    "Jul",
    "Aug",
    "Sep"
    ],
    datasets: [
     {
```
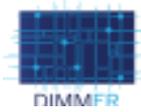
```
        name: "2015",
        data: [
          17192.61271,
          17814.86455,
          18168.334800000004
      ],
        type: "column",
        color: null,
        yAxis: 0
    },
    {
        name: "2016",
        data: [
        17724.343,
        18752.488999999998,
        5266.184
        ],
        type: "column",
        color: null,
        yAxis: 0
        }
    ]
},
compare: {
    datasets: [
    {
        name: "Worst",
        data: […],
        type: "area",
        color: "#F56954",
        yAxis: 0
    },
    {
        name: "Avg",
        data: […],
        type: "area",
        color: "#EDC240",
        yAxis: 0
    },
    {
        name: "Best",
```
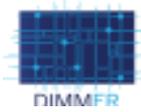
```
        data: […],
        type: "area",
        color: "#4DA74D",
        yAxis: 0
    },
    {
        name: "Pigafetta 52",
        data: […],
        type: "line",
        color: "#333",
        yAxis: 0
    },
    {
        name: "Temperature",
        data: […],
        type: "line",
        color: "#00c0ef",
        yAxis: 1
    }
    ]
},
    currentweather: {
        main: "Clear",
        description: "clear sky",
        imgUrl: "http://openweathermap.org/img/w/01d.png",
        temp: 29.98,
        tempMax: 35,
        tempMin: 27,
        unit: "°C",
        city: "Torino"
    }
}
```

Figure 11: GetCommunityData service

2.3.   Final Semantic Metastore Service

The DIMMER Definitions tool uses the semantic metastore service to get the DIMMER term definitions. Figure 12 shows how this request is made and how the results look like. In this example, the user has entered the term "Temperature sensor" and gets the DIMMER definition of this in return.

```
Get definition
```
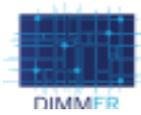
```
$> curl -X GET -H "http://ontology.tno.nl/saref#TemperatureSensor"
```

```
Response Code 200

Body:

{

    saref: "TemperatureSensor",

    rdf_type: "",

    owl_Class: "",

    rdfs_label: "Temperature sensor",

    rdfs_subClassOf: "",

    saref_Device: "",

    rdfs_comment: "A temperature sensor is a device that consists of a sensor, has category

                  saref:Sensor, performs the saref:SensingFunction and is used for the purpose of

                  sensing a property of type saref:Temperature"

}
```

Figure 12: Get definition, semantic metastore service

3. FINAL COMMUNITY PORTAL

This section describes the final version of the Community portal including the Community tool and the Definitions tool.

The main objective of the Community Portal in one word is *awareness*. There are a several ways to create awareness, the first step is to increase knowledge in the subject, the second is to share that knowledge and the third is to be active and start using the knowledge and create new knowledge for others to take part of. The Community portal supports these things by enabling the user with information about anything related to energy efficiency (e.g. posts, events, links). The portal also allows the users to share what they learn, their own experiences or raise interesting questions to be discussed with like-minded. Finally, the portal can also reflect the actions of a user, if for instance the users have implemented different energy saving actions in their own building, the visualized DIMMER data (Community tool) will show these results and can incentivize the users to keep going.

As mentioned before, the target users for the DIMMER project are Public Administrators, Building Estate manager and Energy professionals. The community tool is created for these users to use in the Community portal and communicate with the building residents (public). Ideally, we would have tested the Community portal on real building residents and other public figures but since the most essential parts of the Community portal, which is the DIMMER data visualizations could not be shown to the public according to the confidentiality agreement we used the partners to get feedback on the Community portal and the community tool. All partners were invited to the Community portal and became members allowing them to post comments, join groups etc. Some partners also created groups and started their own discussion about a personal topic. The feedback in general has been positive, the Community portal is a good way for anyone to be part of the discussions around energy efficiency. This is also a great platform for experts to share their specific knowledge with others and get feedback, questions and comments. Which is the basic goal of the Community portal. The usage is very straight forward, especially for anyone that has used a social network before (e.g. Facebook, LinkedIn, Twitter), things like create account, view profile, make a friend requests and leave a comment on a posts or group page is something that most people are comfortable with.

