DELIVERABLE D.T1.2.9

Solutions' merging and integration

D.T1.2.9: Solutions' merging and integration

A.T1.2 Transferability assessment of past outcomes for adaptation, extension & deployment in new PAs

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1. Introduction

The deliverable D.T1.2.9 summarize the tools used from each PP, taking into consideration the adaption needed to widespread usability and impact, the data needed to be collected, the criticisms emerging from the use of the tool and also the lessons learnt from it.

All the tools analyzed have different features, strengths and weaknesses; however they share the common goal of reducing energy consumption in public buildings and raising awareness of employees, students and stakeholders about energy savings.

Some critical aspects are related to the close link between the quality of the input data entered and the performance of the tool, the need to provide a training period for the use of the platforms, the help of external experts for the insertion of data or the difficulty of updating the data entered.

2. Name of the TOOL: Living EPC tool (EPC= Energy Performance Certificate) – eCentral project

2.1 Adaption need to widespread usability and impact

a. Add as many buildings in PA areas as possible;
b. Involve as many stakeholders or users of the tool as possible
c. Promotion of the tool to stakeholders.

2.2 Data to be collected by the partners
The following parameters need to be entered for each building:

a. All relevant energy consumption parameters for all energy consumption systems such as thermo-technical systems, ventilation systems and lighting.
b. All the essential parameters of the building envelope to uniquely define the necessary fata for the calculation of energy measures in the form of reconstruction of the outer building envelope.
c. All the essential parameters of the thermo-technical and ventilation systems necessary fot calculating the improvement measures to the desired level at the user's choice.
d. All relevant parameters of the building lighting system.

2.3 Main criticism

a. The tool allows you to display a solution regarding the energy consumption and proposed measures on time when entering data;
b. The data should be updated periodically.

2.4 Lesson learnt

The result of the tool is very dependent on the quantity of the unput data. Good data gives the user good results.

2.5 Conclusions

The EPC tool is quite complex and would acquire additional programming and technical demands connected to nZEB standard in TARGET-CE implementing countries. The input data needed for using nZEB tool are quite

complex and will require substantial effort from implementing partners. The output of the nZEB calculation would fit perfectly in a One-Place platform where, besides the presentation of the buildings data and energy consumption, the estimated investment and potential savings can be presented and thus platform even more useful. Step by step guide for the renovation of public buildings is a finished product with a clear pathway for energy renovation through different modes of financing. Partner countries can only add their requirements of nZEB regulations.

3. Name of the TOOL: "App to monitor energy performances of schools" – E@S APP

3.1 Adaption needs to widespread usability and impact

➢ Installment of educational labs in schools (Pilot buildings);
➢ External experts are going to be encharged of the up-dating and transfer the APP to the new users:
  o a soft version of the app will be realised in order to allow users to set on the main elements of the pilot building in order to use it. This will allow the app to be sustainable in the long term, even without the support of the project's partners or experts;
  o transfer the code from this company to the new platform where the APP will be hosted: in this sense it is necessary to verify the platform on which to run the APP: compatibility with OnePlace Platform on the BOOSTE-CE website; otherwise, a public server is better than a private one (to be usable after the end of the project): it can be verified if a public authority inside the TARGET-CE partnership (UCBR or other) can host the APP on its server;
  o implement the APP with new layout and logos, etc. and configure the new schools (map/classrooms/sensors, etc);
  o implement the sections (thermal and electric ones);
  o configure the number of measurements on a day, and the period of monitoring;
  o complementary to the use of the E@S APP, there will be the Training package to be transferred and used in new PAs.
➢ Languages: training packages have been developed by each partner in Energy@school project, in national language and to better fit local learning needs: ITALIAN; CROATIAN; SLOVENIAN; HUNGARIAN; GERMAN; POLISH (available on eMS platform or to be asked to UCBR contact persons). A new training package will be developed in English.
➢ As referred to languages, the Energy Guardians Smart-School Management Plan is available in: ENGLISH; ITALIAN; CROATIAN; SLOVENIAN; HUNGARIAN; GERMAN; POLISH languages.

3.2 Data to be collected by partners

➢ Identification data of the school and map with the classrooms and the sensors for electrical and thermal consumption are necessary to be given to the software manager.

It is not strictly necessary that the schools install new devices to communicate with the APP: the APP will work with existing sensors/smart meters. The only need is that they are configured as a preliminary step to make the APP working for the selected school.

