WP 3 – Task 3.2

D3.2. Pilot clusters and main findings

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Version: Final

Submission date: 31 DECEMBER 2013

Dissemination level: **Public**

Summary

Task 3.2. (Application of the methodology and detailed analysis of the pilot cases) was constructed as an internal activity to test and refine the tool functions and Geocluster concept approach.

Task 3.2. tests the application of previous work on tool development and its particular value for the project is that it explores how the tool can be used in practice. Through feedback from users it highlights potential uses, and provides suggestions on corrections and improvements to the current version of the tool. Feedback and recommendations were obtained on

- Ease of use of the tool and how it can be improved, and how data can be better displayed;
- Inconsistencies and errors to be corrected during the project;
- Where new indicators and complementary data could be included.
- Further questions which may be asked and correlations which may be explored
- Exploitation opportunities for the exploitation of the tool (WP5) and future data needs

Two separate activities were planned, explained and developed collaboratively by all partners:

- FREE USE OF THE TOOL and
- TESTING SCENARIOS.

For free use of the tool, members of partner organisations were requested to use the tool to explore its wider potential from their perspective as a user, not just for a specific query or research objective.

In the second activity we have tried to relate our virtual scenarios for the proof of the concept and the tool to very specific situations that are considered an approach to real market and potential users of the tool. These scenarios act as case studies in which the tool is tested.

This document describes the instructions provided to progress these activities, the results of the work from all partners, and the main conclusions for tool refinement for both during the project and for future developments.

Contents

1. Instructions of the exercises proposed

ACTIVITY 1. FREE USE OF THE TOOL

- TIME FRAMEWORK: 9th September – 23th September
- TOOL VERSION: MS6 // PRE-FINAL VERSION

In this activity partners were requested to use the tool. Free use of the tool means to use it apart from a specific query or research objective. In that sense, partners should use the tool from their own professional perspective and needs. They are also invited to share with the people of their organizations opinions and comments about tool usage.

Feedback about several questions above was compiled:

WHAT CAN I DO WITH THE TOOL?
COMMENTS & SUGGESTIONS
WEAKEST ASPECT & ERRORS IDENTIFIED
NEW FORMULAS, INDICATORS
FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

ACTIVITY 2. TESTING SCENARIOS

- TIME FRAMEWORK: 9th September – 1st October
- TOOL VERSION: MS6 // PRE-FINAL VERSION

GE2O partners have tried to relate our virtual scenarios for the proof of the concept and the tool to very specific situations that are considered an approach to real market.

Several case studies (one for each partner: see distribution in the table below) have been performed with potential users and queries to the tool around, basically, of our two technologies.

Each scenario formulation is accompanied by several suggested questions, indicators and correlations that are actually acting as a guide of the exercise.

In some cases, the result of the exercise have highlighted more deficiencies than indicators or functions already present in the tool, but in that sense GE2O partners have tried to present that result as a guide for future developments and as a proof of concept. It will be possible to answer the proposed queries when the information will be available so to prepare future information “boxes” in which new data could be inserted could be considered as an important project achievement.

The scenarios performance:

- One scenario formulation *for each partner*
- Including different type of users
- Including our two technologies
- Including different countries/ scopes (national/regional…)
- INCLUDING PARTIAL OBJECTIVES* TOPICS

***Partial objectives to be achieved:**

Identification of barriers
Selected technology impact potential
LCA and LLCC.
Other environmental impact.
Associated business models .
Readiness for technology innovation, transfer and adoption.
Time to market
Replication potential

SCENARIOS DISTRIBUTION

1 - CSTB	*Not involved in this activity*
2 - TNO	**SCENARIO nº7 PRODUCER (TI)**
3 - ZAG	**SCENARIO nº2 SUPPLIER (SC)**
4 - TZUS	**SCENARIO nº1 PRODUCER (SC)**
5 - BBRI	**SCENARIO nº10 ESCO (TI)**
6 - POLIMI	**SCENARIO nº5 LEGISLATOR (SC)**
7 - IFS	**SCENARIO nº8 MUNICIPAL GOVERNMENT (TI)**
8 - ACCIONA	**SCENARIO nº3 DESIGNER (SC)**
9 - ARCELOR MITTAL	**SCENARIO nº4 INSTALLER (SC)**
10 - DAPP	*Not involved in this activity*
11 - ASM	**SCENARIO nº11 MARKER RESEARCHER PARTICIPATING IN EUROPEAN PROJECT**
12 - E2BA	**SCENARIO nº9 BUILDING OWNER (TI)**
SUBSTITITION OR RESERVE SCENARIOS (not assigned)	*SCENARIO nº6 LCA/LCC (SC)* *SCENARIO nº12 HOUSING ASSOCIATION*

SCENARIO nº1 – PRODUCER

PRODUCER OF A NEW (STANDARD) SOLAR COOLING SYSTEM

[PUSH] A producer has developed a new system for solar cooling he wants to put on the market. In particular he wants to know what the areas where he could be successful are. He knows technical characteristics of his system.

SCENARIO nº2 - SUPPLIER

(NOVEL) SOLAR COLLECTOR PRODUCER

[PULL] The producer of solar collectors has introduced new collectors with very high efficiency he wants to deploy as broadly as possible. He wants to explore in particular solar cooling technology because of predicted energy surplus.

SCENARIO nº3 – BUILDING DESIGNER

[PULL] Building designer is designing / renovating a tall commercial building and he wants to maximize the use of RES. The building itself does not have a sufficiently big roof therefor building integrated solutions are sought. In particular the designer is afraid of cooling due to high expected internal heat gains. Furthermore he is committed to design a cost effective solution.

SCENARIO nº4 - INSTALLER

HVAC INSTALLER COMPANY

[PULL] company, currently involved in HVAC solutions wants to expand its scope of activities, both with new products and by that on new markets.

SCENARIO nº5 – LEGISLATOR

[PULL] In general energy policies of the state in question there is an obligation to increase the use of RES in a yearly basis by 3 % yearly. The analyses show that the effect of introducing RES for heating is not sufficient; currently cooling becomes a problem, consuming electricity. The legislator has got an idea to encourage the use of winter solar heating systems also in summer for cold production. However he heeds a bunch of information before formulating a decree.

SCENARIO nº6 – LCA/LCC

[PULL] The main concern of multiple stakeholders is the LCC and LCA performance of the solar cooling technology in question. The question is interested because of different reasons that are reflected in list of queries.

SCENARIO nº7 PRODUCER

[PUSH] A producer of innovative insulating material (glass wool) is determined to implement his product on the European market on a large scale. The comprehensive market investigation is needed in order to select the most successful markets. The innovative glass wool is dedicated to detached houses with pitched roofs, where the space under the rafter is used as a garret or loft (not used as a storage space). The material is possible to reach the success in climates where there are large temperature differences between summers and winters, as it reduces heat loss well in winter and makes the buildings cooler in the summer.

SCENARIO nº8 MUNICIPAL GOVERNMENT

[PULL] The local authorities are going to renovate the council housing which are owned by the municipal government. Among the planned activities are thermal insulation of exterior walls and roofs. The local government is looking for the most cost-effective solutions.

SCENARIO nº9 BUILDING OWNER

[PULL] An owner of terraced house is going to reduce the heat losses in his house with the thermal insulation application. As his property is placed in a row of identical houses, he is obliged to maintain its exterior design. The building owner is looking for thermal insulation that will not influence the external appearance of house.

SCENARIO nº10 ESCO

[PULL] An ESCO company was invited to cooperation by individual investor who is going to renovate his house and would like to reduce the holistic energy cost of the building at the same time. The building owner is not looking for ambitious goals and advanced technologies as it would be his first investment in energy efficiency solutions. He is thinking about the exchange of elevation in order to upgrade building's market value. It seems that the best solution for ESCO client would be thermal insulation. In order to satisfy clients expectation and to guarantee the commercial profits for ESCO (benefits from the energy savings), an outstandingly effective thermal insulation is needed. The cost of investment is not an issue due to the innovative financing methods delivered by ESCO.

SCENARIO nº11 MARKER RESEARCHER PARTICIPATING IN EUROPEAN PROJECT

[PUSH] A market researcher participating in a large European project aimed to exploit the developed innovative thermal insulation material on European market, is responsible for the investigation of the market potential of the developed solution. The researcher is obliged to verify the market opportunities for the invented thermal insulation and select the most promising markets.

SCENARIO nº12 HOUSING ASSOCIATION

[PULL] Housing association is obliged to adjust owned properties (blocks of flats) to the required U-values norms. After the communication with flats' users it was decided to invest in thermal insulation, in particular in joint less insulation system as there are state subsidies available for this particular way of insulating.

2. Results of ACTIVITY 1 FREE USE OF THE TOOL

2.1. Testing the tool exercise – CSTB feedback

WHAT CAN I DO WITH THE TOOL?

The following items are based on the current version of the tool and do not consider the future functionalities that will be deployed in the final version of the tool.

- Assess the potential for economic growth of different energy-efficient technologies in Europe. For the time being, only two energy-efficient technologies have been deployed: solar cooling and thermal insulation.

- Within a same family of energy-efficient technology, compare different solutions (for instance, single stage or double stage absorption chiller) and assess in which regions of Europe these solution are best suited.

- Combined with additional geo-referenced descriptors (stock by age, U-values, …), the potential for economic growth can be transformed into market potential.

COMMENTS & SUGGESTIONS

- Use default values for all countries where no data is available (U-value, stock, energy use, ….) . This can be done from http://www.entranze.enerdata.eu/#/share-heating-unit-consumption-per-dwelling-at-normal-climate.html
- Many geo-descriptors are displayed but only some of them can be fully analysed (data partly missing, lot of inconsistencies …). All geo-descriptors that are not operational must be greyed (not accessible). It's better to have a limited set of fully processed data than an exhaustive list of data partly completed.
- Many functionalities have been implemented and are offered to users but they are not obvious to understand. When we try to combine different filters (for instance the energy price and climatic data) nothing happens. If it's normal, then this possibility should not exist.
- All energy-efficient technologies (28 families) should be listed even if most of them except 2 are not accessible at this stage (in grey).
- I suggest not starting with a map but with a short text introducing the project, especially the fact that this version is just a proof-of-concept of a geo-cluster approach by means of a tool. Any user should understand at a first glance what he/she is going to find when using this tool and why this version of the tool is not fully operational.
- There is no need to have a map with ge2o pilots. This map does not bring any added-value outside the consortium. A picture of this map can be added to the text explaining the project and its limitations.

- At the start of the project it was decided to collect data at NUT 3 level. However, most of the time, data are available at NUT 2 or even NUT 1 level. My suggestion, if it is possible, will be to start displaying data at NUT 1 or NUT 2 level and to refine data at NUT 3 level only when requested by user and when data is available.

WEAKEST ASPECT & ERRORS IDENTIFIED

General comments

- Geocluster tool is not running with IE
- Data loading is slow. Sometime the data loading process is automatic; sometime there is a need to press the button "show data". I suggest to harmonize the data loading process (either automatic or on request).

Specific comments

- Climate:
    - Classification is made using colour ranges but figures are also automatically displayed. I suggest that figures are only displayed when moving the mouse on corresponding regions of the map.
    - Heating degree days
        - Some data are missing for UK
        - Unit: OK
        - Definition: OK
        - Colour Scale: OK
    - Cooling Degree Days
        - Many data are missing for UK. Yellow pixels in south part of Italy, data must be checked. Belgium is in blue, so the CDD have probably been calculated for 19°C, not 26°C (to be checked)
        - Unit: OK
        - Definition: OK
        - Colour Scale: OK
    - Annual incident energy on a south oriented plane with 45° Slope
        - Data: OK
        - Unit: OK
        - Definition: OK
        - Colour scale: OK
    - Annual incident energy on a south oriented vertical surface
        - Many data are missing for UK
        - Unit: OK
        - Definition: OK
        - Colour scale: OK
    - Average ambient temperature over year
        - Data is missing for UK, in the south part of Italy. Wrong data at the border between Spain and Portugal (value is low (blue point), or is it normal?)
        - Unit: OK
        - Definition: OK
        - Colour scale: OK
    - Average ambient temperature over heating season

- Data is missing for UK
- Unit: OK
- Definition: OK
- Colour scale: OK

- Average ambient temperature over cooling season
  - Data is missing for UK
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Maximum ambient temperature over year
  - No data for UK, Spain and a part of Portugal. Data seem too low for Luxembourg and a part of Belgium. To be checked
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Average ground / water temperature over year
  - Data are missing for UK. Some data seem to be a bit to low in the centre of Spain. To be checked.
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Average ground water temperature over heating season
  - Some Data are missing for UK. Discrepancies between Spain, France and Italy (Do we decrease France value to have a better homogeneity?)
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Average ground / water temperature over cooling season
  - Some Data are missing for UK. Data for Slovenia seem to be a bit low? Do we increase it?
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Average ambient wet bulb temperature over cooling season (**This value will change with the new solar cooling version**)
  - Mediterranean arc only
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Average ambient temperature during daylight over cooling season (**This value will change with the new solar cooling version**)
  - Mediterranean arc only
  - Unit: OK
  - Definition: OK
  - Colour scale: OK
- Average solar irradiation during daylight over cooling season (**This value will change with the new solar cooling version**)
  - Mediterranean arc only
  - Data for centre of Italy seem to be low. To be checked
  - Unit: OK

  - Definition: OK
  - Colour scale: OK
- Building typology:
  - Delete U-value targets (no value available but anyway without any real meaning)
  - Delete heating system (no value available)
- Socio-economic:
  - Gross domestic product and Gross domestic product in the construction sector: Check unit (I doubt that the unit is only €)
  - Employment in construction: Check unit
  - Labour cost: delete (or make this indicator not accessible) because data is missing
  - Electricity price: ranges are not correct. Intervals must be defined.
  - Electricity and gas consumptions: data is existing at: http://www.entranze.enerdata.eu/#/share-heating-unit-consumption-per-dwelling-at-normal-climate.html
- Regulations:
  - National energy regulations: when clicking on a specific country on the map, it will be better if the screen that is displayed contains directly the factsheet for this country (instead of a screen where you have to select again the country).
- Solar cooling:
  - Evaporative cooling is missing
  - Change "The solar Absorption / Adsorption cooling performance indicator (CSPF) is defined has the ratio of cooling power to heating power over the cooling season " by " The Cooling Seasonal Performance Factor for absorption/adsorption chiller is defined as the ratio of cooling power to heating power over the cooling season"
  - Results for solar cooling seem strange. Given the complexity of the algorithm to calculate CSPF, it was decided to pre-calculate CSPF for all configurations apart from the tool. New calculations have been done and seem to better represent the potential market for this kind of technology.

