eTEACHER

D4.6: Manual for Configuration, Installation and Commissioning of eTEACHER (Final Release)

WP 4, T 4.3

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Technical References

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[1] CO = Confidential, only for members of the consortium (including the Commission Services)

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Abbreviation and Acronyms

API	Application Programming Interface
BACS	Building Automation and Control System
BEMS	Building Energy Management System
DBMS	Database Management System
ECM	Expectations – Capabilities – Motivators
IoT	Internet of Things

OPC UA   Open Platform Communications Unified Architecture

WiA   What-if Analysis

WP   Work Package

0 Introduction

The eTEACHER concept consists of encouraging and enabling energy behaviour change of building users by means of continuous interventions displayed through a set of empower tools to drive informed decisions in order to save energy and optimise indoor environment quality. These empower tools are a set of ICT solutions that ensures friendly connection between end-users and building systems, implement continuous behavioural change interventions and provide tailored advice.

The tools can be classified into:

- The **BACS add-ons** (What-if-Analysis, data processing and universal BACS/monitoring system interface)
- The **user-friendly solutions**

The software consists of multiple components. First, sensors/IoT devices are installed in the different buildings. These sensors/IoT devices are read through the BACS container, which collects the data. The data is used by other components to provide the final end user with data.

Metrix shows sensor data in an easy way to the user and tries to visualize the statistics, mainly for facility managers and collects feedback from inhabitants and visualize it via **Pulse**.

The **WiA (What-if-Analysis)**, generates recommendations for energy saving and comfort, based on the sensor data and hints for general energy saving measures. Later hints are even working without any installed sensors.

Further, there are the user-friendly solutions, which are energy efficiency and comfort advisor apps for end-user devices, like **mobiles** and **web**. These apps show the ECMs identified by the WiA (What-if-Analysis) and Metrix/Pulse. It integrates ICT-based behavioural change techniques such as gamification to encourage behavioural change and to facilitate the execution of tailored energy interventions which result in a significantly enhancement of energy efficiency. Gamification is done in multiple ways, like a **ranking** system, a quest log[2] like recommendation system (known from roleplaying games) and different **visualisations of the data**. For example, one of these visualisations is a tree showing how much CO_2 you saved by following eTEACHER recommendations. Another example is the **Virtual Building**, which shows the 3D representation of the building, where users can see real-time data being measured in the different rooms.

0.1 Deliverable Purpose, Scope and Context

The purpose of this deliverable is to accompany the prototype of WP2 and WP3. It is described, how it can be used and what the eTEACHER project is doing, to increase the success of the testing phase. Further, an installation Guide is provided for the installation and configuration of the complete eTEACHER system. This document is an increment of D4.4 and provides all information to successfully implement and use the software.

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[2] The ticket list is similar to a quest log with mission and short actions, with which you get points (which could be seen as some kind of experience).

0.2 Document Status and Target Audience

This deliverable is qualified as confidential in the Description of Action (DoA), for this reason the information gathered, and their distribution is mainly for the consortium members. It contains information for Admins and users, who wish to implement eTEACHER, even outside of the eTEACHER project, without the need to use the prototypes running on eTEACHER consortium member servers. So, consortium members are able to use the content for this purpose.

0.3 Document Structure

This deliverable is broken down into the following sections:

- Section 0 – Introduction: provides an introduction for this deliverable including a general overview of the project and outlines the purpose, scope, context, status and target audience of this deliverable.
- Section 1 - Configuration and Installation Guide for Administrators: explains, how administrators can setup eTEACHER
- Section 2 - User Guide for the eTEACHER App: explains, how the app can be used from an end user perspective.
- Annex A1 - Presentation for Pilots' Training Sessions: consists of a presentation with a short introduction to the tools.
- Annex A2 - Videos for Training Sessions: contains links and brief descriptions of videos, explaining certain functionalities of the tools.

1 Configuration and Installation Guide for Administrators

This section provides information about what administrators need to prepare in order to setup the complete eTEACHER prototype. The eTEACHER system consists of 5 subcomponents. The installation and configuration is described in the following subchapters. An overview of the different Software components, where the installation and configuration are described, is shown in Figure 1.
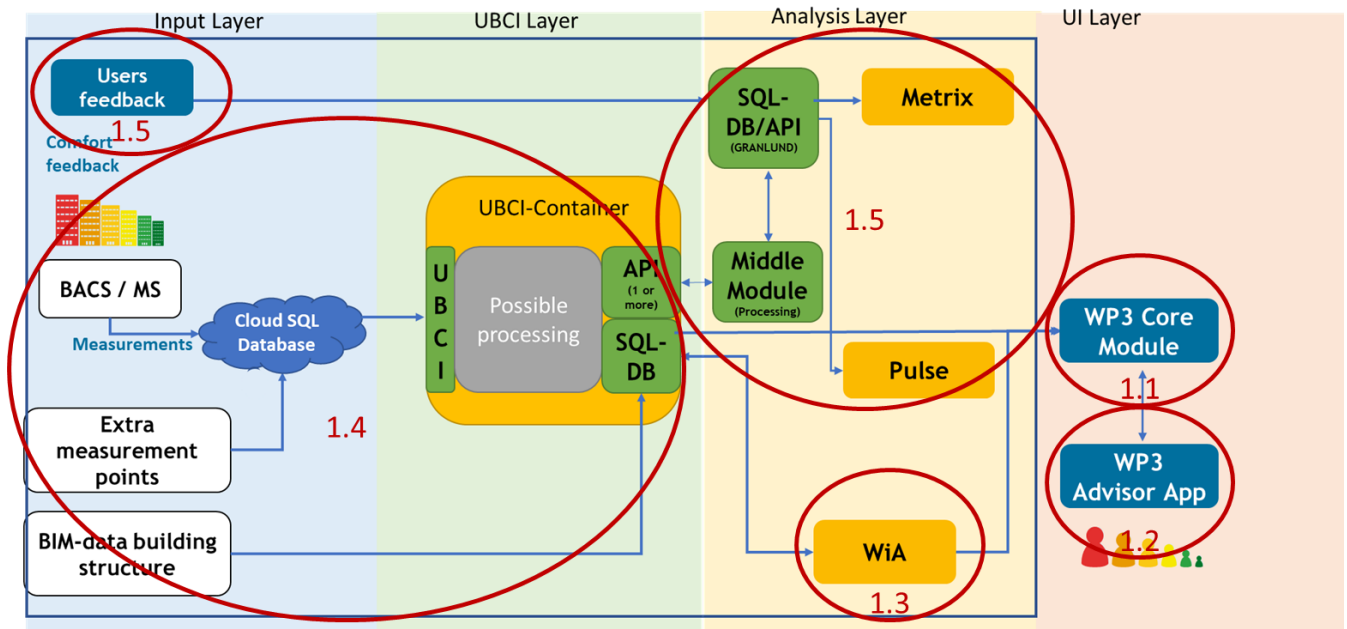
Figure 1 - Software Components of eTEACHER

1.1 Energy Efficiency Advisor Core Service Repository

The Energy Efficiency Advisor Core Service Repository manages the storage and provisioning of Proxy Service Wrapper objects. It is responsible for interacting with the app, saving profile information, calculating the gamification results and providing all the information to the mobile app or website. It is available as a Docker image for easier deployment. It does not need to be installed if the eTEACHER app from the PlayStore, AppStore or the website is used. Nonetheless, the following subsections describe how it could be setup without relying on the eTEACHER infrastructure. Additional configuration for new buildings is not necessary, since this is automatically done via WiA (1.3), BACS (1.4) and Metrix/Pulse (1.5).

1.1.1 Requirements

Some preparations to install the Energy Efficiency and Comfort Advisor Core subcomponent must be set to run a stable instance of it. It is recommended to use the Linux distribution Ubuntu 14.04 as the operating system, due to dependencies of the used Docker version 1.12.1. Any other operating system can be used too, but it cannot be guaranteed that it will work successfully with the Docker version, which is used in eTEACHER. According to this, Docker must be installed with the extension Docker-Compose. Furthermore, access to the Linux root user must be ensured as there are resources that need root privileges.

The following commands are required to set up the Docker Engine on Ubuntu 14.04:

```
1. sudo apt-get update
2. sudo apt-get install apt-transport-https ca-certificates
3. sudo apt-key adv \
   --keyserver hkp://p80.pool.sks-keyservers.net:80 \
   --recv-keys8118E89F3A912897C070ADBF76221572C52609D
4. echo "deb https://apt.dockerproject.org/repo ubuntu-trusty main" | sudo tee
   etc/apt/sources.list.d/docker.list
5. sudo apt-get update
6. sudo apt-cache policy docker-engine
7. sudo apt-get install docker-engine=1.12.1-0~trusty
8. sudo apt-mark hold docker-engine
```

The following commands are required to set up the Docker Compose on Ubuntu 14.04:

```
1. sudo curl -L
"https://github.com/docker/compose/releases/download/1.8.1/docker-
compose-$(uname -s)-$(uname -m)" > /usr/local/bin/docker-compose
2. sudo chmod +x /usr/local/bin/docker-compose
```

To increase security, privacy and limit the access to Docker resources to the eTEACHER environment, it is necessary to create a password file respectively to the affected users, who shall have access to the system[3].

Further, a MongoDB installation is required. Specific instructions for installing MongoDB on Ubuntu 14.04 (the environment used to run the component) can be found online[4].

The following commands are used to add the gpg (GNU Privacy Guard, a tool for asymmetric encryption) public key, add the MongoDB package source to the local server, refresh the package

```
1. sudo apt-key adv –keyserver hkp://keyserver.ubuntu.com:80 –recv
   EA312927
2. echo "deb http://repo.mongodb.org/apt/ubuntu trusty/mongodb-org/3.2
   multiverse" | sudo tee /etc/apt/sources.list.d/mongodb-org-3.2.list
3. sudo apt-get update
4. sudo apt-get install -y mongodb-org
```

listing, and finally install MongoDB:

The MongoDB installation can be verified by running `mongod –version`, which should specify a version string with 3.2.6 or later, i.e. `db version v3.2.6`.

To verify the status of the MongoDB server, the command `ps aux | grep mongod` can be executed, which should show a mongodb process running as the user `mongodb`.

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[3] https://httpd.apache.org/docs/current/programs/htpasswd.html

[4] https://docs.mongodb.com/manual/tutorial/install.mongodb-on-ubuntu/

1.1.2 Installation and Configuration

To install the Energy Efficiency Advisor Core, first, the user has to download the required docker-compose.yml by using the following download link and password:

- Link: https://box.abelssoft.de/d/5c891654b29b16-49652365
- Password: CVYWRH

After all requirements are fulfilled, the file `docker-compose.yml` can be used to setup the eTEACHER's Energy Efficiency Advisor Core. The `docker-compose.yml` file contains all necessary instructions to have a secure and stable service management system. Docker Compose is used to install the software component via a console command. To execute this command, the current location must be the folder /eteacher.backend/. The command to install this component is `docker-compose up`.

Before starting, the configuration has to be setup, to define where the different servers are running, since the Advisor Core is relying on different docker containers. This can be done by opening the subfolder eTEACHER-Core/eTEACHER-Core-Backend and changing the appsettings.json. In it, you can configure the different servers and configure the accounts to access them. The provided configuration should work besides the mongoDb account, which has to be added to the connection string as follows:

```
"MongoDbConfiguration": {
    "ConnectionString": "mongodb://<account>:<password>@127.0.0.1:27017"
}
```

The MongoDB instance is required to store data. As this database will contain user information, including the hashed user password, care should be taken to ensure security regarding access permission to the database interface and the files on disc.

The next step is to build the Docker image. As everything is prepared in the repository, this step is very easy and will take about 5 minutes. The following commands must be entered on the command line.

```
docker build -t eTEACHER.backend
```

Finally, to run the main server process, the following command with no arguments to the Docker instance can be executed.

```
docker run -p <PORT>:80 –name eteacher-core -ti eTEACHER-Core
```

Under normal circumstances and compliance with the requirements, the Advisor Core component should be running after the command mentioned previously. This can be tested with the command `docker ps`. After executing this command, a list with running containers is displayed with their current status. Therefore, one container called "eteacher-core" is running with a uptime of the container, which fits to the point in time, you started it.

In this case, the Open API Documentation with Swagger can be accessed (using HTTPS at the address for the docker instance and the external port specified) after approximately 20 seconds, which corresponds to the time the Advisor Core process takes to start up within the Docker container. The address should be `<server-address>:<PORT>/swagger`, where <PORT> should be an

available port on the server (e.g. 8080). To access the page, the corresponding URL needs to be called via a web browser. An already deployed version can be found online[5].

1.2 eTEACHER Advisor Website

The Energy Efficiency Advisor App/Website Service Repository represents most of the visual part of eTEACHER. It is basically the website the users interact with. It consists of one Docker image. The eTEACHER Advisor Website does not need to be installed if the eTEACHER infrastructure is used. Additional configuration for new buildings is not necessary since this is automatically done via WiA (1.3), BACS (1.4) and Metrix/Pulse (1.5).

1.2.1 Requirements

Some preparations to install the Advisor App subcomponent must be set to run a stable instance of it. It is recommended to use the Linux distribution Ubuntu 14.04 as the operating system, due to dependencies of the used Docker version 1.12.1. Any other operating system can be used too, but it cannot be guaranteed that it will work successfully with the Docker version used in eTEACHER. According to this, Docker must be installed with the extension Docker-Compose. Furthermore, access to the Linux root user must be ensured as there are resources that need root privileges.

The following commands are required to set up the Docker Engine on Ubuntu 14.04:

```
1. sudo apt-get update
2. sudo apt-get install apt-transport-https ca-certificates
3. sudo apt-key adv \
   --keyserver hkp://p80.pool.sks-keyservers.net:80 \
   --recv-keys8118E89F3A912897C070ADBF76221572C52609D
4. echo "deb https://apt.dockerproject.org/repo ubuntu-trusty main" | sudo tee
   etc/apt/sources.list.d/docker.list
5. sudo apt-get update
6. sudo apt-cache policy docker-engine
7. sudo apt-get install docker-engine=1.12.1-0~trusty
8. sudo apt-mark hold docker-engine
```

The following commands are required to set up the Docker Compose on Ubuntu 14.04:

```
1. sudo curl -L
"https://github.com/docker/compose/releases/download/1.8.1/docker-
compose-$(uname -s)-$(uname -m)" > /usr/local/bin/docker-compose
2. sudo chmod +x /usr/local/bin/docker-compose
```

To increase security, privacy and limit the access to Docker resources to the eTEACHER environment, it is necessary to create a password file respectively to the affected users, who shall have access to the system[6].

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[5] https://eteacher-ascora-api.ascora.eu/swagger/index.html

[6] https://httpd.apache.org/docs/current/programs/htpasswd.html

1.2.2 Installation

To install the Advisor App, first, the user has first to download the required docker-compose.yml by using the following download link and password:

- Link: https://box.abelssoft.de/d/2a291654b29b16-4962345
- Password: PVYWEW

First, an optimised version of the project needs to be built. This will include bundling, tree-shaking, dead code elimination and other code optimisations. For that, the used frameworks have to be used as well.

```
$ npm install
$ npm install -g @angular/cli
$ npm install -g @capacitor/cli
```

After all requirements are fulfilled, the file `docker-compose.yml` can be used to setup the eTEACHERs Advisor WebApp. The `docker-compose.yml` file contains all necessary instructions to have a secure and stable service management system. Docker Compose is used to install the software component via a console command. To execute this command, the current location must be the folder /eteacher.ngx/. The command to install this component is `docker-compose up`.

Before starting, the configuration has to be setup to define where the different servers are running. This can be done by opening the subfolder eteacher.ngx and changing the settings.json. In it, you can configure the different servers and configure the accounts to access them. The provided configuration should work besides the AdvisorCore backend address, which has to be added to the uri string, in the following configuration:

```
"AdvisorAPI": {
    "Uri": "https://127.0.0.1:44337"
}
```

The AdvisorAPI instance is required to communicate with other eTEACHER software components.

The next step is to build the Docker image. A shell to the server is required – e.g. via an active SSH connection. The component source code contains a Dockerfile to build a new Docker Image. In detail, the Docker image will fire up a nginx-webserver and deliver the component automatically. The following commands must be executed from the eteacher.ngx folder to build and run the eTEACHER WebApp image. As everything is prepared in the repository, this step is very easy and will take about 5 minutes.

```
docker build -t eTEACHER.ngx
```

Finally, to run the main server process, the following command with no arguments to the Docker instance can be executed.

```
docker run -p <PORT>:80 –name eteacher-ngx -ti eTEACHER.ngx
```

Under normal circumstances and compliance with the requirements, the Advisor WebApp component should be running after this command.

This can be tested with the command docker ps. After executing this command, a list with running containers is displayed with their current status. Therefore, one container called "eteacher-ngx" is running with an uptime of the container, which fits to the point in time, you started it.

In this case, the WebApp can be accessed (using HTTPS at the address for the docker instance and the external port specified) after approximately 20 seconds, which corresponds to the time the Advisor WebApp process takes to start up within the Docker container. The address should be <server-address>:<PORT>, where <PORT> should be an available port on the server (e.g. 8080). To access the page, the corresponding URL needs to be called via a web browser.

An already deployed version can be found online[7].

This version can be used with no specific installations, as it can be accessed with a regular internet browser with JavaScript being fully enabled.

The component has been tested on the 2021 versions of the following web browsers:

• 	Google Chrome (Windows, Mac, Linux)

• 	Firefox (Windows, Mac, Linux)

For installation of the App, just download the apps from the AppStore/PlayStore, described in 2.1.