3.1.   Requirements

Table 2 shows the use cases compiled from the user requirements and scenarios work done in WP5 and further described in D5.2.3, the use case numbers in this table are the same as in the complete use case table for the entire project in D5.2.3. All requirements have been met and will be described in detail in this section by a scenario for each target user.

Target users	Nr	Use cases	App use cases	Status
Public Administrators	30	Communicate with the population	Create informative pages as well as groups for further discussions.	Done
Building Estate manager	31	Display information about a specific building (energy consumption, temperature, air quality)	Display information about a building on the buildings group page, using the DIMMER plugin	Done
	32	Discuss this information with the building users	Enable group discussion	Done
	33	Display benchmark results and building performance	Display benchmarks for a building on the buildings group page, using the DIMMER plugin	Done
Energy professionals	34	Display CO2 emissions and performances for a specific building	Display CO2 information about a building on the buildings group page, using the DIMMER plugin	Done
	35	Display information about peak-related issues, both in general (public) and for a specific building (private)	Create informative pages as well as groups for further discussions.	Done

Table 2: Community Portal User cases

3.1.1. Public administrator Scenario

The main objective within the energy efficiency subject for a public administrator is to reduce energy consumption, energy expenses and emissions within their district. One way to achieve this is to create awareness among the public and one tool to do this with is the DIMMER Community portal. Consider this scenario: A public administrator is familiar with DIMMER and knows that many of the buildings within her district are DIMMER enabled. This implies that she is also aware of the Community portal and wants to use it as a platform to pass through energy related information that she thinks would make the public more aware of the energy efficiency issues within the district. She starts by creating pages on the Community portal to give a basic knowledge about the energy related issues, she also posts information about events that the public can attend to learn more about what they can do to contribute and finally she creates one or more groups where the public can join and discuss these issues and give their take on it. The public administrator learns a lot from the public as well from the discussions such as practical issues (problems with the radiator, windows etc.) and also about their engagement and involvement to solve these issues. She is happy that things are in motion and can lead to real change now that people are more aware of what is going on and want to take action.
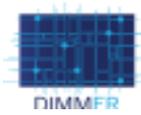
3.1.2. Building Estate Manager Scenario

A building estate manager, responsible for multiple buildings has noticed that the buildings energy consumption has increased abnormally. Her district and also her buildings are DIMMER enabled and she noticed the buildings energy changes using the web portal for energy optimization but she wants to know more and would like to hear from the building residents if they might know about any changes that might be responsible for the increased energy consumption. She signs in as administrator to the DIMMER community portal and creates a group for each of her building. She adds some text to describe the building and also the purpose with the group which is to get feedback from the residents and finally she adds some charts visualizing the building energy consumption using the Community tool. When the group is created she starts sending invitations to the building residents. Soon the discussion has started and she gets very interesting tips from the residents.

3.1.3. Energy Professionals Scenario

An energy professional working for an electric utility company gets an assignment to inform and discuss issues surrounding CO_2 emissions and peak performance with the public. She starts by researching what people know about these subjects and finds out that most people have some knowledge about CO_2 emissions and the issues around them but few people know anything about peak-shaving. She decides to create a comprehensive page describing peak-shaving, how it is used, pros and cons and the impact it can have in the quest for achieving reducing energy consumption. She then notices that there are groups created for some of the buildings her company provides electricity to, these groups are very active and the people (residents) are having very interesting discussions about the energy consumption in their buildings which they can see in charts (see Figure 20). The energy professional decides to add CO_2 emission features to the groups, this means that additional to the energy consumption charts already showing in the group, there are now CO_2 emission indicators as well. She notifies the group members about this and asks the group members about it, she also encourages them to read about peak-shaving and links the pages she previously created.

3.2. Development platform

The Community portal is a WordPress[3] page, or more specifically a part of the DIMMER project WordPress page. The portal uses BuddyPress[4] which is a WordPress plugin to create a social network. The Community tool is created as a WordPress plugin[5] specified in displaying DIMMER data. This plugin is mainly written in PHP with HTML, CSS and JavaScript for the GUI. The web service used by the tool is a WCF[6] web service written in C# using the .NET framework. This service also uses the Central Authentication Service (CAS) to verify that the user has access to DIMMER data in the same way that the other DIMMER applications (e.g. the Benchmarking tool and Dashboard) do. The DIMMER Definitions tool is a jQuery (with HTML and CSS) application embedded in a Community portal page.