NEW FORMULAS, INDICATORS

- Financial incentive indicator must be implemented before the end of the project. As it was done for regulation indicator, a link with the BPIE project can be established (Financial instruments).
- Evaporative cooling is missing. Equations to calculate CSPF are simple and can be directly implemented on the tool.

FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- Future development should include a mechanism for maintaining and updating data otherwise the tool will be out of date. I guess this is already the case with social economic data such as employment rate or GDP.
- Cost (investment, maintenance, exploitation, labour cost, …) will be a key issue in future development. Comparison between solutions belonging to a same family of energy-efficient

technologies cannot be done only based on energy criteria. Financial criteria will have to be included if we want to highlight the importance of life cycle cost analysis.

2.2. Testing the tool exercise – TNO feedback

WHAT CAN I DO WITH THE TOOL?

- Most respondents of the survey say that the tool can support their own work:
  - Estimating the potential of certain technologies and products.
  - Estimate the feasibility of innovations. Especially with regard to relevance, market size, geographical application.
  - Looking up climate (or similar) data such as solar irradiation etc is already useful. I need more detailed information about the building stock.
- Most respondents of the survey also think that the tool can be useful for their clients (e.g. for estimating the potential for certain technologies and for feasibility studies).
- The information needed from the tool is very dependent on the user and his specific question! The tool now contains only general information that may not be enough to answer specific questions of stakeholders.
- One of the respondents told that it was very difficult to use the tool, since there is no guidance and also the data in the tool is too general. In a specific situation you always need specific information. It is not possible to incorporate this all in the tool. Specific branches could develop the tool further according to their own wishes.
- One of the respondents said that he didn't know who could be interested in the tool. In his opinion producers, research institutes, etc. will gather all information needed by themselves.

COMMENTS & SUGGESTIONS

- When people see the tool for the first time it is not immediately clear how to use the tool and what information you can get from it. Maybe it is good to add some kind of instruction / information page. A few other remarks:
  - How can I show multiple layers on the map? Or is this the filters box? No explanation is provided how this works.
  - The explanation of the filters could be a bit more elaborate. For instance, give definitions of 'heating degree days'. If a user doesn't know he will use his own interpretation.
  - it is not clear if filters are currently turned on or off. So after a while I don't know what's displayed on the map.
  - In some searches the colour scale is not clear (for instance, gas price, where the scale runs from green to blue tot red). The colour blue doesn't make sense to me.
  - It is not always clear what units are used.
  - The layers thermal insulation and solar cooling are complex filters. Why not include these in the filters box?
  - The background layer is not related to the technical content. Better to put them in a different place.
  - The button for the filters box is not in a logical place.

  - There is no button to reset or clear all filters.
  - In the filters box the button on the right side of each variable shows a reload icon, but actually it resets a filter, better to change the icon.
- Add a help function or a tutorial.
- Add the source of all data in the tool. Now I don't know how reliable the data is.
- Do we have a license for the open map?

- Thermal insulation – performance indicator
  We still don't understand how to use this part of the tool. Can anyone explain this to us? It would also be good to explain users how this indicator is calculated.

- For age of construction only the number of buildings per km2 is mentioned. It would be good to have both density and number of buildings. Maybe it gives the user more insight to see also the percentage of buildings in a certain construction age category. E.g. 20% of the total building stock before 1945, 10% between 1946-1960 etc. Maybe for the building use this gives also more insight (e.g. 60% of dwellings is apartments/flats etc.).
- For the age of construction it is only possible to select one time period. It would be good if it is possible to select more time periods, e.g. 1961-2000.
- Maybe information about how many buildings have a U-value below a certain level (e.g. 40% of the buildings doesn't have roof insulation, 20% of the buildings doesn't have double glazing etc.) gives more information to the user than an average U-value in a certain time period.

- Pop-up screen with information about a specific territorial unit is helpful. A few comments:
  - There is a separate popup screen for every NUTS3 unit. However, for the Netherlands most information is only available at NUTS2 level. The number of buildings in the popup screen is now taken from the NUTS2 level, which means that the NUTS3 level gets the total number of buildings from the NUTS2 level. E.g. if a NUTS2 level region with 10.000 buildings consists of 3 NUTS3 levels, than in the popup screen for each NUTS3 level it is mentioned that it consists of 10.000 buildings (making a total of 30.000 buildings for the total NUTS2 level, which is incorrect!!). We should either mention in the popup screen that the number of buildings is for the NUTS2 level or we should not make popup screens for each NUTS3 level if there is only data available at NUTS2 level.
  - The pop-up screen only gives information for the period "after 2001", also when we change the filter to another period. It would be good if one can see the exact values for all different time periods.
  - Climatic data (especially temperatures) are shown with 2 decimals. We think it is better to use just one decimal for the temperatures and no decimals for the annual incident energy parameters.
  - Under building typology the U-value of the existing construction has a lot of decimals. Better to reduce is to two decimals.
  - Under building typology the heating system contains "0". Better to mention that no information is available.

  - Number of buildings alone does not say anything. Users would also like to know the density (number of buildings per km2) and the percentage of buildings (e.g. in a certain time period). It would be good to add this to the tool.
  - For different aspects, only the value is mentioned (not the unit). It is helpful to add the unit for each aspect (e.g. labour cost, is this per hour?).
  - For different aspects there are too many decimals used (e.g. gross domestic product doesn't need decimals, gas price 4 decimals is enough etc).
  - It would be good to mention the source of the data in this pop-up screen. Is that possible?
  - For regulation, the link to buildingsdata.eu doesn't direct you to the information of the specific country/region. Is it possible to direct people to the right page?
- Socio-economic layers
  - Is all data in the socio-economic layers coming from Eurostat? → Add the source of the data!
- KML export to Google Earth: What can we do with this?
- Print to pdf: A nice option! We think it is useful if all selected filter criteria will be printed to the pdf as well. Is that possible?

WEAKEST ASPECT & ERRORS IDENTIFIED

- It is difficult for users which filters/layers are needed. It would be good to add a wizard which determines which filters are needed for a certain query.
- It is not clear to users how to use the filter box. More explanation is needed.
- The location of the filter box button is not logical
- The filter box doesn't seem to work properly. When applying the filters and closing the filter box, nothing happens in the map.
- The sliders in the filter box don't work properly. You can only use the left slider.
- The aspects in the filter box need more explanation. Now it is not always clear to users what is exactly meant.

- Filters box
  It is certainly a useful addition, but we don't understand exactly how it works. Is it true that we have to set all filter ranges in the filters box, and we then see only the relevant regions (the regions that meet all filter ranges) in the separate maps for all layers? We tried this in the tool, but it seems that sometimes different regions are shown on the different layer maps…
- Furthermore the filter box seems not always to work properly. After working with the filter box we sometimes only get empty maps…
- The layers "U-value target" and "heating system" don't work properly. We get an empty screen.
- Average ambient temperature over cooling season is very high for UK (>26°C). Probably this is not the average day temperature, but the average maximum temperature??
- Same for the average temperature over heating season (±0°C)
- Thermal insulation – market potential

We can still select all kinds of insulation materials. As discussed during our last meeting in London, it would be good to make a remark if it is possible to use a specific insulation material. E.g. you cannot use glass wool in an existing cavity wall. How are we going to deal with this?
Furthermore it is not clear to users how this indicator is calculated, this should be explained in the tool.

NEW FORMULAS, INDICATORS

- First focus should be on displaying the available data in a good way, worry about adding more data later.

FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- Make it possible for users to add their own data and databases. You could make it fully open, but questions regarding reliability of the data arise. Or always require a reference to a source, or some sort of Wikipedia model.
- An 'open' database will have the biggest impact, because:
    - it will be kept up-to-date (multiple stakeholders)
    - it can be widely used (users can think of new applications)
- Who will be in charge for the data quality? Especially important when it will become an open source tool, where people can add their own data.
- The data (especially about building typology) is not detailed enough. Using data from a more detailed database would improve the quality of the results.
- How do you keep the data in the tool up-to-date?

2.3. Testing the tool exercise – ZAG feedback

WHAT CAN I DO WITH THE TOOL?

- Can get basic data on one place
- Can learn on technologies as described
- Get a whole climate, building typology, socio-economics, regulations.. description for countries on one place, represented in a way which is most suitable for cooling/heating technologies;

COMMENTS & SUGGESTIONS

- Two (or more) »windows« opened at the same time for easier work.
- Maybe some more description of parameter/data/indicator.
- Within layers Thermal Insulation and Solar Cooling it would also be useful to have data about current offer on the market;
- I would suggest that in the tool there is an explanation what are Heating/cooling Degree days (e.g. Heating degree day are considered when outside temperature is below 12 degrees, and are calculated for example is outside temp. is 1 Degree, that means 11 Heating Days..);

- More obvious difference in colours on the map between single classes in layer Geo-descriptor (e.g. Use Residential – Apartment Flats – 150000-200000 and 200000-250000…).

WEAKEST ASPECT & ERRORS IDENTIFIED

- sometimes the tool is slow (to the extent that the user might abort the search)
- there are blue smudges in the Alpine arc (can it be avoided?)
- ERROR: wet bulb, average ambient temperature over daylight, – for Slovenia there are areas without data
- ERROR: U value of walls not filled completely (Slovenia) – no data shown
- ERROR: Case study – thermal insulation: correlating EPS and PUR panel via EATHI S Max yields no result
- Age of construction seems not to be appropriately spaced in the scale
- Sometimes is difficult to differentiate the colours between each other.
- Filter box: no “cancel” available
- Layer Building Typology/ Use Residential + Single + Apartments Flats– Applied Filter Nr. Of Buildings – I suggest smaller font/wider window, that the whole Number of Buildings is visible;
- I suggest text boxes with the whole visible text when you put a mouse arrow on the word, and/or that you can wider a layer box in the tool - within Layer Geo-descriptor;

NEW FORMULAS, INDICATORS

- Data on types of roofs (e.g. flat roofs) could be interesting; maybe also green roofs and even facades.
- The precipitation data would be welcomed as well.

FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- A short user manual.
- Possibility to combine two or more parameters (to evaluate what are the cross-cutting potentials).

Testing the tool exercise – TZUS feedback

WHAT CAN I DO WITH THE TOOL?

- User in one place can find overall information and is easy to use. The information are very useful specially climate data, building typology, socio-economics, regulations. Description for countries
- You can see the potential and market size

COMMENTS & SUGGESTIONS

- It is necessary to have a detailed guide how use the mapping tools. It is very difficult to understand how to use filters and what can of information you can get.
- Will be useful if we can get information and stakeholders name in certain country. Or the price or offer.
- Legends are not clear, especially in terms of unit's solar cooling
- It is not easy to make step back when you are using filters
- It is not entirely clear how we can use filters and solar cooling information.

WEAKEST ASPECT & ERRORS IDENTIFIED

- We don't get any difference information if we use filters in case solar cooling.
- Is difficult to separate the colours between each other

NEW FORMULAS, INDICATORS

- Will be good to have a list of all technology. From task 2.2
- Option to combine two or more parameters

2.4. Testing the tool exercise – BBRI feedback

WHAT CAN I DO WITH THE TOOL?