1.2.3 Configuration

After the installation steps described in Section 1.2.2 are done, the website is reachable on https://127.0.0.1:8080.

Since users of eTEACHER are just allowed to see own data and not the data of others, the user has to prove that he is allowed to see the data. Therefore, QR codes are created by eTEACHER admins. To create a QR code, go to the following local website with any browser on the server the service is running on: https://127.0.0.1:8080/qr-code

To generate a QR code, you need information from the BACS database, which installation is explained later on. How to configure a QR code and which data to use, can be seen in Figure 2.

The QR code has the location stored and some kind of verification. The verification code verifies, that the QR code was generated on the server. Location data is not stored on the server, instead an anonymized ID is saved. This ID is just known to the server and every incoming recommendation is translated to the ID and redirected to the user. How to use the QR code is explained in chapter 2.

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[7]   https://eteacher-app.ascora.eu/

Figure 2 - Configuration Screen for eTEACHER Advisor

1.3 What-if Analysis

The What-if Analysis BACS Add-on consists of a framework that includes three components: an OPC-UA Client (Open Platform Communications Unified Architecture), a DBMS (Database Management System) and the What-If Analysis application. The OPC-UA Client relies on the JAVA technology. The DBMS also uses JAVA and is built as an Open Services Gateway initiative (OSGI) Application that includes needed dependencies. The What-if Analysis is built with Python and integrates necessary packages. The best way to use the WiA is as a cloud service which is run and maintained at Fraunhofer premises. However, the same framework can be installed locally if needed after eTeacher project. Next, the installation of this app and what can be obtained from it is described. It should be noticed that the WiA cannot be used without other BACS-addons:

- To feed the tool with real data, the UBCI should be used as a back-end storage for live monitoring data (1.4)
- To visualize results the eTeacher app provides a front-end (1.1, 1.2).

1.3.1 Requirements

Containers are used to easily pack, ship and run What-If application. Containers encapsulate applications with all their dependencies to run on every host with a container runtime installed. A separate container is built for each application of What-If analysis: OPC-UA Client (JAVA), Postgresql-Database and What-If Analysis (Python). These containers are built on a build-pipeline

in every release. After passing some tests and building the docker container, the created container images are pushed to a private container registry. To use these images, two options are available: Docker and Docker Compose for development purposes and Kubernetes for production. The installation of Docker and Docker compose is already described in (1.1.1, 1.2.1). Setting up and configuring Kubernetes for production is complicated and therefore, using a cloud provider like Azure Kubernetes Service (AKS) is recommended. To install and configure What-If on Kubernetes, a helm chart is provided. So, a helm installation (version 3) is necessary.

1.3.2 Installation and Configuration

Docker Compose is used for easily testing and development of What-If Analysis. Docker Compose is a tool to run multi-container Docker applications. The "docker-compose.yaml" file used could be found under "/docker-compose" folder of the eTeacher git repository. To start the What-If application, cd to "/docker-compose" folder and execute:

```
docker-compose up
```

To examine, that all services are up and running, execute:

```
docker-compose ps
```

Kubernetes is used in production. Ensure that "kubctl" command is working and connected to the cluster. The Kubernetes cluster needs a default storage class with dynamic provisioning to collect and persist data of the What-If application. Also, the cluster needs access and credentials to the private Container registry via "imagePullSecrets". Configuration for Kubernetes is provided by a helm chart. The chart is stored under "/k8s" folder in the git repository. To install What-If application on Kubernetes, cd to "/k8s" directory and execute:

```
helm install --namespace eteacher --create-namespace what-if ./eteacher
```

1.4 eTEACHER BACS add-ons for UBCI

The BACS add-ons are provided as containers for the software Docker. The following add-ons are used for the eTEACHER solution:

•   common database based of MySQL

•   eTEACHER SyncTool (three instances)

•   eTEACHER API

•   eTEACHER OPC UA add-on

1.4.1 Requirements

Similarly to chapter 1.1.1 the software Docker with the extension Docker-compose is needed to install and execute the BACS add-ons.

To be able to administrate and maintain the common database, a software tool is needed. A commonly used software tool is phpMyAdmin. It is a free tool that is written in the scripting language PHP for administrating the DBMS MySQL or its fork MariaDB. Therefore, it is recommended to run an instance of phpMyAdmin, for example via Docker, too.

1.5 Metrix, Pulse, User Feedback and Virtual Building

In the case of Metrix and Pulse, the administrator needs to purchase the Manager software from Granlund. For the user feedback, the administrator also needs to purchase the vibemetrics service. To use Metrix, Pulse, user feedback, and the virtual property, the data warehouse should be available.

1.5.1 Requirements

Metrix, Pulse, and the virtual property use information collected from the UBCI container. For data transfer, the UBCI container must be installed and the API must be defined and configured. To provide feedback in the "Your comfort opinion" section of the eTEACHER application, Metrix and Pulse must be installed and configured.

Outdoor air temperature is a necessary measure of Metrix for performing calculations. The sampling interval should be at least 10 minutes.

In addition to the actual measuring point, metadata should be attached to the measurement, which indicates the location of the measurement in the building, zone or room level and in the technical building process.

1.5.2 Installation and Configuration

Collecting information from different systems and processing it requires data integration between the systems. In data processing, the interfaces between different systems and their functionality become important.

The eTeacher Pulse service integrates five different systems. Three systems and vendors are involved in processing user feedback, and two systems and vendors are involved in processing Metrix data. In addition, there are three systems involved in presenting a BIM model.

Pulse and feedback

For Pulse, a building must be created in Metrix and the real estate and building level IDs (zones, etc.) to which Pulse values can be assigned need to be defined. Once the building has been set up with its facilities and equipment in the Metrix database, the feedback data from the vibemetrics service can be configured for a specific property using a configuration file (see **Figure 3**).

```
10      <add key="Pulse_DatabaseID" value="87"/>
11      <add key="Pulse_ObjectID" value="24"/>
12      <add key="Pulse_DatabaseUDL" value="C:\Fm32\PulseServices\eTeacher_Spain_Torrente\Db\eTeacherDemo.udl"/>
```

Figure 3 - Part view of pulse service configuration file

Once the necessary configurations have been made, the Pulse service (see Figure 4) can be started and the feedback data is stored in Granlund Manager database.

Name	Status	Description	Startup Type

PulseService_eTeacher_Romania_BuildingA	Started	Automatic	Local System
PulseService_eTeacher_Romania_BuildingB	Started	Automatic	Local System
PulseService_eTeacher_Romania_BuildingC	Started	Automatic	Local System
PulseService_eTeacher_Romania_BuildingD	Started	Automatic	Local System
PulseService_eTeacher_Spain_Arcoiris	Started	Automatic	Local System
PulseService_eTeacher_Spain_Guerena	Started	Automatic	Local System
PulseService_eTeacher_Spain_OAR	Started	Automatic	Local System
PulseService_eTeacher_Spain_Residential	Started	Automatic	Local System
PulseService_eTeacher_Spain_Torrente	Started	Automatic	Local System
PulseService_eTeacher_Spain_VillaFranca	Started	Automatic	Local System
PulseService_eTeacher_UK_Djanogly	Started	Automatic	Local System
PulseService_eTeacher_UK_NCC	Started	Automatic	Local System

Figure 4 - Part view of pulse service in Metrix server

Once the Pulse service is started, you can configure other necessary parameters on the Manager Configuration site. After this complex multi-system procedure and data processing, the user can see the wellness status of the property in the user interface (see Figure 5).
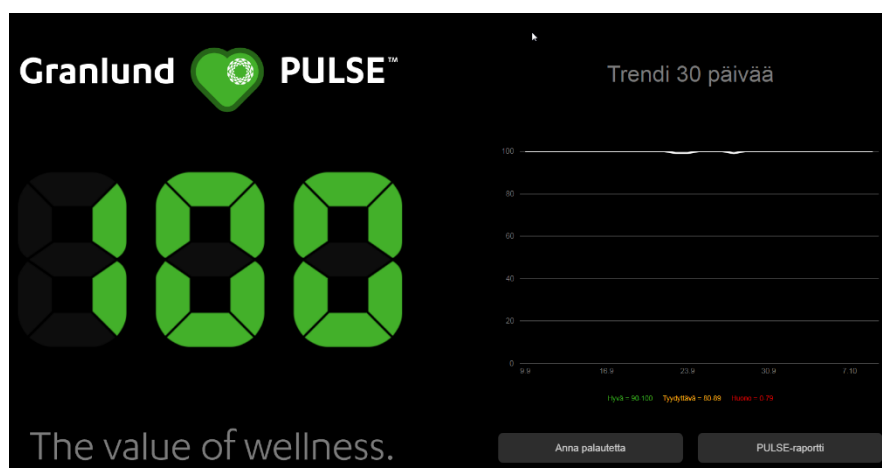

Figure 5 - Granlund Manager Pulse score in Romania, building C

Metrix

Metrix is part of the pulse service and can be used as a measure of a property's performance and indoor conditions as well as supporting property maintenance. The Pulse score can be calculated based solely on the users' feedback, but it can be also varied by the persistence of real estate conditions and performance. The baseline for the Pulse output value is always 50. When only users' feedback is used, one good or bad vote varies the score by 1%. However, if the Pulse value is also affected by the Metrix score, then one good or bad comfort vote affects 0.25% and the Metrix score affects 0.75%. Setting up Metrix and starting a data transfer to calculate the Pulse score is more complicated than just providing user feedback. There are many ways to implement Metrix, depending on the level of analysis of every specific building. At Metrix, you have the option to look at the indoor conditions, the energy efficiency and/or the building performance, being able to choose one, two or all of these parameters.

In the eTeacher Project, we have focused more on the perspective to monitor temperature and space conditions, so this outlines the basics of data processing regarding indoor air quality and temperature monitoring.

Initially, a new table or database is created in the Metrix raw data database, where data from eTEACHER Common database will be stored. See Figure 6 below for eTeacher database tables. The information in the columns from the left is: HostID, HostName, HostAddress, HostInputPath, ActiveStatus and CreatedBy.

5	UKDjanogly	UKDjanogly	UKDjanogly	1	MVu
6	UKNCC	UKNCC	UKNCC	1	MVu
7	RomaniaInCity	RomaniaInCity	RomaniaInCity	1	MVu
18	SpainArcoiris	SpainArcoiris	SpainArcoiris	1	MVu
19	SpainGuarena	SpainGuarena	SpainGuarena	1	MVu
20	SpainTorrente	SpainTorrente	SpainTorrente	1	MVu
21	SpainOAR	SpainOAR	SpainOAR	1	MVu
22	SpainResidential	SpainResidential	SpainResidential	1	MVu
23	SpainVillafranca	SpainVillafranca	SpainVillafranca	1	MVu

Figure 6 - Part view of Metrix database

Once the data transfer from the eTEACHER Common database to Metrix is established, a space hierarchy similar to the eTEACHER Common database is manually created in Metrix. Configuring a new measurement in Metrix is done manually using Metrix's setup pages (see Figure 7) .
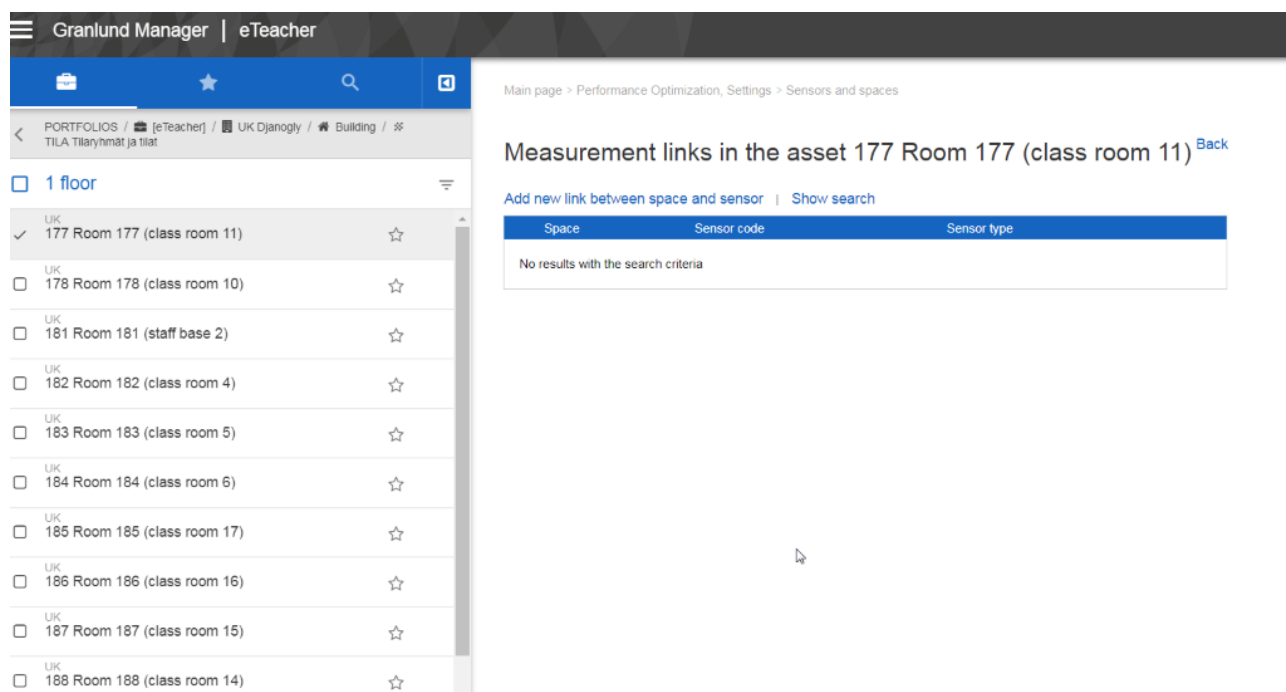

Figure 7 - Connecting measurements to a room and floor in Metrix

On the Metrix setup page, room measurements can be linked to created rooms and define sensor types (see Figure 8). It is also possible to view the measurement history. This ensures that the sensor is the right one.

Figure 8 - Detailed definition of a room sensor for a specific space in Granlund Manager

You can select a mode, which depends on the type of the measured data, and a sensor can be selected from among the points to be transferred to the database. It is also possible to access the measurement history. This ensures that the sensor is the right one. Once you have successfully paired the sensor, you can see the measurement links (see Figure 9):

Figure 9 - Measurement point connect to a specific space

A very important part of Metrix is the definition of specific conditions and energy efficiency targets for every building. Target values and target areas may vary by country or even within a country. Special attention should be paid to this when there are buildings to be determined in different countries. Metrix's usability and reliability are largely based on properly set targets. The user and facility manager should be involved in defining the target range in order to achieve a good result. Target values must be defined for each quantity to be measured (see Figure 10).

Figure 10 - Target range setting page in Granlund manager

Finally, once all the configurations and data transfer preparations have been completed, the end user can see the data shown in Figure 11 and Figure 12 for example.

Figure 11 - Key calculated values of temperature in Granlund Manager
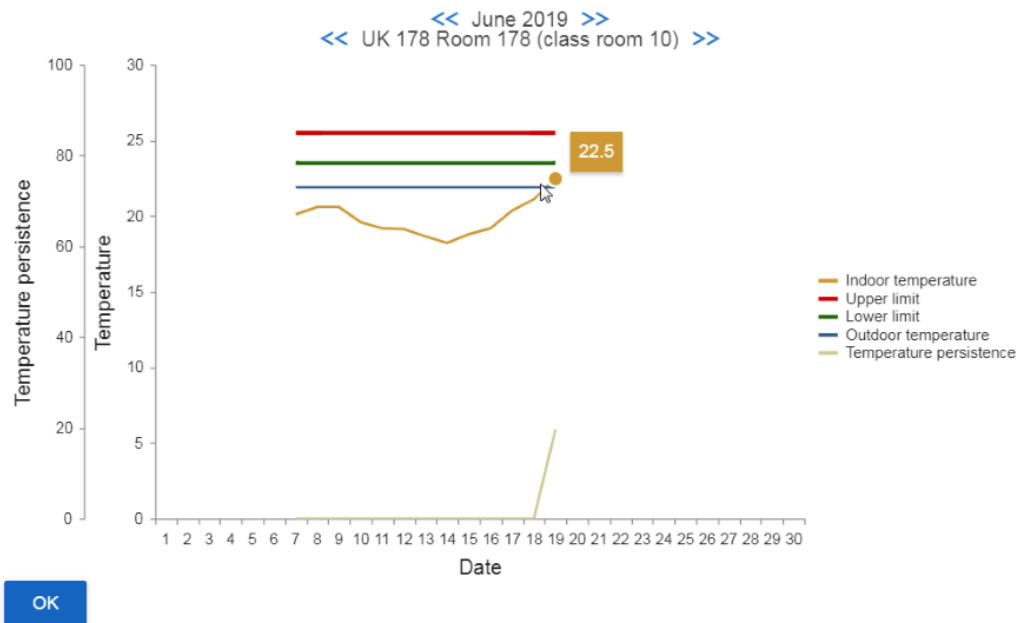
Figure 12 - History view of temperature behaviour and target values.

Lower and upper limit, average measured values, temperature persistence and indoor temperature are calculated and presented to the user in a visual, user-friendly way. Historical data and current indoor temperature versus targets or outdoor temperature can be also viewed.

Figure 12 shows some data problems. For example, it quickly indicates that the outdoor temperature sensor is not working properly since outdoor temperature should not be a constant value. Indoor air temperatures have also been quite low in June, but without knowing the actual outdoor temperature, the reasons for this low temperature are hard to find. It can be also observed from the figure that the temperature limits might be too high.