3.3. Community tool GUI

As mentioned before, the Community portal is part of the DIMMER project site found at http://www.dimmerproject.eu/, in the top menu of the site there is a link to the Community portal main page (see Figure 13), on this page the user can read

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[3] https://wordpress.org/
[4] https://buddypress.org/
[5] https://codex.wordpress.org/Writing_a_Plugin
[6] https://msdn.microsoft.com/en-us/library/ms731082(v=vs.110).aspx

more about what the Community portal is, what they can do there, join the community and read news and about events related to energy efficiency. There are four submenus linked to the portal: *Groups, Members, Links and Definition tool*.
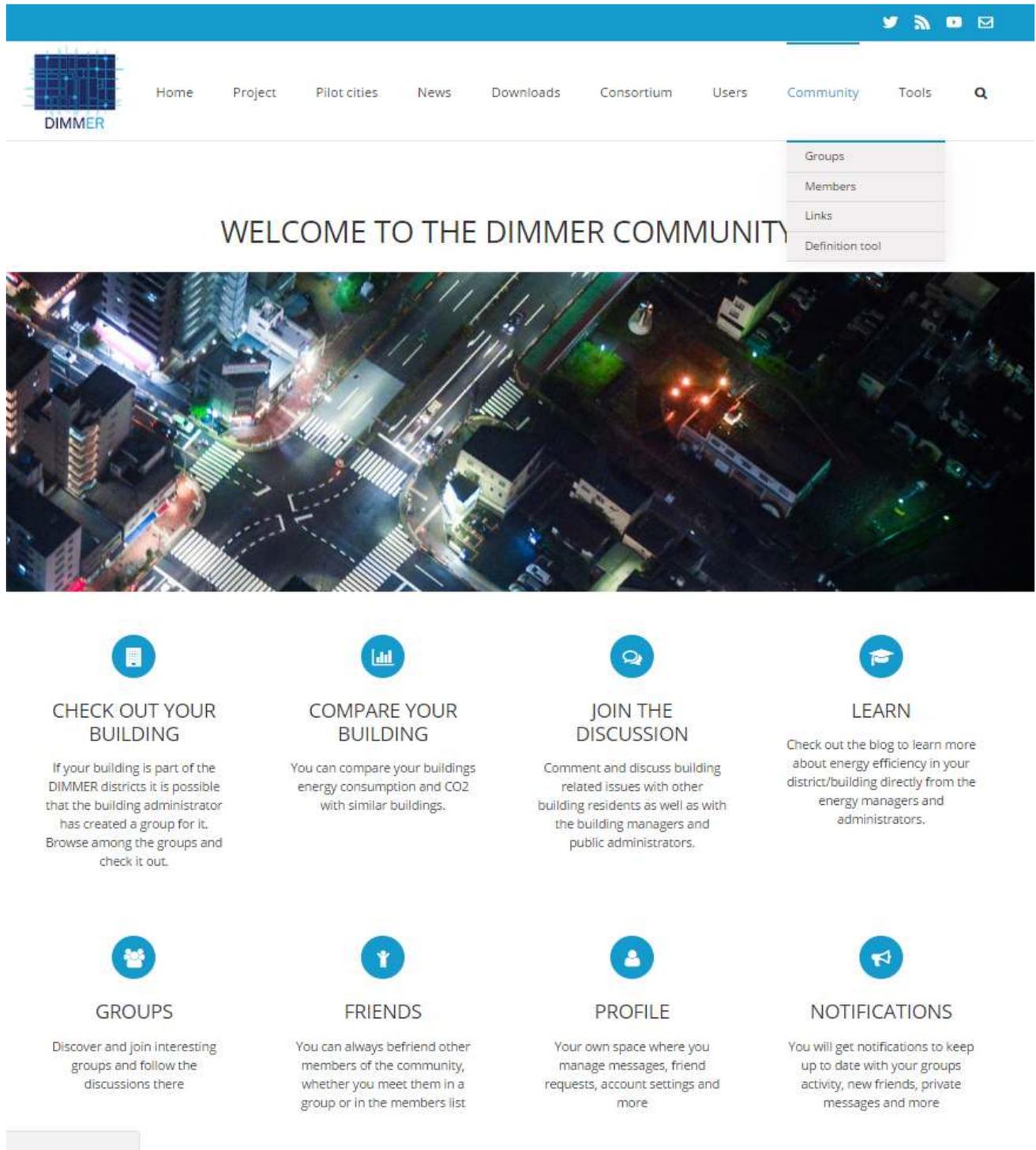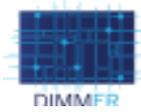

Figure 13: Community Portal first page

A group is simply a page where members can join and discuss different topics or issues by leaving a comment or posting an image, link or video. Any member can create a group and invite friends to join the group, if the group is public any member can join but if the group is private the members need to be invited to the group by the group creator. The Groups page (see Figure 14) shows a list of groups which varies depending on if the user is signed in or not, if the user is an administrator and which groups he/she has joined. If the user is not signed in, the list of groups will consist of all public groups created by a member or administrator often to discuss a topic e.g. green lifestyle, green education or peak shaving. If the user is signed in, he/she will see the public groups as well as the private groups he/she has joined. If an administrator is signed in, he/she will see all groups (public and private).