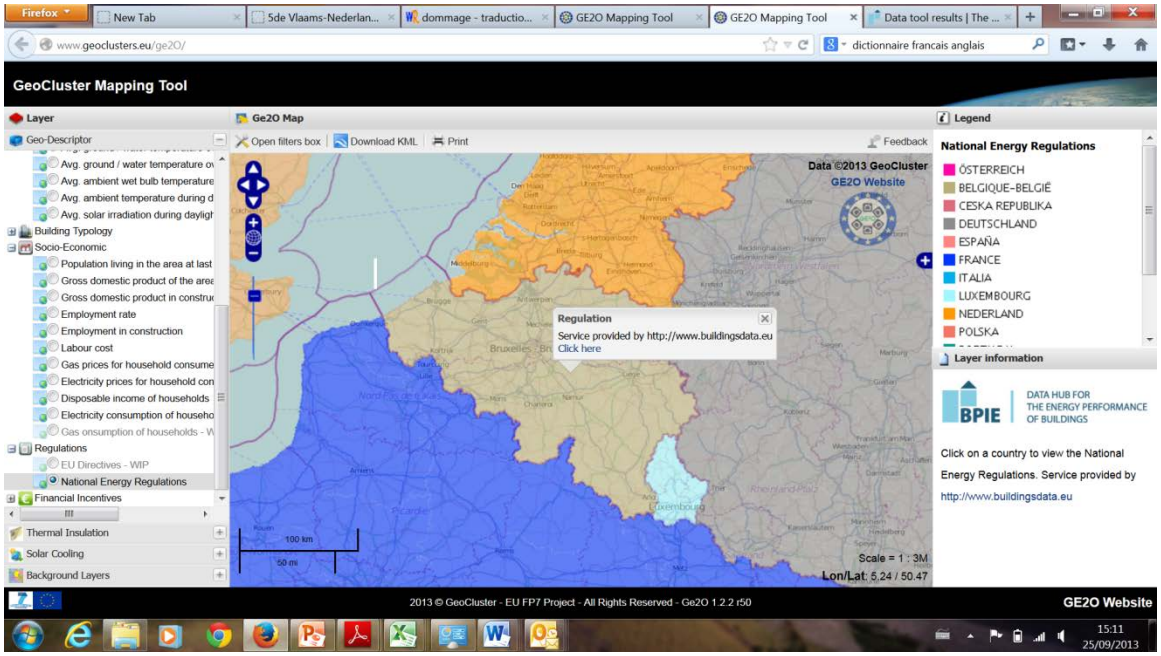
All types of queries are possible. This is the great advantage of the tool: all technological and non-technological information are gathered in one tool (no need to go from one site to another).

Particularly, as a research institute, we are interested in the following outputs of the tool:

- A precise and flexible comparison of different European regions in the context of EEB. This will help us to "benchmark" the 3 Belgian regions against neighbours and fix priorities in R&D actions
- precise data on climate, to be used as inputs for modelling
- a didactic support that can be easily used in workshops, presentations, fairs, …

COMMENTS & SUGGESTIONS

- The rapidity could be improved: some queries can take several seconds to give a result. And once you have it, if you change the scale, the tool runs for another set of seconds. An improvement would be that you could zoom in or zoom out in the same results without launching again the query system.
- It's not always clear where you have to click to obtain information. For example, I don't manage to obtain the fiche with Belgian regulations when I click on "Belgium" on the map



Perhaps it is already possible (but I have not found it) it would be useful to extract one map-result in a .jpeg or .tif format to be able to use it in reports

- There is something strange in the query about :

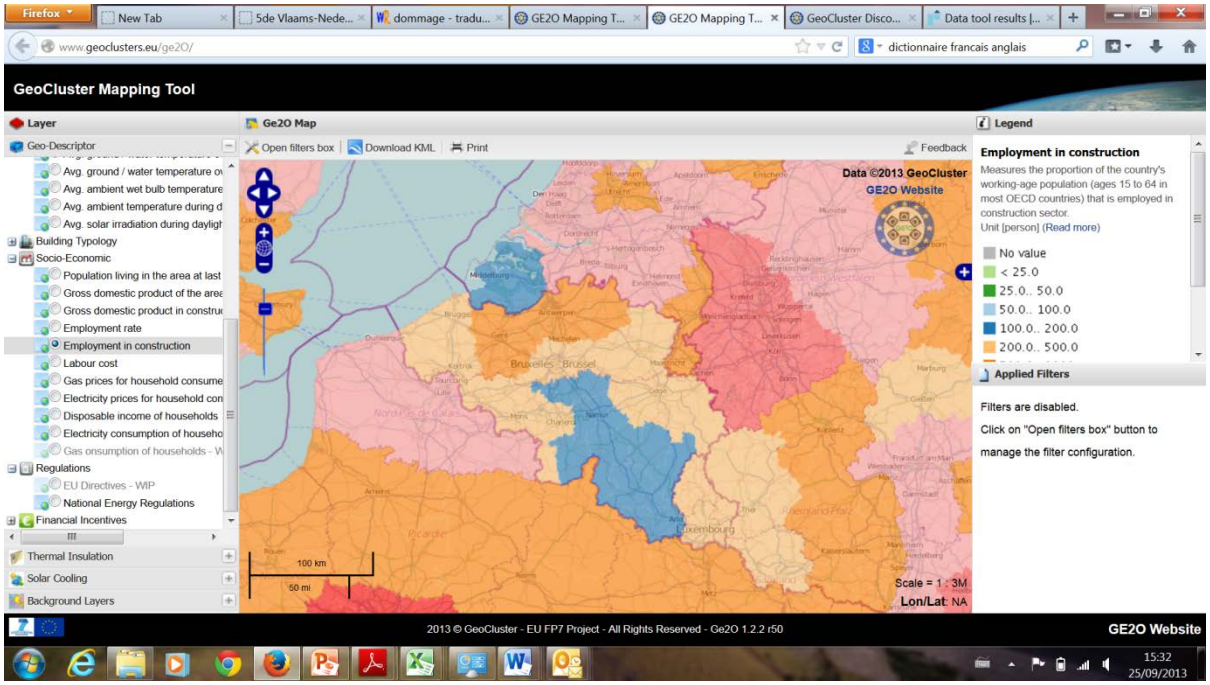
Employment in construction

Measures the proportion of the country's working-age population (ages 15 to 64 in most OECD countries) that is employed in construction sector.

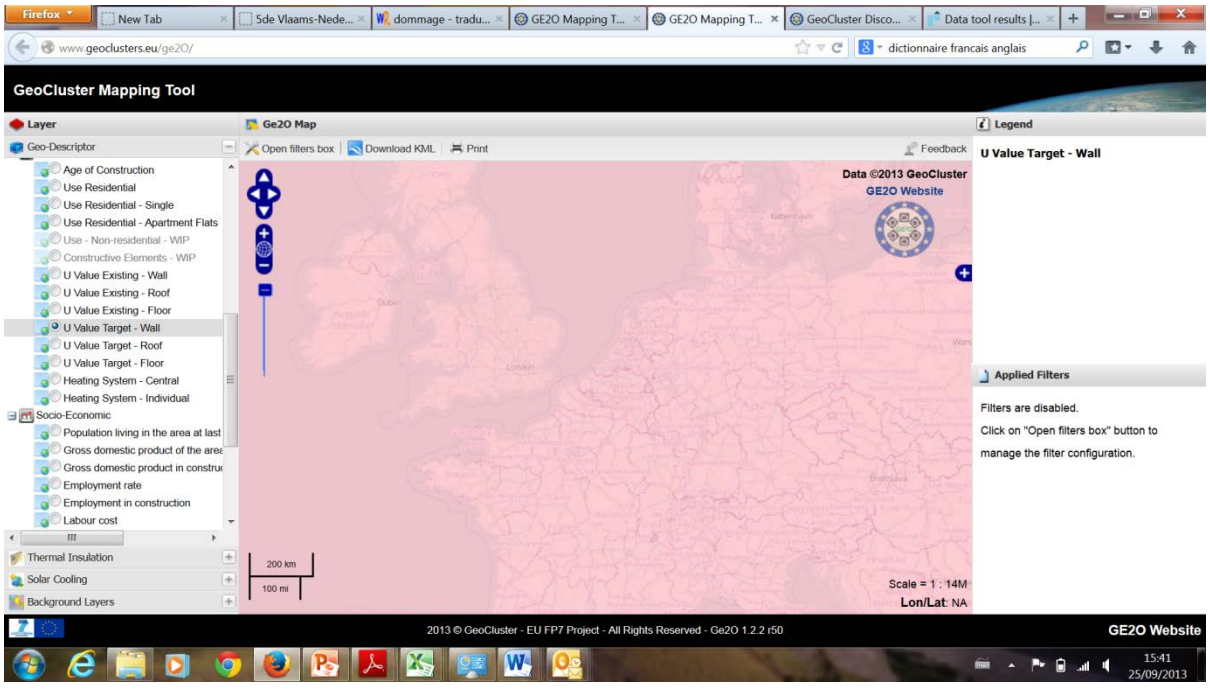
Unit [person] (Read more)

The definition seems to give a percentage (“proportion”) but the unit is expressed in “persons”.

Moreover, the result is not possible: between 100 and 200 for Wallonia. Probably it is to be multiplied by 1000 …



- The query on U value target (roof, wall, floor) doesn't work (pink screen)



FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- Extension to other country (Germany) is a must for a professional use
- Parameters related to rain in climate data would be interesting
- The list with the 70 European clusters is not accessible (or I haven't found the way to get it)

2.5. Testing the tool exercise –POLIMI feedback

WHAT CAN I DO WITH THE TOOL?

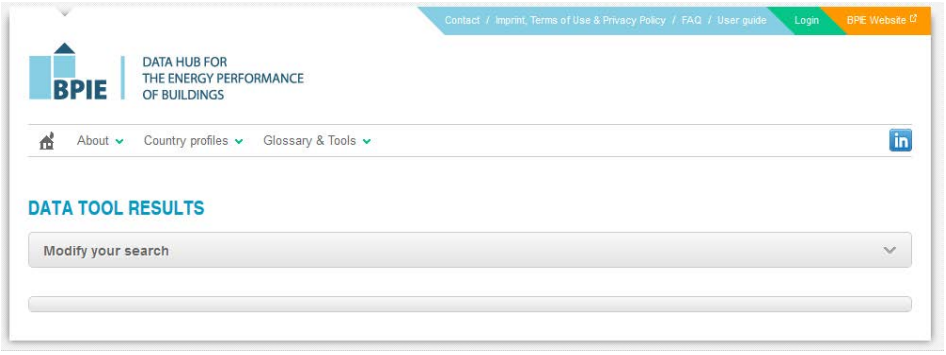
- I can visualize information regarding Energy efficiency in Buildings across EU in terms of interactive and dynamic geo-referenced map.

COMMENTS & SUGGESTIONS

- Could be interesting to add the link to the tool into the website of the project.
- Referring to default maps – EU Territorial unit, we suggest adding the NUTS definition. For example: NUTS classification = Nomenclature of territorial units for statistics, it is a hierarchical system for dividing up the economic territory of the EU for the purpose of : (1) The collection, development and harmonization of EU regional statistics; (2) Socio-economic analyses of the regions: (3) Framing of EU regional policies. (Source: Eurostat). GE2O has chosen to use NUT3 unit i.e. small regions for specific diagnoses. More info can be found here: http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction)
- Present the building use layer with RELATIVE AND ABSOLUTE DATA.
- Regulations: Link to buildings data (Data Hub of BPIE) is useful and agreed by all the partners, but it must be integrated by the information collected and provided to the WP leader during task 2.2 even if are not consistence for the whole countries.
- It could be useful to add the definition of basic parameters directly in the legend having the same title and subtitle: for climate maps for example the maps will be more directly readable if in the legend the definition of annual irradiation will appear without the links to “read more”, but this suggestion is valid also for other layers.
- Could be useful to add the source of the U value target for each country, we are sure that that during the collection of these data, partners have also delivered the sources of information.
- It is not clear the market potential map for the solar cooling no information or legend is available for the user.

WEAKEST ASPECT & ERRORS IDENTIFIED

Regulation layer: clicking on different countries to redirect to the country sheet of building data, all the time it appears a strange screen as following, and I’m not able to see the regulations as promised in the tool.



- Perhaps introduce instruction in the cloud that appears on the Geo Mapping Tool

NEW FORMULAS, INDICATORS

Tool needs to have a list of the whole 25 technologies identified by the project and described into the DEL 2.2. At least with a brief description without specific indicators. These could be added in the future as a further implementation of the tool.

2.6. Testing the tool exercise –IFS feedback

WHAT CAN I DO WITH THE TOOL?

Some possible uses identified:

- **Climate layer**: Potential to integrate climate data into other GIS projects such as 3-D Energy Atlas used in neighbourhood demonstrator project for community retrofit e.g. installing solar panels on buildings as part of retrofit measures available.
- **Building typology layer**: Potential to identify areas for retrofit investment to improve energy efficiency of buildings using type of heating system/U-value and age (also socio-economic factors)
- **Socio-Economic layer**: Useful socio-demographic input into assessment of living conditions can identify which areas are most exposed to fuel poverty and would benefit most from retrofit
- **Regulations/financial incentives layer**: Up to date knowledge of local support schemes and regulations. There is value in comparing assistance/loans available across the EU and identifying good practice for incentivizing potential energy efficient schemes (especially if we can get evaluation data on the schemes?)
- **Thermal insulation and solar Cooling**: Better understand the types of types of technology available and their market potential across EU.