2 Userguide for the eTEACHER App

2.1 Accessibility and Installation

The eTeacher Project app has been developed for several platforms to help people saving energy and improving their comfort level with the most frequently used devices. It can be used as a mobile app and as a desktop application in the browser. For mobile devices, it is available in the well-known app store of Google (Playstore) and Apple (iOS Appstore) as well as in any browser via a website.

The eTEACHER App is available in the respective stores under the following links:

- Play Store: https://play.google.com/store/apps/details?id=de.ascora.eteacher
- AppStore: https://apps.apple.com/de/app/eteacher-project/id1485405835

For using the eTeacher Project app in a browser, the following URL can be used:

- https://eteacher-app.ascora.eu/projects

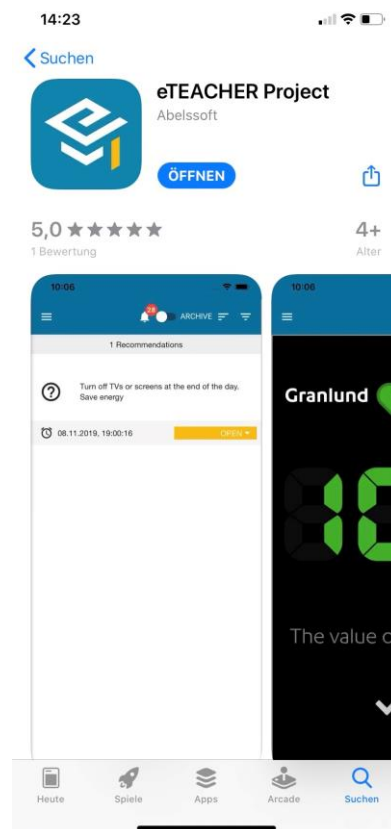**Figure 14 - Appearance in the Google Play Store**

Figure 13 - Appearance in the Apple App Store

An installation is only necessary for the mobile devices, as the website can be used out of the box with full functionality. To install the apps, the normal process of app installation can be followed by clicking the download button on the app page of the store.

2.2 First App Start

When the app starts for the first time, the user is asked to login with its user credentials. If the user is new, a registration process follows. As the UI of the Android, Apple and desktop apps only differs in their appearance, only the Android version will be used to visualise the figures.

2.2.1 Registration Process

To register on eTeacher as a new user, s/he must click on "Register" in the login screen below the input fields. A window will then appear with a register form (Figure 16). To complete the registration process, the user has to enter his/her first name, last name and e-mail address. After that, the user is asked to choose a password. The password must include:

- lowercase letters
- uppercase letters
- at least 1 number
- at least 1 special character

After the user has filled in the mandatory fields, the registration process finishes by clicking on the "Register" button. The user will then receive a confirmation email, which must be confirmed by the user (Figure 15). If this e-mail ends up in the Spam folder, the user will not be able to login.
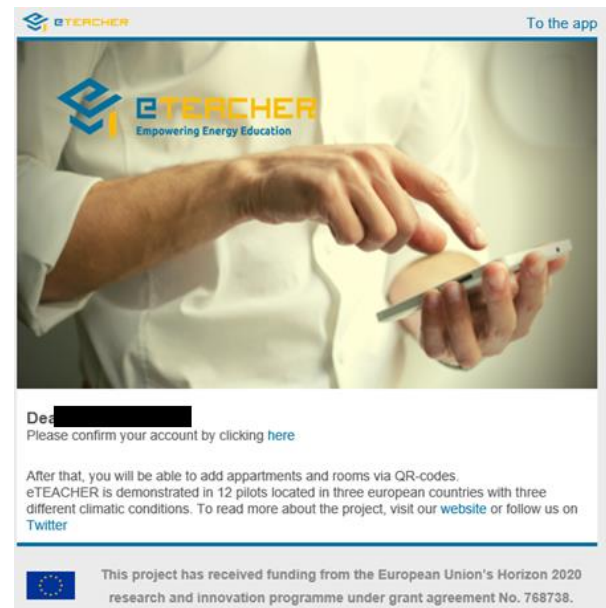
Figure 15 - Confirmation email

Figure 16 - Register form

2.2.2 User profile

After a successful authentication, a context menu (three dots) on the top right-hand side appears, which enables the user to open the user settings. These settings enable the user to:

- Select a profile image
- Change the email address
- Change the language used in the app. Currently available languages are:
  - o English
  - o German
  - o Spanish
  - o Romanian

Any change must be saved manually by clicking on the "Save" button.

2.3 Navigation Overview

After a successful login, the user can use all the functionalities the app provides. In the navigation bar (Figure 17) on the top, there are different symbols to guide the user through the functionalities:

1. A click on the three lines to open the so-called hamburger menu leads to the menu where all functionalities can be accessed. The hamburguer menu can be accessed from all views of the app by clicking on the three dashes in the upper left corner.

2. Notifications will keep you up to date. These will be sent automatically and will be received in real time after an action has been triggered.

3. The magnifying glass enables the user to have full text search in the app.

4. A click on the three dots on the right-hand side opens a popup to change the app settings.
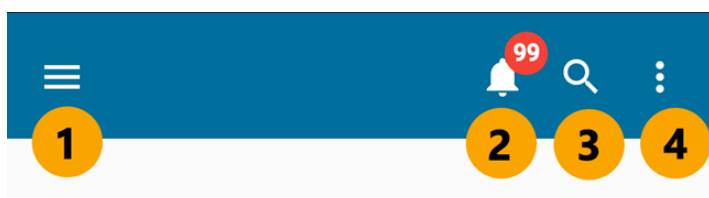
Figure 17 - Top navigation

When you select a room, you get your recommendations displayed and the upper menu view changes as follows:
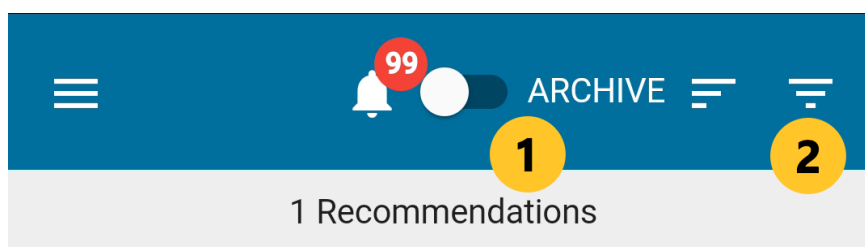
Figure 18 - Top bar

The hamburger menu and the bell remain the same, and the archive and filter options are now visible:

1. If the user activates the archive s/he will see all closed recommendations, s/he has closed in the past.
2. If the user right clicks on the right symbol with the three horizontal lines, the filter radio opens. The user can filter by title, date due to, due from and create at.
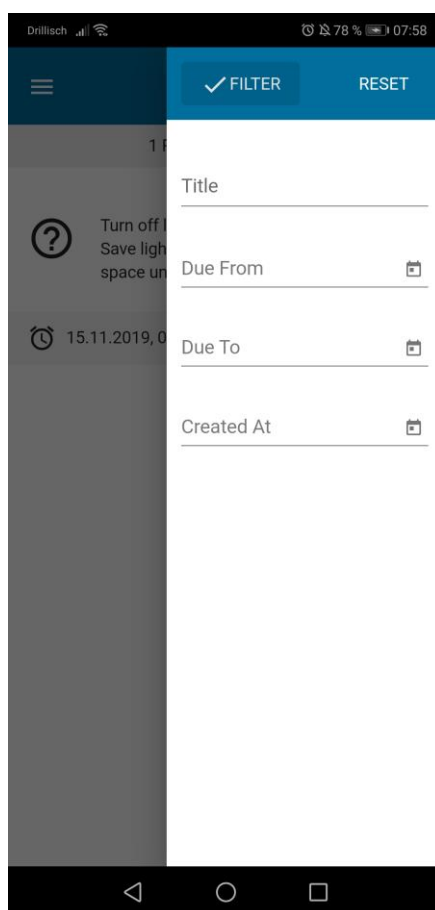
Figure 19 - Recommendation filter

2.4 Create a room and retrieve room information

To create a new room, either a QR scan can be used or a manual entry via a form. By using the manual addition of a room, a new window will appear where the user must fill in the following details (Figure 21):

1. An image, that will be used to identify the room. It can either be selected from a gallery or generated by the internal camera of the mobile device
2. A room name, e.g. Kitchen
3. A room size to determine the energy efficiency

After a successful addition of the room, it will be added to the start page of the app.

To import room information to the app, the QR scan can be used. Therefore, a camera in the mobile device is needed to scan the QR code. After scanning the QR code with the eTEACHER app, the location is added to the user's profile and the app navigates to the recommendations of that location. If the location already exists, scanning of a code will just navigate to the recommendations of the location.

Figure 20 - Menu of the eTEACHER Advisor App

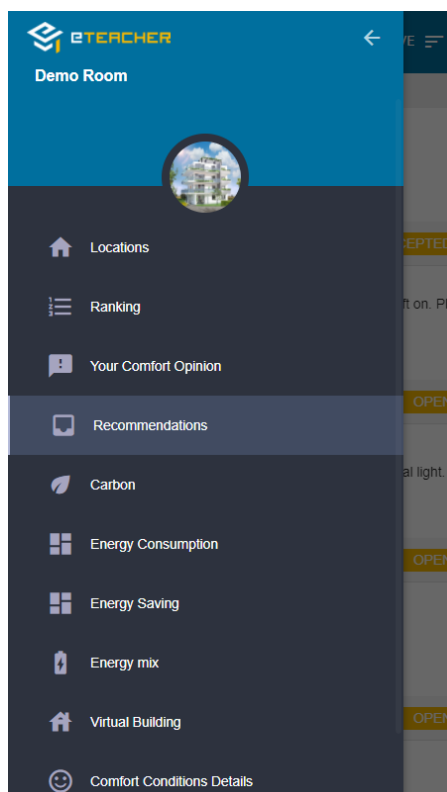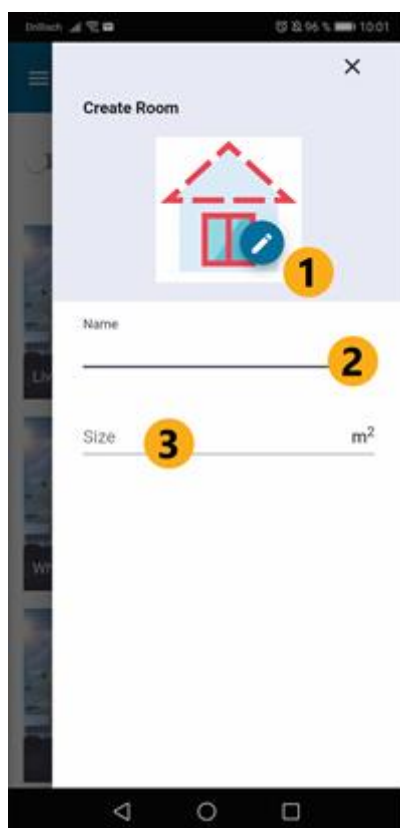**Figure 21 - Create room manually**

2.5 Recommendations

By selecting "Rooms", an overview of all imported rooms is provided. Selecting an entry out of the room collection enables the user to get recommendations for a specific room. On the one hand, the recommendation guides the user to reduce energy consumption and the associated costs and, on the other hand, to do something good for the environment, which is nowadays a very sensitive and important topic.

These recommendations are generated by the What-if-Analysis, which is a software tool that aims at providing building users with tailored recommendations on how they can reduce building energy consumption and energy costs. For that purpose, different strategies for engaging users into more energy-efficient behaviour have been investigated and a catalogue of energy conservation measures has been elaborated. These energy conservation measures consist of simple actions that a building user (resident, facility manager, staff, etc.) can undertake. These actions shall support him/her saving energy and removing his/her bad habits that lead to energy wasting. These energy conservation measures consist for example of:

- Saving cooling and heating energy through more optimal HVAC settings, improvements of solar energy gains by acting on shading components, avoiding energy wasting through openings or when rooms are not occupied.
- Saving lighting energy using more natural light or powering-off fixtures when there is no need for using artificial light.
- Saving electrical energy by switching off unnecessary appliances, devices or equipment when not used
- Etc.

To make it possible for this software tool to automatically identify and evaluate proper energy conservation measures in real time during building operation, the WiA implements computational methods that analyze information about the building and its current usage. This information is provided by a monitoring system of the building including meter and sensor data. By processing this information, the WiA can identify different relevant energy conservation measures and translate them into tailored recommendations that are transferred to the eTeacher App. End-users can then read and apply them for engaging their actions towards more energy efficiency. One important feature of the What-if-Analysis tool resides in its ability to be used in any kind of building regardless of its existing technical systems, usage and users. Fraunhofer IIS EAS has developed this tool that is part of overall eTeacher software package.
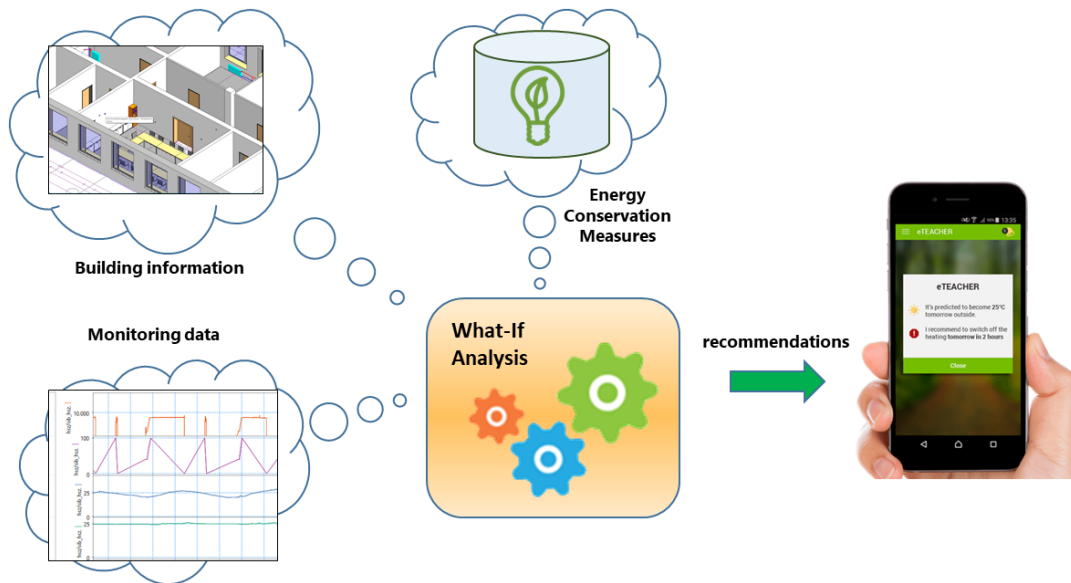
Figure 22 - What-if-Analysis

As previously mention, the results of the What-if-Analysis are included in eTEACHER app as recommendations and advices. The ticket list (Figure 23) displays all recommendations/advices to reduce the energy consumption and encourage energy savings. The ticket is set to "Open" by default and it can be set to "Done" when the user accepts the recommendation and follows the instructions.
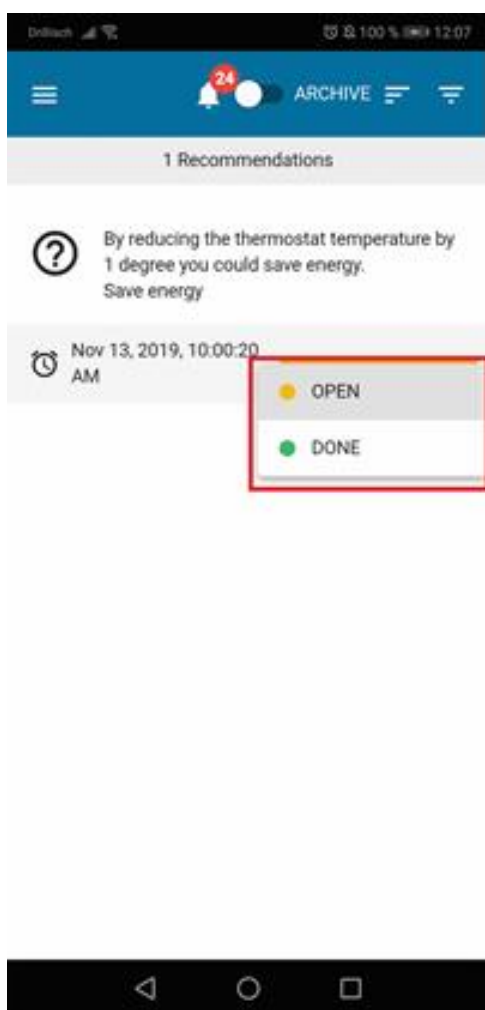
Figure 23 - Ticket list
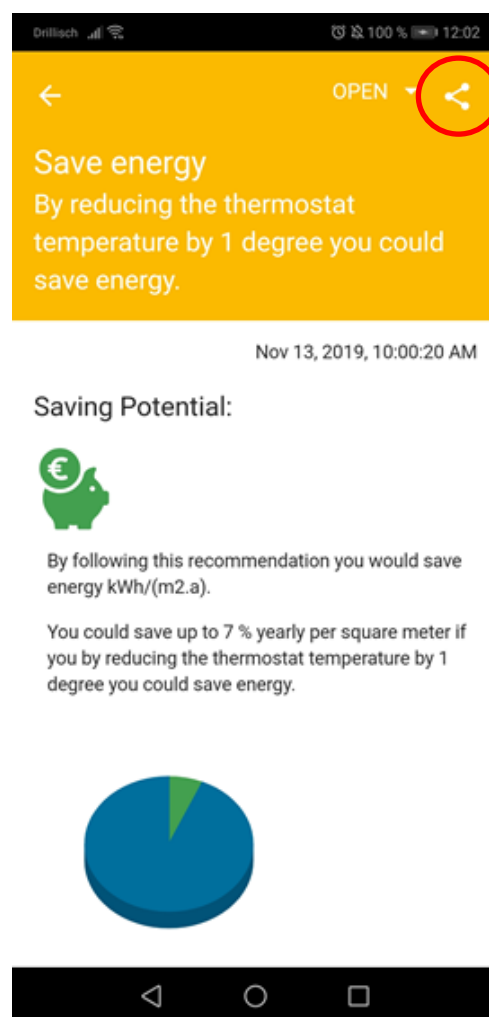
Figure 24 - Ticket details

List entries can be extended with additional information about the ticket, such as purpose, target, or creation date of the ticket (see Figure 23). There is also information on the saving potential the user can achieve by following the instructions.