3.3 Main criticism

a) Pilot buildings: it is better that they dispose of an ENERGY AUDIT, to make it a preliminary part of the training and to make pupils conscious of the level of their monitoring measures;

b) It is necessary to foresee a DEDICATED TIME during TRAINING: first of all pupils need to learn about and write their ACTION PLAN; then they need to make at least one week of BASE MEASUREMENTS; finally at least one monitoring week on the basis of the elaborated Action Plan; and then if they like, they can go on with it at home!

c) Importance of the duration of the training and period of the year with respect on when to implement the measurements: thermal topic could be not so interesting in spring, rather more in wintertime, but not so significant if the monitoring lasts for less than 3 months;

d) the experimentation with the APP should run together with the TRAINING.

3.4 Lesson learnt

The success of the APP and training depends on the involvement of the school (teachers and pupils).

3.5 Conclusions

Technical and non-technical solutions from the Energy@school project should be taken into consideration as an ensemble. In order to have efficacy on behaviors the training and the Energy Management Plan should be implemented together with the practical experimentation through the APP.

4. Name of the TOOL: Online Energy Platform-OnePlace & 3d EMS tool, Training material and Financial strategies (FBK/EWUT – BOOSTEE-CE)

4.1 Adaption needs to widespread usability and impact

➢ Adjustment the Graphical user interface (GUI) of the Oneplace platform to contain in the frame of capitalized projects, previously elaborated strategies and action plans, energy efficiency and financial tools.

➢ To widespread the 3DEMS in new pilot areas the geospatial data (building footprint: vector data in SHP format; maps: raster/vector data in TIF/JPEG/SHP format; LiDAR data / point clouds: unstructured data in LAS/LAZ or ASC format) and as well the energy related information/attributes for pilot buildings are needed.

➢ Creation of the new database for TARGET-CE buildings and as well pilot buildings.

➢ Implementation of the CityEnGov solutions into 3DEMS tool, especially for the City of Ferrara.

➢ Development of PV maps depends on the available LiDAR models in Pilot Areas.

➢ Extension of OnePlace training materials including the new PA areas.

➢ Integration of the "financial training" together with capitalized projects in order to develop unique and competent training materials.

➢ Consider new financial sources giving the new forthcoming EU funding programme (Horizon Europe, Interreg, ESIF, etc.)

4.2 Data to be collected by partners

A) To widespread 3DEMS following data have to be collected:

Geospatial data:
- o Building footprints, with/without attribute information (such as number of floors, building, height, etc.),
- o Point clouds acquired with LiDAR flights, from where buildings heights and roof shapes could be inferred,
- o DTM/DSM of the surrounding environment for the PV potential estimation.

Non-spatial data (energy related information for pilot buildings):
- o Official name of the building
- o Year of construction
- o Building type
- o Typology (number of floors)
- o Energy source type (heat)
- o Energy audit
- o Energy consumption (heating)
- o Electricity consumption
- o The specific CO_2 emissions
- o The total CO_2 emissions[tons/year]
- o Technology used to harvest a renewable energy source
- o Estimated photovoltaic potential of building roofs
- o Energy efficiency measures already implemented in the building
- o Recommended energy efficiency measures for the building
- o Estimation of the amount of heating losses in the building
- o Smart meters
- o Images of each Pilot Action building
- o Other (suggested by partners).

B) To widespread content of the OnePlace (financial strategies, action plans) following data have to be collected:

- o The project partners have to provide (from former projects) developed strategies and action plans. Based on collected materials new strategic documents will be developed for TARGET-CE's pilot areas.
- o The materials should be accessible online in order to link them with the OnePlace platform, which serves as a hub containing all materials.

4.3 Main criticism

- o For a fully functional 3DEMS tool, the basic geospatial data and energy-related data has to be delivered for each Pilot Action area. The quality of the 3D geometries depends on the quality / resolution of the delivered geospatial data.
- o If the OnePlace platform is supposed to be a hub which contains all capitalized outputs, the tools from the previous projects have to be fully accessible and open to use / tailor by new Pilot Areas.

4.4 Lesson learnt

The generation of 3D building models for the new Pilot Areas (PAs) relies on particular geospatial data, such as building footprints (with attributes), LiDAR point clouds, etc. The procedure cannot produce 3D geometries without this data, which could be hardly attenable (or are out-of-date) in small municipalities due to lack of open geo-data. The transnational cooperation of TARGET-CE will allow partners to understand how and where geospatial data could be found or obtained and how useful they are for better management and planning of urban activities.