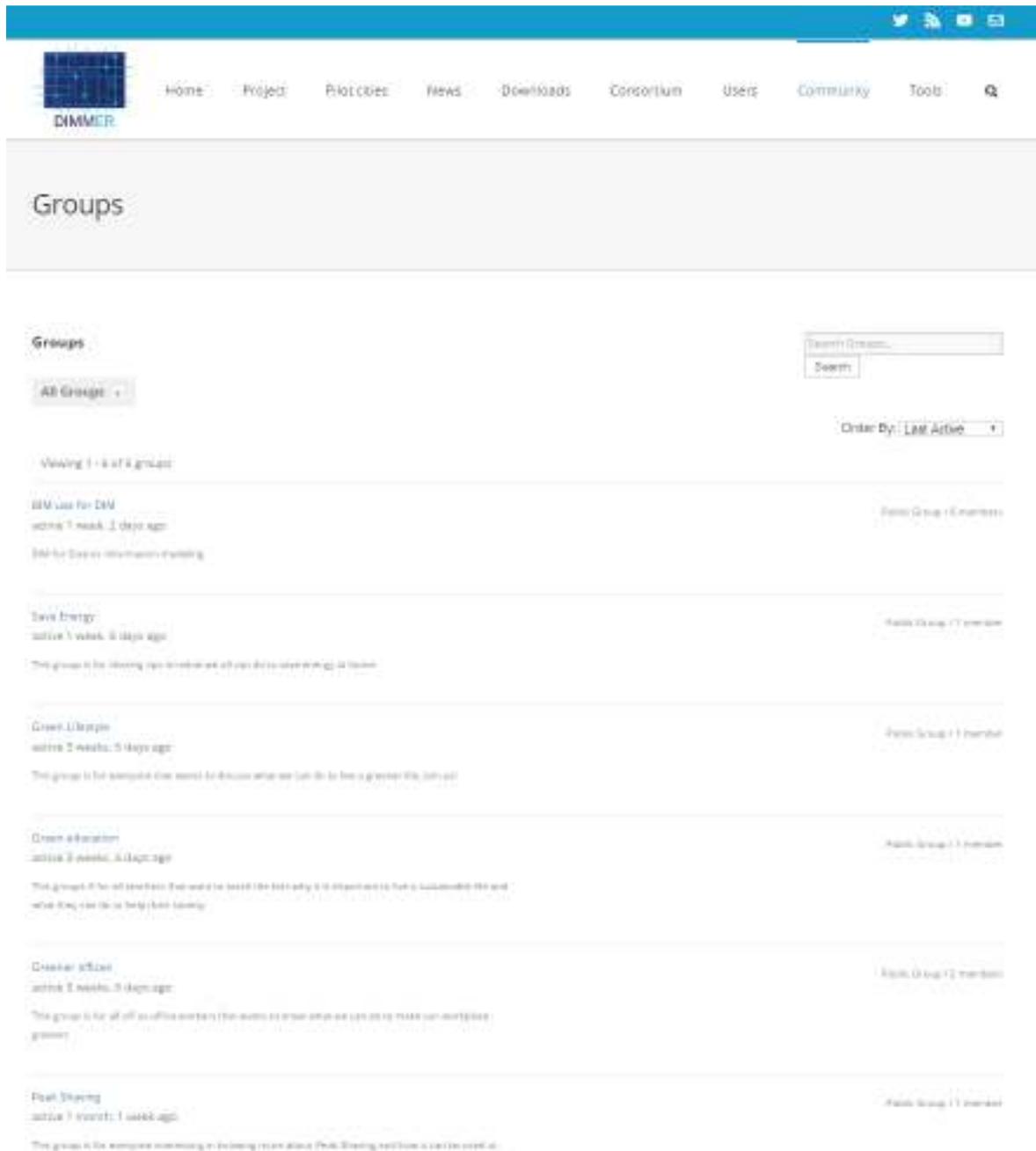
Figure 14: Community portal groups

The Members page shows a list of the Community members and any member can send a friend request to any other member. Being a friend means that they can send private messages to each other, invite each other to groups and get notifications on each other's activity.