Finally, the app motivates and encourages the user to follow the recommendations using gamification mechanisms, like a ranking, rewarding with a higher place in the ranking to those users that follow more recommendations. For more information, see Sections 2.8 to 2.11.

2.6 Social media sharing

Sharing content is a great opportunity to spread achievements for the users and to advertise the app for eTeacher. The app provides the abilities to share recommendations and achievements to communicate the benefits that has been performed with the app. To share the content, the user can interact with the "share-symbol" (highlighted in Figure 24) and select one of the following platforms.

- Facebook
- Twitter
- WhatsApp

If the links has been shared, visitors are being redirected to a webpage, where they can learn more about the eTeacher and also get it touch with the user that shared the post (Figure 26).
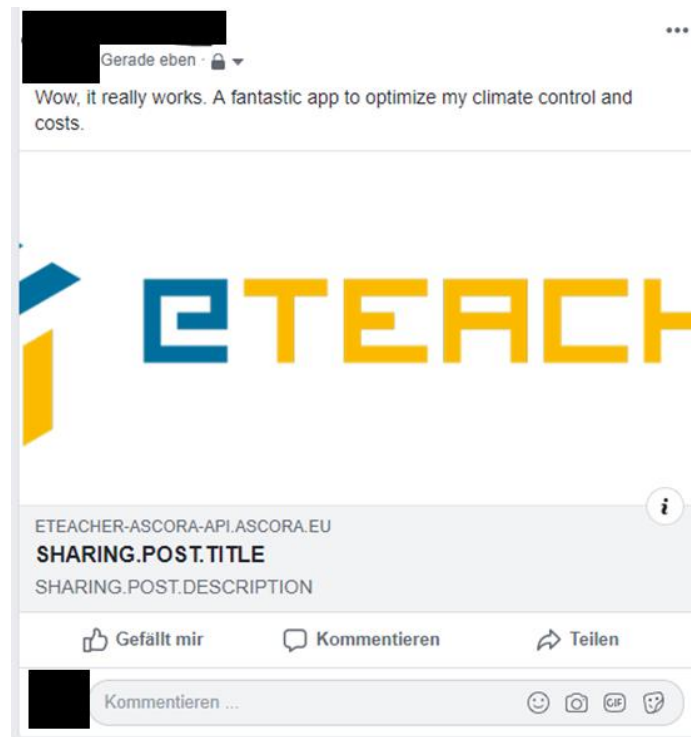

Figure 25 - Sharing via Facebook

Figure 26 - Visitor Redirection

2.7 Notifications

As mentioned already, notifications are a great option to keep the user always up to date. These notifications will be sent automatically from the backend to the app and will be received and displayed in real time. eTeacher provides two different kinds of notifications:

- **App notifications** (see Figure 18) are always highlighted inside the app during the usage. The indicator for new notifications can be seen in the upper right corner of the app. As soon as new notifications arrive, the app visualizes it within a bell-symbol that has a red circle with a number indicating how many new notifications arrived.
- **Push notifications** are used to also notify the user on the mobile device, even if the app is not running. The notifications are shown directly on the lock display. By clicking on the notifications, the app starts and shows detailed information.

2.8 Energy Consumption and Energy Saving

The app also provides a dashboard to analyse individual consumption values of previous months. These dashboards can be found inside the hamburger menu under Energy Consumption and Energy Saving labels. There, charts are shown to visualise sensor data. This chart is customisable via a date picker where the period of energy consumption data displayed can be changed to fit the user needs. To help the user understanding the data, a legend is included in the chart and the numerical value of the different measurements can be also displayed.

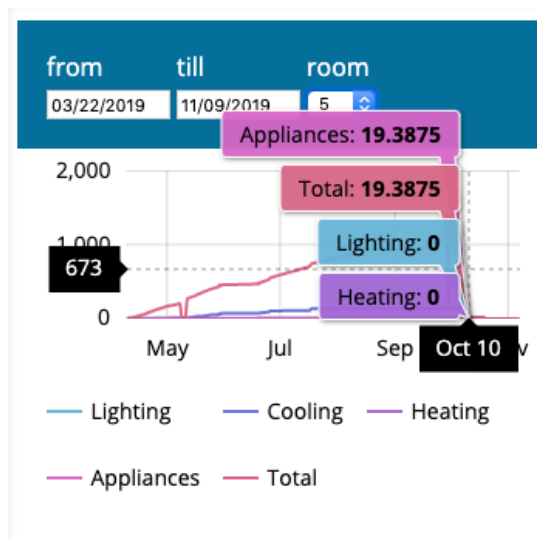In the Energy Saving screen (Figure 28), you can see the difference between this week/month and the next one.

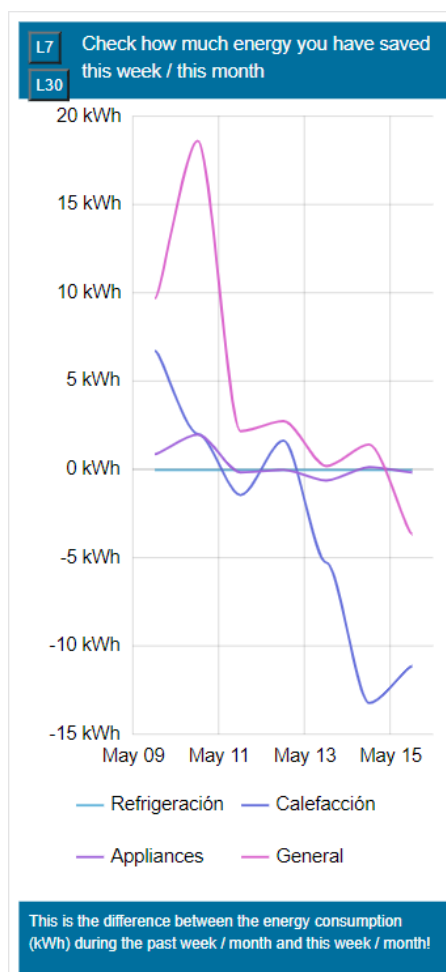**Figure 27 - Energy Consumption**


Figure 28 - Energy Saving

2.9 Ranking

The ranking works in such a way, that it rewards the user, if s/he follows recommendations and marks them as done in the app. For each completed recommendation there is a different number of points earned, which is based on the possible savings but a minimum of 1 point is awarded for it. It compares the actual logged-in user to other users and shows behind the name, the actual ranking position, and the ranking points in comparison to all eTEACHER users. The other profiles, where the user is compared to range from the user with the most points in the complete eTEACHER app so the user can compete against the best. In addition, the average user can be seen as well, which summarizes the average points of all users of the eTEACHER project. Further, the user can see, how far away the next user in the ranking is, so that s/he is able to see an easy catch up. While all mentioned profiles are anonymous, out of privacy reasons, it is possible, that users can compare with each other directly. With the sharing functionality described in 2.6, it is possible to connect to each other. So, the users can see each other in the ranking, with their profile picture. These can be individual users, like friends and family or if only one account is used for certain community office rooms, also different office rooms. By hovering the individual rankings or clicking them, it is possible to see the exact number of points.

Figure 29 - Ranking

2.10 Carbon

If the user clicks on the menu item Carbon s/he will get an overview of the CO_2 savings achieved by accepting eTEACHER recommendations. These CO_2 savings are compared against a tree. Trees and forests produce biomass and oxygen from CO_2 and sunlight. To absorb one tone of CO_2, an oak must grow for about 80 years. In this graphic the app visualizes, with the help of a tree, how much carbon got saved by following the recommendations of the app. If the tree is filled completely, that would mean, that your CO_2 savings equal the amount of CO_2 saved by an 80-year-old oak.

: 71.0%

: 29.0%
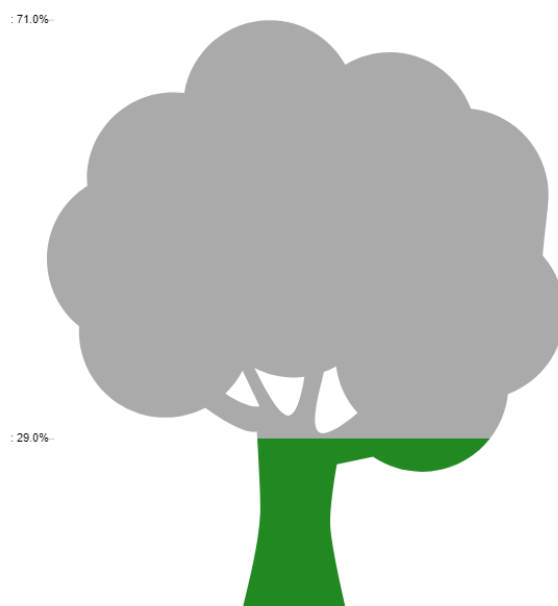
Figure 30 - Carbon Savings

2.11 Energy Mix

The menu item Energy mix shows the energy distribution of the apartments/rooms of a profile. In this view, the eTEACHER user can see how much of his/her energy usage is due to cooling, heating, appliances or lighting. This way, the user can be more aware of possible savings, if s/he sees too much energy is used for cooling, for example.

Lighting: 16.7%

Heating: 33.3%

Cooling: 16.7%

Appliances: 16.7%

Other: 16.7%

Lighting 16.7%   Heating 33.3%   Cooling 16.7%   Appliances 16.7%   Other 16.7%
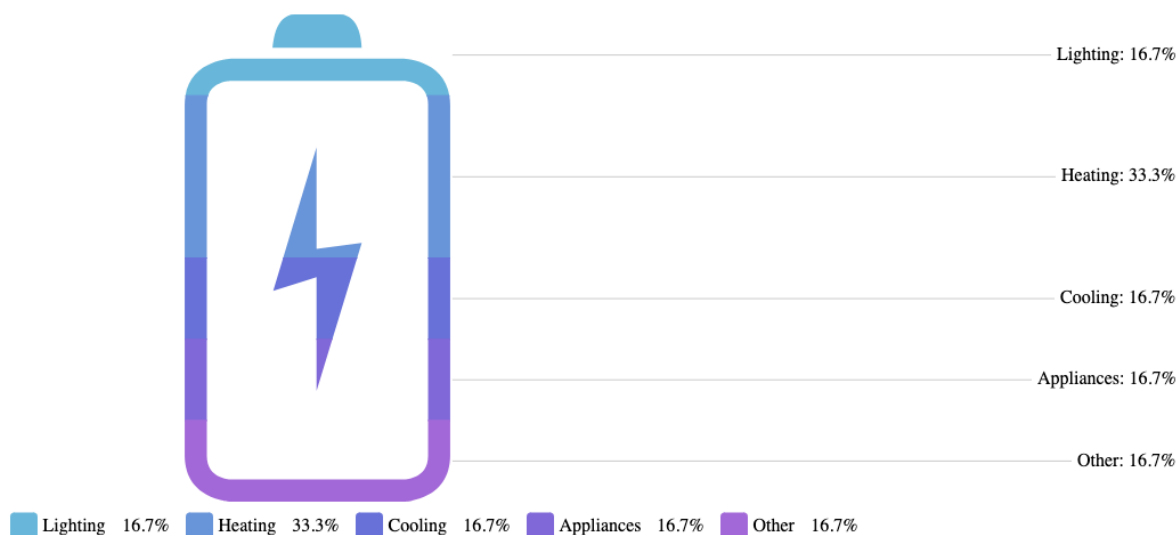
Figure 31 - Energy Distribution

2.12 Your Comfort Opinion

The user can provide feedback on indoor air quality or the overall comfort of the property. Feedback can be given pressing the buttons shown in Figure 32, which can be access by different methods:

1) eTeacher app through "Your comfort opinion menu"
2) "Pulse" view
3) Using a QR code located in room.

2.12.1   Feedback

When the user signs into the feedback page, s/he can see the interface shown in Figure 32. Then, s/he can give feedback by pressing a smiley face or sad face.
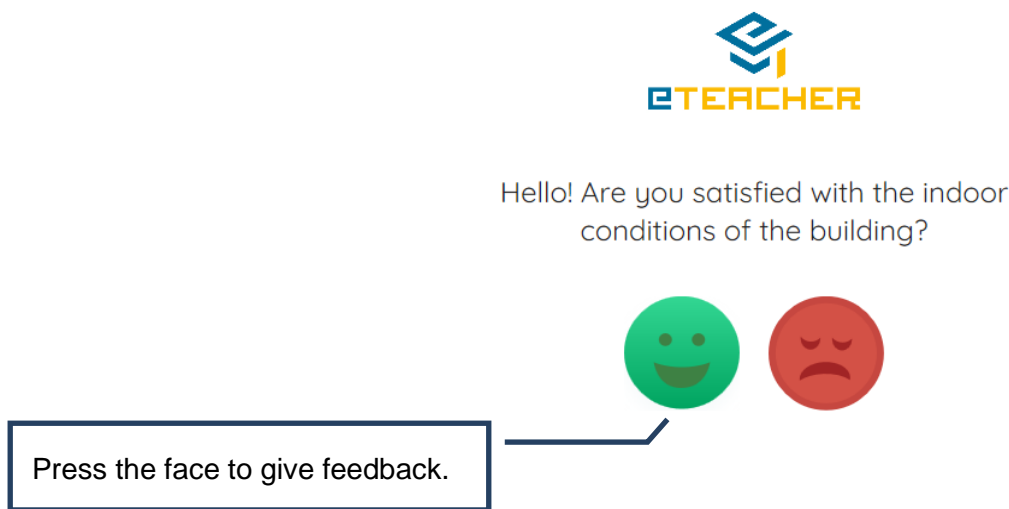
Figure 32 - Main view of feedback page

When the user presses one of the faces, a text box appears below the faces so s/he can give a more detailed feedback. Below the text box, there are also different tags that can further refine feedback, for example, to the room level (see Figure 33).

Figure 33 - Feedback page after you press faces

2.12.2   Dashboard

Once the necessary refinements to the feedback have been made, the feedback can be submitted by pressing the continue button. Dashboard shows user feedback statistics and Pulse score, which can be reached via the virtual building. You can browse for user feedback at any time interval. Once you have selected a time period, you can view the number and distribution of feedback during that time.
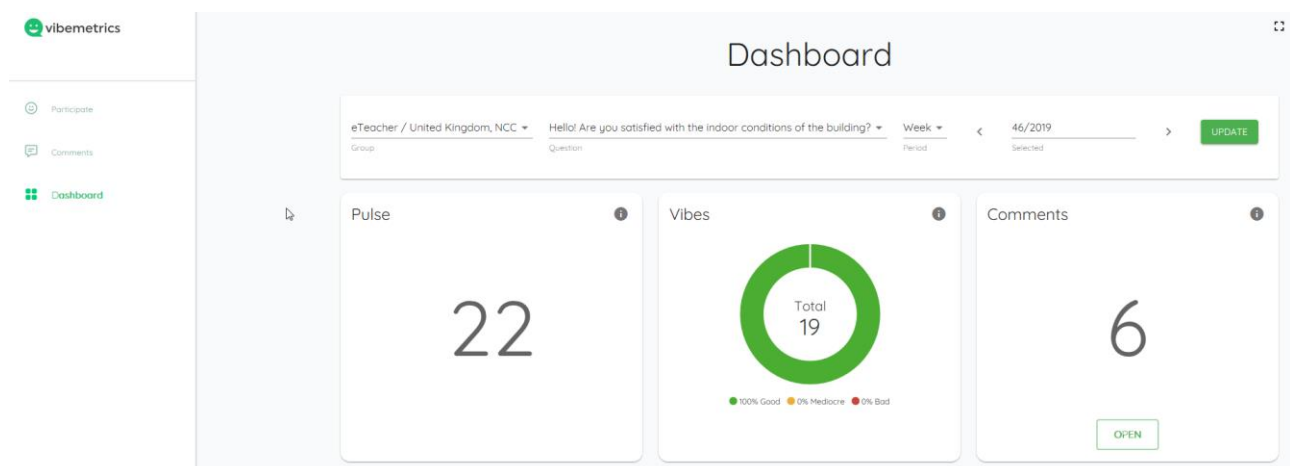
Figure 34 - Dashboard view

2.12.3   Comments

You can view, comment, like, and respond to users' anonymous comments (see Figure 35)
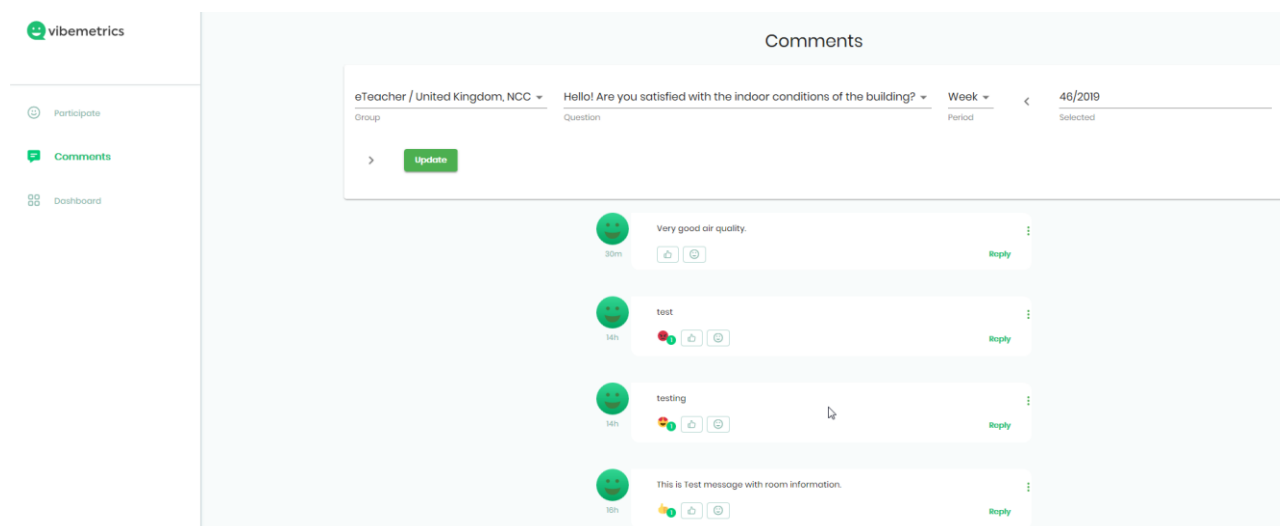
Figure 35 - Comment View

Metrix, performance optimization

Performance Optimization gathers the building automation data and translates it into performance indicators of the property. These indicators help to optimize the facility performance to the planned or targeted level by assisting/aiding the facility manager with useful information.