COMMENTS & SUGGESTIONS

- For a new user it is takes a time to understand and get used to the tool. We need a clear guide.
- Can we speed up the processing?
- For the new user results may often appear counter-intuitive at first. This may be because of the way the data was input due to
    - Inconsistencies in data availability for different countries – different time periods, different NUTS levels available
    - Inaccuracies in the data (see section 3)
- It would be helpful to have explanatory notes for the results of a search. For example for market opportunity for volume of insulator at NUTS level 3.
    - Explain the basis of the formula. It would really help to be directed to the underpinning data (e.g. population, area) and formulae used.
    - While the tool needs to be simple for unsophisticated users , sophisticated users will want to understand the basis and limitations of the approach, and be able to make their own assessments and develop additional queries
- We need a mechanism by which trusted and trained persons can own, access and correct the data. If each partner reviews and corrects the data it may be faster to remove inconsistencies
- If the tool is to be open source we should trial how this can work with some of the GIS technical experts in the partner's teams.

WEAKEST ASPECT & ERRORS IDENTIFIED

- Inconsistencies and errors in UK data – either missing values or incorrectly attributed categories. (**See Annex for list**)
- Thermal insulation and market potential layer error in data
- Solar cooling layer error in data and no search component for market potential
- Unable to cross-reference indicators i.e. compare the market potential of thermal insulation and building U values
- Slowness of loading data
- Error/lack of ease to load information box on regional data
- There may be some incompatibilities with our PC desktops – the screen occasionally freezes so we only see half the picture completed.

NEW FORMULAS, INDICATORS

- Agree more important to get current data and presentation right first – after all this is proof of concept and it is better to have limited functionality which works really well, rather than lots of functionality and associated imperfections.
- **Cost** is a critical element in supporting decisions – we understand this is difficult and variable can we assess this in some simple way?

FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- **Quality control** – need a mechanism for maintaining and updating data otherwise the tool will be out of date.
- **Financial incentives and regulations** – We have data, it would be good to update as this is useful in examining costs for improvements for SME's and home owners.
- **Integration with other GIS tools** – how easy would it be for users to add other layers or integrate with other GIS tools? Perhaps we should explore with ESRI or other users?

2.7. Testing the tool exercise –ACCIONA feedback

WHAT CAN I DO WITH THE TOOL?

- Research porpoises are covered by wide climate and building stock data very useful for performance equations.
- BASIC Market potential analysis related to stock, climate, U Value Targets (as are the only present indicators and the most specifics, because the others are quite general).
- BASIC STRATEGIES SELECTION ON DESIGN STAGE (useful for architects and also installations designers)
- ESCOS: business model definition
- MAIN POTENTIAL USERS: manufacturers (+suppliers) & researchers. Designers.

COMMENTS & SUGGESTIONS

- *Not all users proposed are in our opinion "potential" users. In a first view we considered some excluded form initial list (see below)*(also in the list we make a differentiation between: **users**; **possible developers** and **not vocational participants**)*
- *As it is developed now, it is high skill demanding to exploit tool potential.*
- ***Downloads:** .pdf could be a good additional option*

- *Units could be better expressed in **bold** characters (e.g.* **[W/m² · K]** *instead of* [W/m² · K])
- *Data form "HUESCA" (a NUT3 region in Spain) is missing for buildings of the range ("before 1945")*
- *Some data from CANARY ISLAND doesn´t appear*
- *Some data form Portugal are missed (Atlantic coast mainly)*

WEAKEST ASPECT & ERRORS IDENTIFIED

- ***BENELUX ÁREA:** the space selected as Benelux area is not correct (as Germany is included suggest an unfair weakness, not real) BENELUX is **BE**lgium; **NE**therlands and **LU**xemburg (only).*

- *The **light green colour** in legend is **not easily visible** in common screens. Difficult to perceive.*

- *There are quite a lot of errors on cartography (toponimia; and most of all territorial limits) see **e.g.1** (below)*

- *In the scale 1:55 The name of Spain doesn't appear but other countries, even Madrid city… ??*

- *It could be much better if when looking for climate data (that the window size don´t show complete) the text is shown by a label. See **e.g.2** (below).*

- *ERRATA in the text of solar cooling "performance indicator":* The solar Absorption / Adsorption cooling performance indicator (CSPF) is defined **has** (should be: as…) the ratio of cooling power to heating power over the cooling season.

NEW FORMULAS, INDICATORS

HOW TO BETTER PRESENT BUILDING TYPOLOGY DATA:

- The Unit: **Nºbuildings/km2** doesn´t provide really useful information. It could be considered talking about building density but doesn't help to illustrate or improve the value of Age of construction data (AND THIS IS ONE OF THE MOST IMPORTANT DATA TO VALUATE MARKET POTENTIAL OF TECHNOLOGIES!! TO VALUATE RETROFITTING NEEDS AND ALSO TO DEDUCE BASIC BUILDING CHARACTERISTICS). In our opinion is difficult to put in perspective. In some regions with very big or very small size it gives a tricky answer. From the point of view of Urbanism other indicators could be more appropriate (as is more representative at urban scale than at regional scale). The data as it is doesn´t fits with project´s tool users/queries/objectives. See **e.g.3 (below) IF FINALLY IT IS CONSIDERED IMPORTANT DATA SHOULD BE PRESENTED SEPARETELY OF AGE OF CONSTUCTION VALUES** → in that sense AGE OF CONSTRUCTION should be presented as: Total Nº of buildings in each range and % Buildings (each age) in relation to the total of buildings.

- Buildings USE data should be also put it in context: TOTAL Nº of buildings and %Residential/total uses buildings (separately)

EQUATIONS AND VALUES CONSIDERED IN THE PRESENTION OF TECHNOLOGICAL LAYERS ARE NOT CLEARLY EXPLAINED 8what is composing that answer!!. Variables in the equation should be explained by an information box. It is a key part of the project. Information should include: correlations methodology; used variables and applied formula). IT IS IMPORTANT THAT THIS PART

OF THE INFORMATION OF THE PROJECT APPEARS TRANSPARENT (as a way to show ur great effort and also as the only way to continue the work by other organizations) *See* ***e.g.4***

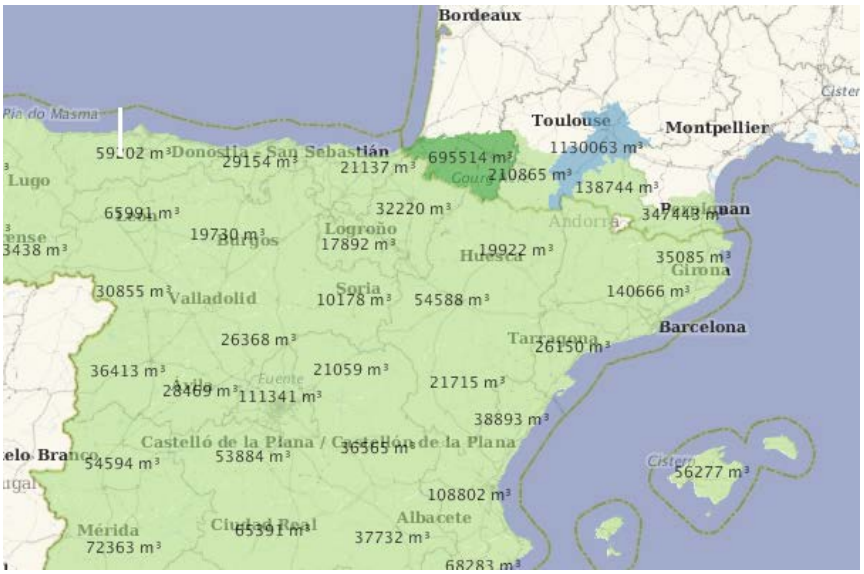
FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- All the indicators prosed in the layers should be developed.
- At least two complete equations should work properly in the tool before the end of the project, as the "concept" is present but not proved.

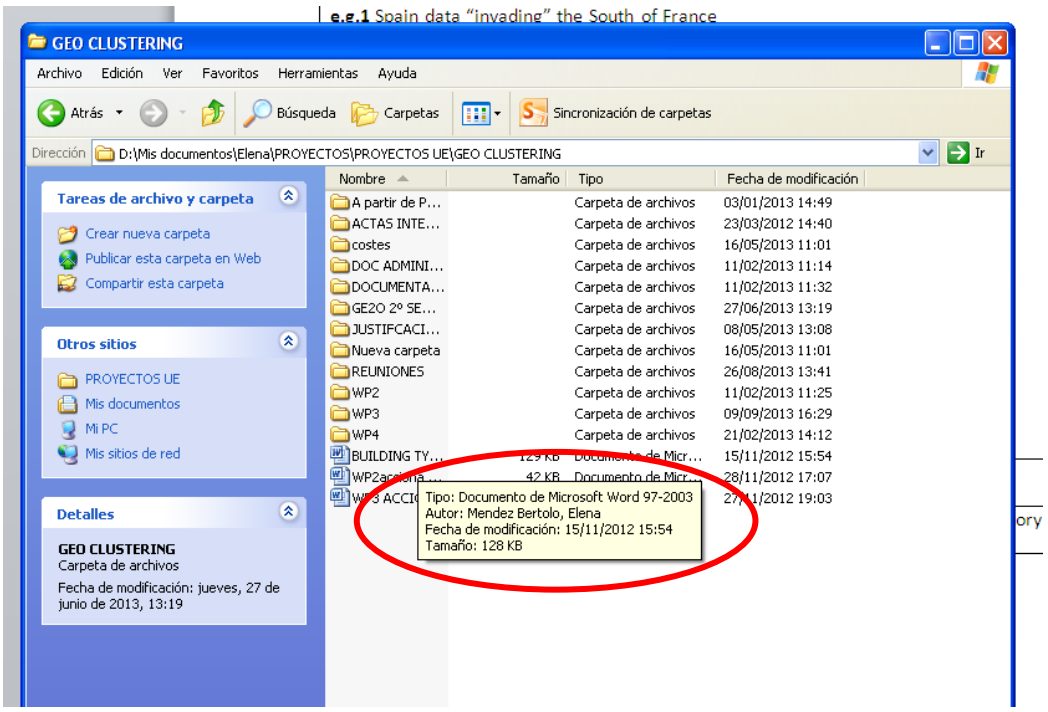
USER	Detail	PARTICIPATION
1. ADMINISTRATION / AUTHORITIES	Local (Municipal or similar)	*possible developers*
	Regional (District or similar)	*possible developers*
	National (Country regulators)	*possible developers*
	European (EU directives)	*possible developers*
2. BENEFICIARIES / DEVELOPERS	Administrations	***not vocational participants***
	Housing associations	***not vocational participants***
	Private Companies or Person	***not vocational participants***
3. FINANCIERS / INVESTORS	Banks	***not vocational participants***
	Other Financial institutions	***not vocational participants***
4. ARCHITECTS	Designers of the building	*users*
5. ENGINEERS	Geotechnical (civil works)	***not vocational participants***
	Structural	***not vocational participants***
	Envelope (Façade, roof)	*users*
	Energy	*users*
	Electrical	*users*
	HVAC	*users*
	Sanitary	***not vocational participants***
	Interior Designer	***not vocational participants***
	Environmental	*users*
	Sustainability	*users*
6. BUILDING CONTRACTORS	Contractor	***not vocational participants***
	Subcontractors	***not vocational participants***
7. PRODUCERS	Materials (steel, concrete, glass…)	*users*
	Components (floors, roofs, façade, internal partitions,…)	*user*/ *possible developers*
8. ASSEMBLERS	At factories	***not vocational participants***
	On site	***not vocational participants***
9. RESEARCHERS	Companies	*users*/ *possible developers*
	Technological Centres	*users*/ *possible developers*
	Universities	*users*/ *possible developers*
10. USERS OF THE BUILDINGS	Companies (Offices)	***not vocational participants***
	People (Dwellings)	***not vocational participants***
11. OTHERS	Consultants (energy efficiency, sustainability, quality…)	*users*
	ESCO	*users*
	Certification body (ISO, etc…)	*possible developers*
	Clusters	*users*/ *possible developers*
	NGOs	***not vocational participants***
	Lobbies	*possible developers*