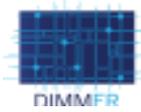
Figure 15: Community portal members

To use the Community tool the user must be a Community portal administrator and be signed in. The first step is to enter the CAS credentials which verifies if the user has access to DIMMER data (see Figure 16). The second step is to configure Community portal groups with DIMMER buildings (see Figure 17) for instance if the user already created a group for the
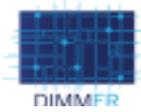
Pigafetta 52 building. He/she can link that group with the DIMMER building (see buildings list in Figure 18) and thus get data for that specific building. The user can also choose which components show on the group page, there are four components:

- Basic info: shows basic information about the building such as name, address, height, location etc.
- Trend: shows an indication of increased/decreased energy consumption, CO2 emissions and temperature
- Monthly consumption: shows a chart of the monthly energy consumption for the building. Both for current year and last year.
- Compared consumption: shows a chart of the buildings' energy consumption compared to a similar building

Once the user has configured the Community tool and saved the changes he/she enables the tool by copying the short code (see red selected area in Figure 17) and pastes it on the group page (see Figure 18). When all that is done, and the page is updated the group page will show the DIMMER components. Figure 19 shows the group page without the Community tool enabled and Figure 20 shows the same group page when the Community tool is enabled.
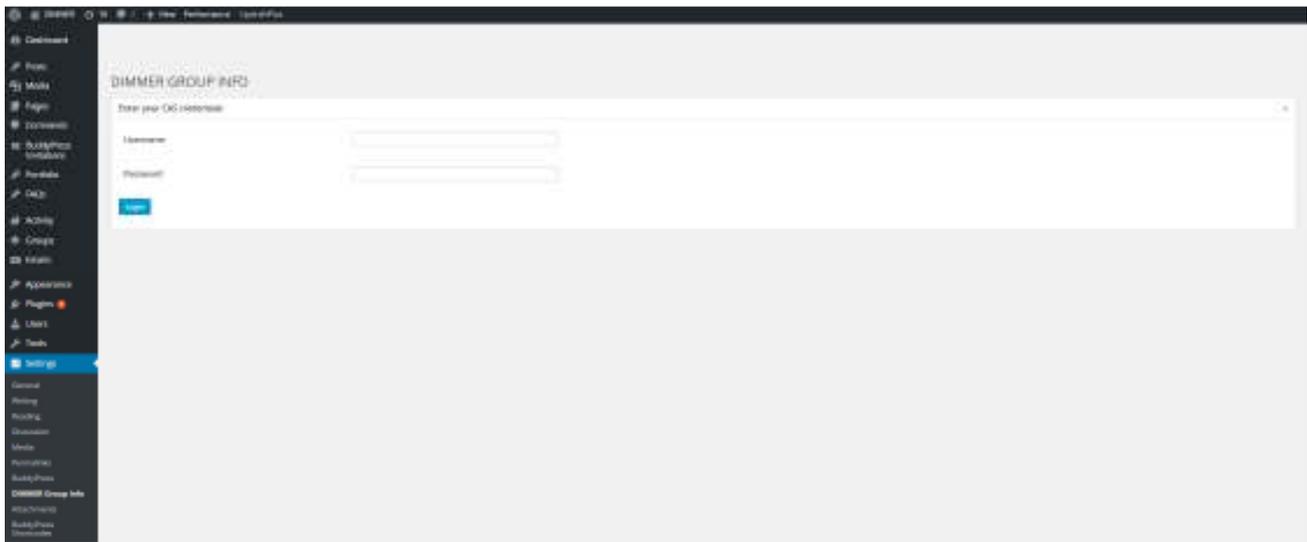
Figure 16: Community tool CAS credentials
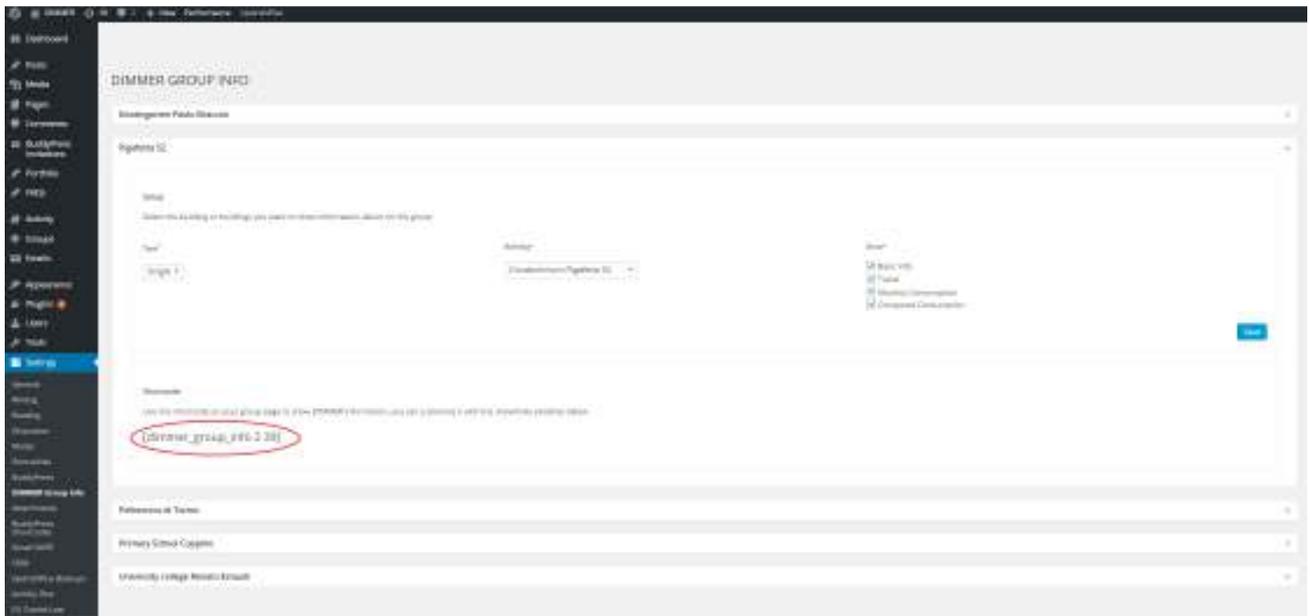
Figure 17: Community tool admin settings
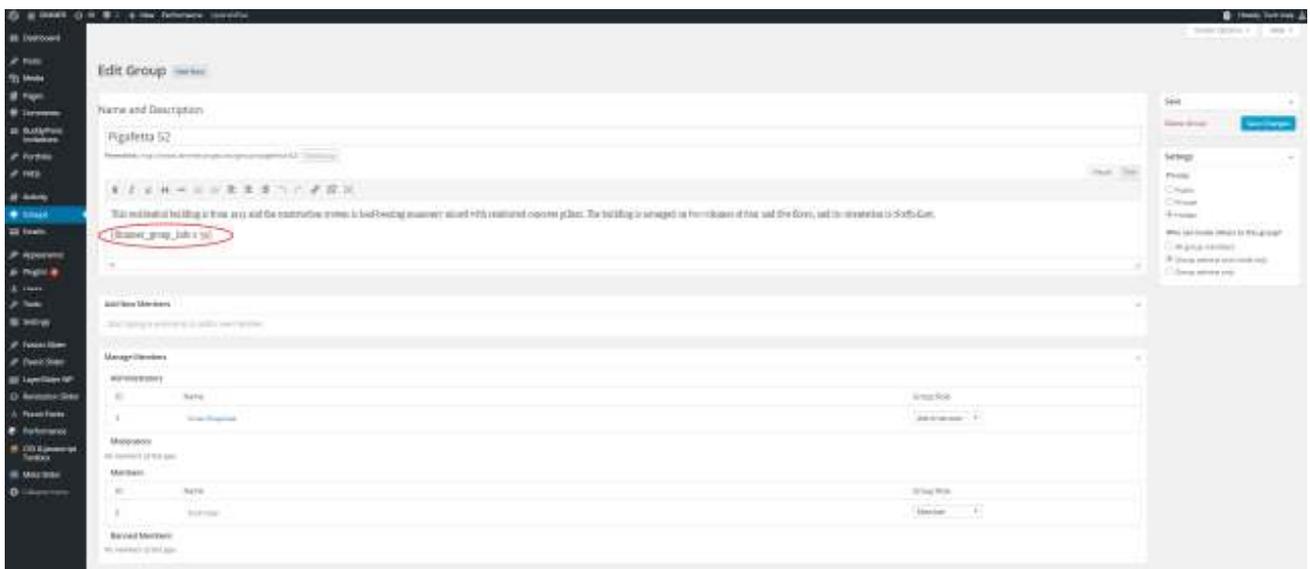
Figure 18: Add Community tool to group in admin mode

Pigafetta 52

Pigafetta 52

Group Admins

Hidden Group   active 4 minutes ago

This residential building is from 1913 and the construction system is load-bearing mansonry mixed with reinforced concrete pillars. The building is arranged on two volumes of four and five floors, and its orientation is North-East.
