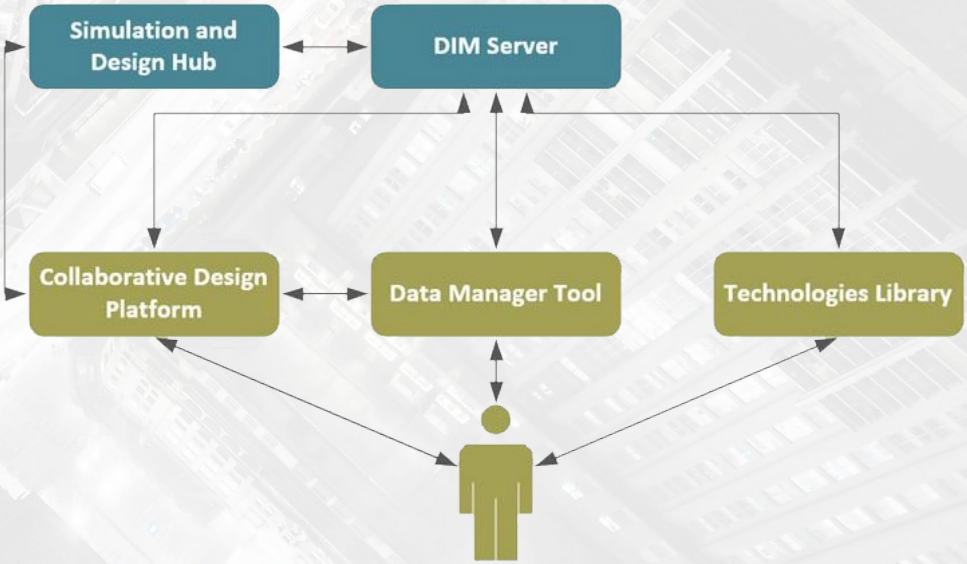
Tools of New TREND's Platform

Booklet 7



NewTREND

NewTREND, Booklet 7: Tools of New TREND's Platform.

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http://newtrend-project.eu/home-it/

Table of contents

1. Introduction: Tools of the Platform

The purpose of this tool is to evaluate potential energy efficiency refurbishment of the building but also to guide the decision makers in the selection of the best energy retrofitting strategy for the building in the context of the district. It's fundamental to consider the building as part of the district, seen as a whole energy system to improve the efficiency of the global energy balance.

The main tools of the NewTREND Platform are:

- Collaborative Design Platform (CDP)
- Data Manager (DM)
- DIM Server
- Acoustic Comfort module
- Thermal Comfort module
- Simulation and Design Hub (SDH).

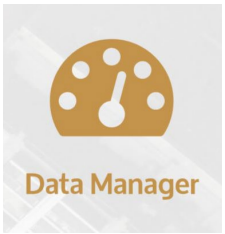
The **Collaborative Design Platform** is the front-end software tool and the main interface for users. Here takes place Project Creation through a cityGML file and it can be complemented by BIM Models; this step is crucial as it is functional to all the project activities. To create a project it is required the input of time-scope, project name and description. Users must also input the district file and the accepted format is cityGML.

This file gives a basic description of the project scope and buildings can be seen in 3D and their features navigated. After uploading district and building files, project planning can really take off.

A big portion of the CDP is dedicated to the visualization of simulation results. The main simulation output is building and district KPIs that describe the performance of a given scenario from energy, economic and social point of view. It is possible to give a priority level to every category and also to each Key Performance Indicators. Moreover several visualization tools are offered to help the user analyze scenarios giving a prediction on energy consumptions, comfort, expenses, etc.

Users can simulate Buildings and Districts at their current state or create new potential scenarios to assess and predict potential improvements in energy efficiency. Simulation can be run with different modes, depending on the level of detail of input data:

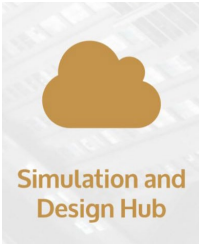
- BASIC MODE: Lowest data requirements, enter a minimum set of data to virtually acquire results about any building in the neighbourhood. The number of outputs in this mode is limited and most of the inputs are pre-defined and offered in the form of drop down lists.
- ADVANCED MODE: Rely heavily on user inputted data to operate in good accuracy, high demand on data and a well detailed 3D BIM model. Advanced mode can perform comprehensive, detailed and accurate analysis on a single room level, results include environmental, user comfort and other analyses. Advanced mode allows the user to display and edit properties of a building in more detail at Room level.
- PREMIUM MODE: Used when real monitored values of the building are available. The user is able to get the most accurate representation of their building using this mode. Data Manager allows entering monthly energy consumption and production data, found on utility



The **Data Manager** is a web application developed to assist in the data collection process of a retrofit design project. It is accessible via the web browser and scalable to be accessed by portable devices. The data manager's core functionality is to assist in the collection of data required for the creation of a BIM model of the existing building and neighbourhood. User can update the model with additional attributes, pictures, file and notes. When using the Data Manager from a portable device it is also possible to take pictures using the device's integrated. Pictures are directly stored and made available for all users download. This is a useful functionality while on a site inspection. In the Attribute view, the user is able to specify all the components characterizing the neighbourhood. In this section user enters information about district heating, storage or renewables already existing in the district.Data Manager sends collected details to the DIM Server for secure storage.

The **DIM Server** is at the core of the NewTREND tool kit, acting as its memory. DIM receives data concerning district and buildings from the CDP and the DM. It stores securely all the information entered or processed in various software tools and also the results of dynamic simulations. It creates associations between different sets of information so that it can be analysed as the sum of the parts rather than separate sources of information. It is extensible to allow new techniques and approaches to reuse the info.

DIM Server provides a web-based form to enter input data for the Acoustic Comfort analysis to determine the optimal acoustic design for occupants' well-being. As first the user creates the façades, then he associates elements (wall, windows, doors, small elements) to each façade to create an "As-is" model. "What-if" scenarios can then be created where existing elements can be modified or deleted, and new elements added. For each data, the user enters the information through labels, which give the possibility to choose between different options from a drop-down list. The same approach has been adopted for the Thermal Comfort analysis to determine the optimal acoustic design for occupants' well-being. A sensitivity analysis it's done to identify the critical parameters and optimize the retrofit design. The thermal comfort algorithm analyses the indoor thermal comfort from building level to room level, taking into account all the relevant aspects for the retrofit design process.



The **Simulation and Design Hub** is an interactive cloud-based software tool, able to support the design team in assessing the impact of different design options on the building to be refurbished taking into account the surrounding neighbourhood, through the assessment of dedicated district level design options.

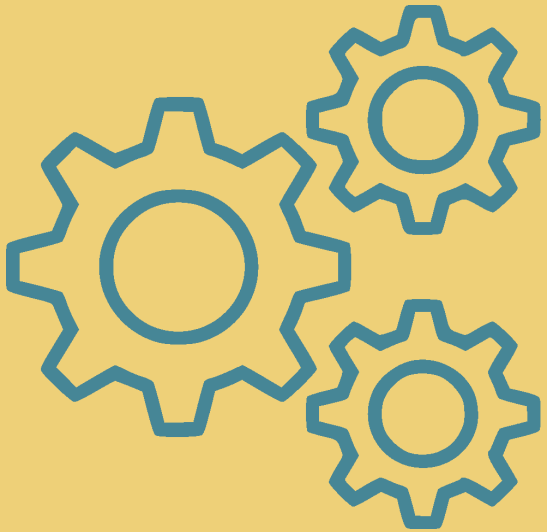
The Collaborative Design Platform is the main tool that the user interacts with:

- Sets up the project;
- Uploads relevant building & district geometry (via IFC & cityGML files);
- Sets up retrofit scenarios and schedules simulations;
- View results and data.

The SDH engine is performing all the necessary calculations to allow members of the retrofit design team to take informed decisions on suitable retrofit interventions in all design phases, taking into account environmental criteria as energy efficiency but also economic and comfort aspects.

In the Simulation Design Hub take place dynamic simulations and calculations to create future retrofit scenarios. Users can display in the CDP the results of the dynamic simulations. Simulation supports retrofit design and decision making along the retrofitting process. The SDH is activated whenever a user triggers a simulation from the CDP and the simulation progress is displayed. After a few minutes, when the simulation is completed, the results are post processed, the KPIs are calculated and sent to the DIM server for storage.

The NewTREND tools



2. Background information

The NewTREND Collaborative Design Platform user manual is intended to guide the users to understand the rationale behind the Collaborative Design Platform (CDP), developed in the NewTREND project. It can be used as a guideline document during the evaluation of the software by the consortium members, as well as a baseline for creating training material required for the Training sessions.

This user manual is structured in three main sections:

Section 2 provides some background information on NewTREND tool kit

Section 3 provides the user of some basic information, useful before operating with the online tool

Section 4 is the step-by-step user manual describing the complete functionalities of the tool.

This section provides some background information about the NewTREND web tool kit, the CDP's requirements, and the initial research and investigation conducted prior to the prototype implementation.

2.1 The NewTREND web tool kit

NewTREND tools, including the Collaborative Design Platform (CDP), can support all stakeholders working on building retrofit projects during all project phases from design/data collection to validation/operation. In this context, the expression "stakeholder" includes all people involved in or affected by the retrofit project including experts like architects or energy consultants as well as non-experts like building owners or tenants. NewTREND focuses on the refurbishment of one building including its interactions with the neighbourhood. It needs to be noted that in the context of NewTREND software prototypes, the terms neighbourhood and district refer to one main building plus up to 10 surrounding buildings. Nevertheless, the software system shall be designed so that in the future it could be extended to accommodate bigger neighbourhoods/districts.

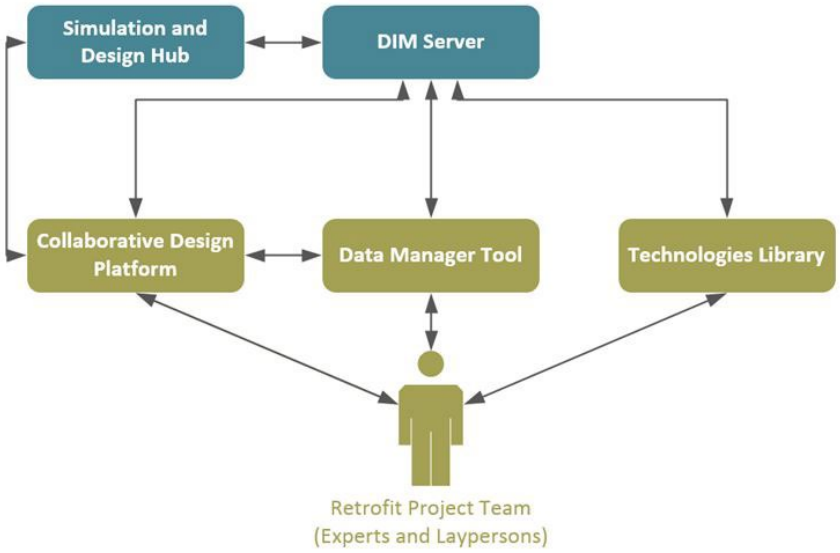


PHOTO 1: Overview of the NewTRend web tool kit

An overview of the NewTREND toolkit is represented in Photo 1. Blue boxes show tools with which users don't interact with actively. The user at the bottom interacts with:

- The Data Manager tool (DM), it collects data and information required for the creation of a District Information Model to study neighbourhood and individual buildings
- The Technology Library, to get information regarding the retrofit technologies available on the market, and how these were applied in case studies in the past
- The Collaborative Design Platform (CDP), designed to ensure the correct application of the Integrated Retrofit Methodology developed in WP2.
- NewTREND tools also interact with each other in various ways, for example:
- All information entered or processed in various software tools are stored on the Interoperable Data Exchange DIM server
- The dynamic simulations and complex calculations of the user-created future retrofit scenarios take place on the Simulation and Design Hub (SDH), while results are stored on the DIM server and can be displayed and analysed by the user on the CDP.

2.2 The NewTREND Modes

To overcome the challenge of limited availability of data when collecting information of existing buildings, NewTREND offers its users the possibility to operate in three different modes of operation namely; Basic, Advanced and Premium. These modes offer the user different outputs as per extensivity and the accuracy of the provided data for the project in question. The main difference between the three modes lies in the amount and the degree of accuracy of the geometric along with the semantic data of the building/neighbourhood which in turn have a direct impact on the number of outputs NewTREND will be able to offer to its users in each mode.

The NewTREND Basic is the mode with the lowest data requirements. Due to the limited availability of a BIM/DIM models for existing building stock and the fact that the creation of full BIM/DIM model of existing buildings is usually a very time and resources intensive process, the Basic mode is introduced as a way to bridge the gap between a full BIM/DIM model and basic 2D drawing of a building. The Basic mode takes advantage of the results of previously conducted research projects and widely available information to operate. Thus, the mode heavily relies on default values to generate its results. On one hand, this allows the user to enter a minimum set of data and to virtually acquire results about any building in the neighbourhood; on the other hand, the number of outputs in this mode is limited to energy and life cycle cost related outputs, excluding user comfort related outputs.