2.12.4   Control Panel

The Control Panel is located on the top of the Home Page and it allows users to manage system and user specific settings.

In public properties, the Metrix Control panel can be accessed directly by clicking on the "Comfort Condition Details" eTeacher hamburger menu, section "Do you want to know the indoor conditions of your building?". To access Metrix in private buildings, such as residential buildings or properties with a higher level of data protection, the user must be logged in separately with a username and password.
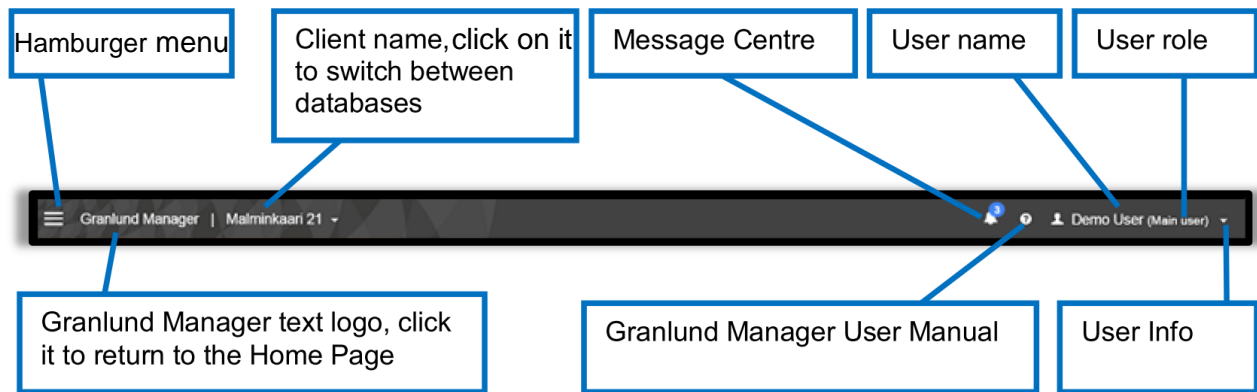
Figure 36 - Control Panel

The top left corner locates the process icon, through which user can navigate to the process panel. The Process Panel shows all the processes and functions available to the user in the system.

Process icon locates on the top left corner

Clicking on the "hamburger menu" opens a list of processes the user has access rights to

Click on the feature to navigate to its view directly

Click the **X** icon to go back to Home Page

Most Used section shows the features which the user frequently uses. User can also click on the feature and navigate to its view directly.
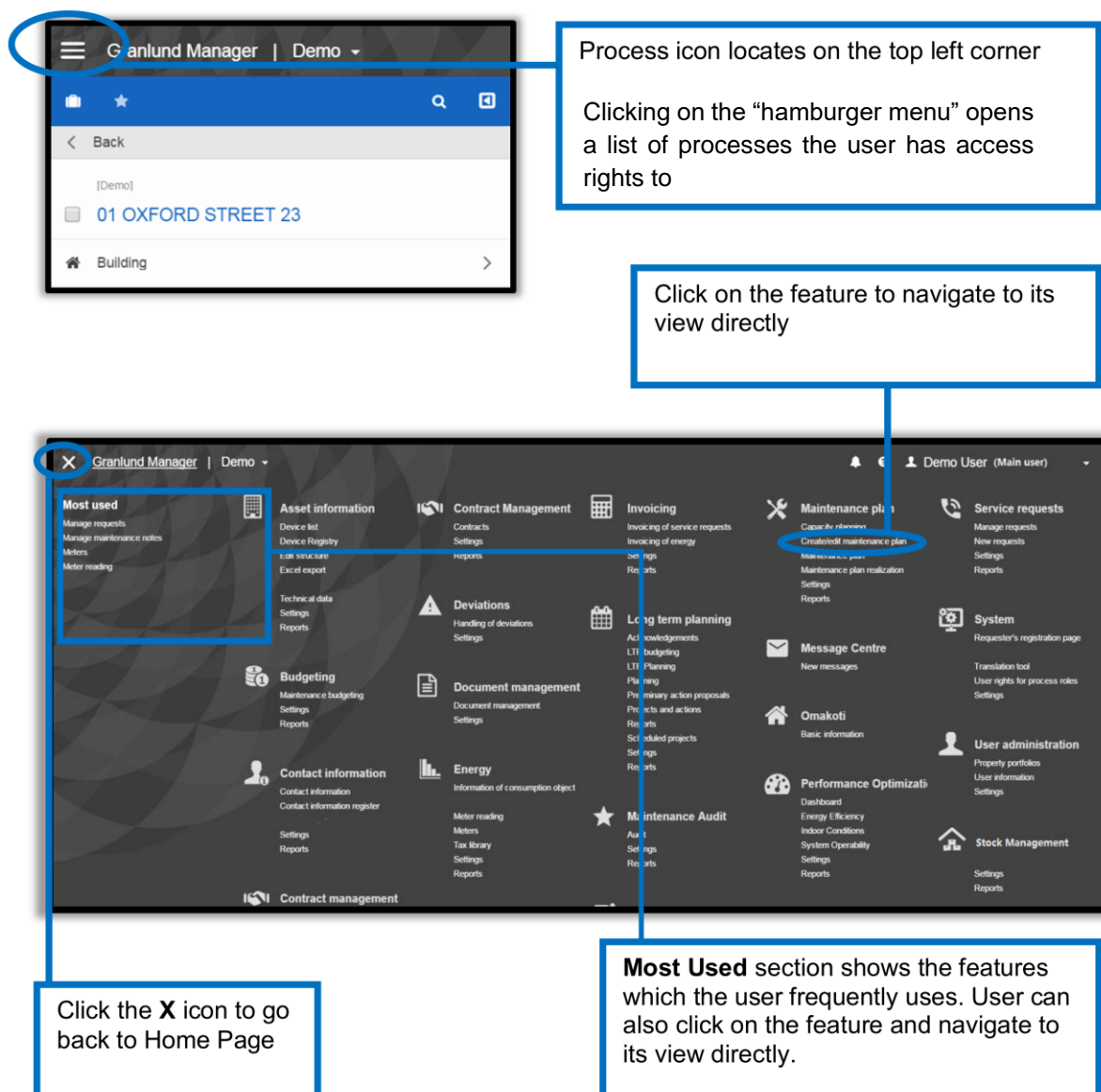
Figure 37 - Process Panel

Your Process Panel may look different from the one shown here, as the process and its functions are shown in accordance with your user access rights.

2.12.5 Performance Dashboard

The following section shows the steps to get the performance data of a building.

To view Dashboard

1. Select the site in the Property Portfolio to view the site you are interested in.

In frontpage, the overall Performance Score and values of indoor air quality are shown on module screen. By clicking the name you can switch into Dashboard-view View on frontpage, the overall

Figure 38 - Main page. Select site and performance score in property portfolio.

2. Select the Dashboard view by clicking on the dots

Main page > Performance Optimization > Dashboard

Performance metrics: D1 City Academy school

Use the search feature to view information in the time range you want.

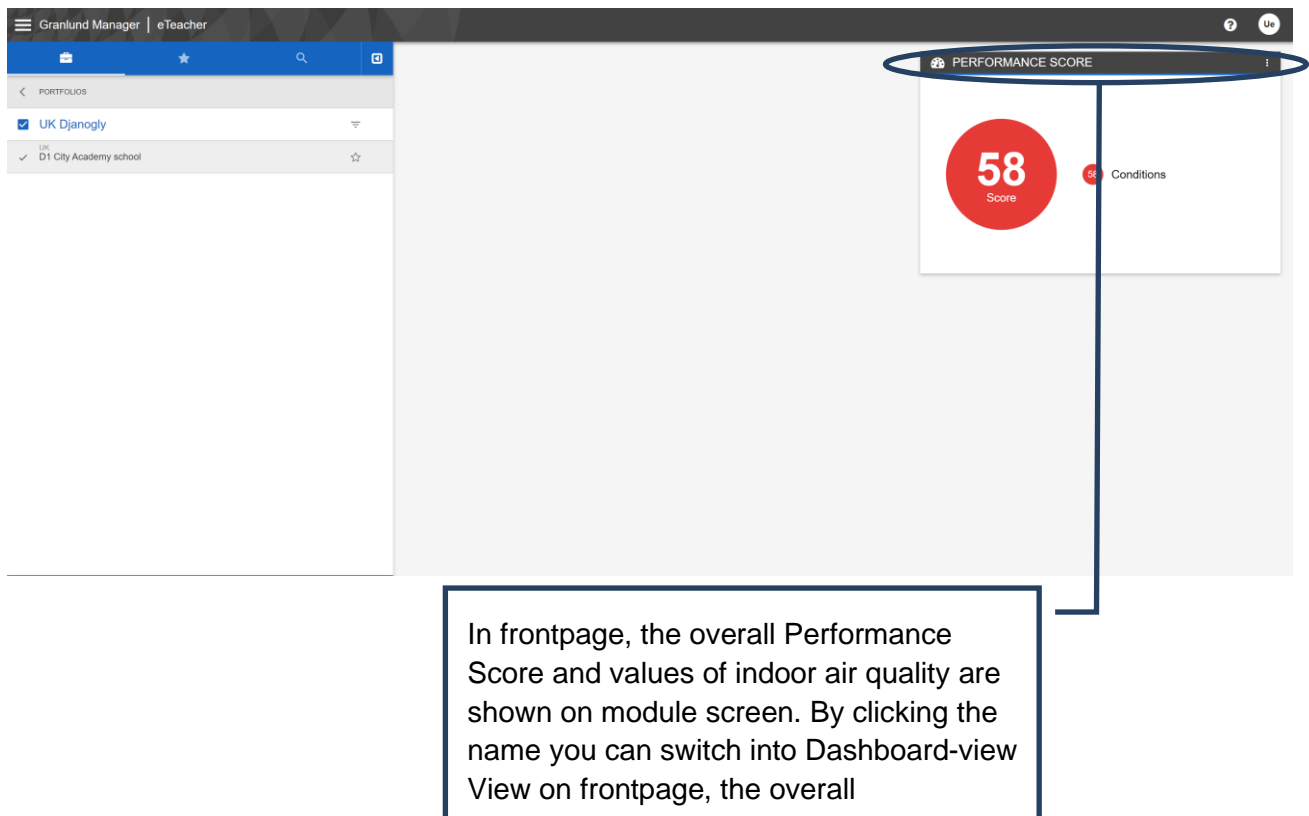The Dashboard is divided into the three key factors by ribbons: Energy Performance, Indoor Conditions and Operability. Currently, only Indoor conditions are available in the eTeacher project.

Metrix score based on indoor air quality.

The Dashboard shows the trend over the last 12 months.

At the bottom, the user can see the lowest performing rooms.

The result shows the measured rates distributed in good, acceptable, and bad categories (distinguished by colour).

The ranges are:
Green = Good =100-90
Yellow = Acceptable = 89-80
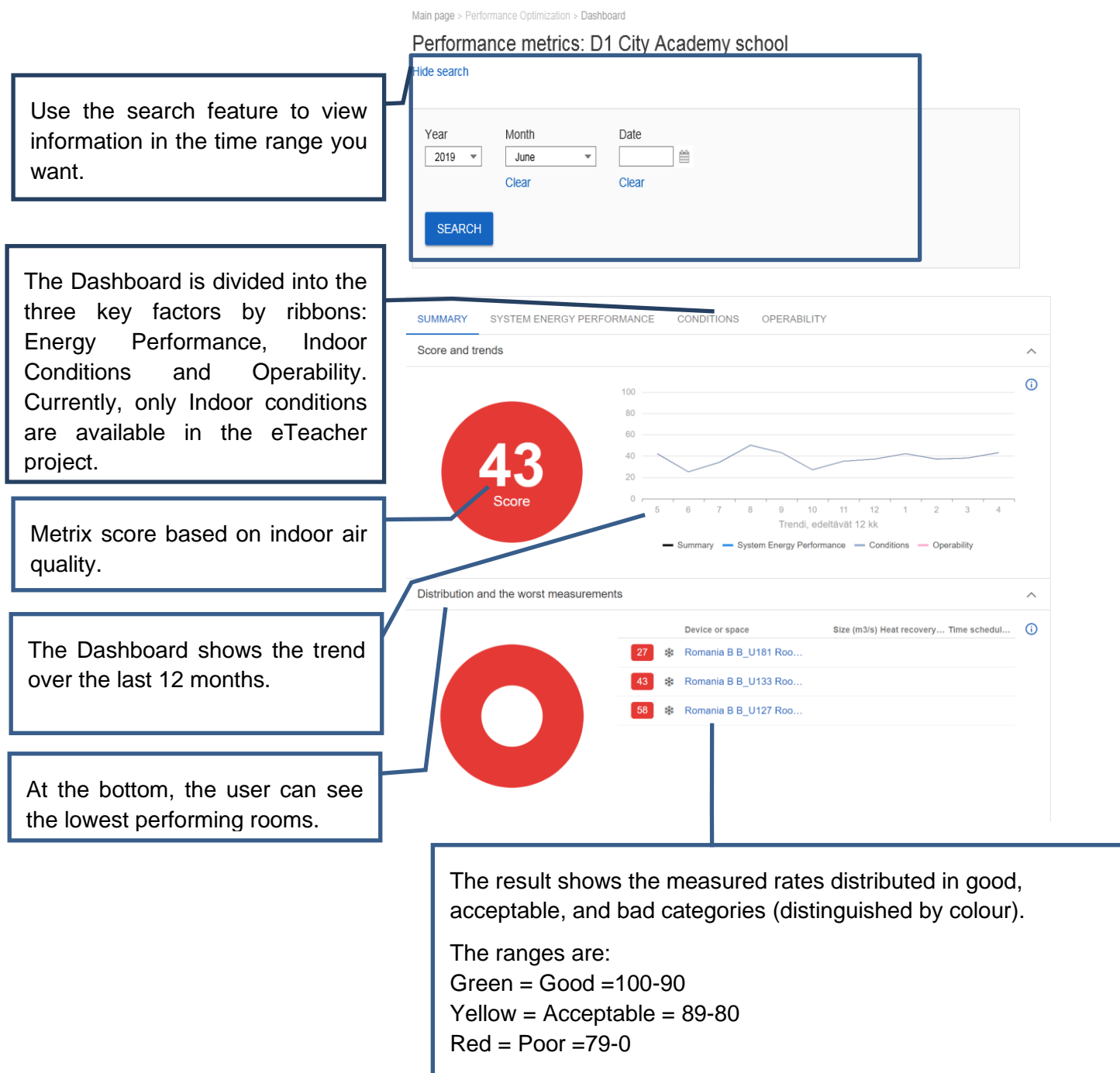Red = Poor =79-0

Figure 39 - Dashboard View

3.   The default view is the Summary. Click on the panel to switch to indoor air conditions.

2.12.6   Detailed Metrics, indoor conditions

1. In the **Process Panel** the user can find the **Performance Optimization** section and click on **Indoor Conditions**.
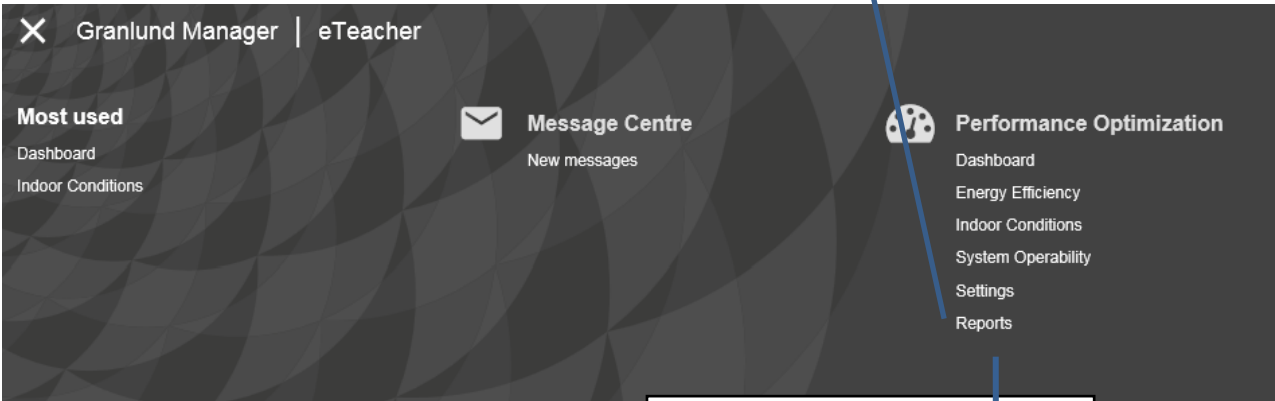
> Use the search feature to view information in the time range you want.