ILLUSTRATIVE EXAMPLES

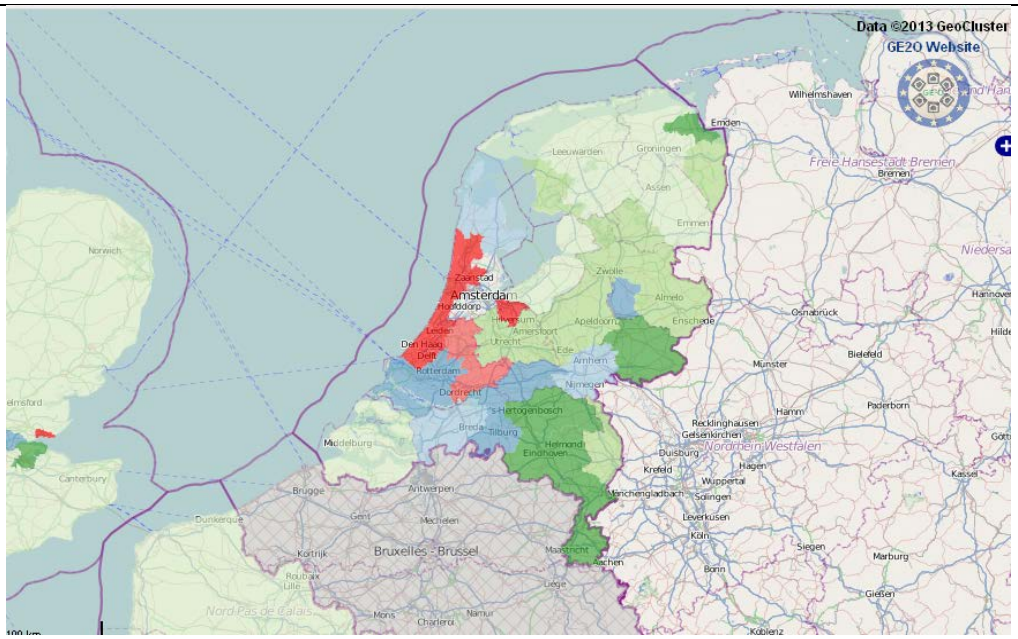
e.g.1 Spain data “invading” the South of France



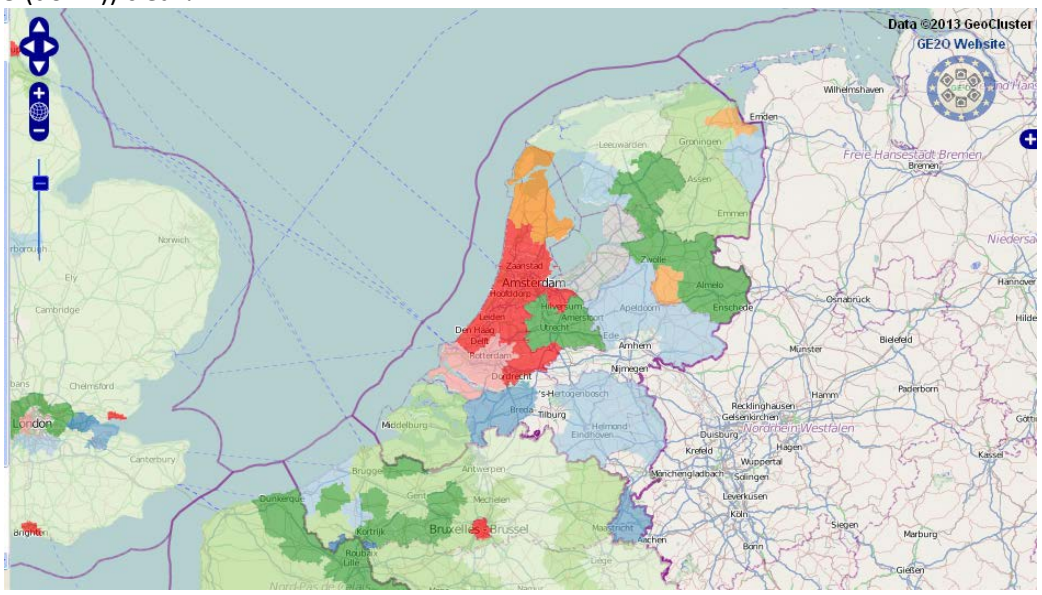
e.g.2.



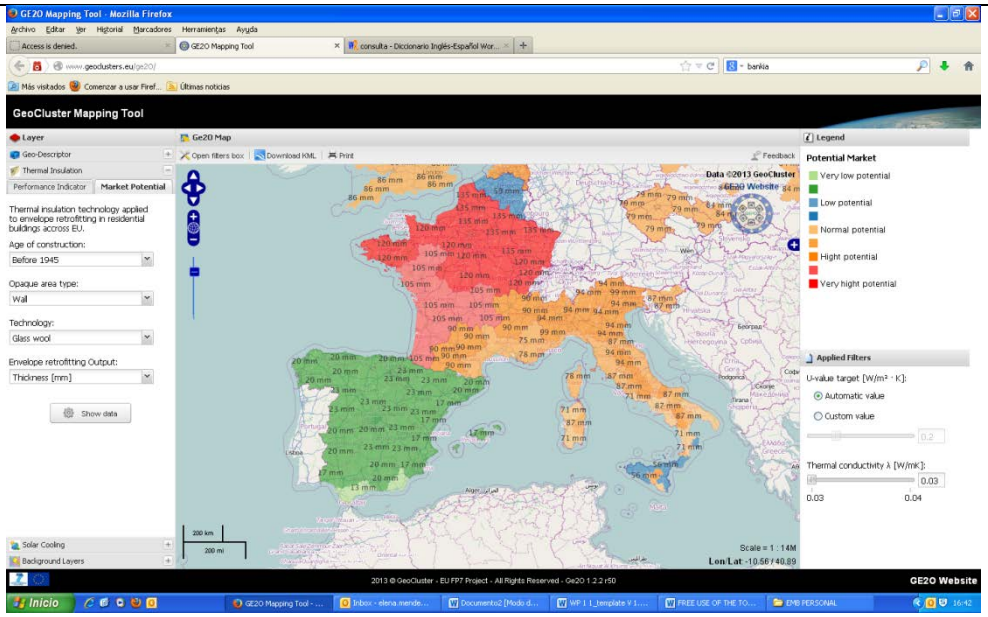
e.g.3. Are the Netherlands the place with more Nº or buildings or the smallest territory?



Is the difference between the recent stock (after 2001 (up)) and the eldest stock (previous to 1945 (down)) clear?



e.g.4 I have many doubts (as equation information is not clear) about the information provided on e.g. "Thermal Insulation". As a result, the "Potential Market" query shows a low or very low potential for thermal installation in Spain…. *What does this mean?*



If my query is (e.g. as producer of Glass wool) are there many buildigns to retrofitt with thermal insulation, at least for my knowledge of Spanish reality the answer is: yes, there is a good market opportinuty as many buildings need to be better insulated. Are there opportunities for ESCO´s bussiness models as the energy is increasingly high enough to exist a general perception of the need of saving? The answer will be also: yes. Other thing is that in spain there are probability of investment form owners of the building, and then the answer will be: no… But the answer this way, seems strange result to me, and puts my in alert because maybe there is mistake on data base.

2.8. Testing the tool exercise –ARCELOR- MITTAL feedback

WHAT CAN I DO WITH THE TOOL?

- The tool allows to easy and quick check some building indicators across Europe
- Also to compare some data between different countries and indicators

COMMENTS & SUGGESTIONS

- A user manual (pdf) in the web to make easier to work with the tool

WEAKEST ASPECT & ERRORS IDENTIFIED

WEAKEST ASPECTS

- It´s more a marketing tool than a technical one. Difficult for a constructor or manufacturer to a real use or to help in their projects

ERRORS:

- Regarding Luxembourg, we don´t understand the U-values of existing walls, roofs and floors. The y aren´t coherent with the excel file we provided.

NEW FORMULAS, INDICATORS

- A filter showing only applicable technology in a region could be an added value, because no all technologies are applicable in all regions due to different ways of construction

FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- Possibility for the final user to write its own equation to make a correlation
- Included Germany and other countries in the database
- More than insulation and solar cooling information (energy efficiency??)

2.9. Testing the tool exercise –ASM feedback

WHAT CAN I DO WITH THE TOOL?

- As a research & development centre focusing on market analysis in the construction sector we can mainly use the tool to investigate the market potential of differ European areas for particular technologies offered by our potential clients – manufactures whose aim is to introduce new product on the market or to gain new markets.
- Especially, socio-economic data is significant in the mentioned case, but also Building Typology part delivers important information indicating the potential market size in the particular areas.
- Not only market potential for the technologies/products might be identified. Also market potential of services associated with the technologies assessed with the tool might be estimated.

COMMENTS & SUGGESTIONS

- Term 'Normal potential' among the legend's items of Market Potential should be discussed according to our opinion:
- 'Normal' is wrong choice in case of indicating potential of markets. It does not sound well as it is quite biased term – 'normal' is descriptor that impose assessment which should be avoided in case of objective scientific studies.
- Our proposition of changes: Medium potential / Average potential

WEAKEST ASPECT & ERRORS IDENTIFIED

- There is a lack of data in case of Poland in case of Building Typology. In some indicators (e.g. existing U-values, Age of construction) the data is included partially, in the others (e.g. Use residential - Single) the tool does not present even fragmentary data while in both cases the data have been delivered by ASM (the last update to DAPP took place 21st June 2013). It needs to be verified.
- The NUTS3 codes being used in case of Poland are not valid any more. This division was in force between November 2005 and December 2007. Update of the previous division has been made and we have revised NUTS3 codes since 2008. We have been informed by DAPP that the problem is that all of our geometries were based onto the latest available GIS map of Europe, and that map is based on the old NUTS. In a result, the single countries cannot be modified without risking making a mess in the whole map. Nonetheless, it seems that NUTS division used in the tool should be the most recent one in order to be as much useful as

possible for the users. Additionally, any updates will be much more complicated when we stay with the old version of NUTS 3 division.

NEW FORMULAS, INDICATORS

- It would be worthy to complete the tool with 'Building permits' indicator.
- Values of the mentioned indicator might influence future markets' size as it might be used as a market potential indicator as it allows for estimating future trends in construction sector.
- The indicator is updated on a regular basis in case of the whole European Union and available at EUROSTAT statistics databases (buildings permits – percentage change; building permits - 2010=100). The number of permits given in particular countries is usually published by the national statistical offices.
- Another indicator allowing for estimation of success on particular markets of any technologies/products is 'Import value/import quantity' of particular materials/products in particular countries. The mentioned indicator indirectly indicates the potential of particular areas/countries – the bigger import, the bigger demand of reporting country.
- National import data is available at EU Export Helpdesk: http://exporthelp.europa.eu/thdapp/display.htm?page=st%2fst_Statistics.html&docType=main&languageId=en

FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- Taking into account ASM's point of view, it would be beneficial if the tool is developed further in a marketing direction - more and more detailed possibilities for market potential analysis (as described above) would be required.

2.10. Testing the tool exercise –E2BA feedback

WHAT CAN I DO WITH THE TOOL?

- The tool allows its users to access to a very rich knowledge repository for the pilot clusters, covering climate information, types of buildings, U-values (existing and targets), socio-economic information, etc. to a nuts 3 level. It also incorporates a hyperlink to the website http://www.buildingsdata.eu/ where the user can consult not only various statistics but also policies and regulations.
- In addition, the tool delivers the market potential of solar cooling for different technologies and for different regions. In the same vein, it displays the performance indicator CSPF for distinct types of collectors over distinct areas.
- Moreover, the application allows its users to study the market potential of thermal insulation applied to envelope retrofitting in residential buildings across EU, taking into consideration several aspects such as age of construction, type of surface to be isolated and the technology used. The outcome can be chosen to appear as additional thickness of insulation material to reach the target in mm or volume (insulation material quantity for one typical house in m3).

COMMENTS & SUGGESTIONS

- In general, we think the Tool is very user friendly

WEAKEST ASPECT & ERRORS IDENTIFIED

- With regard to climate, there are 4 indicators that are not being displayed for Portugal:

  1. Maximum ambient temperature over year
  2. Average ambient wet bulb temperature over cooling season
  3. Average ambient temperature during daylight over cooling season
  4. Average solar irradiation during daylight over cooling season

- I think this is due to the fact that these indicators were upgraded from:
  WP2/TASK2.2/Ge20 data on db/z-layers/pt
  Instead of
  WP2/TASK2.3/Data collection/ClimateGeo-descriptorsDataCollectionAll

- Furthermore, the indicators *disposable income of households* and *labour cost* are not being displayed at all.
- In the thermal insulation menu, for the market potential option, I detected a mistake: *across* should be written across.

NEW FORMULAS, INDICATORS / FUTURE DEVELOPMENTS (NEEDS FOR TOOL IMPROVEMENTS AND EXPLOITATION)

- WP3 identifies and defines potential users of the tool. In short, it was written that Government and authorities could use the GeoCluster Mapping Tool to locate similarities with other EU regions (in terms of building typologies, climate, financial schemes, regulations, etc.) and that the European Commission could use it to encourage key stakeholders to work together in finding other regions where similar ideas could be put in practice by, for instance, providing them with public financial incentives. Also, it was foreseen that the tool could help banks and other financial institutions evaluate the risk of financing a given project by measuring the project's level of replication regarding building typologies, socio-economic indicators, climate, regulations, financial incentives, etc. and that architects, engineers, designing teams and construction/building industries will be using the tool to identify markets where they could easily get into. Finally, we believe NGOs and lobbyists will be using the tool to collect as much information as possible regarding as many different aspects as possible in order to influence decisions made by legislators or regulatory agencies. For instance, if a given measure or project has proven effective in a specific area, lobbyists will be interested in finding other regions where a similar idea could be implemented, accelerating actions by local governments in energy efficiency and climate change, improving international cooperation.

As a matter of fact, I believe the mapping tool can satisfy many of the needs mentioned above, what is remarkable. However, I think it fails to serve users of buildings, or, in other words, companies (offices) and people (dwellings). In order to address this issue I suggest 2 measures that could possibly be put into practice in future developments of the tool:

1. Technologies should be sorted out into "interior" and "exterior";

2. Sellers/producers of energy efficient technologies would subscribe to the tool, having their products/websites made available to the public in return.