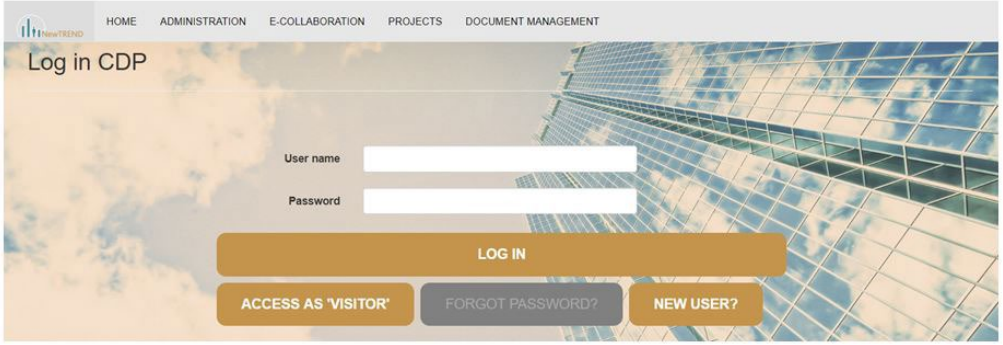
The NewTREND advanced is a mode of NewTREND with high demand on data. This mode requires that the building has a well detailed 3D BIM model (i.e. a geometric model including detailed building properties). Thus, the NewTREND in Advanced mode can perform comprehensive, detailed and accurate analysis on a single room level. In Advanced mode the user can acquire vast array of analysis results that include environmental, user comfort, and other detailed analyses. Therefore, and in contrast to Basic mode, NewTREND in Advanced mode relies heavily on user inputted data to operate with good accuracy.

The NewTREND Premium mode can be used when real monitored values of the building are available, for example utility bills or smart meter data with monthly breakdown of building energy consumption. The user is able to get the most accurate representation of their building using this mode.

3. Generalities

The CDP is a platform that is installed after a simple integration project. This means that a specific instance of the tool will be deployed to every client that requests it, with dedicated storage are and computational power. This will also mean that the address to access the tool will be given to the user after this integration phase. Also, a first set of master credentials will be created to start working on the platform.

After entering the required information, it is possible to access the CDP by log in.



Visitor access is also provided, in which it is possible to access only some limited functions of the CDP, without being able to make changes of any kind.

Once the user is logged in, there is the home page, where all the different activities of the CDP are displayed.

In the next chapter every functionality of the system will be taken into consideration and analyzed.

4. Description of the CDP functionalities

The CDP areas that will be found on the platform are listed below and explained thoroughly in the next pages.

- Administration

In which workgroups and members are managed as follows:

- Workgroups: for each workgroup it is possible to create, edit, delete and assign members.
- Members: for each workgroup it is possible to create, edit, delete and confirm members
- E-collaboration

In the CDP, the creation and management of pools, surveys and quizzes can be carried out.

- Projects

On the platform it is possible to manage projects: creating, editing, deleting. For each project it is possible to:

  - Set properties like starting date, target date and closing date;
  - Manage phases (a phase is a group of tasks);
  - Manage tasks. For each task you can:
    - assign members;
    - assign tasks that are related to the current task;
    - visualize the Gantt chart.
  - Project details
    - Scenario manager
    - District manager
    - Buildings manager

For many of these managements, separate chapters have been dedicated for a more detailed description of the activities.

- Document Management

Allows connection with the data manager.

4.1 Administration

4.1.1 Generalities

Within the Administration activity, there are two entities that can be managed:

- Workgroups
- Members

4.1.2 Workgroups

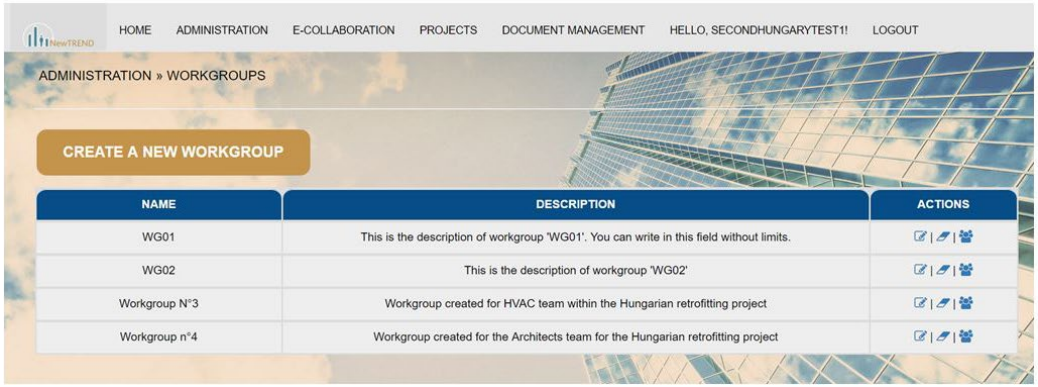
Each workgroup has the following structure:

Field	Mandatory?	Format	Notes
Name	Yes	Max 30 characters	'Name' must by unique and cannot be modify after creation.
Description	No	Text	

WORKGROUPS OPERATIONS

WORKGROUPS LIST

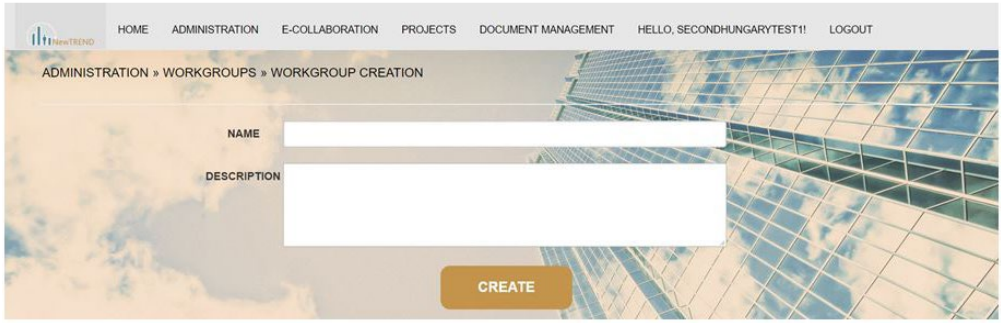
Path: Home→Administration → Workgroups



In addition to the possibility of creating a new workgroup, the functions applicable to existing workgroups are the modification, removal and assignment of the members.

CREATION OF A WORKGROUP

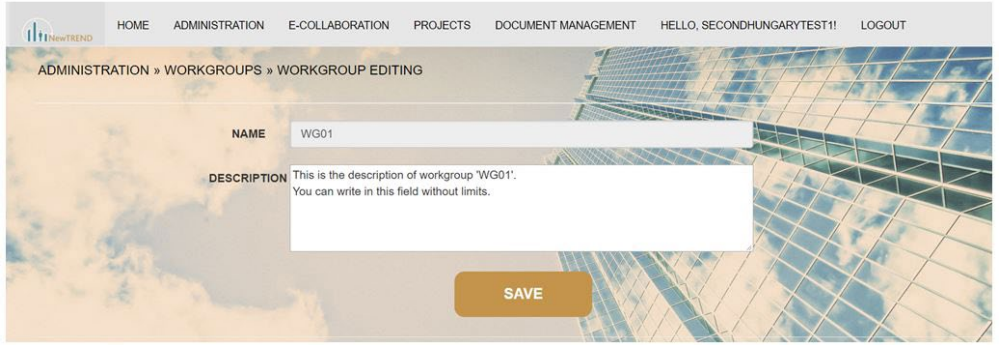
Path: Home →Administration → Workgroups → Create a new workgroup



EDITING A WORKGROUP

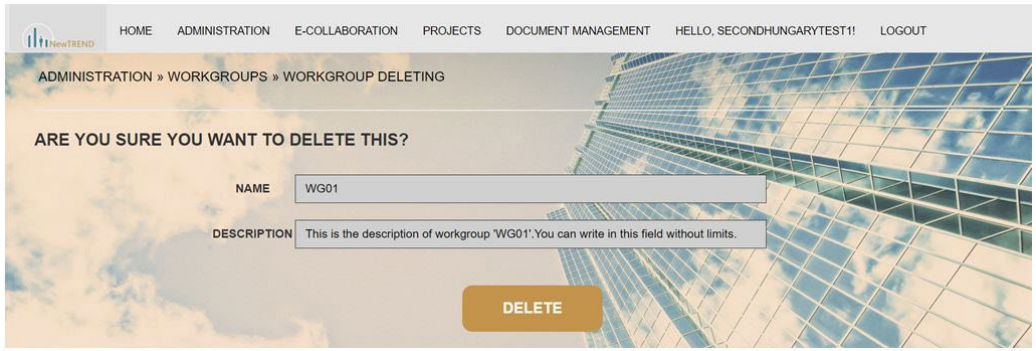
Path: Home → Administration → Workgroups → Edit

In the editing phase, the workgroup name cannot be changed.



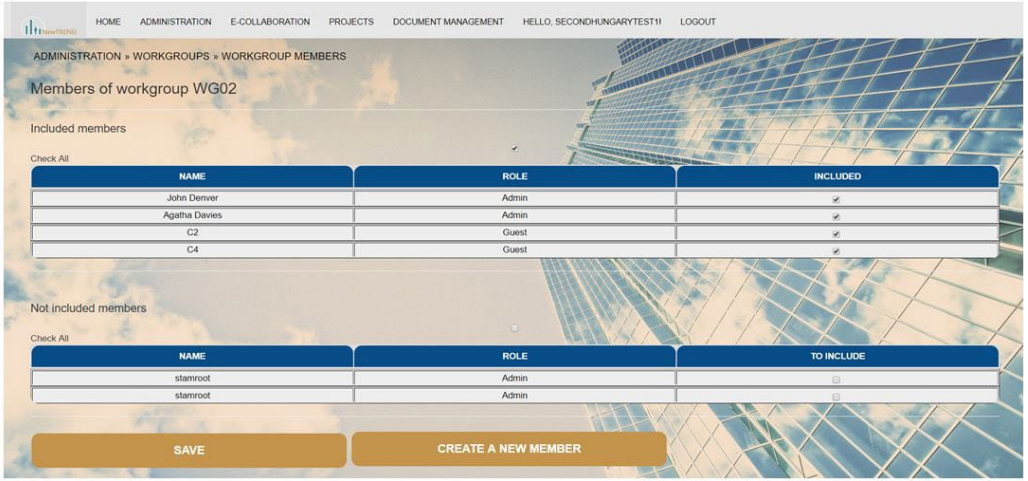
DELETING A WORKGROUP

Path: Home → Administration → Workgroups → Delete

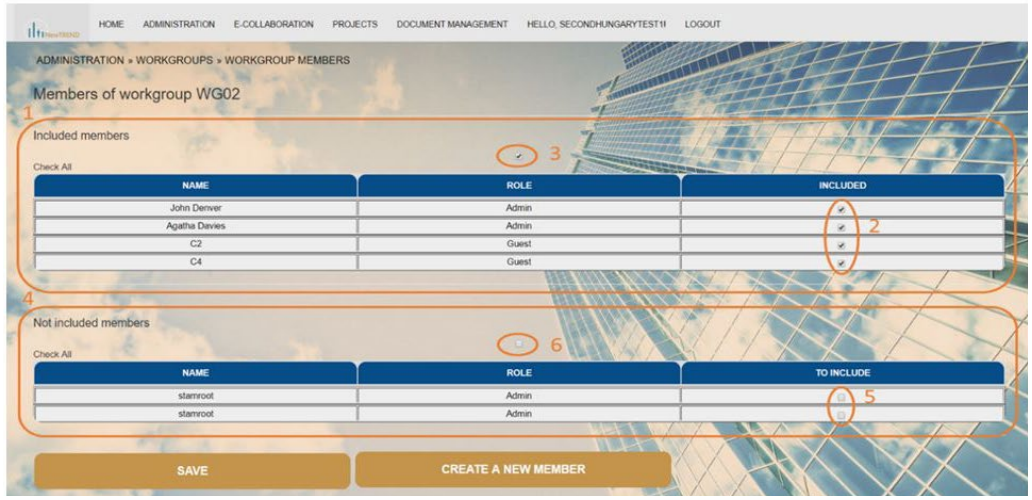


MEMBERS OF A WORKGROUP

Path: Home → Administration → Workgroups → See members



This page is composed has shown below:



- In the upper part (1) there are members who currently belong to the workgroup; it is possible to delete one or more members from this membership by disabling the corresponding checkboxes (2). The checkbox over the table (3) allows to select / deselect all the members present in this part.
- In the bottom part (4) there are members who currently do not belong to the workgroup; it is possible to include one or more members in this membership by enabling the corresponding checkboxes (5). The checkbox over the table allows to select / deselect all the members present in this part (6).

The button 'Save' allows to save the made changes. It is possible to create a new member directly from this page (button 'Create a new member').

4.1.3 Members

Members are physical person that can access to the various functionalities of CDP.