> Here you can see the details of different sensors connected to Metrix.

> When you click on the system name, you will see a graphical representation of the main parameters being measured in the selected system.

> You can see the targets and current metering data from the systems in both views.

Figure 40 - Indoor air conditions, detailed metrics

2.12.7   Reporting

1. In the **Process panel**, the user can find the **Performance Optimization** section and click on **Reports**.

Open the left top selection in Granlund Manager.

Then select "Reports" from the Performance Optimization module.


This is an efficient and quick way to get a Performance Score-report.
The Report also shows you the weakest scoring system / rooms from different subcategories.

For reporting period, you can select either years, months or given dates which are included.

Figure 41 - For the reporting period, you can select either years, months or days, selecting specific dates.

2. By selecting "Preview Report", the tool generates the report.

You can also download a PDF, Word or Excel version by clicking on the disc icon.
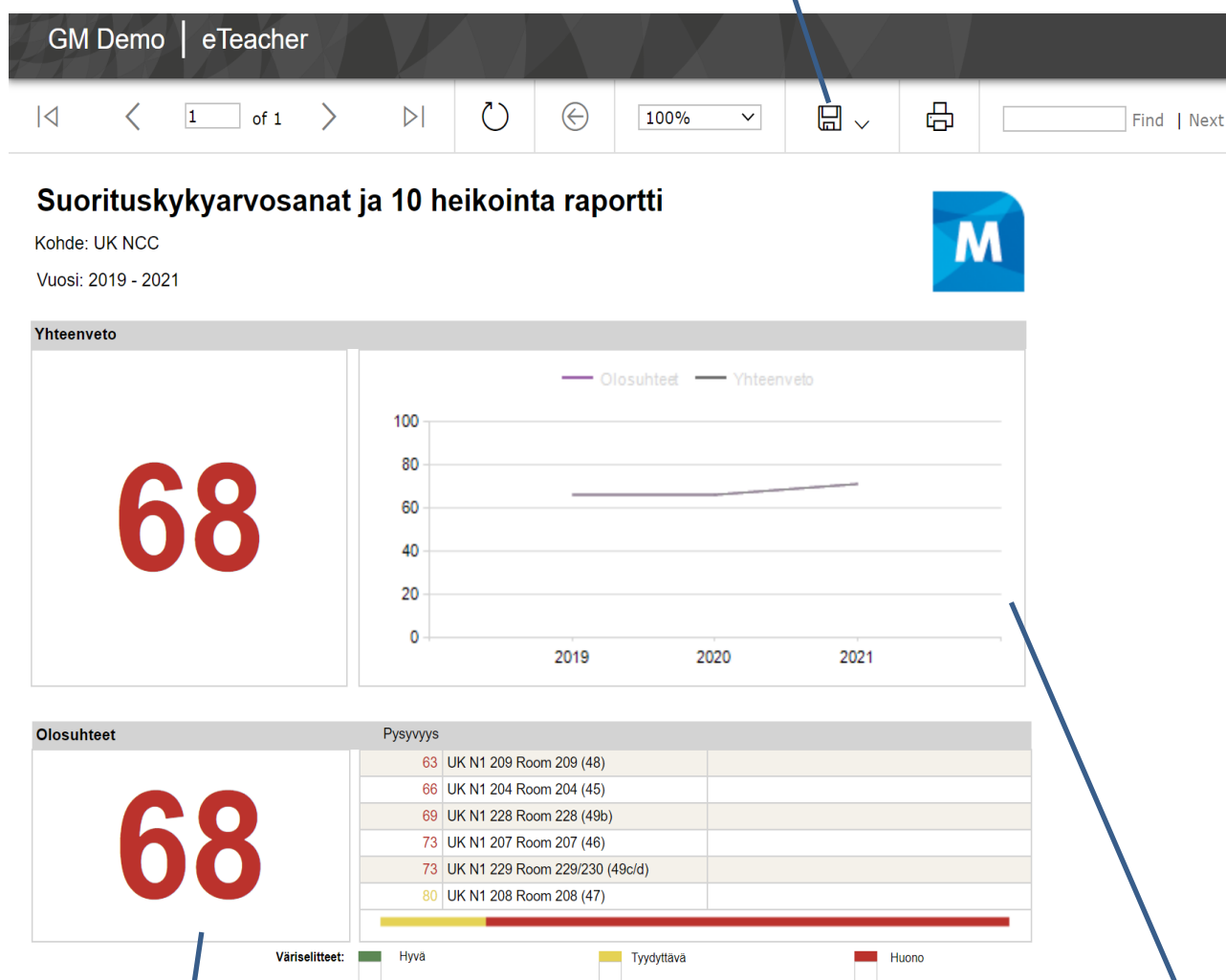
This view shows the trend during the selected period.

These views show the situation on different sub-categories during the selected period and the 10 weakest systems during the period.

Figure 42 - The weakest 10' report

2.13 Building's pulse

Building's PULSE score combines building performance and users' feedback in one single value. Building users can provide user feedback via the eTEACHER app or web-based user interface as explained previously.

Trend line of pulse score.

You can give feedback by pressing this button.

You can read more about how the Pulse value is determined and a summary of feedback and property performance.

Pulse score combines user feedback and system performance.

Standard limits are:
Green = Good =100-90
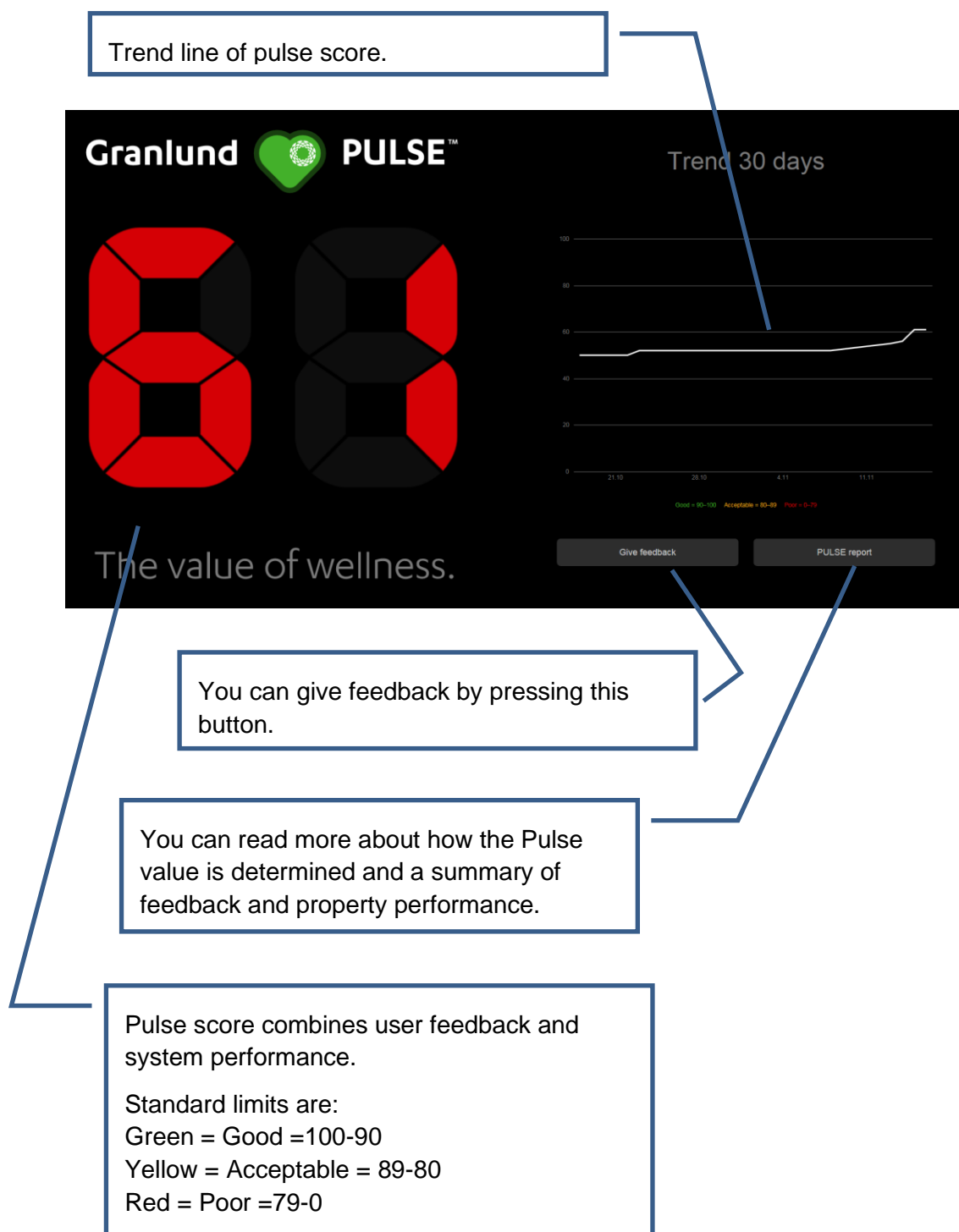Yellow = Acceptable = 89-80
Red = Poor =79-0

Figure 43 - Pulse score and its trend

2.14 Virtual building

The Virtual building is a virtual version of a real building. In a virtual building, real data can be displayed with spatial data using a 3D representation. Virtual real estate provides a more easily accessible way for people to read information and to target information at a specific location. For a human being, the thermal imaging-type 3D representation is more illustrative than a list of measurements. In a virtual building, actual measurements can be represented as in a heat map or thermal image (see Figure 44).
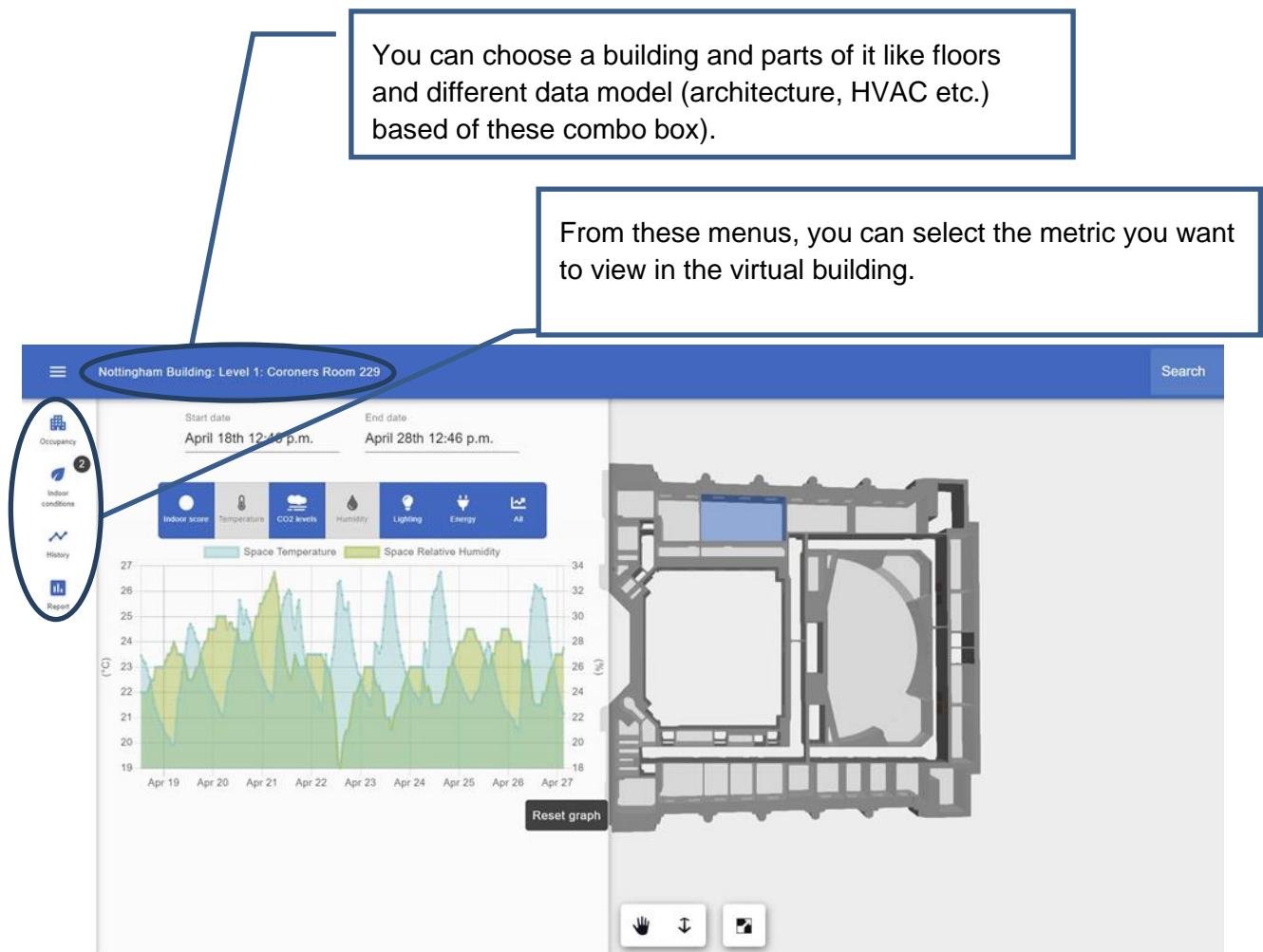

Figure 44 - Virtual building

The Occupancy view shows if there are people present in the room by coloring the room on the model in green (free) or red (occupied).
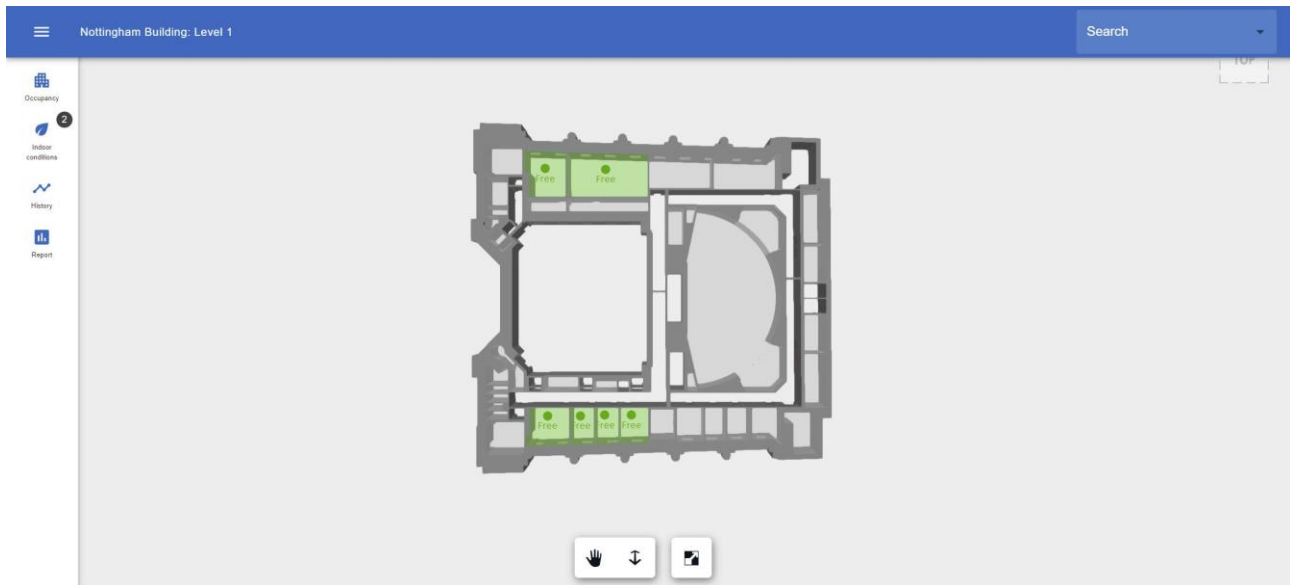
Figure 45 - Virtual building, occupancy information