4.5 Conclusions

The success of the transferability assessment of the 3DEMS tool and OnePlace platform for adaptation, extension & deployment in new PAs relies on several factors: (i) data availability (both special and non-spatial), (ii) extension of training materials including the new PA areas; (iii) providing updates of financial sources giving the new forthcoming EU funding programme (Horizon Europe, Interreg, ESIF, etc.).

5. Name of the TOOL: Split – Feedschool

5.1 Adaption needs to widespread usability and impact

Generally, the Feedschools tool is already widely applicable, but some adjustments are necessary for multinational usability:

- language adaptation of the intervention strategies (energy saving reminders in the national languages should have greater impact);
- intervention strategies should be updated/renewed after some time to re-establish awareness for EE measures;
- adaptation of the GreenSoul questionnaire to local and/or building requirements.

5.2 Data to be collected by partners

For each building collected data should include:

- general data of object: address, name, school grade (kindergarten, primary, secondary), operating time factor;
- parameters of the building: useful area, gross heated volume, dissipating surface divided by elements (walls, roofs, glazing) is necessary for the calculation of energy efficiency with different renovation options;
- parameters of the building systems: heating, cooling, lights, ventilation;
- historical energy consumption for the last 3 years.

Data above are usually available in energy audits, which in generally all school objects already have. Data is necessary for the calculation of energy efficiency with different renovation options in the web toolkit.

5.3 Main criticism

It will be necessary to use the help of external experts to enter data and investment costs in the App, if they are not listed in energy audits. It would be good to expand different public buildings typologies so that results

can be obtained through one tool, i.e. so that the local government can gain a better insight into the energy condition of its buildings, so that a priority list of buildings for renovation can be determined.

Suggested technical improvements of toolkit:

- There are not all heating sources covered, in continental Croatia there are schools which are using district heating.
- In the Renovation options module it would be good to have more options for selecting elements of walls, roofs.
- There is not an option to change heating source, such as change of fuel oil to more energy efficient heating pumps which are running on electric energy.

5.4 Lesson learnt

The result of the tool is very dependent on the quality of the input data. Good data gives the user good results. Calculation of energy savings varies from region to region, to expand the toll it is necessary to adapt it to the savings calculation methodology in different regions.

5.5 Conclusions

The main potential of the tool is that local governments can arrange the database of their objects, to categorize them so that their renovation and financing methods can be planned. Increase the base of schools, include as many different schools as possible.

6. Name of the TOOL: Sipro – CitiEnGov

6.1 Adaption needs to widespread usability and impact

The Toolkit is a set of guidelines for (1) integrating data from different sources into the standard data model and (2) make them interoperable. The Toolkit wants to be a source of knowledge and inspiration for cities involved in energy planning. It addresses cities which are just beginning to implement energy plans as well as cities with Sustainable Energy (and Climate) Action Plans (SEAPs/SECAPs) already defined, endeavouring for even smarter and more efficient solutions.

The idea of the Toolkit is to build up the "transnational template" starting from initiatives already defined at European level by the data specifications related to the INSPIRE Directive. The conceptual model starts from the Data Specifications defined by the INSPIRE Directive as baseline, and considers all requirements and characteristics of energy data provided during the Citiengov project.

The Toolkit can be used by other Municipalities to set up their energy dashboard: on this Toolkit section http://toolkit.citiengov.eu/index.php?title=Transnational_methodology are available the conceptual data model and the procedures to create the database. The SQL scripts for creating tables in both Oracle and PostGIS platform are available on the CitiEnGov online toolkit: http://toolkit.citiengov.eu/index.php?title=Transnational_methodology#Physical_implementation_of_data_model.

This methodology is useful to help the Municipalities to increase the interoperability of energy-related data about the three main sectors: Buildings, Mobility, Public lighting; it's a practical "how-to" guideline for:

a) modelling energy data that are usually managed, collected and shared by local authorities to efficiently support the decision-making process about energy planning for buildings, mobility and public lighting;

b) implementing ICT services to allow the sharing of energy-related data through web services through interoperable software protocols and open standards

The Energy dashboard is a database (for both Oracle and PosgreSQL platforms) where the local authorities can easily organize geographical data about buildings with their properties and attributes

The municipal energy dashboard could be implemented in order to:

- o update the energy dashboard implemented in CitiEnGov within the municipal webGIS application (based on Geonext solution) with updated flows of new data from the Region (energy certificates), Hera (consumption), GSE (photovoltaic), etc.
- o configure the editing functionality in Geonext to allow the Municipality to modify online data about "municipal energy units" and/or "historical buildings".