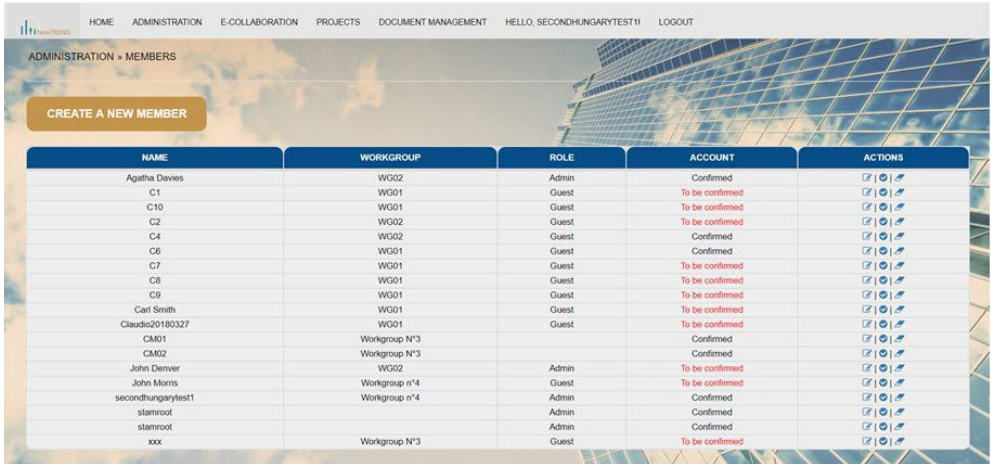
Each member entity has the following structure:

Field	Mandatory?	Format
Name	Yes	Max 30 characters
Password	Yes	
Membership to one workgroup	No	
Role	Yes	There are 5 distinct roles: Admin Developer Expert Non-expert Guest

MEMBERS OPERATIONS

LIST OF MEMBERS

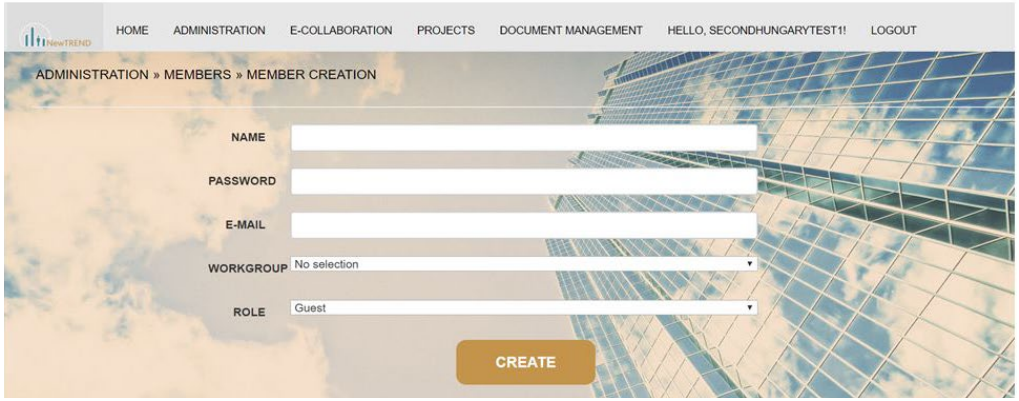
Path: Home → Administration → Members



Also, in this case, there is the creation function. While for existing members it is possible to modify them, confirm them (function only accessible to administration members) or delete them.

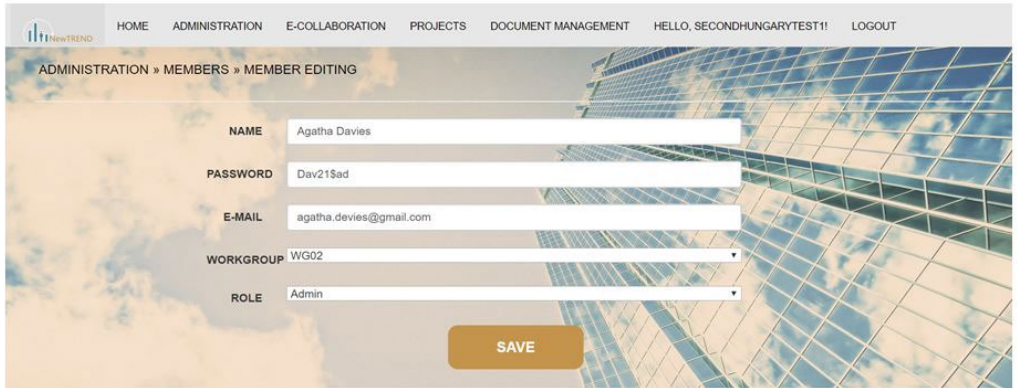
CREATION OF A MEMBER

Path: Home → Administration → Members → Create a new members



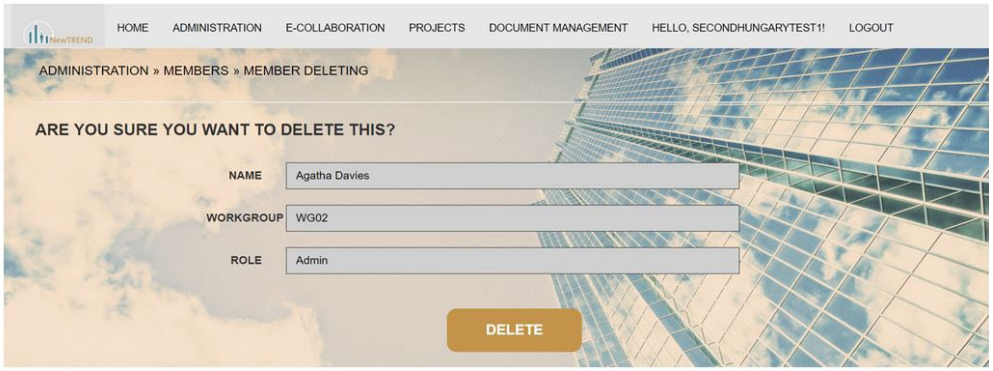
EDITING A MEMBER

Path: Home → Administration → Members → Edit



DELETING A MEMBER

Path: Home → Administration → Members → Delete



4.2 E-Collaboration

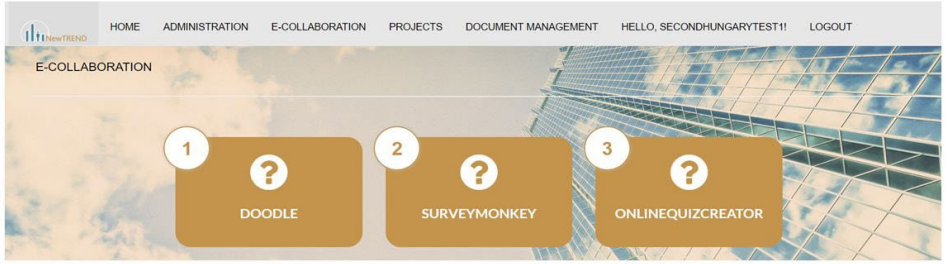
4.2.1 Generality

CDP offers the possibility to use some types of social tools to encourage the exchange of information between members and to conduct surveys. For these features, external tools are used. The following table lists social tools:

Social tool type	Name	Reference
Pool	Doodle	http://doodle.com/
Survey	Surveymonkey	https://www.surveymonkey.com
Quiz	Onlinequizcreator	www.onlinequizcreator.com

It is possible to access these tools through this page:

Path: Home → E-collaboration



All three types of these implemented social tools have the same structure:

Field	Mandatory?	Format	Notes
Name	Yes	Max 30 characters	'Name' must by unique.
Description	No		
Created	---		(Read only) It's the date when the task was created.
Deadline	Yes		
Workgroup	No		
Completed	No		
Results			It is the link at which it is possible to see the results of the poll
Invitation URL	No		It is the link to be sent to the members of the workgroup associated with the poll so they can participate to the poll itself. This type of notification has not yet been implemented in this version of CDP.
Management URL	No		It is the link through which the poll user can manage the poll itself.

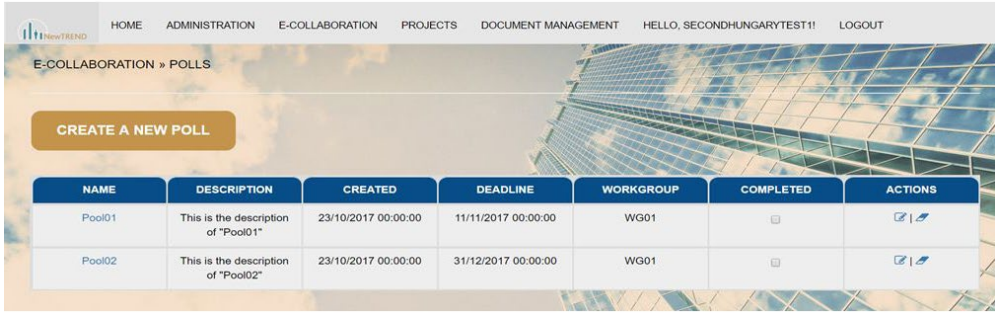
4.2.2 Polls

A poll is used to ask one simple question: the external tool used is ‘Doodle’.

POLLS OPERATIONS

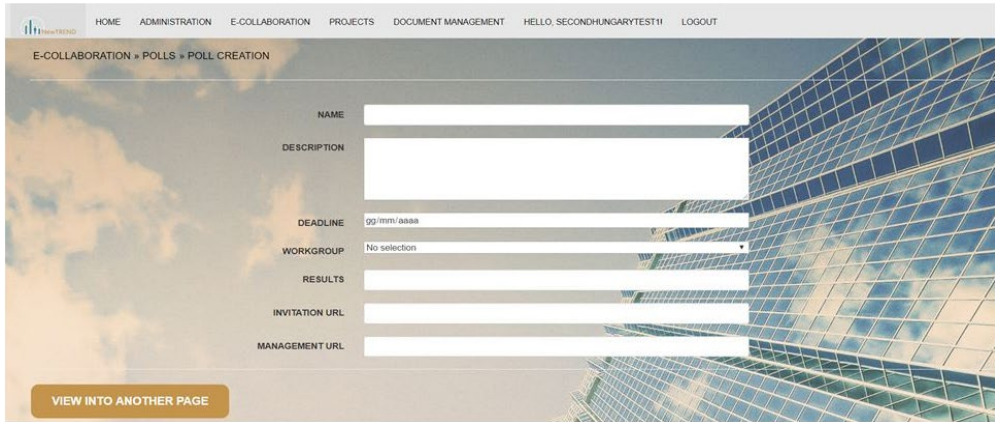
LIST OF POLLS

Path: Home → E-collaboration → Polls

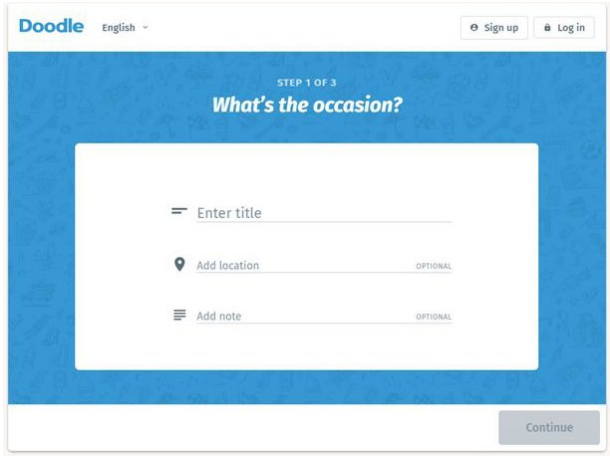


CREATION OF A POLL

Path: Home → E-collaboration → Polls → Create a new poll

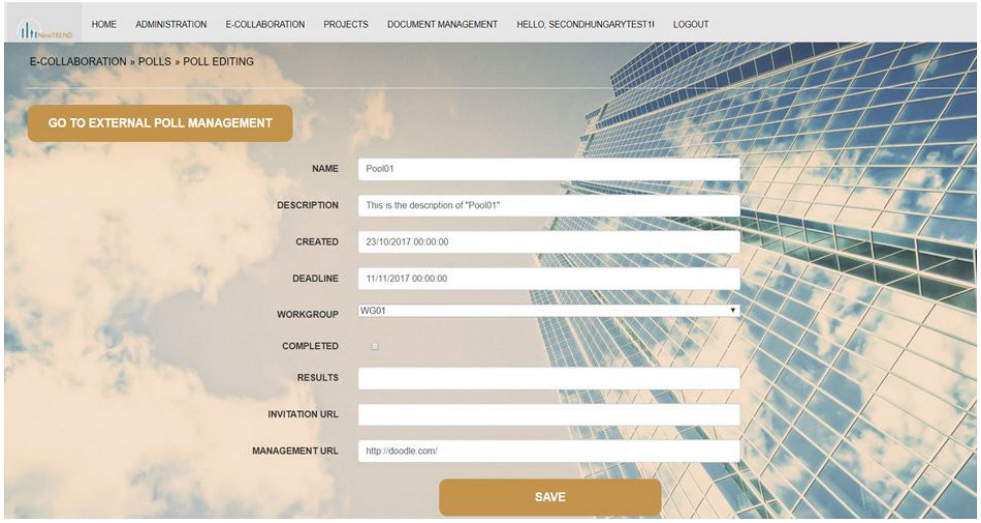


At the bottom of the window there is the external tool (Doodle); browsing inside it you can copy and paste the corresponding links to the 'Results', Invitation URL' and 'Management URL' items:



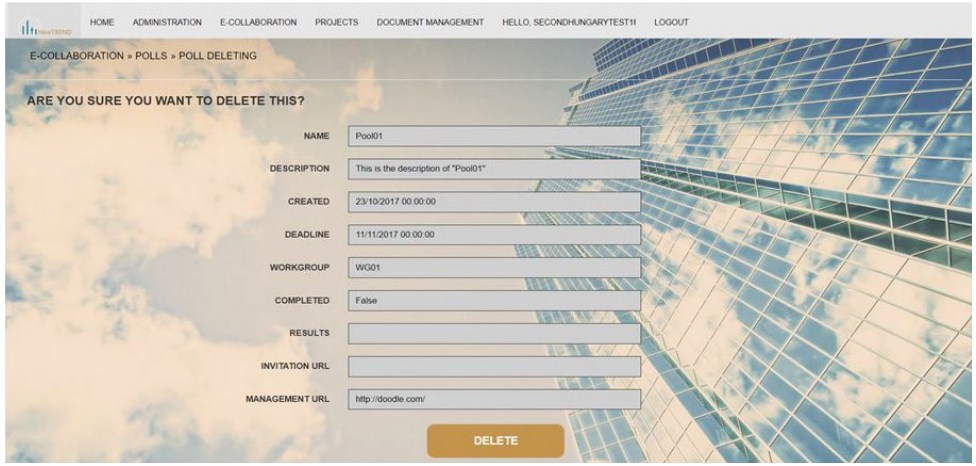
EDITING OF A POLL

Path: Home → E-collaboration → Polls → Edit



DELETING A POLL

Path: Home → E-collaboration → Polls → Delete



4.2.3 Surveys

A survey is generally used to ask a wide range of questions.: the external tool used is 'Surveymonkey'. The structure and operation are quite similar to what is described in the polls (see 4.2.2).