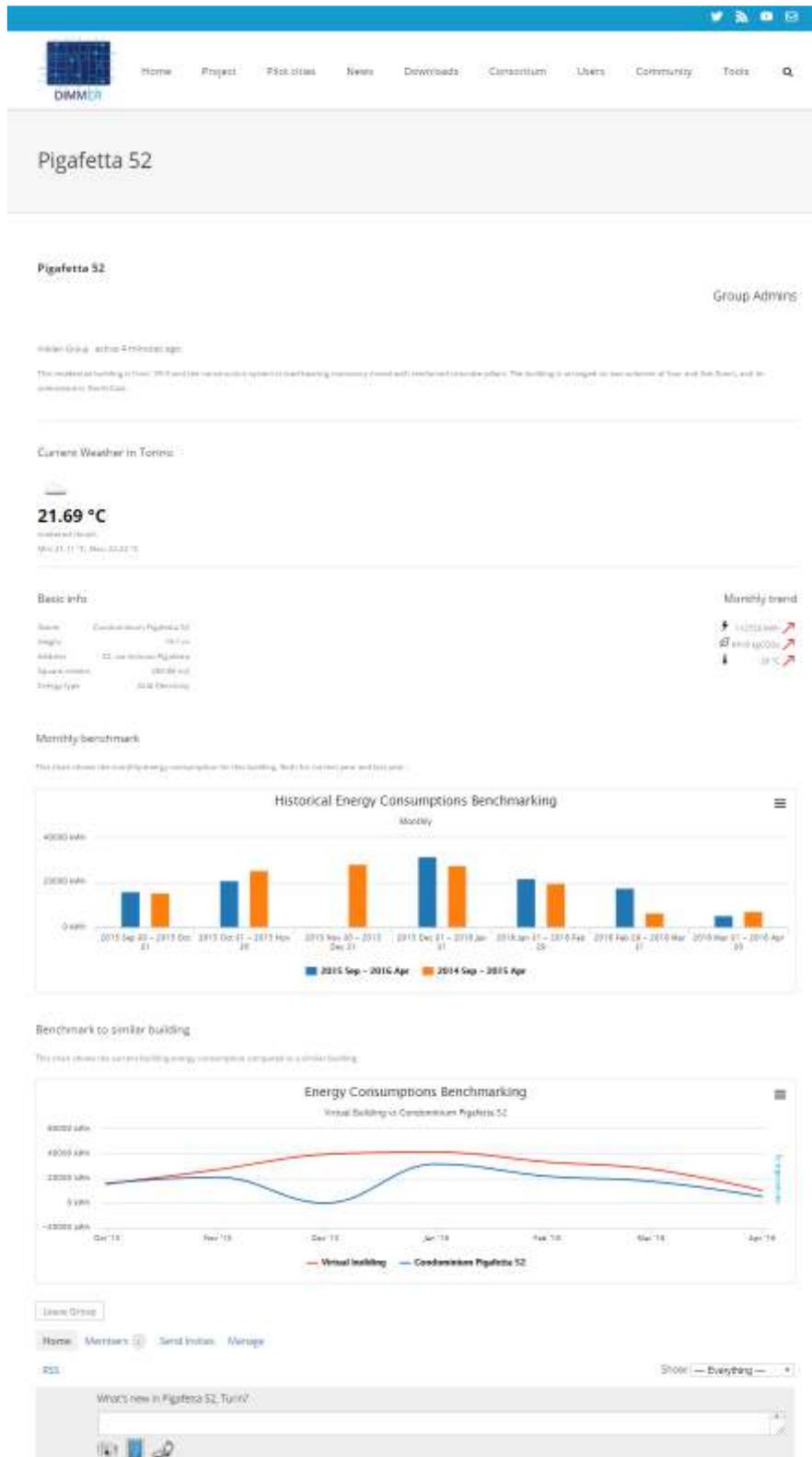
Leave Group

Home   Members (2)   Send Invites   Manage

RSS   Show: — Everything — ▾

What's new in Pigafetta 52, Turin?