The Indoor conditions view shows different indoor condition values, such as Temperature, CO_2, Humidity or Lighting levels in the rooms that contain the appropriate sensors. A legend explaining the scale of the colors is also shown.
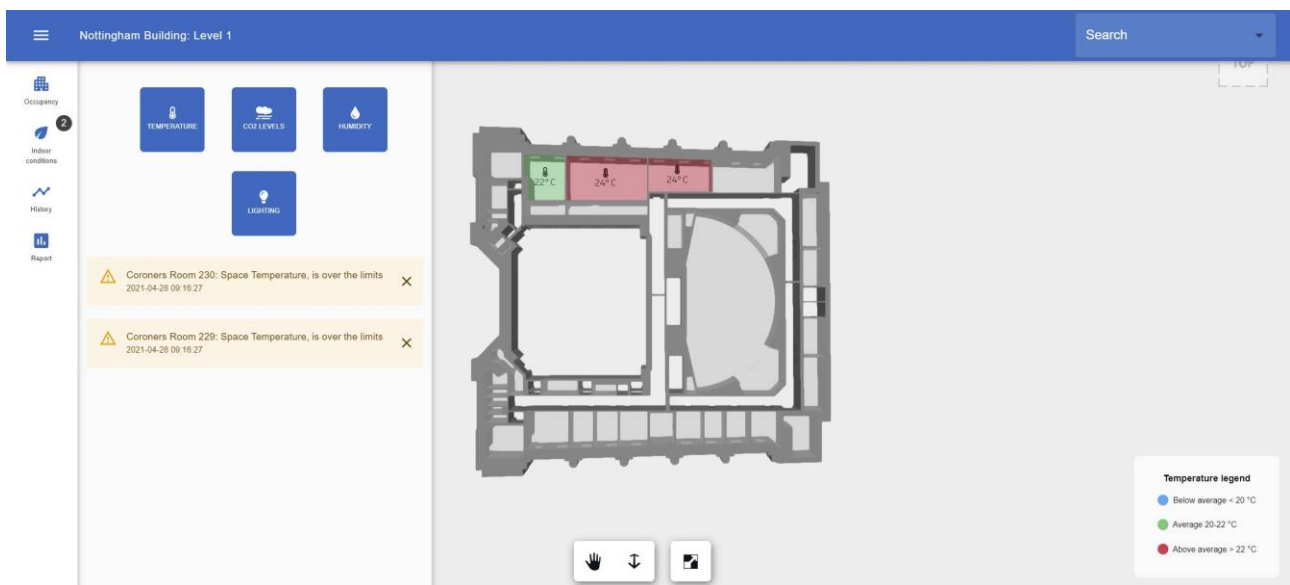

Figure 46 - Virtual building, indoor condition information

The List of indoor conditions view opens a list of all available indoor conditions in the room selected and their current real-time values.
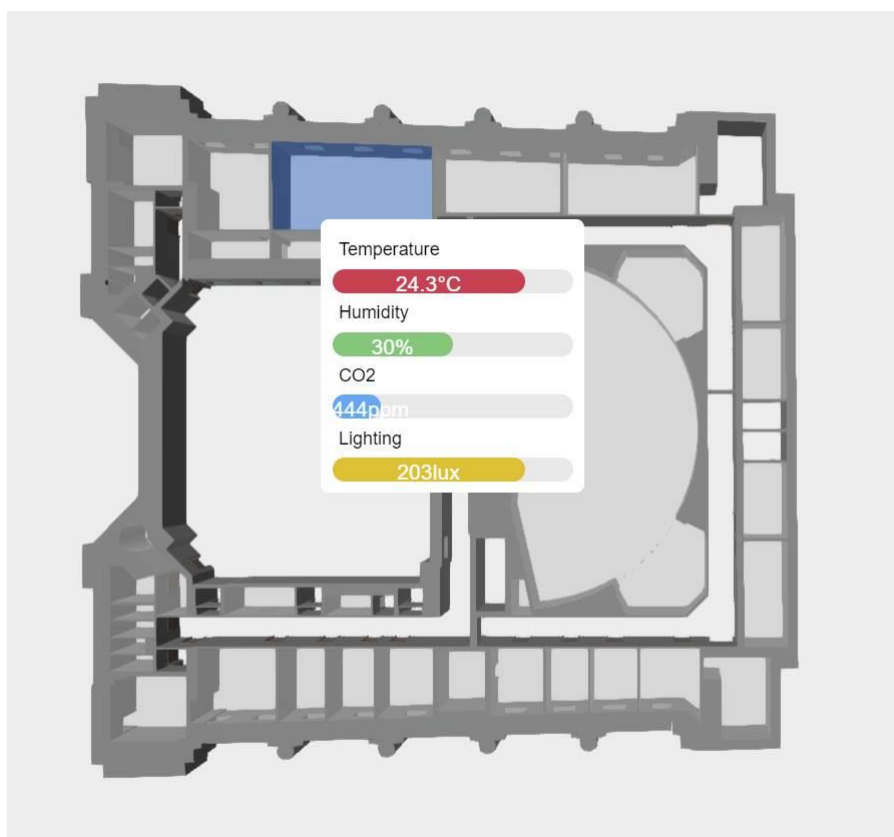
Figure 47 - Virtual building, list of indoor conditions

The History view shows the progression of different indoor condition data during a period of time selected by the user. The graph can show one or more indoor conditions at the same time, thus facilitating data comparison.

Figure 48 - Virtual building, history view

Finally, the Report view shows a table of CO_2 values at either room or floor level. This representation of data makes it easy to observe the patterns in data variation.

Figure 49 - Virtual building, air quality report

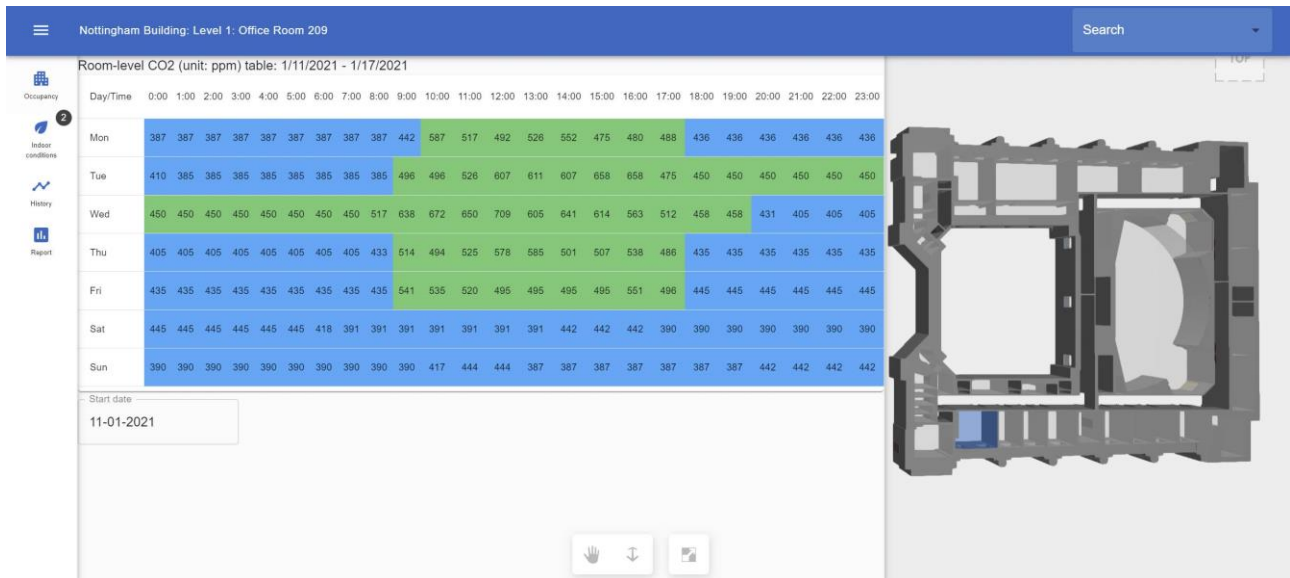## Annex A1. Presentation for Pilots' Training Sessions

This project has received funding from the European Union's Horizon 2020
research and innovation programme under grant agreement No 768738

Do you know that…

…every degree over **20 degrees** can add 10% to your heating bill?

…one **LED light bulb** could save you over €100 in electricity costs over its lifetime of about 20 years?

…**double-glazed windows** lose 50-70% less heat?

…**thick curtains** or removable insulating window panels will reduce the flow of cold air into your home?

…**smart metering systems** for gas and electricity could save you 3% of your energy use?

Source: for further tips visit https://ec.europa.eu/clima/citizens/tips_en

You can...
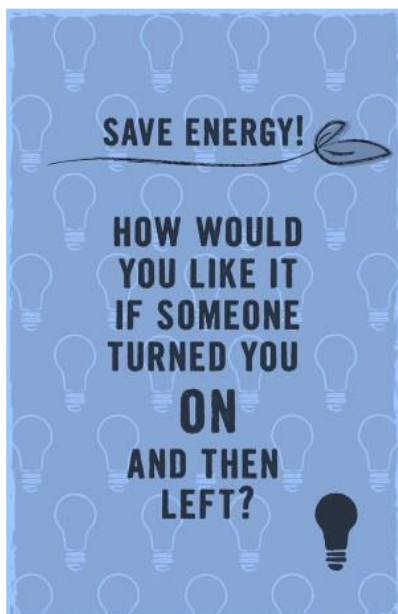
SAVE ENERGY.

SAVE MONEY.

HELP THE ENVIRONMENT.

And we can help you get started!

The eTEACHER APP

eTEACHER is an energy efficiency app which helps you saving energy, by providing recommendations based on your energy behaviour.

- **At home**: Monitor your energy data, save energy and money and help the environment

- **At work**: provide feedback about your energy comfort to help managers setting the optimal thermal conditions

- **At school**: engage your students! Create competitions between classes and make your students aware of the climate change

Installation

The eTEACHER project app has been developed for several platforms
Website - through Browsers with no installation
Mobile - Playstore (Android) and iOS Appstore (Apple)
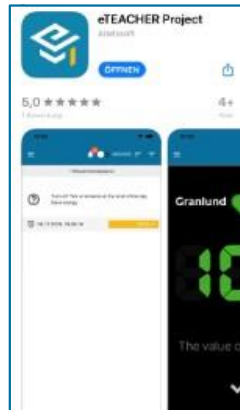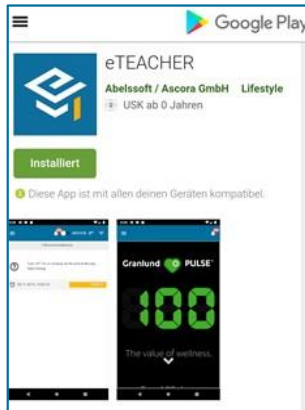
**Look for eTEACHER
& Click on**

INSTALL

Log in

When the app starts for the first time, the user is asked to login with its user credentials. How to do that?

1. click on "**Register**"
2. fill out the **form**
3. Choose a **password**:
   - lowercase letters,
   - at least 1 uppercase letters,
   - at least 1 number,
   - and at least 1 special character (@ ! ? + …)
4. click on "**Register**" again
5. confirmation **email** (check in the SPAM!): click on the link and log in with your email and password

User profile

YOU'RE IN!

It's time to set your account.

Use the top right-hand context menu to change the settings

- Select a profile pic: other users can see your pic in the rankings

- Choose your language:

  - English
  - German
  - Spanish
  - Romanian

Any change must be saved manually by pushing the button SAVE

How to use the app

1 The so-called **hamburger menu**. Here you can select the different sections of the eTEACHER app.

2 **Notifications** will keep you up to date, will be sent automatically and will be received in real time if the system notices something to improve.

3 The **magnifying glass** enables the user to have full text search in the app.

4 A click on the three dots on the right side opens a popup to change the app **settings.**

Into a room

To **create a room** you can **scan its QR code** : the code automatically updates the room info and provides recommendations.

When you click into a room you get your recommendations displayed and the upper menu view changes: **archive (1) and filter (2)** are added.

1 By activating the **archive** you will see all past recommendations sent by the system.

2 If you click on the right symbol with the three horizontal lines, the **filter menu** opens. You can filter by: title, due date, due from and create at.
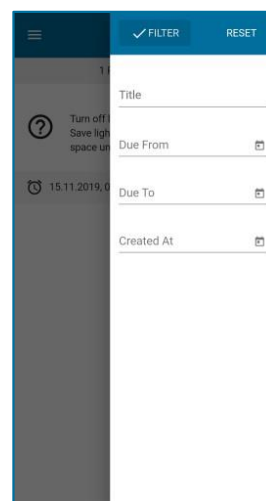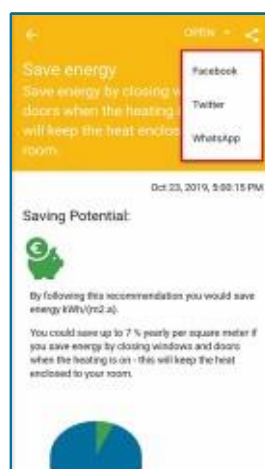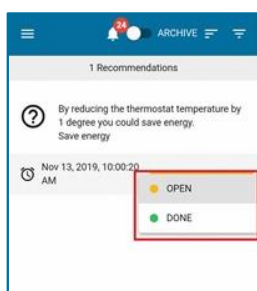
Recommendations

The ticket list displays all the **recommendations** to help user reducing the energy consumption, and thus save energy.

The ticket is set to "Open" by default. It can be set to "Done", when the user followed the instructions.

You can also **share your action** via Facebook, Twitter and WhatsApp, to influence further users!

Notifications

App notifications : always highlighted inside the app during the usage

Push notifications to notify the user even when the app is not running. By clicking on the notifications, the app starts running and shows detailed information.

Energy tools

DASHBOARD : it shows the consumption of the specific room/apartment and the development of the monitoring. shows the consumption of the current room/apartment (lighting, heating, cooling and the total consumption).

RANKING : it rewards the user, if he follows recommendations and marks them as done in the app. You can compete against the average user, the best user and the user right above you. If you share your recommendations, you can connect to other users and compete directly against family members, friends…

CO$_2$ SAVINGS : the eTEACHER tree shows how much CO$_2$ got saved by following the recommendations.

ENERGY DISTRIBUTION : shows the energy distribution of the added apartments/rooms of a profile. This makes you more aware about your energy use.
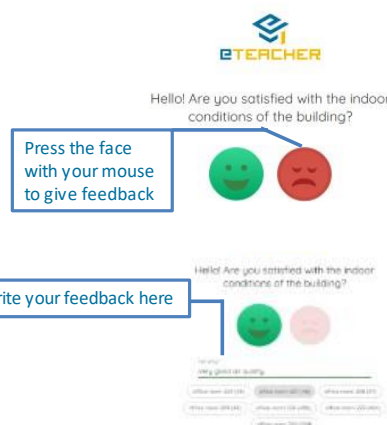
Comfort tools

The user can provide comfort feedback on indoor air quality or the overall comfort of the property.

FEEDBACK: you can give feedback by pressing a smiley face or sad face. When you press one of the faces, a text box will appear below the faces, which will give you more accurate feedback. You can also leave a comment to give more hints for the building managers in improving the room conditions.

METRICS: gather the building automation data and translate it into performance indicators of the property. These indicators help to optimize the facility performance to the planned or targeted level.

Hello! Are you satisfied with the indoor conditions of the building?

Press the face with your mouse to give feedback

Write your feedback here

Comfort tools

1.   Select the **site** you are interested in

2.   Select the **time frame**

3.   The Dashboard is divided to the key factors by ribbons:
      Energy Performance, Indoor Conditions and Operability

4.   Metrix score based on indoor air quality

5.   The **Dashboard** shows you the development during the last 12 months

Summary   System Energy Performance   Indoor conditions   Operability

Score and trends

Score

59

Indoor conditions

Trendi, edeltävät 12 kk

Distribution and the worst measurements

	Space	Building
18	UK D1 187 Room 187 (class room
20	UK D1 171 Room 171 (staffbase1)
40	UK D1 188 Room 188 (class room
41	UK D1 178 Room 178 (class room
51	UK D1 183 Room 183 (class room

Show all buildings of the property

Comfort tools

- **BUILDING'S PULSE**: Building's pulse is score where building performance and users feedback are combined and represented through a single PULSE score. Building users can provide user feedback via the web -based user interface or through feedback buttons

Trend line of pulse score

Pulse score is combine of feedback and system performance.

You can give feedback by pressing this button.

You can read more about how the Pulse value is determined and a summary of feedback and property performance.
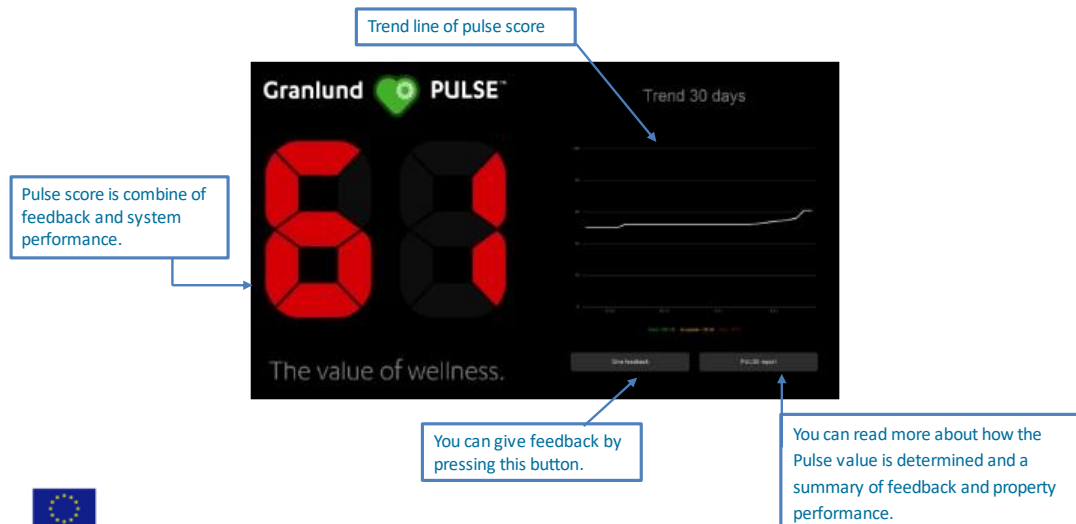
Comfort tools

In a virtual building, real-time measurements can be displayed with spatial data using a 3D representation. A thermal representation is easier than a list of temperature measurements!