3. Results of ACTIVITY 2 TESTING SCENARIOS

SCENARIO nº1 – PRODUCER

Responsible Partner: TZUS
Technology: SOLAR COOLING (SCS)

PRODUCER OF A NEW (STANDARD) SOLAR COOLING SYSTEM

1. Indication of a principal question of the scenario:
[PUSH] A producer has developed a new system for solar cooling he wants to put on the market. In particular he wants to know what the areas where he could be successful are. He/She knows technical characteristics of his system.

Solar cooling is a part of cooling technology. Include several options in the field of energy efficient cooling: evaporative cooling, desiccant cooling, absorption cooling (solar adsorption cooling and solar absorption cooling).
Cooling application is used in building to decrease the indoor air temperature to improve the comfort. Technology performance indicator describes behaviour of different possibility. The indicators are CSPF and/or COP

2. List of queries / needed information:

- What is "normal" CSPF of systems in the database?
  FLATE PLATE COLLECTOR
  Absorption single stage 0,4-0,5
  Absorption double stage no data
  Adsorption 0,4-0,5
  VACUUM TUBE COLLECTOR
  Absorption single stage the pink colour but the value isn't in legend
  Absorption double stage 1,0-1,2
  Adsorption again pink

- What is available solar energy in certain area?

Cooling technology is related to four climatic parameters:
-T air, a: Annual average external air temperature [°C]
-Tair, max : Maximum annual external temperature [°C]
-Tair, c, s: Average cooling seasonal external dry bulb temperature [°C]
-Tair, WB, c, s: Average cooling seasonal external wet bulb temperature [°C

Tools provide this information for each project country also is available Avg. solar irradiation during daylight over cooling season (Average solar irradiation during daylight over cooling

season on a south oriented plane with a 45° slope. Unit [W/m²])

- What is the required cooling load?

Tool proves this information in detail.

- Are there legal requirements for the system (e.g. minimum CSPF)?
- Are there incentives / tax reductions available?

This information is not available at the moment.

3. **Required indicators:**
   - CSPF of the solar cooling- indicators in tools
   - Solar irradiation-indicators in tool
   - Cooling degree days-indicators in tool
   - Legal requirements presence- not developed yet
   - Incentive / tax reduction presence-not developed yet

4. **Possible cross relations**
   Not identified

5. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?** To what extend the tool provides me with the required information?
   The tools gives a lot of information in this area but some more information is still desired

SCENARIO nº2 - SUPPLIER

Responsible Partner: ZAG
Technology: SOLAR COOLING (SCS)

1. Indication of a principal question of the scenario:

[PULL] The producer of solar collectors has introduced new collectors with very high efficiency he/she wants to deploy as broadly as possible. He/she wants to explore in particular solar cooling technology because of predicted energy surplus.

The query to the tool is motivated by the following: performance of the collar cooling system depends on all linked components. One of important components is solar collectors, used to capture thermal energy and deliver it to the cooling machine. Unlike in gas powered absorption cooling systems operating temperature represents major operating limitations, since absorption machines of today need at least heat fed in at minimum 55°C. With increasing this temperature by 10 or 20 degrees significantly different operating conditions and thus better performance can be achieved.

2. List of queries / needed information:

- **What are the operating requirements for the solar-cooling system?**

The operating parameters are very important. As stated, it is rather important at what temperature collectors are able to provide thermal power. This is a question also if using surplus of solar energy can be used in solar cooling when using existing collector field.

The tool does not provide for a free-input parameters but it gives indications on type, used. Considering that solar collectors today deliver heat in range up to 120°C this approach might be sufficient.

- **What is "proper" (expected) CSPF of the SCS?**

The CSPF will again depend on several factors. However in this scenario the user of the tool is not system expert but rather he/she wants to assess how interesting the SCS might be on the selected market h/she is targeting.

The tool provides general data on market potential and expected CSPF. With combining the two pieces of information the tool user gets an idea about market potential for his collectors in conjunction with SCS. Further tool development might easily present this type of information by self-built queries.

- **Presence of the SCS on specific market?**

Another question interesting for the user in scenario is the competition. Has someone already introduced the solar-cooling technology on the market in question? This might be very important query from the user of the tool at list as provision for further sources.

The tool at the moment does not provide such information (technology deployment map).

- **How much energy in actually available?**

Among technology related questions availability of solar energy is top ranking since it affects the size and the applicability of the collectors for the SCS. The query is simple: what is the solar energy potential per sq. meter. The answer regulates sizing of the collector field in a SCS.

The tool provides sufficient climatic data for estimation of the potential; It provides solar irradiation and air temperatures, two key factors for solar collectors.

- **Cooling load required form the SCS per m^2 of the cooled area?**

The last question in the scenario deals with the requirement for cooling energy per building. This information is very important in assessing the potential, since cooling load is connected to the

size of the whole system and by that to the size of the collector field with given efficiency and operating parameters of the collector.

The tool provides information on cooling load enough in detail it can be used.

3. Required indicators:

Identified required indicators are as described:

- **T min, inlet (minimum inlet temperature)**

At the moment not given in the tool directly. The importance for the scenario is high.

- **CSPF of the SCS**

Indicated in the tool. The importance for the scenario is high.

- **Presence on the market, e.g. share of SCS in overall cooling devices**

Not indicated in the tool. The importance for the scenario is medium due to dynamic nature of the issue and due to other available sources of information (e.g. internet advertising).

- **Solar irradiation**

Indicated in the tool. The importance for the scenario is high.

- **CDD (cooling degree-days)**

Indicated in the tool. The importance for the scenario is high.

4. Possible cross relations

Performance of solar cooling technology will from technical reasons depend on performance of solar collectors, in particular efficiency and temperature characteristics. The final version of the tool could reflect this dependency, provided that solar collectors as a technology include these two technical parameters.

How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?

The current version of the tool provides valuable source of comprehensive information. The usefulness of the tool (feedback from the real stakeholder) is good. Some information is still desired, more conditioned search and filtering is also desired.

SCENARIO nº3 – DESIGNER

Responsible Partner: ACCIONA
Technology: SOLAR COOLING (SCS)

BUILDING DESIGNER

1. **Indication of a principal question of the scenario:**

[PULL] Building designer is designing / renovating a tall commercial building and he wants to maximize the use of RES. The building itself does not have a sufficiently big roof therefor building integrated solutions are sought. In particular the designer is afraid of cooling due to high expected internal heat gains. Furthermore he has on obligation to design a cost effective solution.

2. **List of queries / needed information:**
   - What is possible cooling power of the SCS per m^2 of the collector area?
   - What is the cooling power provided by the SCS?
   - What is the efficiency of the collector?
   - How difficult is to install the SCS hooked on façade collectors – is there working force available?
   - What is the cost of installation?

3. **Required indicators:**
   - Specific power of the SCS (W/m^2 collector)
   - solar irradiation
   - CDD (cooling degree days)
   - Labour cost

4. **Possible cross relations**

Temperature of fluid, provided by a façade solar collector must be sufficient in order to power SCS (Typically > 60°C). Not all collectors provide temperature that high efficiently.

5. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?**

SECTION 1 SCENARIO (cont.) CASE STUDY DEFINITION The building I need to retrofit with the objective of improving energy efficiency and maximizing the use of RES is sited in the city centre of Madrid. Is a tall building of 8 floors, used by Public Administration as offices, built in 1983. My proposal should comply with the need to find cost-effective solutions and minimize disruptions during construction works as the building will be in use.

My energy demand is high both for heating during winter and for cooling during summer time, being the cooling time more energy demanding than heating time as the building is internally overheat because of its limited ventilation, high use of lighting, high profile of occupancy and south orientation that permits important solar gains within its glass façade. I also have a high consumption of light inside the building.

My first approach was to introduce photovoltaic panels in the roof, facing two problems: new regulation in Spain (new taxes to photovoltaic technologies use) and a short surface to use them.

Someone tell me about Solar Cooling Technology and the possibility to use it both with photovoltaic or solar thermal energy. But I only have brief references about the technology and I don´t really know nothing about requirements, prices, legislation or possible financial incentives…

SECTION 2/3/4: USING THE TOOL…

On a fist approach I considered useful to know about my **TARGET UVALUES** for Madrid climate.

Also to have climate data related with the performance of possible RES technologies (photovoltaic or solar thermal energy):

- Annual incident energy on a south oriented plane with a 45° Slope **(for panels)**
- Annual incident energy on a south oriented vertical surface **(for panels)**
- Annual Average External air Temperature **(for ventilation)**
- Average Heating Seasonal External Air Temperature **(for ventilation)**
- Average Cooling Seasonal External Air temperature **(for ventilation)**
- Maximum Annual External Air temperature **(for ventilation)**
- Annual Average Ground / Water Temperature **(for solar cooling)**
- Average Heating Seasonal Ground / Water Temperature (not useful)
- Average Cooling Seasonal Ground / water Temperature **(for solar cooling)**

I also considered interesting the reference to **ELECTRICITY PRICES** (I need them for my equation on amortization period) But as I know the Spanish market I am aware that we have taxes and specify incomes for solar energy use)) (being a foreigner this information (only having price) would be tricky.)

I could complement (I need it actually!) this information being redirected to Building Technical Code. As I am Spanish and the information is in Spanish language, I could it follow legal requirements without problems (ALERT: not the same for foreigner's speakers! I also notice that recent changes in the CTE are not included NOT ENOUGH ACTUALIZED INFORMATION).

What I considered important but missing information in this first approach:

- ➔ At this moment **not information of prices** (cost effectiveness is a requirement for my project!) **or financial incentives are available.**
- ➔ At this moment **I could only have information on two technologies. As I am interested in ventilation systems or alternative technologies for cooling or RES for me the tool seems incomplete**.
- ➔ **Not specific correlation between TECHNOLOGIES and (*SPANISH)* REGULATION IS PRESENT** (only performance measure values) In the future… FINANCIAL INCENTIVES INFORMATION SHOULD BE ALSO CORRELATED TO TECHNOLOGIES
- ➔ As I am interested in Solar Cooling that is a not introduced or common technology yet and I was advice of installation or maintenance specialized **service I miss linkages to PROVIDERS AND TECHNICAL EXPERTS** as a real reference closer to my purchase needs.
- ➔ **No way to complete the information provided.**
- ➔ I still have many doubts and I find **no way to send technical questions to be solved within a technical information´s platform.**

SECTION 5: List of queries / needed information:

- What is possible cooling power of the SCS per m^2 of the collector area?

- What is the cooling power provided by the SCS?
- What is the efficiency of the collector?
- How difficult is to install the SCS hooked on façade collectors – is there working force available?
- What is the cost of installation?

SOLAR COOLING ANALYSIS:

Only one indicator is provided: ratio of cooling power to heating power over the cooling season (**NOT ADDITIONAL EXPLICATION OF WHAT INFORMATION IS COVERING THIS INDICATOR IS PROVIDED**. I ALSO MISS A **TECHNICAL NOTE** ABOUT THE TECHNOLOGY)

Market potential clearly chooses for me a type a Solar Cooling technology (Absorption double stage). What is this? How much it cost? What are the needs for its installation (surface, orientation, installation and control areas surface and requirements, works needed, others…)?

Why is this better? I would prefer to know and understand the basis of these criteria, that should be explained

- Is energy price considered?
- Should I use photovoltaic panel or solar thermal energy?

Other questions:
What other technologies are available to reduce cooling energy demand?
May I use my façade for panels?

SCENARIO nº4 - INSTALLER

Responsible Partner: ARCELORMITTAL
Technology: SOLAR COOLING (SCS)

HVAC INSTALLER COMPANY

1. **Indication of a principal question of the scenario:**
   [PULL] A company, currently involved in HVAC solutions wants to expand its scope of activities, both with new products and by that on new markets.
2. **List of queries / needed information:**
   - What cooling power can I provide form the SCS
   - What part of cooling load can I cover by SCS
   - What is the difficulty level in installation of the system
   - What is the level of implementation of the technology
   - Are there incentives or other instruments that might significantly boost the implementation?
3. **Required indicators:**
   - Specific power of the SCS (W/m^2 collector)
   - CSPF of the SCS
   - Presence on the market, e.g. share of SCS in overall cooling devices

4. **Possible cross relations**
   Not identified.

5. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?** To what extend the tool provides me with the required information?
   Regarding software tool there are information in the tool about climate that are essential for the Solar cooling systems, so this information is valuable and positive to have with just work with the tool. About heating and cooling systems there is no so much information, just general info not very useful for installers of SCS system. Also regulations, which links to other web pages. It´s especially important to improve the finance incentives ("coming soon…" when you click in the tool), because they are key in the development of renewable technologies like solar cooling. Also legislation is basic and quite different depending of the country.
   Specifically the Solar Cooling information is divided in two main fields: performance indicators are just solar Absorption / Adsorption cooling performance indicator (CSPF) and limited to the south of Europe.
   It is no clear the criteria of Market potential and also complicated the use of the tool to someone not related with the project. It is basic to include a easy user guide of the tool and an explanation of how correlations work.