6.2 Data to be collected by partners

The Energy Dashboard implemented during the CitiEnGov project can be also replicated by other municipalities using the model described in the CitiEnGov Toolkit.

The CitiEnGov Wiki-Toolkit (http://toolkit.citiengov.eu/index.php?title=Main_Page), in addition to the model description, allows downloading the SQL script to create the database.

The complete SQL scripts of the data loading procedures are available but will have to be adapted according to the input data of each municipality.

6.3 Main criticism

The main challenge in adapting and using the energy dashboard in other municipalities is represented by the type of input data used. The dashboard uses specific algorithms that can certainly be replicated in other cities at a national level while for locations abroad a prior check on the input data must be made.

Another challenge is represented by the use of the Geonext WebGIS application that is owned by a private service provider, so it can be used through a license in two ways:

- installed on the customer's servers;
- or in the cloud on the provider's private server:

As for the case study of Ferrara, the main challenge will be the possibility to integrate the OnePlace 3D viewer with the municipal Geonext webGIS application.

6.4 Lesson learnt

For the CitiEnGov Toolkit, the idea is to build up the "transnational template" starting from initiatives already defined at European level by the data specifications related to the INSPIRE Directive. The conceptual model starts from the Data Specifications defined by the INSPIRE Directive as baseline and considers all requirements and characteristics of energy data that partners provided. Even though the implementation of INSPIRE data models is not the focus nor the goal of CitiEnGov they will be used as a starting point and as a common approach to get a common view and common semantics about energy-data.

Therefore, the objective of the activity will be twofold:

- o a common conceptual data model, to be considered as a possible target schema for exporting and sharing data outside the local context and outside the organization;

o   a reference implementation, as SQL-based relational database (possibly for Oracle and PostGIS platforms).

6.5   Conclusions

The energy dashboard is a very useful tool for local authorities and various municipal sectors to define new urban and energy policies for cities. The possibility of integrating the dashboard with different types of data (energy, urban planning, tourism, mobility) allows all sectors of public offices to obtain information and develop studies and strategies to improve the use of renewable energy and the energy performance of cities. and specifically of public buildings.

7.   Name of the TOOL: MAE – EMPOWER – Good Practice Register

7.1   Adaption needs to widespread usability and impact

o   converting the form to collect good practices;
o   appropriate selection and assignment of practices to given stakeholders;
o   collecting as much information as possible on how to finance and implement good practices.

7.2   Data to be collected by partners

The following data need to be collected for selected Good Practices:
o   Title of Good Practice
o   Name of city, region where Good Practice were executed
o   Type of building
o   Timescale
o   Category of Good Practice
o   Short description of Good Practice
o   Benefits from Good Practice (parameters e.g. energy usage reduction)
o   Pictures
o   Contact details (name organisation or partner, email, phone)

7.3   Main criticism

a.   Register shows only general information about the Good Practice – for more information every stakeholder has to get direct contact with the Partner responsible for action.
b.   No update possible (file).
c.   No possibility to add your own practice (partner not participating in the EMPOWER and TARGET project)

7.4   Lesson learnt

All collected practices under the empower project should be filtered and selected practices related to energy modernization of buildings transferred to the appropriate section of the One Place platform, due to the lack of the possibility to extend the Register in its current form. All practices should be better promoted during the educational activities of the TARGET project and shared on social networks.

7.5   Conclusions

Good Practice Register is quite simple and synthetic way to show various types of measures to improve energy efficiency depending on the needs of a given stakeholder. In a short time, you can be inspired by the found solution and find contact with people who have carried out these activities. Of course, the Good Practice Register should be properly adapted to the needs of the TARGET project, and the practices collected by the Partners limited to the scope of the project. In this direction, the fill-in form used for the collection of good practices in the EMPOWER project will be updated, which will include data for good practices collected within the BOOSTEE project. The best practices transferred from the Good Practice Register along with the new practices collected by the TARGET project partners will be an added value to the One Place Platform.

8. Name of the TOOL: MAE – Panel2050 "Roadmapping process sustainable energy strategy"

8.1 Adaption needs to widespread usability and impact

a. Adaptation of PANEL 2050 templates, training materials to the TARGET-CE requirements.
b. full involvement of PA.
c. creating a well-detailed baseline, vision and action plan.