You can choose the comfort measures that you wan to visualize such as temperature, humidity or CO2 in a color coded scheme

You can easily detect which room temperature is too high to make adjustments.

You can make the difference!

Annex A2. Videos for Training Sessions

Videos can be found on the Youtube channel of eTEACHER, explaining some functions of the eTEACHER app. All of the videos are available on the following Youtube channel:

https://www.youtube.com/channel/UCiRCZFIAaUVALhfoEh1BQIg/videos

Video 1 - eTEACHER - Recommendation video guide

- *Description*: This video describes the feature of eTEACHER App that provides you with recommendations in terms of simple actions you should perform within the facility in order to save resources. Some recommendations are general hints while some others are specific advices depending on sensors and meters data. A resource saving potential is provided for each recommendation in some relevant unit (values per year or per day mean you should repeat the same kind of action over this time span).

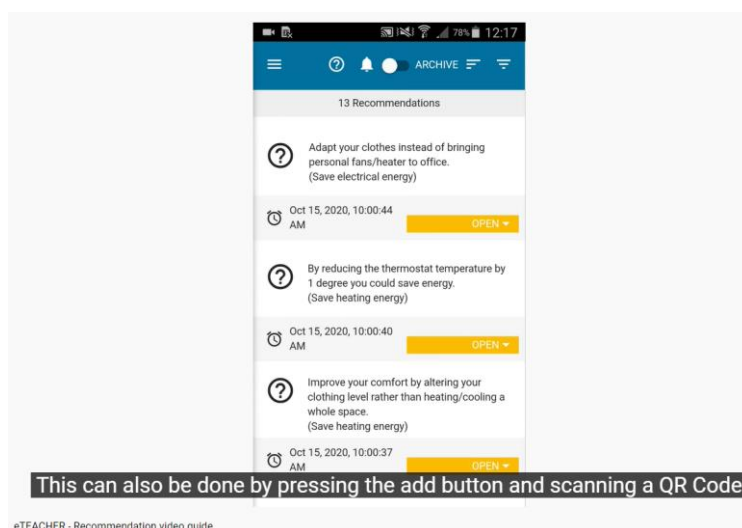- *Link*: https://www.youtube.com/watch?v=zGL_IQXjBk8

Figure 50 - eTEACHER - Recommendation video guide

Video 2 - eTEACHER - Ranking and Carbon video guide

- *Description*: this video gives an overview of the CO_2 saving feature of the eTEACHER app. To make it more visual, we took the average carbon footprint of the energy production in Europe for every kWh, used the carbon absorption of an oak, which has grown for 80 years and compared them to the energy saved through fulfilled eTEACHER recommendations. So, here you can see, how many 80-year-old oaks are less needed, because of your effort.
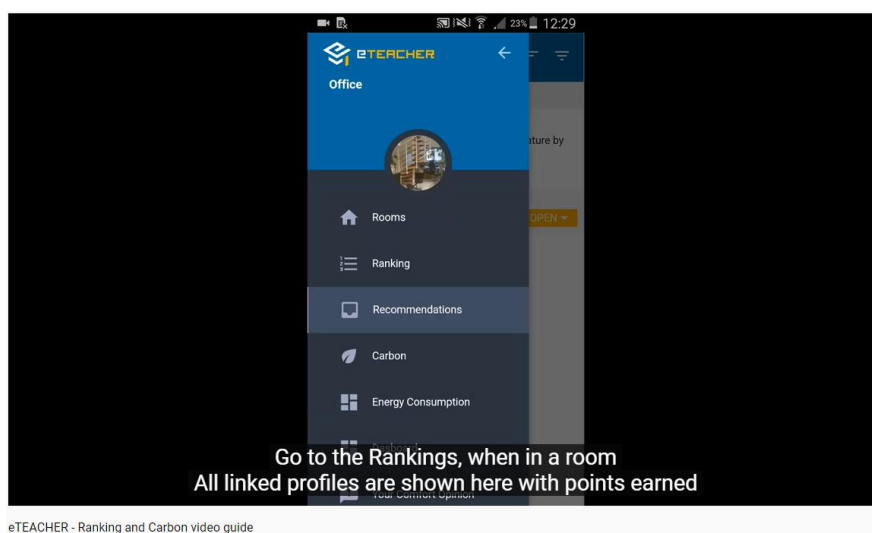
- *Link*: https://www.youtube.com/watch?v=xtyA9nk2lw4

eTEACHER - Ranking and Carbon video guide

Figure 51 - eTEACHER - Ranking and Carbon video guide

Video 3 - eTEACHER - Energy Consumption and Saving video guide

- *Description*: this video shows the energy consumption feature. It is divided into different categories and shows, what amount of energy you are using for lighting, heating, cooling, appliances. You can select a different timespan on the upper right or by selecting that area directly on the graph. This dialogue shows your consumption this week/month compared against the week/month before. Did you use less energy or more energy in the last week/month?
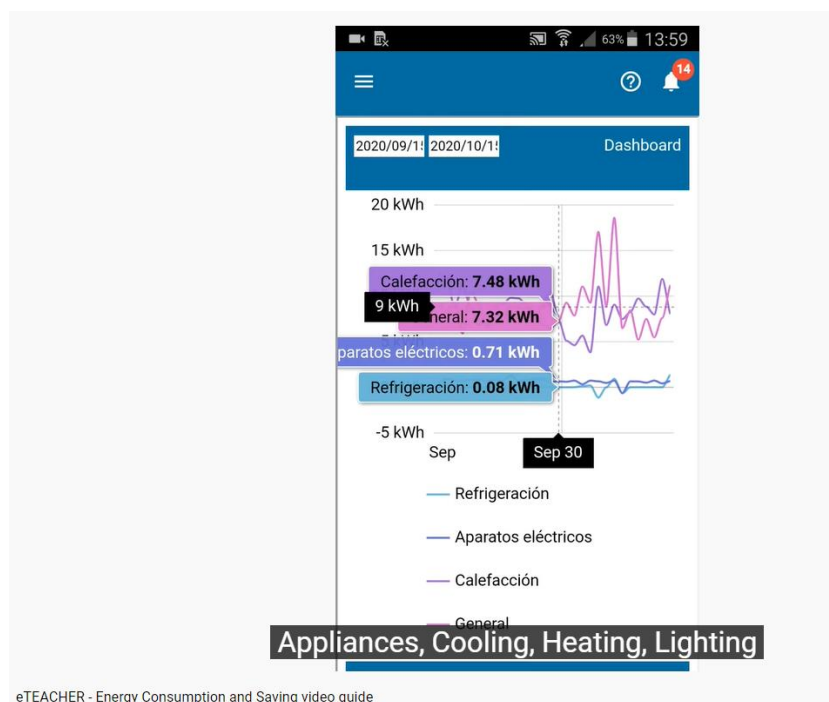
- *Link*: https://www.youtube.com/watch?v=uwtYMBC9gp4

eTEACHER - Energy Consumption and Saving video guide

Figure 52 - eTEACHER - Energy Consumption and Saving video guide

Video 4 - eTEACHER - Energy Mix video guide

- *Description*: this video shows the Energy Mix feature, which tells the users where their energy is consumed, based on the sensors attached to eTEACHER. Here they can see, where the biggest optimizations could be done.

- *Link*: https://www.youtube.com/watch?v=9V5adTg3Zy8
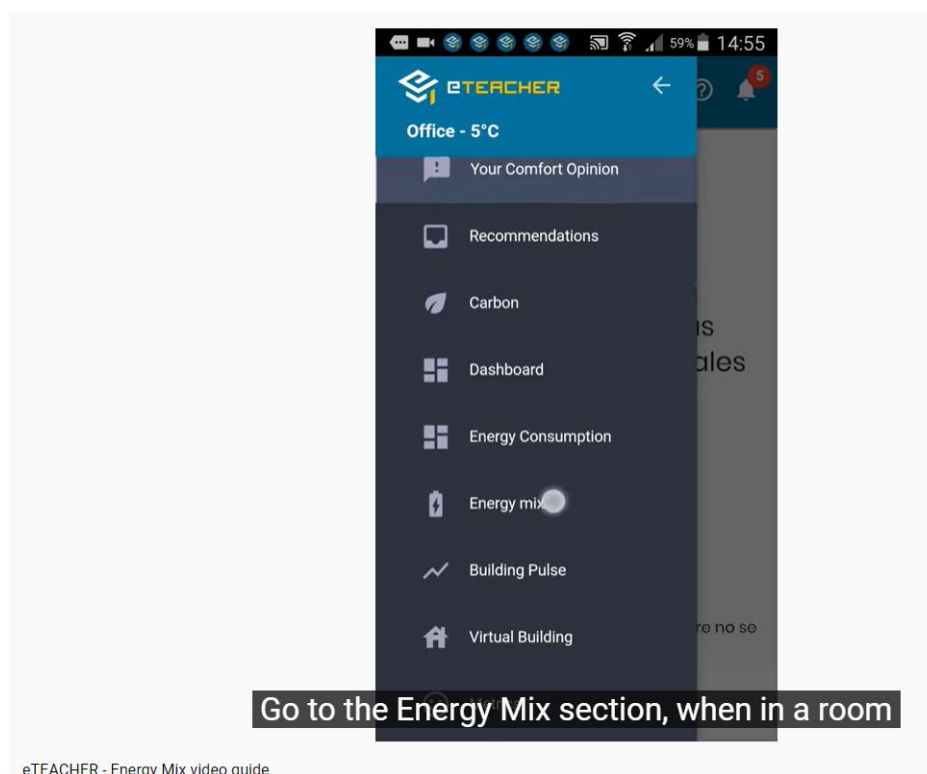
Figure 53 - eTEACHER - Energy Mix video guide

Video 5 - eTEACHER - Comfort opinion

- *Description*: this video gives an overview of the comfort feedback feature in eTEACHER app. Building users can provide user feedback via the web-based user interface in this application. In "your comfort opinion" sections, you can express your opinion or feeling about indoor air quality by clicking on smiley face (positive feedback) or sad face (negative feedback).
The feedback will be read by the property maintenance staff and will react if necessary. Property maintenance staff can also provide aggregated feedback on building performance and user feedback in a Pulse report over a period of time. User feedback contributes to Pulse Score along with measured Performance.
After you click on the face image, a field will appear where you can enter a more detailed description of the feedback. In addition, you can define the content of the feedback as being in one of the boxes below the field, such as air humidity, quality, or temperature.

Once you have provided more specific feedback as needed, press the continue button to move forward, and to view and comment on the feedback of others. From the Dashboard tab, you can view feedback stats and Pulse Score.

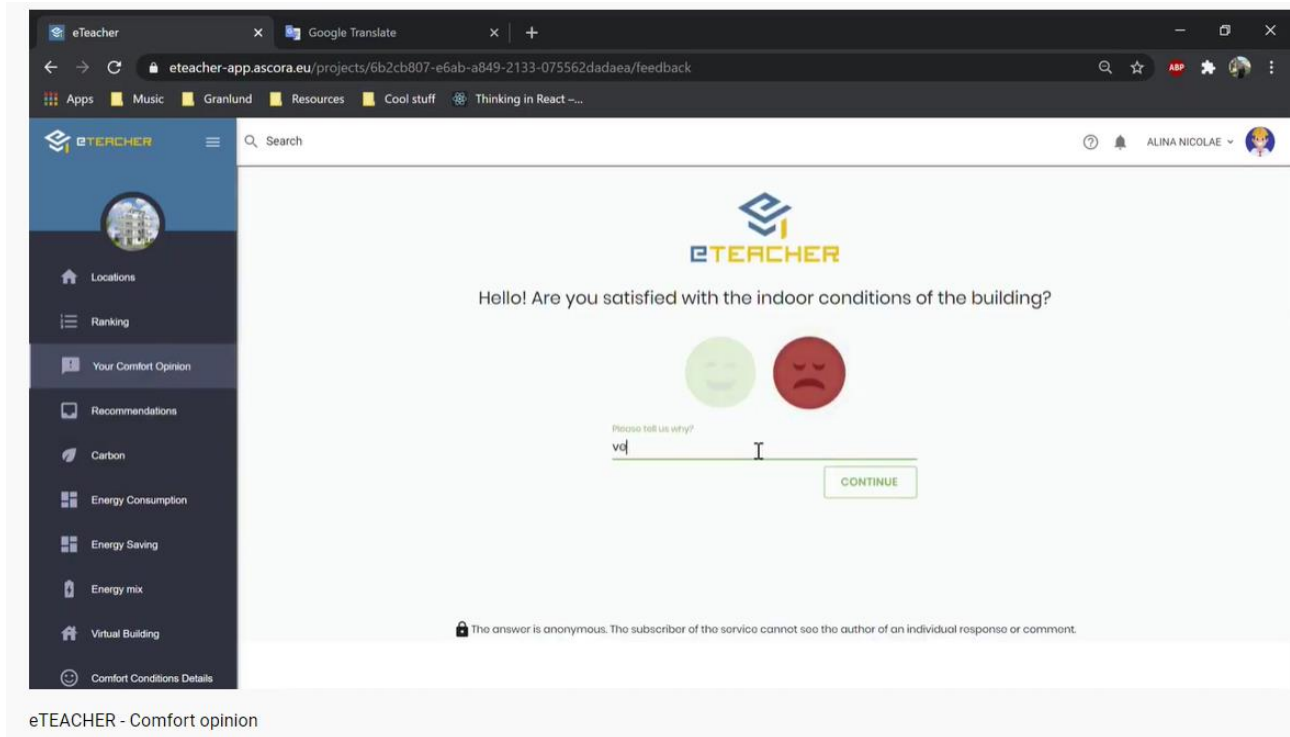- *Link*: https://www.youtube.com/watch?v=CNZGc45Am_U

eTEACHER - Comfort opinion

Figure 54 - eTEACHER - Comfort opinion

Video 6 - eTEACHER - Pulse video guide

- *Description*: this video provides an introduction to the Pulse feature. the pulse score is the value of wellness and it always starts at 50. It can consist of feedback alone or based on feedback and measured performance. One good or bad feedback changes the score by one unit. This happens when user feedback is only used. If the Pulse value is also affected by the Metrix score, then one good or bad feedback affects 0.25% and the Metrix score affects up to 75%. Pulse score get values between 0-100. Values between 90-100 are considered good, 80-89 satisfactory, and 0-79 are considered poor.
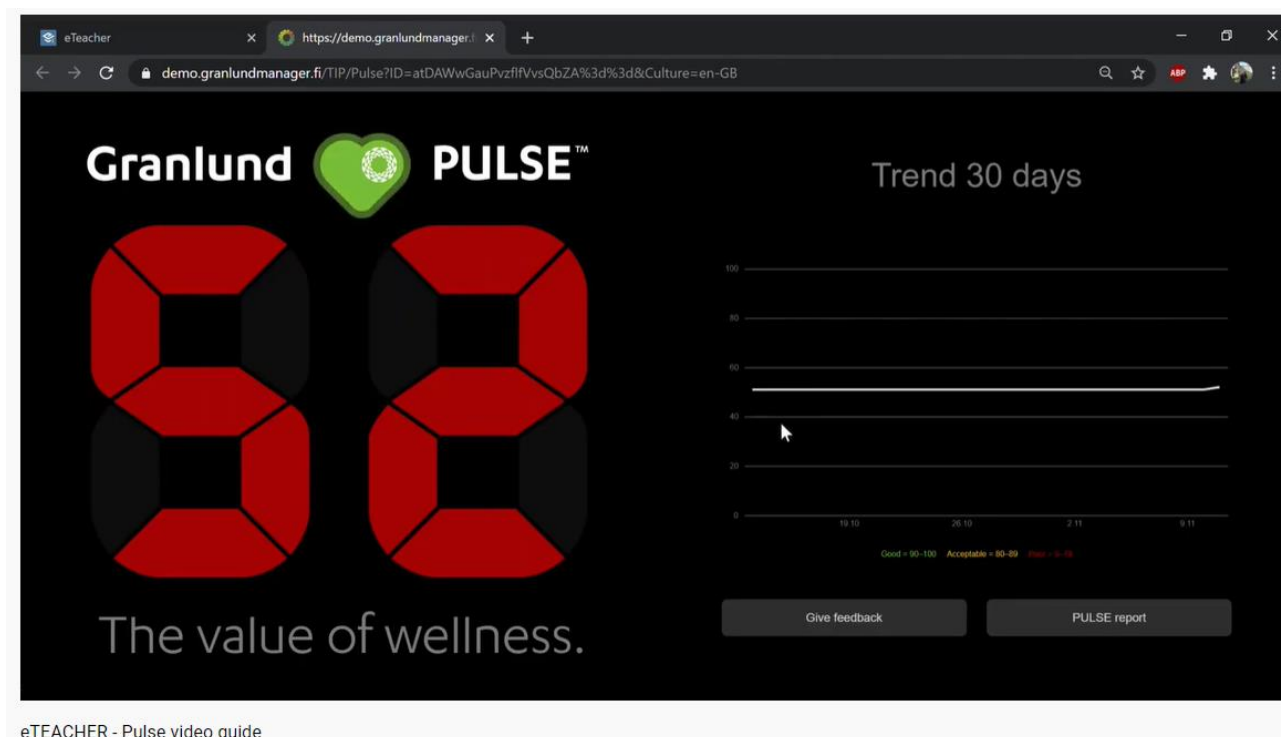
- *Link*: https://www.youtube.com/watch?v=rA9YFLeIjJE

eTEACHER - Pulse video guide

Figure 55 - eTEACHER - Pulse video guide