SCENARIO nº5 – LEGISLATOR

Responsible Partner: POLIMI
Technology: SOLAR COOLING (SCS)

LEGISLATOR

1. Indication of a principal question of the scenario:

[PULL] In general energy policies of the state in question there is an obligation to increase the use of RES in a yearly basis by 3 % yearly. The analyses show that the effect of introducing RES for heating is not sufficient; currently cooling becomes a problem, consuming electricity. The legislator has got an idea to encourage the use of winter solar heating systems also in summer for cold production. However he heeds a bunch of information before formulating a decree.

2. List of queries / needed information:

About LEGISLATIONS on RES in EU

GENERAL REMARK:
Being a simulation of a legislator user, one of the first step using the Geo Mapping Tool could be the check of the regulations and financial incentives maps available and unfortunately there are not present, there is only the link to the data hub (that it still not

works correctly as remarked during the previous exercise for WP3). The data hub is a good data base but it could be interesting to have EU overview on the main regulations related to the two technologies investigated. Following a really brief draft for solar cooling that helps us for the filling in of this scenario exercise.

STATE OF ART:

In March 2007, the Heads of State and Government of the EU 27 countries adopted a binding target of 20% final energy consumption from renewable energy by 2020.

In January 2008, the European Commission presented a draft Directive on the promotion of the use of energy from Renewable Energy Sources (RES) which contains a series of elements to create the necessary legislative framework for making 20% renewable energy become a reality.

After the European Parliament and the Council agreed upon the RES Directive in December 2008, it entered into force in June 2009. If properly transposed into national law, the RES Directive will become the most ambitious piece of legislation on renewable energy in the world. The RES Directive creates a positive climate for the long-term development of solar thermal technologies in Europe.

Following the main paths of RES Directive:

5 December 2010	Member States have to transpose the Directive's provisions into national law & communicate to the Commission how the Directive has been transposed
31 December 2011	Member States start to report every 2 years (December 2011, 2013, 2015, 2017, 2019, 2021) on progress in reaching national objectives.
2012	The European Commission start to report every two years (2012, 2014, 2016, 2018, 2020, 2022) on progress made in reaching the RES Directive's objectives. It may propose corrective actions.
30 June 2013	Member States who are below the biannual milestones of the indicative trajectory have to submit an amended action plan by June of the following year.
31 December 2014	The European Commission has to report on the evaluation of implementation of the Directive (notably on the cooperation mechanisms & review the greenhouse gas emissions threshold in article 17(2)).
2018	Report by the European Commission proposing a Renewable Energy Roadmap for the post-2020 period. It may be accompanied by legislative proposals
2021	Report by the European Commission reviewing the application of this Directive: NREAPs, forecasts, cooperation mechanisms, support schemes, etc.

- Is there similar legislation (as intended) already in place

In Italy the main legislation regarding the cooling energy need in building (National level) are:

UNI TS 11300 part 3;

UNI EN 12975-1:2006 *"Impianti solari termici e loro componenti - Collettori solari - Parte 1: Requisiti generali" (Thermal solar systems and components - Solar collectors - Part 1: General requirements). (National level);*

UNI EN 12975-2:2006 *"Impianti solari termici e loro componenti - Collettori solari - Parte 2: Metodi di prova" (Thermal solar systems and components - Solar collectors - Part 2: Test methods). (National level);*

Decreto Legislativo 30.05.2008 n.115 *"Attuazione della direttiva 2006/32/CE relativa all'efficienza degli usi finali dell'energia e i servizi energetici e abrogazione della direttiva 93/76/CEE" (concerning the application in Italy of the Directive 2006/32/CE) simplified the*

procedure of installations of solar thermal panels (see article n.11). Installation of solar thermal panels is now considered as routine maintenance and does not need of any specific authorization.

*For the financial incentives for solar cooling is the **Ministerial Decree of 28 Dec.2012** (the so-called "**Renewable Energy for Heating & Cooling Support Scheme**") implemented Legislative Decree no. 28 of 3 Mar. 2011 on a scheme of support for small-scale projects of energy efficiency improvement and production of thermal energy from renewables. Eligible projects concern: energy efficiency improvements in existing building envelopes (thermal insulation of walls, roofs and floors, replacement of doors, windows and shutters, installation of solar screens); and construction of new renewable-energy systems (heat pumps, biomass boilers, heaters and fireplaces, solar thermal systems, including those based on the **solar cooling technology**).*

These regulations don't appear into the geo mapping tool, even they were indicated during data collection!

*Table summary of the **Renewable Energy for Heating & Cooling Support Scheme for Italy***

Country / region	Italy
Name of programme	Mechanism of Renewable Heating Systems and Energy Efficient Measures (small size)
Type of incentive	Rebate (a feed-in tariff could be implemented after two years)
Eligible technologies	Solar hot water systems, solar space heating, solar cooling
Applicable sectors	Public and private entities with existing buildings
Amount	Systems below 50 m² Solar hot water and space heating 170 Euro/m² and year for two years Solar cooling 255 EUR/m² and year for two years Systems above 50 m² Solar hot water and space heating 55 EUR/m² annually over five years Solar cooling 83 kWh/m2 annually over five years
Maximum incentive	Solar heating and cooling installations are financed up to a maximum of 1,000 m² of gross collector area
Requirements for system	Collectors/systems certified with EN12975 or EN12976. Collectors must be certified also Solar Keymark
Requirements for installation	no
Finance provider	Gestore dei Servizi Energetici (GSE) **www.gse.it/en/Pages /default.aspx**

Total funds	EUR 900 million for the first year, of which EUR 200 million are reserved for public institutions and EUR 700 million for private entities, the following years will be adapted accordingly
Funding source	Levy on natural gas tariffs
Effective date	Beginning of January 2013 (planned)
Expiration date	End of December 2015
Website	**www.gse.it/en/Pages/default.aspx**
Last review of this tabloid	December 2012
Contact	Gestore dei Servizi Energetici GSE S.p.A. Renewable department Pilsudski, 92 – 00197 Roma **rinnovabili@gse.it**

- Are the characteristics of the technology clear and simple enough to formulate in a decree

The technical maps of the solar cooling could be clear for expert technician, but they are not easily readable from all kind of users and sometimes also the legislators are not so detailed informed into technical aspects. Maps must be more detailed described (i.e. CSPF could be more detailed described into the legend or the market potential map needs some suggestions to read the results).

- What is the efficiency range of the system
  See previous answer.

- What is the potential for RES deployment, concerning given location

As indicated in the previous question, we think that currently in Italy the potential for RES deployment is directly linked to their financial incentives that are not currently available into the tool.

- What is possible impact on local labour market

No data or maps could help us to answer this question, the only link could be the map of the Employment in construction (Measures the proportion of the country's working-age population that is employed in construction sector) but it is also necessary to know the level of worker qualification.

3. **Required indicators:**
   - Geographical legislation deployment for specific requirements

Currently the GeoMappingTool doesn't provide this kind of information, that are fundamental for the legislator point of view in order to know how the other member states are working to support the diffusion of the solar cooling technology.

- CSPF range

Currently the GeoMappingTool provides a map with CSPF range subdivided in function of the collectors, but we think that they are not easily readable by all kind of users.

- Solar irradiation

Into Climate layers they are available the following maps related to the solar cooling technology: Average ambient temperature during daylight over cooling season. Unit [°C], Average ambient wet bulb temperature over cooling season. Unit [°C], Average solar irradiation during daylight over cooling season on a south oriented plane with a 45° slope. Unit [W/m²], Average Cooling Seasonal Ground / Water Temperature (Based on air floating average temperature of the last 15 days > 26°C). Unit [°C].

4. **Possible cross relations**

The possible cross correlation maps could be: solar irradiation, financial incentives and electricity consumption in summer to identify the plus of consumptions for cooling needs.

5. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?** To what extend the tool provides me with the required information?

The current version of the tool provides general information about the solar cooling technology and no data for regulation and financial incentives that are the main important aspect for a legislator, but also for all other kind of investors in this technology.

One proposal for *further implementation of the GeoMapping could be to start from the results of other European research on the topic to address the data implementation or link to other software free already available (i.e. The SOLCO database is a project deliverable and it is the result of this market study. It provides information on both solar panels and chillers locally available on above mentioned four insular markets.*

The database contains following information:

1. *Technical characteristics;*
2. *Sizes*
3. *Costs*
4. *Commercial contacts*

As output information, the database provides an Excel datasheet with technical characteristics of each solar panel and each chiller available on studied insular markets. The database requires: Microsoft Access (2003 or 2007); Microsoft Excel (2003 or 2007).

The database is downloadable from www.solcoproject.net with all technical datasheets included as database.zip. This zip file needs to be extracted into a new dedicated folder named by the user.).

As stated into the Solco Project ("Removal of non-technological barriers to Solar Cooling

technology across southern European islands" - www.solcoproject.net) in fact, solar cooling is nowadays possible and reliable but a number of non-technological barriers hamper its large scale exploitation. Its main findings highlighted that:

- *The subject matter is quite innovative and people feel that they need both technical and financial guidance to approach it and adopt it*
- *Financial aid is one of the main preoccupations of potential users*
- *SC technologies should be included in financial incentive schemes (national and European)*
- *One important barrier with respect to the success of financial schemes is the bureaucratic approval procedure*
- *Demonstration of the technology plays a crucial role, even if it is just in one building of the community*
- *Successful introduction of solar technologies should have strong links with the government's overall climate change policies and environmental priorities*

This suggestion could be interesting to address the collection of further data to reach the widest range of users interested into solar cooling technology.

Other relevant projects that could be considered as references.

- *CLIMASOL project this project website contains useful information regarding solar cooling, the principles, strategies and techniques for reducing summer cooling loads. It also has a complete survey about all the different techniques related to solar air conditioning, as well as an in depth description of installations in Europe. The document exists in English and French on the website. For the Italian translation click here. For the Greek translation click here.*
- *SOLAIR This website explains the project objectives, the consortium of partners and the target groups of SOLAIR. It also contains a compilation and presentation of European best practice examples for increasing the share of solar cooling appliances throughout Europe. (National market analysis for solar air-conditioning systems).*

SOLARCOMBI+ This website provides a highlight of the project, its objectives and partners. The aim of this project is to take the newly commercially available small scale sorption chillers and identify and promote standardized Solar Combi+ systems for small applications: i.e. combined solar water and space heating and cooling up to a cooling load of 20 kW.

SCENARIO nº7 PRODUCER

Responsible Partner: TNO
Technology: THERMAL INSULATION

1. **Indication of a principal question of the scenario:**

[PUSH] A producer of innovative extra high insulating material (glass wool) wants to implement his product on the European market on a large scale. A comprehensive market investigation is needed in order to select the most successful markets. The innovative glass wool is especially developed for houses with pitched roofs, where the space under the rafter is used as living space. The success factor of the product is the fact that the material achieves a higher insulating value (lower

U-value) with the same thickness and for the same price than other insulating materials.

2. **List of queries / needed information:**

About the building typology:

GENERAL REMARK: These questions are different for each insulation material and application area of an insulation material. It will not be possible to include all data that could be of interest in the tool. Maybe we can help the user by making a wizard which helps him/her to define which information is needed (a first example for this is given in the annex).

Question: In which areas do they have a high percentage of dwellings with a pitched roof which is not yet insulated? And where do people use the space under the rafter / attic as a living space?

5. In the map you will need several filters:
    a. Percentage (and absolute number) of dwellings with pitched roof (probably this information is not available, maybe information if dwellings with a pitched roof are built in a certain region gives already enough information)
    b. Percentage (and absolute number) of dwellings without insulation in the roof (or insulation below a certain level, e.g. U>1 W/m2K). At the moment only the average U-value is available in the tool. We think this is not the only information needed.
    c. Percentage of dwellings where the attic (or space under the rafter) is used as a living space (probably this information is not available; maybe you can make an estimation).

    --> This results in a number of dwellings which are suitable for using the insulation material. For the producers it is interesting to know the characteristics of these dwellings (construction age, type of dwelling, etc.)

    REMARKS:
    Most of the information about building typology will be only available for the total building stock and not for subpopulations of the building stock (there is no relation between the different filters). Actually you would like to have information about the number of dwellings with a pitched roof without insulation, where the attic is used as living space. In the tool there will be the following filters:
    - the number of dwellings in the total building stock with a pitched roof
    - The percentage of dwellings without roof insulation.

    However, it could be that all dwellings with a pitched roof are not insulated; while on average for the region 30% of the roofs are not insulated (the other 70% of insulated roofs are of dwellings without a pitched roof). If this is the case the tool will give wrong information. We should make a remark about this in the tool.

About the climate:

Question: In which areas is it useful to insulate the roof of dwellings?