4.2.4 Quizzes

The external tool used is 'Onlinequizcreator'. The structure and operation are quite similar to what is described in the polls (see 4.2.2).

4.3 Project

4.3.1 Generalities

A project is related to the management of a DIM model that contains a representation of a district.

A project has the following structure:

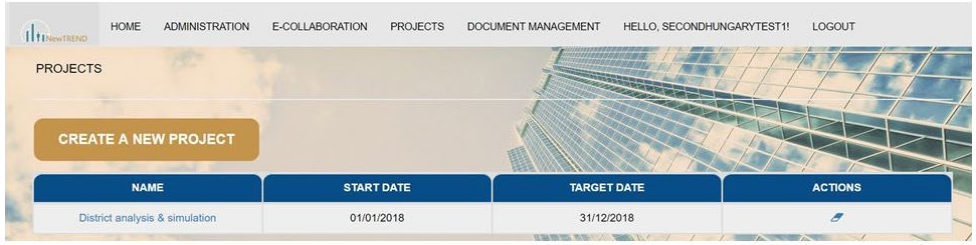
Field	Mandatory?	Format	Notes
Name	Yes	Max 30 characters	'Name' must by unique.
Description	No		
Start date	Yes		It must be: <= 'target date'.
Target date	Yes		It must be: >= 'Start date'.
Is closed	No		Indicates whether the project is finished or not.
Closing date	No		In this version of CDP, it must be set. If the project is not completed, it is possible to put a fictitious date and the field 'Is closed' to 'False'
Creator name	---		(Read only) It's the name of member who created the task
Creation date	---		(Read only) It's the date where the project was created.

In each project it is possible to enter multiple tasks, each of which can be associated with one or more members. It is also possible, for each task, to indicate dependencies. Tasks can be grouped in 'phases'.

4.3.2 Projects operations

LIST OF THE PROJECTS

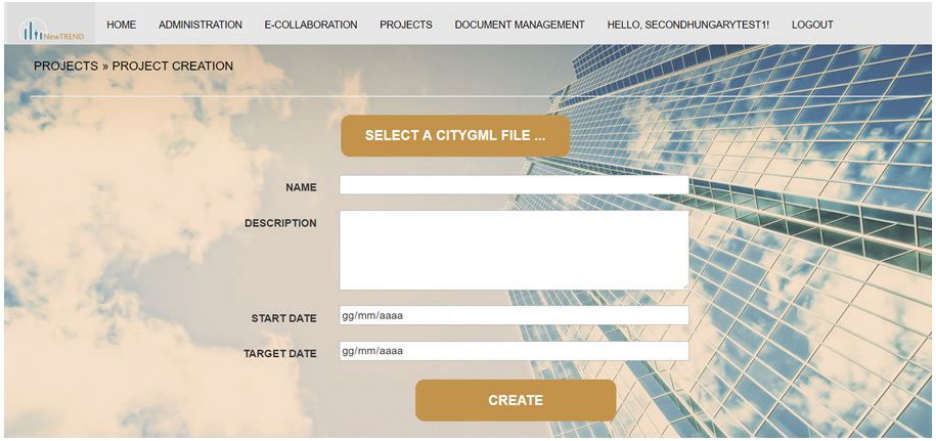
Path: Home → Projects



On this page it is possible to create a new project, delete an existing project or access a project using many features, which will be explained in the next chapters.

CREATION OF A NEW PROJECT

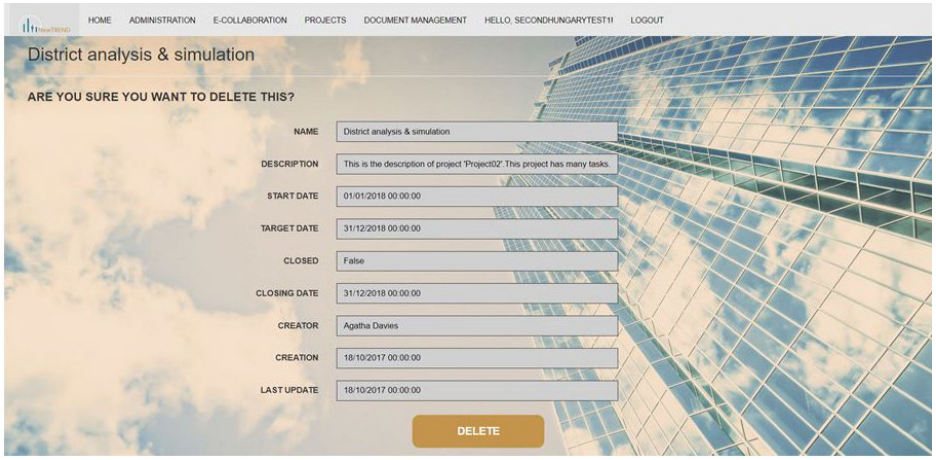
Path: Home → Projects → Create a new project



As previously mentioned, each project is associated to a DIM model that contains a representation of a district. For this reason, during the creation phase of the project, it is necessary to load the GML file of the district.

DELETING A PROJECT

Path: Home → Projects → Delete

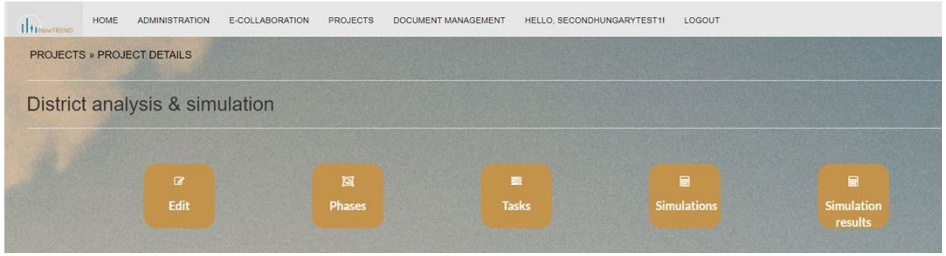


In the next chapters the details of the project will be analyzed:

- Project management: Editing, phase and task with all its functions
- Scenario: creation, editing, deleting
- District: view, download, upload, as-is and what-if simulation.
- Buildings: view, download, upload, as-is and what-if simulation.
- Project information
- Gantt
- Simulation results

4.4 Project management

Path: Home → Projects → Project details

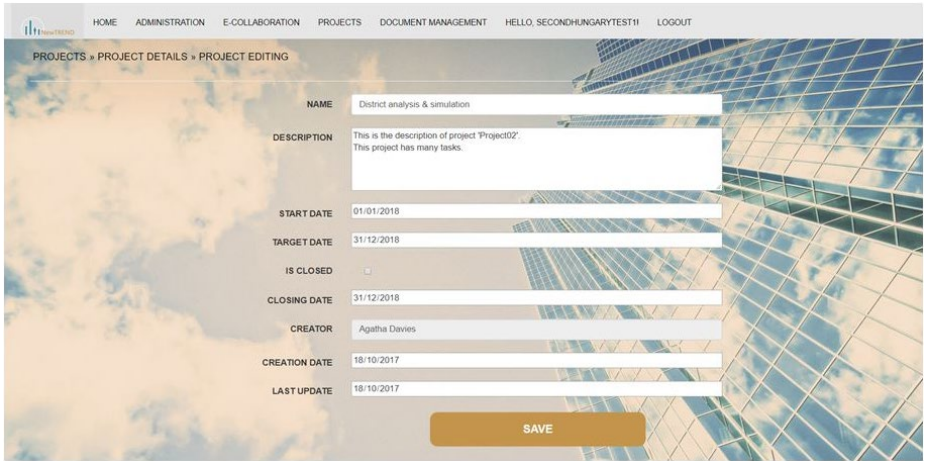


The first part of the "Project detail" page contains several buttons:

- Edit: allows to make changes to the project.
- Phases and task: allow the management of their functionality.
- Simulations: contains the simulation list and the possibility to delete the simulation
- Simulation results: described and explained in section 4.8.

4.4.1 Editing a project

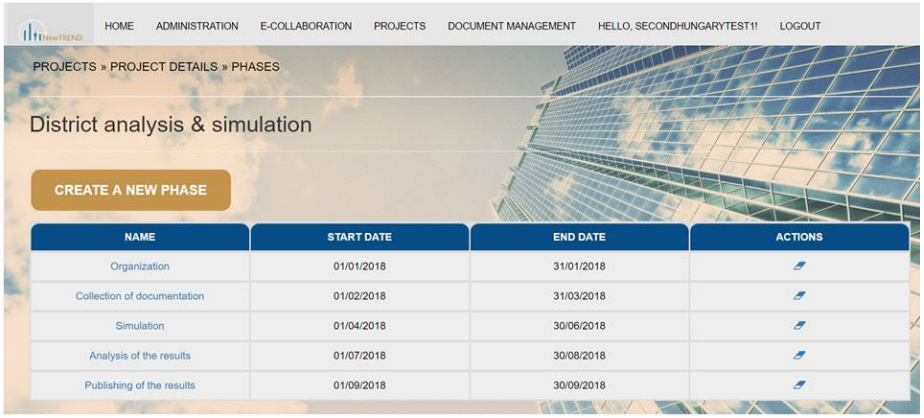
Path: Home → Projects → Project editing



4.4.2 Phases management

LIST OF PHASES

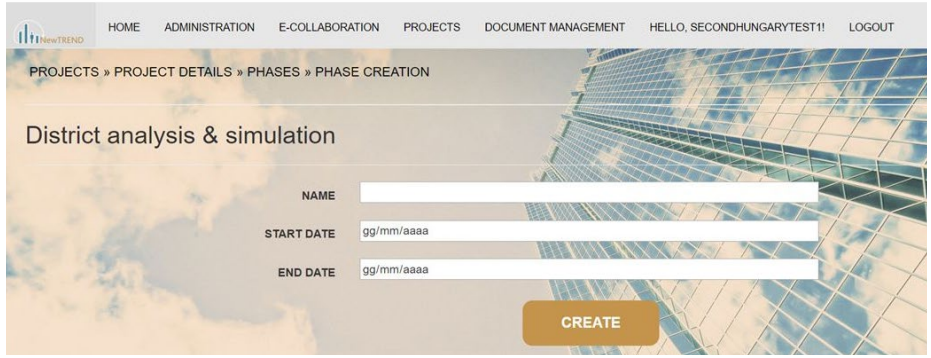
Path: Home → Projects → Project details → Phases



The functions applicable to 'Phases' are: creation, modification and elimination.

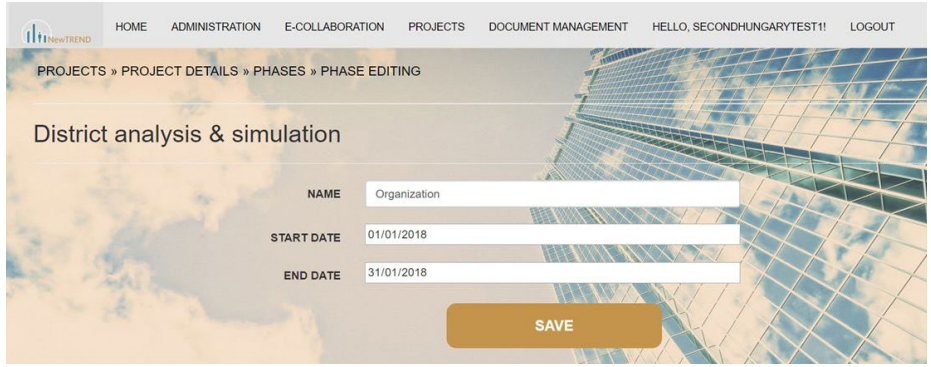
CREATION OF A PHASE

Path: Home → Projects → Project details → Phases → Create a new phase



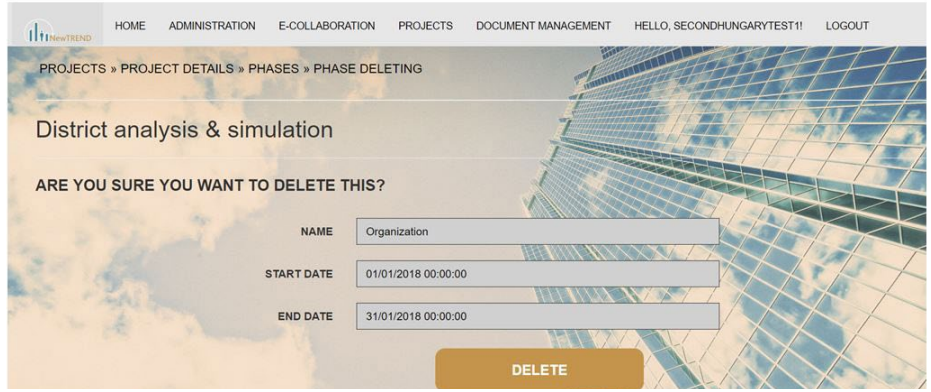
EDITING OF A PHASE

Path: Home →Projects → Project details → Phases → Edit



DELETING A PHASE

Path: Home → Projects → Project details → Phases → Delete



4.4.3 Tasks management

GENERALITIES

Each task can be associated to one or more members; it is also possible, for each task, to indicate dependencies. Tasks can be grouped in 'phases'.