Figure 19: Community portal group without Community tool enabled

Figure 20: Community portal group with Community tool enabled

3.4.   DIMMER Definitions Tool GUI

The DIMMER Definitions tool is very simple to use. The user enters a DIMMER related term (e.g. DIM, Context Awareness Framework) and clicks on the search button. If the entered term is found, the definition will be shown below the search field. There is also a *Quick Search* feature containing links to terms that the user might be interested in, once the user clicks on one of these links the definition appears below the search field as before.
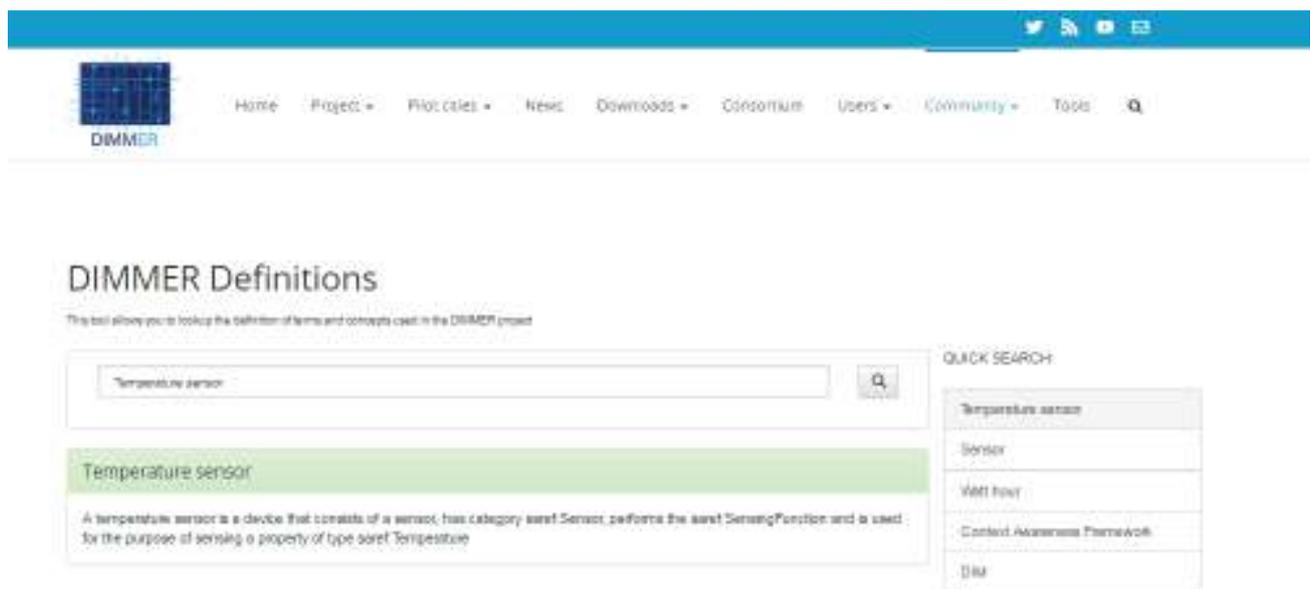

Figure 21: Community portal Definitions tool

CONCLUSIONS

The Community portal has successfully fulfilled the requirements (see Table 2) and is a platform that allows the target users to create awareness among the public and building residents. The decision of using WordPress for the Community portal was made having the target users (Public Administrators, Building Estate manager and Energy professionals) in mind. The initial idea was to create a tool that allows the user to create their own social network and by using WordPress the user would not need to write a single line of code. Just creating a social network, or as we call it, a Community portal is nothing new but using DIMMER components such as the middleware, the Context Awareness Framework, Ontologies etc. as is done by the Community tool makes the DIMMER Community portal unique and special.

The Community portal in this project includes both pilot sites, Turin and Manchester. But imagining a real scenario there would most likely be two Community portals, one for each city or maybe even one for each district in each city. The point is that the Community portal concept is flexible and would fit both approaches.