8.2 Data to be collected by partners

The following data need to be collected to prepare the action plans:
- indicators
- actions and scenario of development – step by step description,
- milestones,
- time schedule,
- impact on region,
- barriers,
- involvement on stakeholders,
- budget and resources needed,
- indorsement of implementers and political decision-makers,
- monitoring strategy and risk management.

8.3 Main criticism

- problems during the implementation of one of the stages may cause long delays in the implementation of the action plan.
- incorrect definition of the baseline may cause problems in the implementation of the action plan and obtaining decent results.

8.4 Lesson learnt

All documents that are the basis for determining the next steps of the pilot actions must be adapted to the foreseen scopes covered by the pilots. The initial stages must be prepared as thoroughly as possible, as errors in their preparation found in the late stages of implementation may prove difficult to correct.

8.5 Conclusions

"Roadmapping process sustainable energy strategy" allows you to prepare a detailed scope of the project, from the baseline level to the full action plan. As you go through the steps, clearly state your goal and vision. During the implementation of the task, avoid any changes that may inhibit the implementation of the action plan. As a result of the activities of the TARGET-CE project, it is planned to implement pilot actions and energy management plans. These plans should be developed on the basis of the Roadmapping process.

9. Name of the TOOL: "Advocating for Sustainable Energy in Central Eastern Europe"

9.1 Adaption needs to widespread usability and impact

- adaptation the train-the-trainers material (translation)
- efficient usage of training materials to engage "Forerunners" in given regions
- strongly engaging and guiding stakeholders in actions

9.2 Data to be collected by partners

There is no needed data to collect

9.3 Main criticism

Material prepares Forerunners for only one cycle – lacking of ways how to recycle effects or transform it in future.

9.4 Lesson learnt

This material is fully ready and usable. National Train-the-Trainers should be conducted in order to ensure efficient and complete training of Forerunners.

9.5 Conclusions

"Advocating for Sustainable Energy in Central and Eastern Europe" is a finished product and can be implemented under the TARGET-CE project. It is worth remembering that its effectiveness depends on the amount and intensity of training with stakeholders. The activities carried out in connection with the adaptation of this document only require translation for the purpose of national training. Materials from these training sessions should be combined with materials devoted to the Roadmapping process.

10. Name of the TOOL: WEIZ – H2020 GreenSoul

10.1 Adaption needs to widespread usability and impact

In general, the GreenSoul tools are already widely applicable, but some adjustments are necessary for multinational usability:

- o language adaptation of the intervention strategies (energy saving reminders in the national languages should have greater impact);
- o intervention strategies should be updated/renewed after some time to re-establish awareness for EE measures;
- o adaptation of the GreenSoul questionnaire to local and/or building requirements.

10.2 Data to be collected by partners

For each building collected data should include:

- o electric energy consumption (if possible at room level);
- o heating consumption;
- o user data (GreenSoul questionnaire) of every inhabitant/employee (maybe even regular visitors).

10.3 Main criticism

The intervention strategies (feedback information, energy saving reminders,...) could/will lose their appeal after time or won´t change the EE behaviour of the users at all (depending on the willingness of the user). Also in already energy efficient buildings and/or energy conscious users in the buildings, the impact of the interventions won't increase EE behaviour significantly.

10.4 Lesson learnt

- o Update/renew intervention strategies if they lose their appeal for EE behaviour;
- o If energy consumption data is available at a small level (e.g. office level), a competitive situation could arise that could cause increased EE behaviour.

10.5 Conclusions

The GreenSoul solutions used in Target-CE can be an easy, simple and effective way to change people's behaviour towards energy efficiency in public buildings. The set intervention strategies should be easy to implement and use in public buildings, if the necessary energy data is available. Even visitors should be influenced in their behaviour by the set interventions. But the results are always depending on the willingness to change one's behaviour and how much attention is paid to the intervention strategies. Also after some time the set interventions may lose their appeal and the interventions should be exchanged with new ones.

11. Conclusion

The tools are designed to trigger lasting behavioral changes through the exchange of good practices, tools, networks, knowledge. All the tools have a high degree of replicability and they can be used in public buildings, schools with features similar to those analyzed in the project. This is why apps and tools are designed in different languages. The aim of the project is to create a single web platform precisely to reduce fragmentation, facilitate their diffusion, reduce barriers and make the use of tools easier and more intuitive.