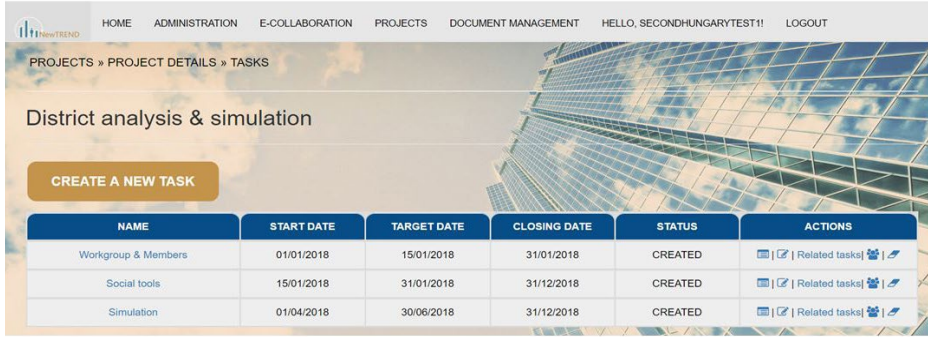
A task has the following structure:

Field	Mandatory?	Format	Notes
Name	Yes	Max 30 characters	'Name' must be unique among the tasks of the current project.
Summary	No		
Members	No		
Status	---		There are 5 distinct roles CREATED RUNNING SUSPENDED CLOSED
Start date	Yes		It must be: <= 'Target date' and <= 'Closing date'.
Target date	Yes		It must be: >= 'Target date'.
Closing date	Yes		It must be: >= 'Start date'.
Related tasks	No		
Parent task	No		
Location	No		
Sub location	No		
Creator	---		(Read only) It's the name of the member who created the task
Creation date	---		(Read only) It's the date when the task was created.
Modification date	---		(Read only) It's the date of the last modification.

TASKS OPERATIONS

LIST OF TASKS

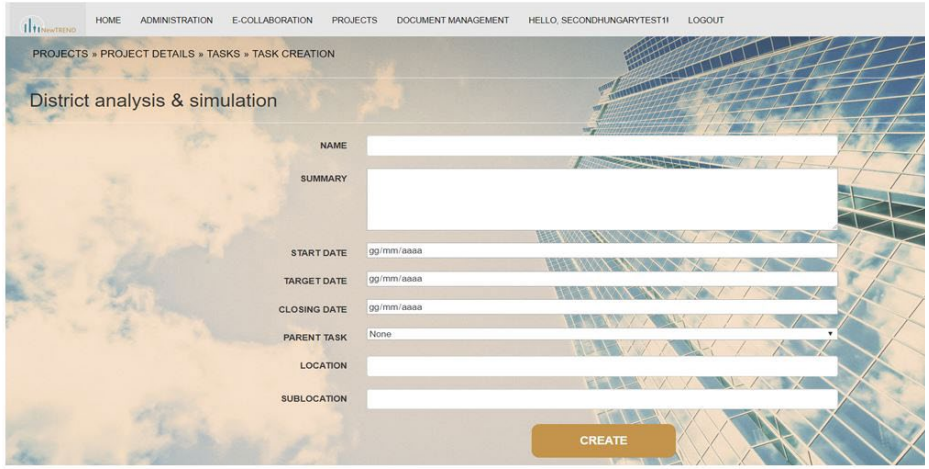
Path: Home → Projects → Project details → Tasks



In this section the functionalities are: create new task, view the details of existing task, modify it, show the related tasks and see members.

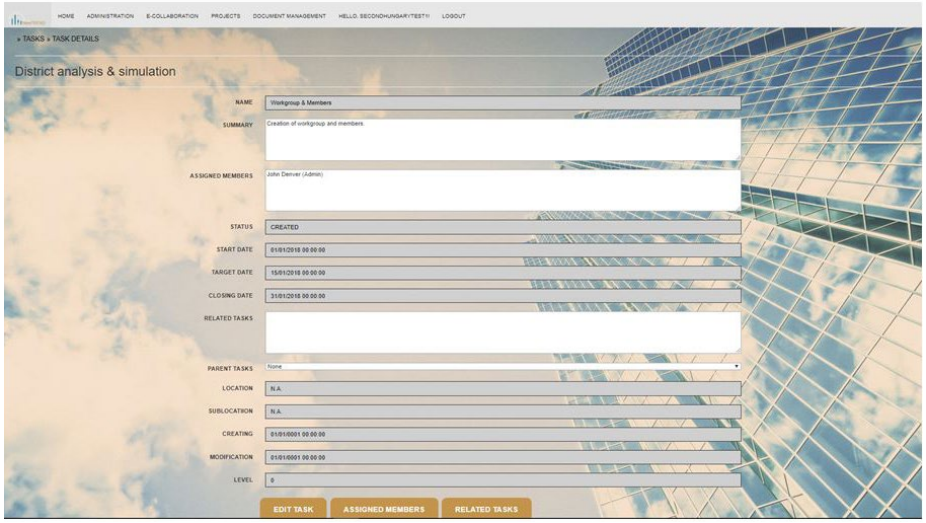
CREATION OF A TASK

Path: Home → Projects → Project details → Tasks → Create a new task



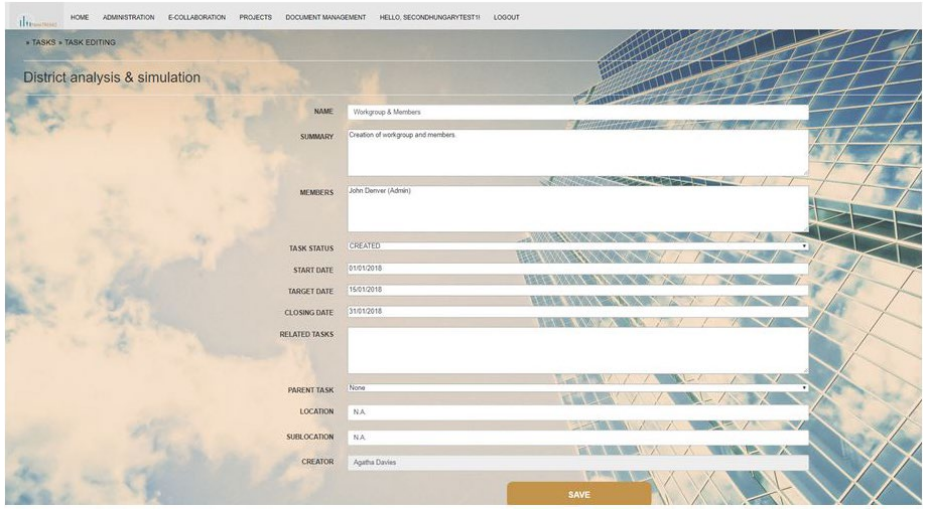
DETAILS OF A TASK

Path: Home → Projects → Project details → Tasks → Details



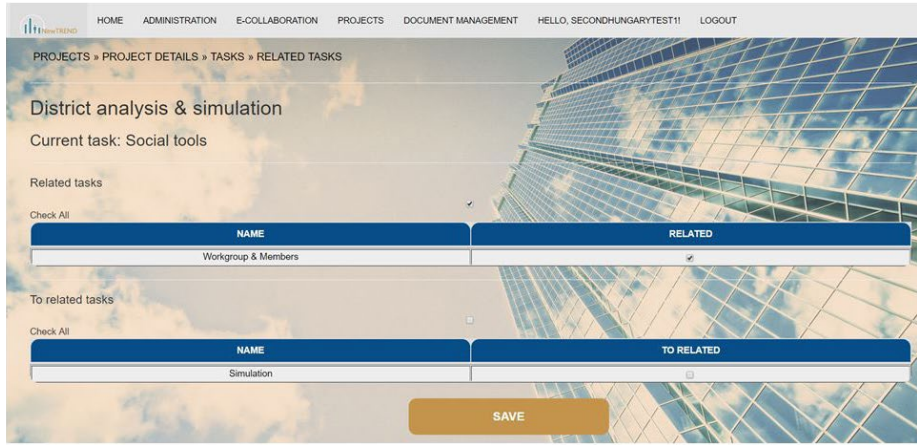
EDITING A TASK

Path: Home → Projects → Project details → Tasks → Edit

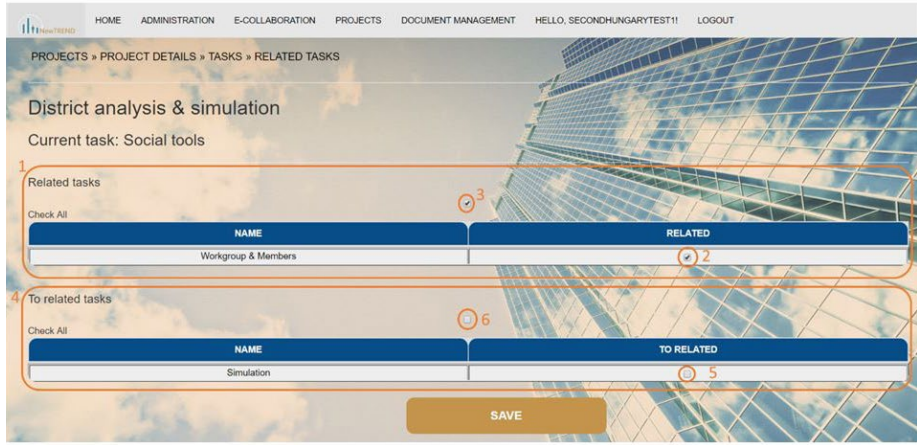


RELATED TASKS

Path: Home → Projects → Project details → Tasks → Related tasks



Below it is shown the composition of the page ‘Related tasks’:

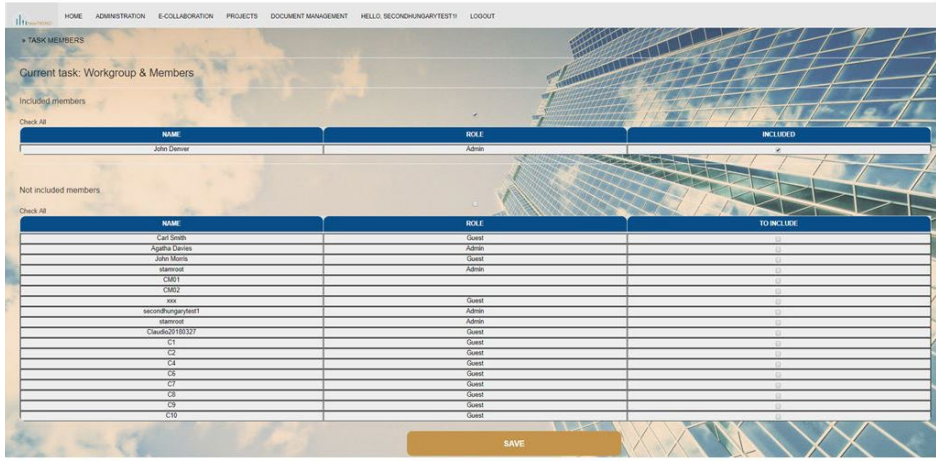


- In the upper part (1) there are the tasks related to the current task; it is possible to delete one or more tasks from this membership, it is necessary to disable the corresponding checkboxes (2). The checkbox over the table (3) allows to select / deselect all the tasks present in this part.
- In the bottom part (4) there are tasks that aren’t currently related to the current task; it is possible to include one or more tasks in this membership; it is necessary to enable the corresponding checkboxes (5). The checkbox over the table allows to select / deselect all the tasks present in this part (6).

The button ‘Save’ allows to save changes made.

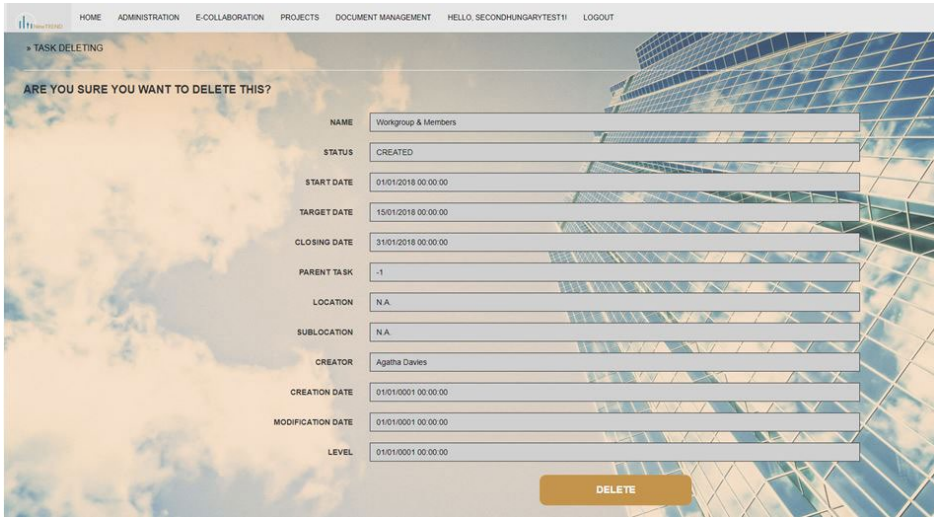
TASK MEMBERS

Path: Home → Projects → Project details → Tasks → See members



DELETING A TASK

Path: Home → Projects → Project details → Tasks → Delete

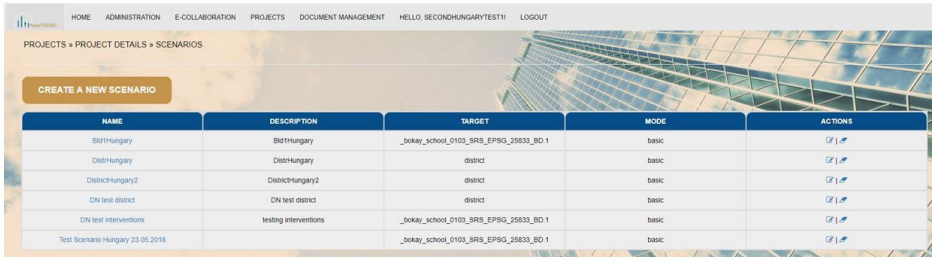


4.5 Scenarios

The scenarios allow the creation of different situations with different interventions, applicable for both the district and the buildings. Once a scenario is created, it is possible to simulate it and verify its goodness by comparing the KPIs and displaying the results (see 4.8).

LIST OF SCENARIOS

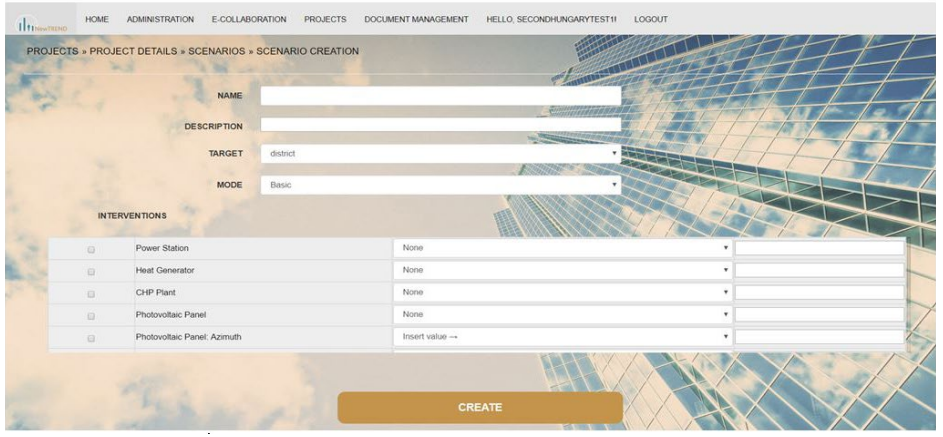
Path: Home → Projects → Project details → Scenarios



In addition to creating a new scenario, it is possible to modify and delete existing ones.

CREATION OF A SCENARIO

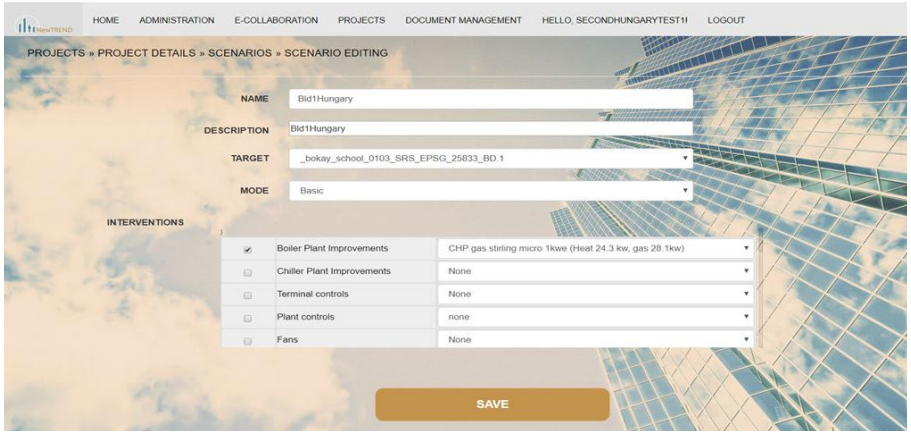
Path: Home → Projects → Project details → Scenarios → Create a new scenario



In the simulation creation, it is possible to enter the name and description of the scenario, the target: district or one of the present buildings, the mode (basic, advanced or premium) and the choice of the interventions.

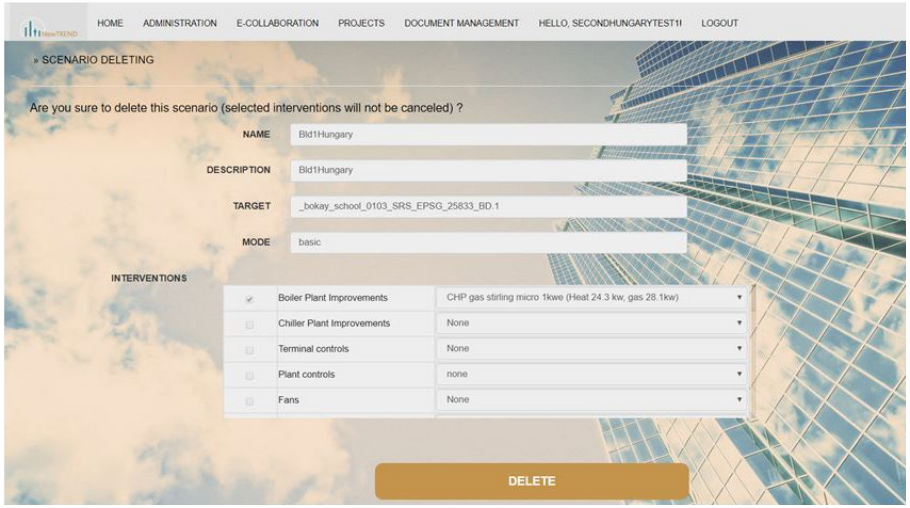
EDITING A SCENARIO

Path: Home → Projects → Project details → Scenarios → Edit



DELETING A SCENARIO

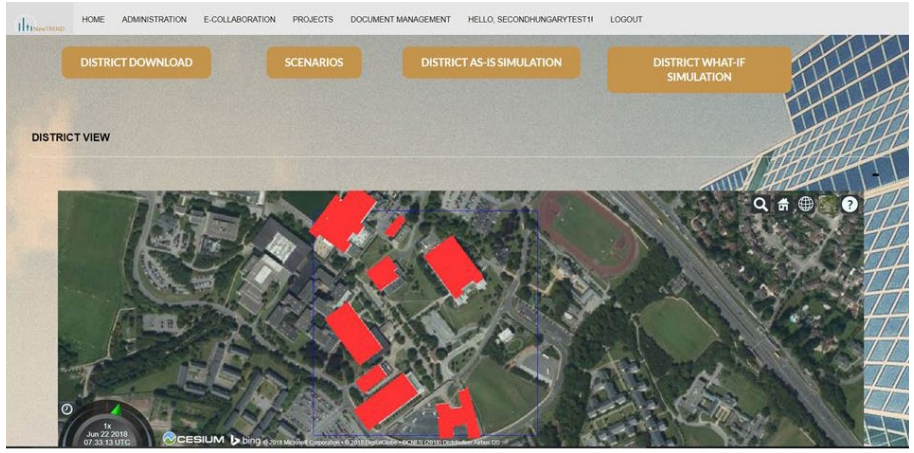
Path: Home → Projects → Project details → Scenarios → Delete



4.6 District

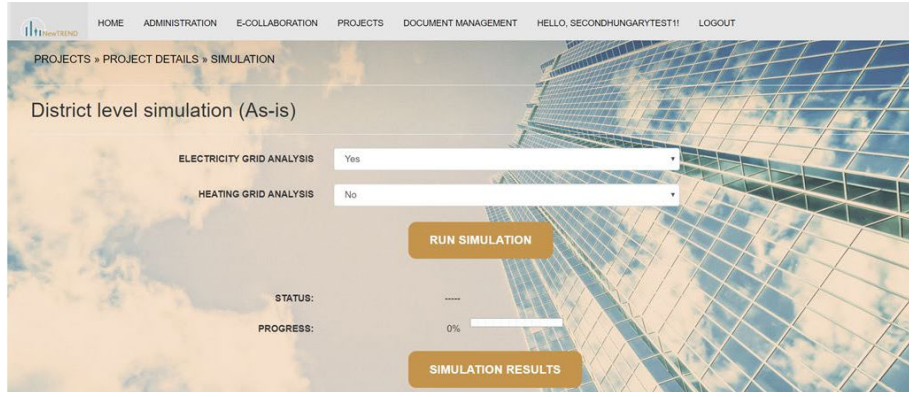
The district is loaded when the project is created. Within the "Project details" section it is possible to see the previously loaded district, in which the buildings belonging to the district are highlighted in red. The other applicable functions are the download of the district and the “as-is” or “what-if” simulations. The “as-is” simulation allows to calculate and obtain parameters that describe the actual and real conditions of the district. The “what-if” simulations allow to verify the behavior and the performances of the district following interventions chosen by the user, through the scenarios, and then simulated.

Path: Home → Projects → Project details



DISTRICT AS-IS SIMULATION

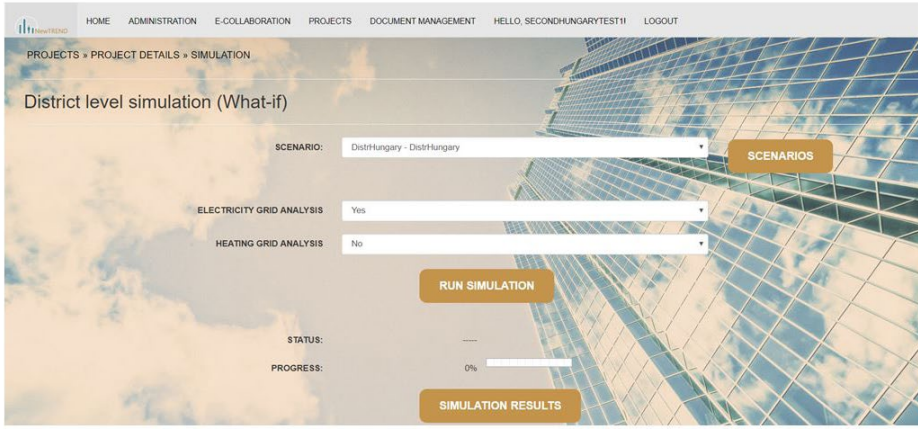
Path: Home → Projects → Project details → District as-is simulation



Before starting the simulation, it is necessary to set one of the two present items to "true": electricity grid analysis or heating grid analysis. Once the simulation is started, the status indicates whether the simulation is running, finished or failed. While the progress represents, numerically, the trend of the simulation. Once the simulation is completed successfully, it is possible to view the results (see 4.8).

DISTRICT WHAT-IF SIMULATION

Path: Home → Projects → Project details → District what-if simulation



In the "what-if" simulation, a scenario, among those previously created, is simulated.

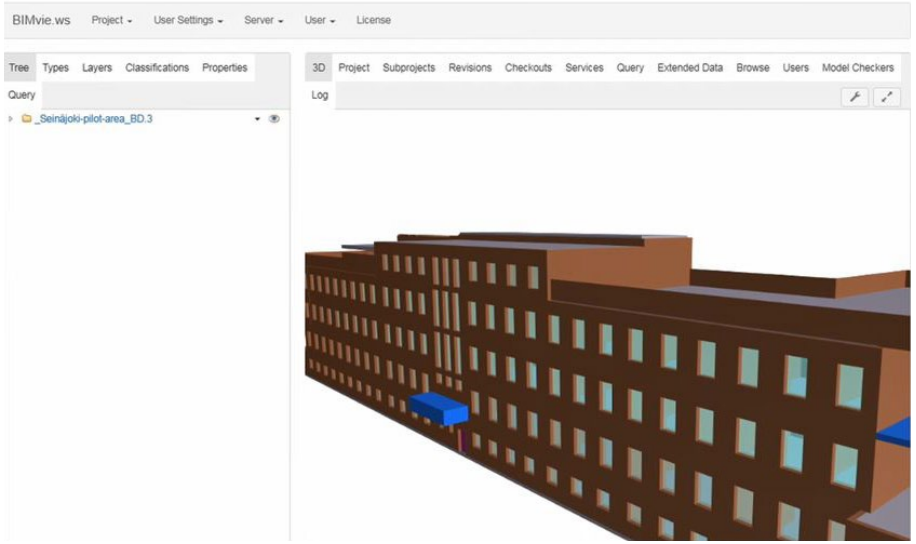
4.7 Buildings

The buildings are part of the district loaded into the project. For each building it is possible to view it, upload it, download it and apply the "as-is" and "what-if" simulation.

Path: Home → Projects → Project details

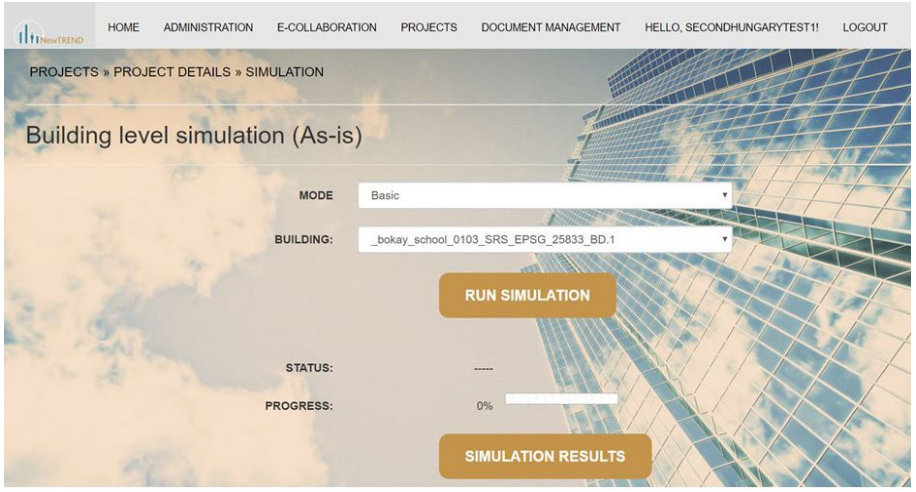
BUILDING VIEW 3D

Path: Home → Projects → Project details → View 3D



BUILDING AS-IS SIMULATION

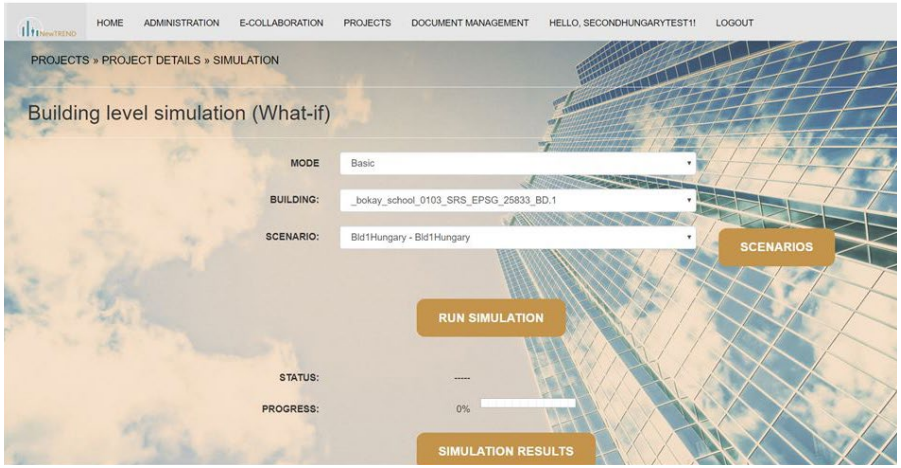
Path: Home → Projects → Project details → As-is



In this case, it is necessary to insert the mode (base, advanced or premium) and the chosen building. The other information is already described for the district (4.6)

BUILDING WHAT-IF SIMULATION

Path: Home → Projects → Project details → What-if



In the "what-if" simulation, beyond mode and building, it is necessary to choose the scenario.

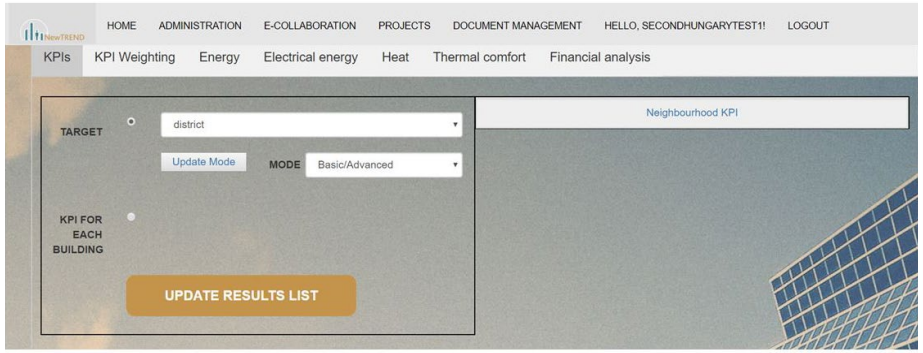
4.8 Simulation results

This section presents all the results obtained from the "as-is" and "what-if" simulations of the district and buildings. There are several tabs and each allows to view results in different ways.

Attention: It is important to click on all the update buttons before selecting the graph to be displayed.

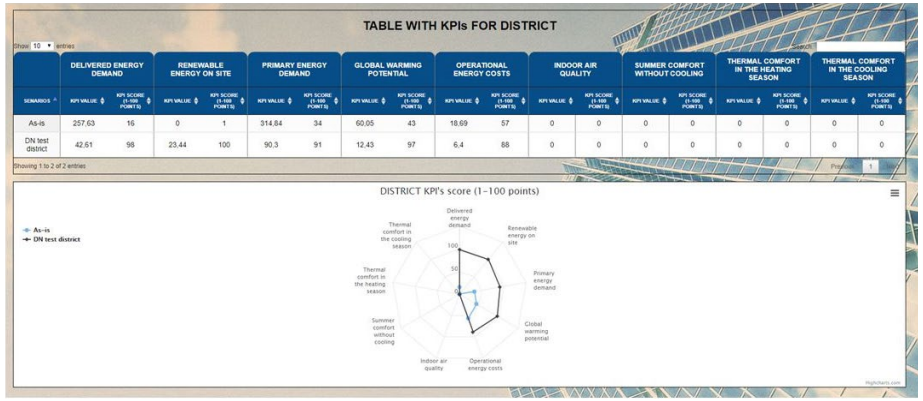
4.8.1 KPIs

Path: Home → Projects → Project details → Simulation results → KPIs



In the KPIs tab, it is possible to show the data in two different cases.

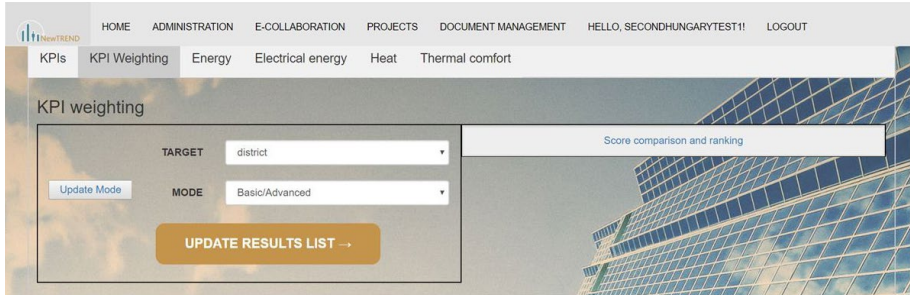
In the first case the target, district or a building, and the mode, basic/advanced or premium, must be chosen; with respect to the chosen target, its KPIs will be shown. The results are shown (as shown in the figure below) both in a table and in a radar chart. The example shown is related to the district, where there is an "as-is" and a "what if" scenario. The present data refers to the different KPIs, in particular the KPI value and the score, that can vary between 1 and 100, are reported. The KPI scores are shown in a radar chart to allow an immediate visualization of their trend.



The second case shows the performance of buildings for each KPI. Therefore, given a KPI, it is possible to understand its trend in the different buildings, and to verify if it is necessary to act locally or globally.

4.8.2 KPI Weighting

Path: Home → Projects → Project details → Simulation results → KPI Weighting



Once the target and the mode have been defined, weights can be applied to the KPI.

In the table, there is a list of the three sustainability categories for the building and district KPIs:

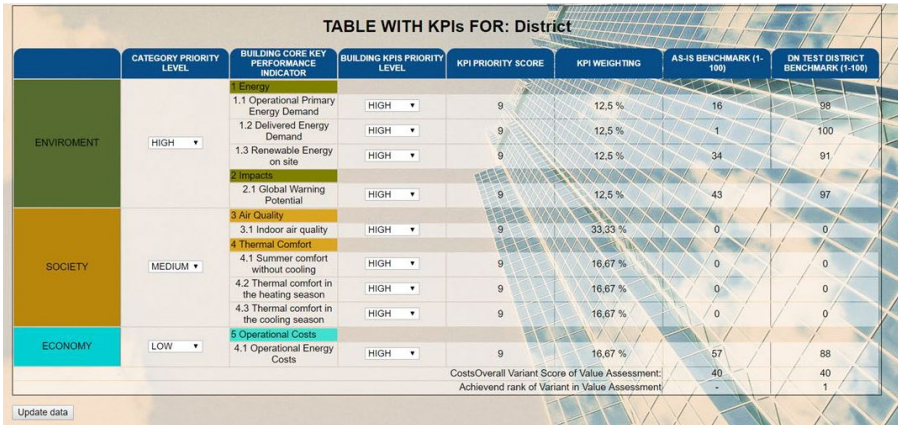
- Environmental Quality
- Society Quality
- Economic Quality

Here, the user can select for each of the three categories a “Category Priority level” from a list which uses the following three selection options:

- High (Score = 9)
- Medium (Score = 6)
- Low (Score = 3)

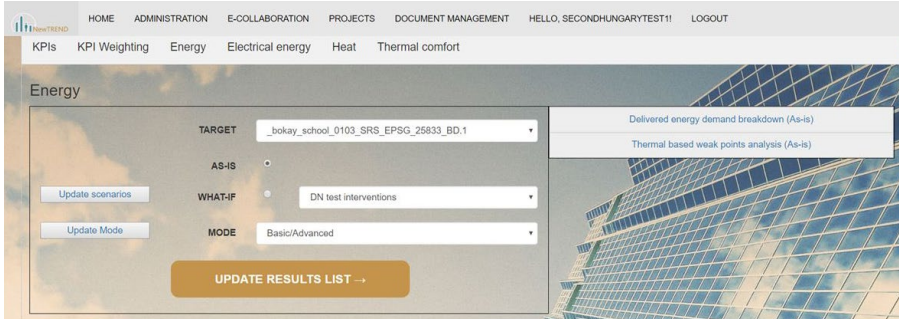
In addition to providing a priority level to the categories, it must also be assigned to the indicators of each category. Based on these choices, the KPI priority score and KPI weighting are defined. While, the KPI values for the scenarios will be weighted according to the weights computed. Finally, an evaluation and classification of the best “what-if” scenario will be defined.

The results in Premium mode have the same type of display with respect to the basic / advanced mode.



4.8.3 Energy

Path: Home → Projects → Project details → Simulation results → Energy



Once the target, the scenario and the mode have been defined, two different graphs can be displayed.

The first chart "Delivered energy demand breakdown" allows to show the delivered energy demand breakdown of the building. In the graph, the total annual delivered energy demand of the building is shown. All sub-demands forming the total delivered energy demand of the building are displayed in kWh/m^2 as well as a percentage of the total demand

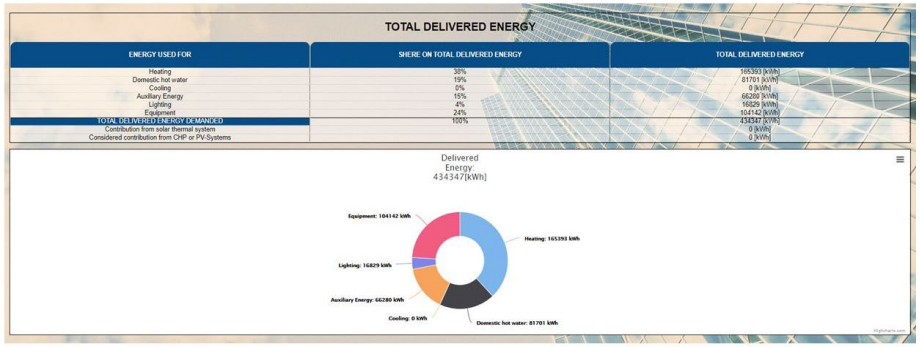
The list of variables that can be used for creating the breakdown and sums up to the total delivered energy demand of the building is shown below:

A1: Thermal-based demand

- Heating
- Cooling
- Hot water
- Auxiliary energy
- Lighting
- Equipment (Plug loads)

While, the breakdown of the energy that is generated by the building has negative values. The list of variables:

- Contribution from solar thermal systems
- Considered contribution from CHP or PV-Systems



The second Graph “Thermal based weak points analysis” describes the heat balance showing the balance for the heating season in which the relevant gains and losses are shown. The following three categories for heat losses are considered in the heat balance:

- transmission trough thermal envelope
- ventilation
- infiltration

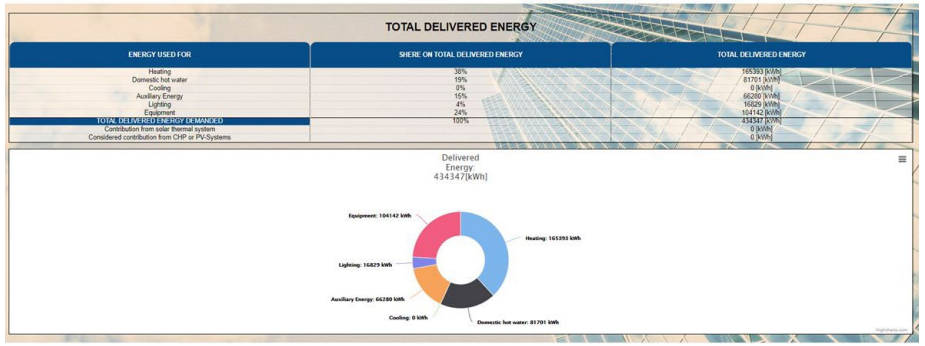
The following two categories for heat gains are considered in the heat balance:

- solar gains
- internal gains

Then using these data, it is possible to identify the weakest points in the heating balance during the heating season.

The total transmissions losses through the thermal building envelop are caused by different building components. The main building components to be considered are:

- B1.1: Roofs
- B1.2: Outer Walls
- B1.3: Exposed Floor
- B1.4: Windows
- B1.5: Doors
- B1.6: Thermal bridges



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- infiltration

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- solar gains
- internal gains

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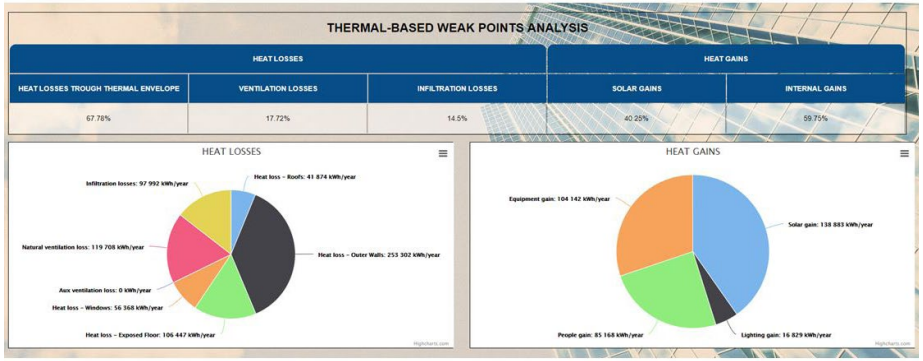
- B1.1: Roofs
- B1.2: Outer Walls
- B1.3: Exposed Floor
- B1.4: Windows
- B1.5: Doors
- B1.6: Thermal bridges



The results in Premium mode have a different view than the basic / advanced mode. The monthly and annual results are shown in the table below.

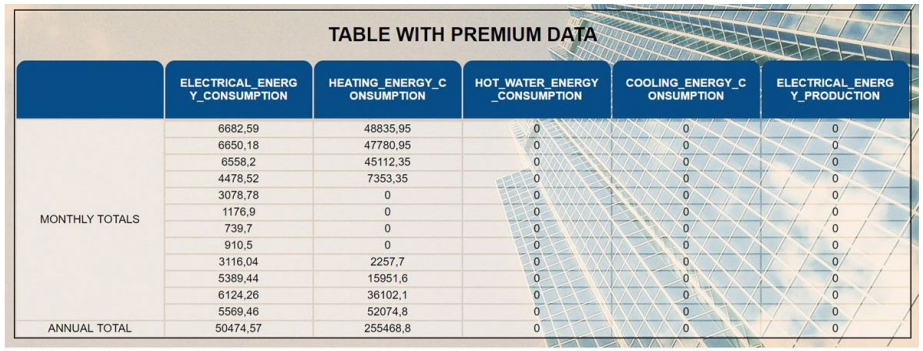
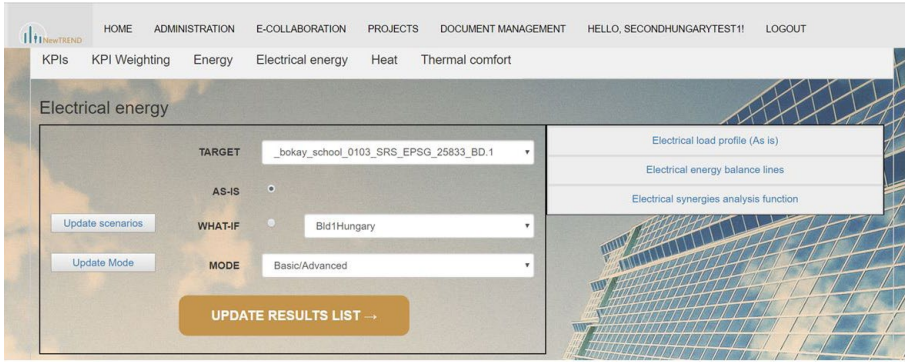


TABLE WITH PREMIUM DATA

	ELECTRICAL_ENERGY_CONSUMPTION	HEATING_ENERGY_CONSUMPTION	HOT_WATER_ENERGY_CONSUMPTION	COOLING_ENERGY_CONSUMPTION	ELECTRICAL_ENERGY_PRODUCTION
MONTHLY TOTALS	6682,59	48835,95	0	0	0
	6650,18	47780,95	0	0	0
	6558,2	45112,35	0	0	0
	4478,52	7353,35	0	0	0
	3078,78	0	0	0	0
	1176,9	0	0	0	0
	739,7	0	0	0	0
	910,5	0	0	0	0
	3116,04	2257,7	0	0	0
	5389,44	15951,6	0	0	0
	6124,26	36102,1	0	0	0
	5569,46	52074,8	0	0	0
ANNUAL TOTAL	50474,57	255468,8	0	0	0

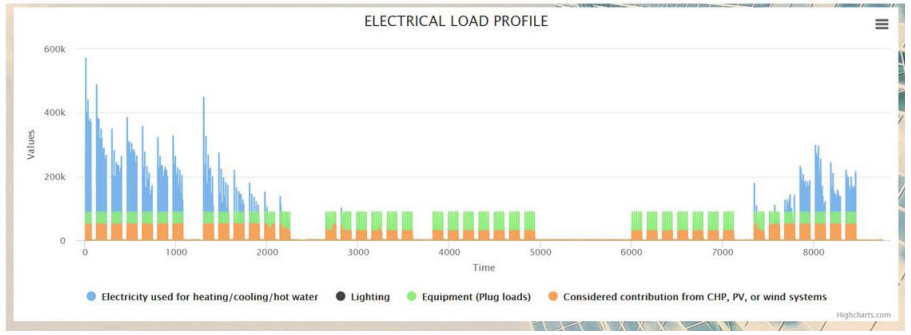
4.8.4 Electrical energy



In this case, there are three different graphs.

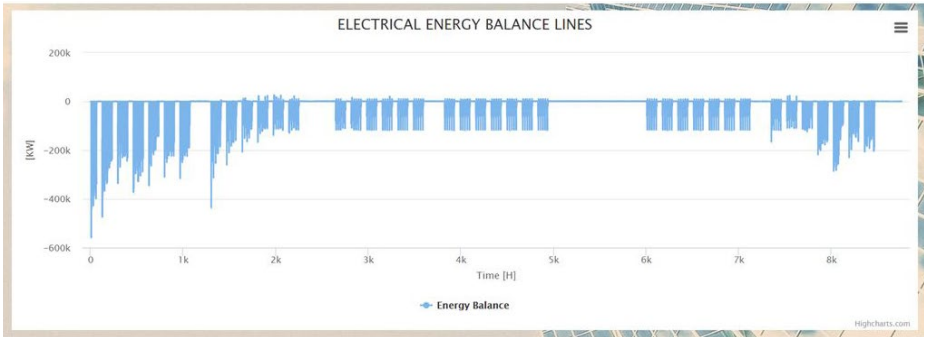
The first is “Electrical load profile”. When investigating the building’s electrical load profile, it is important that users can identify the main electricity consumers that contribute to each segment of the load profile. Thus, the user with this function is able to view hourly contribution of the following electricity demand aspect on the different segments of the load profile (Base load, intermediate load and peak load):

- A2.1 Lighting
- A2.2 Equipment (Plug loads)
- A2.3 Auxiliary energy
- A2.4 Considered contribution from CHP or PV-Systems (negative)



The second graph is “Electrical energy balance lines”

The electrical energy balance is the result of subtracting the produced energy from the consumed energy at every simulation step for the simulation time. Positive values in the balance graph indicate that the on-site energy production exceeds the consumption and negative values show that the consumption is higher than production.



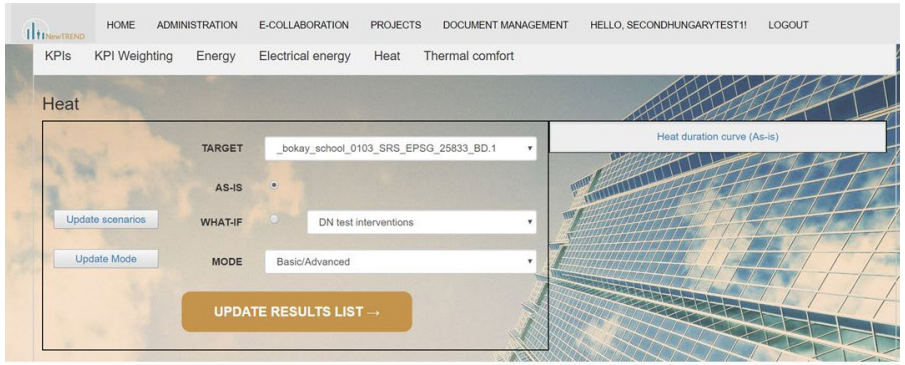
The third chart is “Electrical synergies analysis function”. It informs the user about the amount of over produced energy that can be used (exported) to other building or the amount of energy that can be imported from other building in the district to cover part or all of the consumption. This can be done by comparing the buildings balance lines to evaluate the amount of energy that can be exported or imported between buildings.

The results in Premium mode have a different view than the basic / advanced mode. The monthly and annual results are shown in the table below.

TABLE WITH PREMIUM DATA

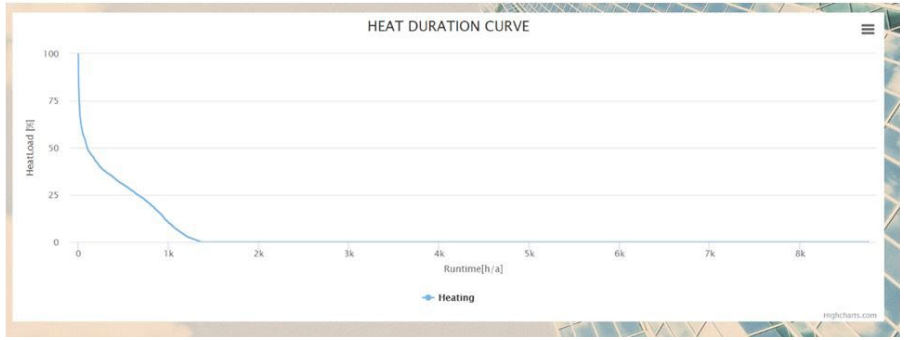
	ELECTRICAL_ENERGY_CONSUMPTION	HEATING_ENERGY_CONSUMPTION	HOT_WATER_ENERGY_CONSUMPTION	COOLING_ENERGY_CONSUMPTION	ELECTRICAL_ENERGY_PRODUCTION
MONTHLY TOTALS	6682,59	48835,95	0	0	0
	6650,18	47780,95	0	0	0
	6558,2	45112,35	0	0	0
	4478,52	7353,35	0	0	0
	3078,78	0	0	0	0
	1176,9	0	0	0	0
	739,7	0	0	0	0
	910,5	0	0	0	0
	3116,04	2257,7	0	0	0
	5389,44	15951,6	0	0	0
	6124,26	36102,1	0	0	0
	5569,46	52074,8	0	0	0
ANNUAL TOTAL	50474,57	255468,8	0	0	0

4.8.5 Heat



The heat duration curve characterizes the total heat demand of a single building. The maximum peak load as well as the minimum base load can easily be interpreted from the duration curve. The heat duration curve usually displays the sum of the following loads:

- Space Heating Demand



- Domestic Hot Water Demand

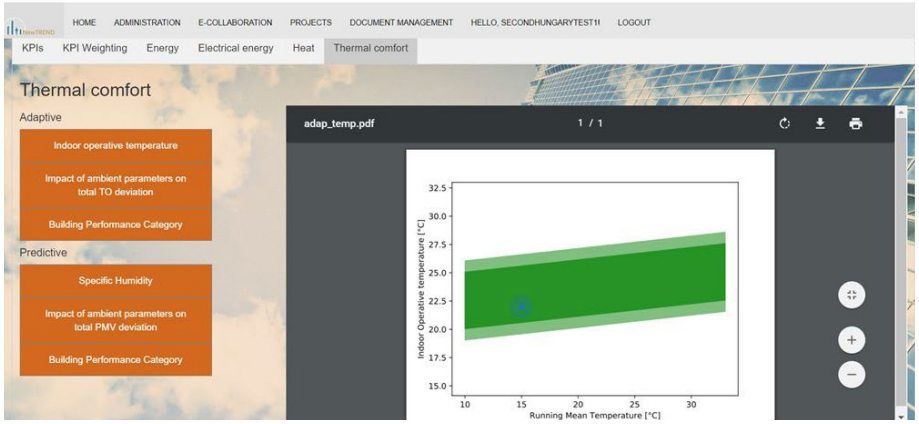
The results in Premium mode have a different view than the basic / advanced mode. The monthly and annual results are shown in the table below.

TABLE WITH PREMIUM DATA

	ELECTRICAL_ENERGY_CONSUMPTION	HEATING_ENERGY_CONSUMPTION	HOT_WATER_ENERGY_CONSUMPTION	COOLING_ENERGY_CONSUMPTION	ELECTRICAL_ENERGY_PRODUCTION
MONTHLY TOTALS	6682,59	48835,95	0	0	0
	6650,18	47780,95	0	0	0
	6558,2	45112,35	0	0	0
	4478,52	7353,35	0	0	0
	3078,78	0	0	0	0
	1176,9	0	0	0	0
	739,7	0	0	0	0
	910,5	0	0	0	0
	3116,04	2257,7	0	0	0
	5389,44	15951,6	0	0	0
	6124,26	36102,1	0	0	0
	5569,46	52074,8	0	0	0
ANNUAL TOTAL	50474,57	255468,8	0	0	0

4.8.6 Thermal comfort

Another fundamental output of CDP simulations is information on user thermal comfort. This is calculated with three different models and for Hot and Cold season. Moreover, a description on the sensitivity of comfort parameters as well as dedicated KPIs are calculated.



4.9 Project information

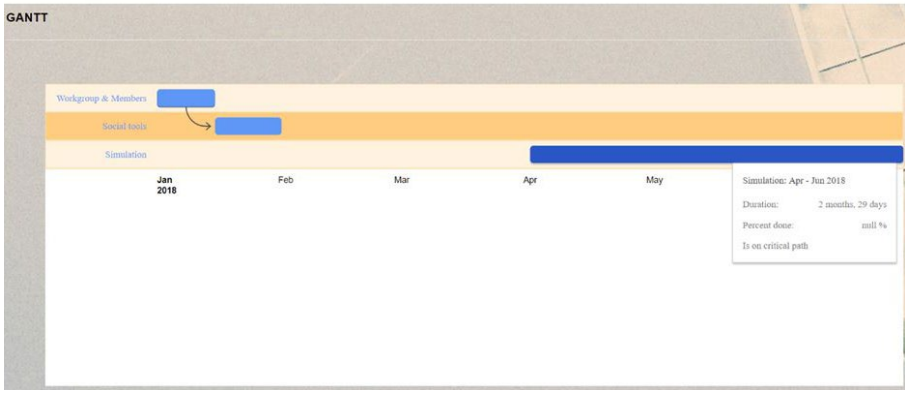
Path: Home→ Projects → Project details

PROJECT INFORMATIONS

NAME	DESCRIPTION	START DATE	TARGET DATE	IS CLOSED	CLOSING DATE	CREATED BY	CREATION DATE
District analysis & simulation	This is the description of project 'Project02'. This project has many tasks.	01/01/2018 00:00:00	31/12/2018 00:00:00	No	31/12/2018 00:00:00	Agatha Davies	18/10/2017 00:00:00

4.10 Gantt diagram

On the Project Details page, a Gantt diagram is generated, starting from the associated tasks, which shows, for each task, any dependencies that you have specified (via the 'Related tasks' item). Each task also displays some information, including the duration and completion percentage. The critical path is also displayed. Before viewing, a consistency check is performed between the tasks to verify that there are no circular paths between the tasks themselves.



Project Partners

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