6. In the map you will need several filters:
7. For heating
    a. Heating degree days per area: in areas above a certain number of heating degree days it is useful to apply insulation material.
        REMARK: It will be difficult for stakeholders (especially producers) to decide what the minimum number of heating degree days for a useful application of insulating material is.

    b. U-value of existing building stock with a pitched roof / Percentage of dwellings with a pitched roof without insulation in the roof (or insulation below a certain level, e.g. U>1 W/m2K). In combination with the heating degree days this will show if there is potential for insulation.
        REMARK: it is difficult to decide when (at which values) there is potential

    c. Target U-value according to the building regulation (or regulation for the energy efficiency as a whole). We have to differentiate this in regulation for existing and for new dwellings. If there is tight regulation and there is a large percentage of dwellings without roof insulation, there is potential for insulation.
        REMARK: it is difficult to decide when (at which values) there is potential

8. For cooling (of less importance than heating):
    a. Cooling degree days per area
    b. U-value of existing building stock / Percentage of dwellings without insulation in the roof (or insulation below a certain level, e.g. U>1 W/m2K).
    c. Target U-value according to the building regulation (or regulation for the energy efficiency as a whole).
        REMARK: See the remarks for heating

<u>Interest in insulation:</u>

Question: In which regions are people interested to insulate their roof?

9. In the map you will need several filters:
    a. Financial incentives for insulation
        If people get an incentive they are probably more willing to invest in insulation (also because the payback time will be shorter).

    b. Percentage of income spent on energy use
        If people spent a big part of their income on energy use they are probably more willing to invest in insulation (the payback time is shorter). At the moment only the gas-/electricity price is included in the tool, but this aspect alone doesn't say anything.

c. Regulation regarding energy efficiency of dwellings
   If there is a lot of regulation about energy efficiency there is probably more attention for energy efficiency in a region and people are more willing to invest in insulation.

d. Attitude of people regarding energy efficiency
   If people care about energy efficiency they are probably more willing to invest in insulating their dwelling. This aspect is not yet included in the tool and will be difficult to include in future.

e. Economic climate in a region
   If there is a lot of economic growth and a low unemployment rate, people are probably more willing to invest in insulation.

f. The percentage of buildings that is renovated in the last years
   If renovation is popular, probably more people are willing to invest in insulation. This aspect is not yet included in the tool.

g. Ownership of the dwelling
   This aspect determines the target group for the insulation material producer. If the residents are the owners of the dwelling, he has to focus on them. If the residents only rent the dwelling, he has to focus on the housing corporation. This aspect is not yet included in the tool.

h. Probably there are more aspects that we forgot to mention here…

REMARK: it is difficult to set the boundaries for these aspects (when people are willing or not willing to invest). All these aspects together determine if people are willing to invest.

10. **Possible cross relations**

Not identified.

11. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?** To what extend the tool provides me with the required information?

The current version of the tool doesn't give enough detailed information about the building typology (in this case information about the type of roof, use of the attic, and presence of insulation material is needed). For each type of insulation material the building specific information needed will be a little bit different (i.e. in the case of cavity wall insulation information is needed about the percentage of dwellings with cavity walls, the percentage of cavity walls without insulation etc.). We think it is not possible to adapt the tool in a way that it will include all information possibly needed, but we can try to include the most commonly needed information (as far as this information is available for the different countries, i.e. there is probably no information about use of the attic, but we

can make a rough estimation for this). It would also be good if stakeholders can add their own information to the tool.

There is information available in the tool about climate, but it is difficult to define the boundaries for the different parameters. E.g. for the heating degree days it is not clear for the stakeholder at what number of heating degree days it will be useful to insulate the roof. This also depends on other aspects.

For the more social aspects (like economics, financial incentives etc.) the user needs to interpret himself how all these aspects have a positive or negative effect on the applicability of roof insulation. It is impossible to give a single objective answer to the user related on this topic (the user should define the boundaries himself).

GEOCLUSTERS: TESTING SCENARIO nº8

Technology: THERMAL INSULATION
Responsible Partner: IfS

Indication of a principal question of the scenario:
[PULL] The local authorities are going to renovate the council housing which is owned by the municipal government. Among the planned activities are thermal insulation of exterior walls and roofs. The local government is looking for the most cost-effective solutions.

List of queries / needed information:

General Remarks
In the UK, Municipalities such as Local Authorities generally represent a population of about 100,000 to 250,000 and their role of is generally to prioritise and target government funding support for social and refurbishment according to local needs, identify and contract with suppliers. Large cities contain several municipalities and set priorities for individual municipalities but may not be directly involved in local delivery (except for some flagship pilot projects such as Green Deal in Birmingham and RE:FIT in London.)

Municipalities often work in partnership with social landlords to align public, private and third sector sector funding streams and oversee implementation. For example the IfS works with a Municipality (Swale District Council) and Amicus Horizon to develop and deliver a community retrofit project for 270 homes of which 200 are managed by Amicus and the rest privately owned. As well as helping to align their funding with that of the energy efficiency obligation of a Utility, the IfS also obtained government funding to monitor, measure and evaluate the programme, and to disseminate the learning, identifying issues to be addressed and good practice for future community scale projects.

- ***What are the thermal insulation materials available on the local market?***

Yes – a wide range of options for the thermal insulation materials layer for walls, roofs and floors, with performance indicator and market potential

- ***What are the possible costs of the mentioned investment?***

Not available from model – it will depend on material and may reduce significantly with scale of investment. e.g. cavity wall insulation in the UK may cost around €600 for a three-bedroomed semi-detached home (Source: Energy Saving Trust).

- ***What would be the possible payback time?***

Not available from model – see suggestions under cross relations.

Payback periods for thermal insulation can be attractive, more so as energy prices are expected to continue to rise, e.g. cavity wall insulation for the above three-bedroomed semi-detached home in the UK may have an annual payback of around €170.
While payback may be estimated from predicted changes in U-value and energy consumption, actual performance varies from prediction (20% is common) at individual dwelling level, reflecting individual variations in dwellings, e.g. orientation, construction materials, prior levels of insulation and efficiency, quality of installation (e.g. thermal bridges) and tenant behaviour.
Payback calculations will be more reliable for an aggregated group of dwellings.

- ***What are the possible reductions in energy use per year?***

We can estimate performance of thermal insulation (and solar cooling technology). Reductions in energy use per year need separate calculation based on current average electricity and gas use and estimated efficiency increase

- ***What is the maintenance cost of available technologies possible to be adapted?***

Not available from model. Most thermal insulation should not need any significant maintenance for several decades, unless badly installed (thermal bridges, or gaps in insulation, are not uncommon).

- ***Will the operating costs be lower for local authorities only, or also for the current residents of the buildings?***

The model shows electricity/gas prices for household consumers along with disposable income, so the savings in energy costs can be estimated. *[Perhaps we can provide a simple calculator or a link to existing calculators?]*

In the UK, while some local authorities still manage social housing, most social housing have been outsourced, to be run by not-for-profit arms-length management organisations (ALMOs) such as registered social landlords (RSLs) and Housing Associations. In some cases these are managed by the residents.

The beneficiary of investment depends on the business model used, but savings are targeted primarily at residents, and in some cases investors, rather than local authorities. Where energy bills are included in rents the local authority / ALMO costs can be aggregated

[NB: National government also seeks to make indirect savings through the reduced investment needed in energy infrastructure as more efficient homes use less energy.]

- ***Are any financial incentives available for the local governments planning to invest in energy efficiency of their properties?***

Financial incentives are not available from the model; however some EU member states there are government incentives for energy efficiency and renewables. In the UK for example

  - **Energy Companies Obligation** (ECO) energy efficiency scheme, which places obligations on energy utilities to deliver retrofit targets. All the benefits go to the residents
  - **Green loans,** such as the UK Green Deal, to enable occupants to borrow to make energy saving improvements to their property and pay the money back via instalments through electricity bills. The UK scheme provides for an assessment, applying for cash-back and choosing the green deal provider.
  - **Direct investment** where investors will share the savings with the residents,
  - **Local Authority schemes** are often available and will vary between countries and municipalities, e.g. for Tower Hamlets- East End Energy Savers and Tower Hamlets Energy-Community Power, London Warm Zone, MRA Energy Efficiency Scheme (for council tenants)

[NB Thermal insulation is often carried out together with installation of renewables such as solar PV, or more efficient district heating schemes, which can provide an additional financial incentive and improve overall viability. Several EU national schemes provide incentives including *feed-in tariff*s for 'self-produced' electricity. The schemes vary from country to country and from year to year, and can depend on the amount produced. Typical prices range from 0.1 €/kWh to 0.6 €/kWh]

Required indicators:

Cost of available technologies

Currently not available from the tool, and will be dependent on current markets, location and installation costs. Thermal insulation is generally a light and bulky material so transportation costs over long distances may be significant. The best option may be a simple categorization of material cost to give specific required performance data for a given region.

- ***Financial incentives presence***

Not available from model, and vary across countries and in time. However this is a very important indicator - financial incentives are needed to stimulate demand, develop the market and reduce costs as volumes increase.

- ***Specification of particular technologies available on the local market: effectiveness, estimated payback time, estimated maintenance cost etc.***

Data available for thermal insulation potential of technology available, no data on effectiveness, estimated payback time, estimated cost etc.

Possible cross relations

The main needs for municipalities are, in addition to better understanding the available materials for thermal insulation.

(i) identify potential costs and savings and enable estimates of payback period for retrofit on different building stock owned by the municipality and its partners e.g. ALMOs;
(ii) target specific areas of need (e.g. poor housing with low insulation or high U-values) and fuel poverty (low income and high energy need);

Cross relations would be of value between the following:

a. Electricity/gas prices and annual energy consumption (related to heating needs and indicating current total costs);

b. Installation costs (labour costs and if possible, estimate of material costs – perhaps as a simple fraction of total cost?);

c. Financial incentives;

d. Efficiency gains in performance (reduction in energy use through thermal insulation, based on current and projected U value's for existing walls, floors and roofs,

Carbon reduction may be a specific local authority target (determined from reductions in amount of energy use and source of energy for heating (gas, coal, oil, renewables)).

How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)? *To what extend the tool provides me with the required information? (to be completed by the responsible partner after the testing process)*

The tool provides an introduction to what is available, and the visual GIS-based presentation is potentially very useful, with functions allowing identification of technology and market potential of different thermal insulation measures.

An important use could be to relate performance to cost and payback times and to understand and address where the needs are strongest in sufficient detail (see previous section).

Barriers to using the tool on the above scenario are lack of data and layers to assess the costs/impacts of renovating council housing. More precise building stock data e.g. U values and energy performance measures such as SAP ratings (Standard Assessment Procedure) which provide energy use for unit floor area). Energy use data may be available at dwelling level for social housing landlords but can be difficult to collect and subject to data protection and privacy issues).

SCENARIO nº9 BUILDING OWNER

Responsible Partner: E2BA
Technology: THERMAL INSULATION

1. **Indication of a principal question of the scenario:**
   [PULL] An owner of terraced house is going to reduce the heat losses in his house with the thermal insulation application. As his property is placed in a row of identical houses, he is obliged to maintain its exterior design. The building owner is looking for thermal insulation that will not influence the external appearance of house.

2. **List of queries / needed information:**
   Is any thermal insulation available on the local market that can be implemented in the interior spaces?
   What is the possible cost of the investment?
   What is the expected payback time?
   What will be the reduction in energy costs after the thermal insulation application?
   What will be the reduction in carbon dioxide emission?

I would not focus on the existence/absence of solutions but rather on their types/features. Also, if I were the owner of the terraced house I would not restrict my search to the "local market" because in today's world all sorts of products can be purchased online/shipped from worldwide. From my point of view, the query "are any thermal insulations available on the local market that can be implemented in the interior spaces?" should hence be replaced by "what types of insulation can be applied to interior spaces?"

In addition, I believe the query "what will be the reduction in energy costs?" should be replaced by "what will be the reduction in energy consumption?" and the question "what will be the reduction in carbon dioxide emission?" removed from our list. Indeed, by knowing *energy consumption* one can easily calculate *energy costs* and *CO2 emissions*.

Also, we could also add to our list of queries:

- Are there any financial incentives that I could benefit from?
- Are there any legal restrictions on how the insulation process is carried out?

Required indicators:

12. Type of available interior thermal insulations
13. Cost of available interior thermal insulation
14. Specification of particular technologies available on the local market: effectiveness in CO2 and heat losses reduction, estimated payback time, estimated maintenance cost etc.

If I were the owner of the terraced house I would most probably list down all the products that I could use to insulate interior spaces and then, for each product, try to answer the following questions (easily converted into indicators):

- Where can I find/purchase this product?
- What is the product's efficiency/potential in terms of U-values?
- How costly would the installation be?
- What is the lifetime of this product?
- Does this product also reduce noise pollution?
- Are there any maintenance considerations?
- How much room size could I possibly lose?

- Can I apply/install the product myself or does it require professional expertise?
- How long does the installation process take?
- Once insulated, will I need to upgrade the ventilation system (due to lower degree of natural ventilation)?

3. **Possible cross relations**
   Not identified.

4. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?**

I believe the mapping tool (as it is now) would not satisfy many of the needs addressed in this specific scenario because, even though the tool lists several technologies, it does not indicate whether these solutions are available on the local market nor presents their specifications (efficiency, cost, lifetime, etc.). To me, even if specifications are decided to be kept away from the tool, technologies should be sorted out into "interior" and "exterior".

SCENARIO nº10 ESCO

Responsible Partner: BBRI
Technology: THERMAL INSULATION

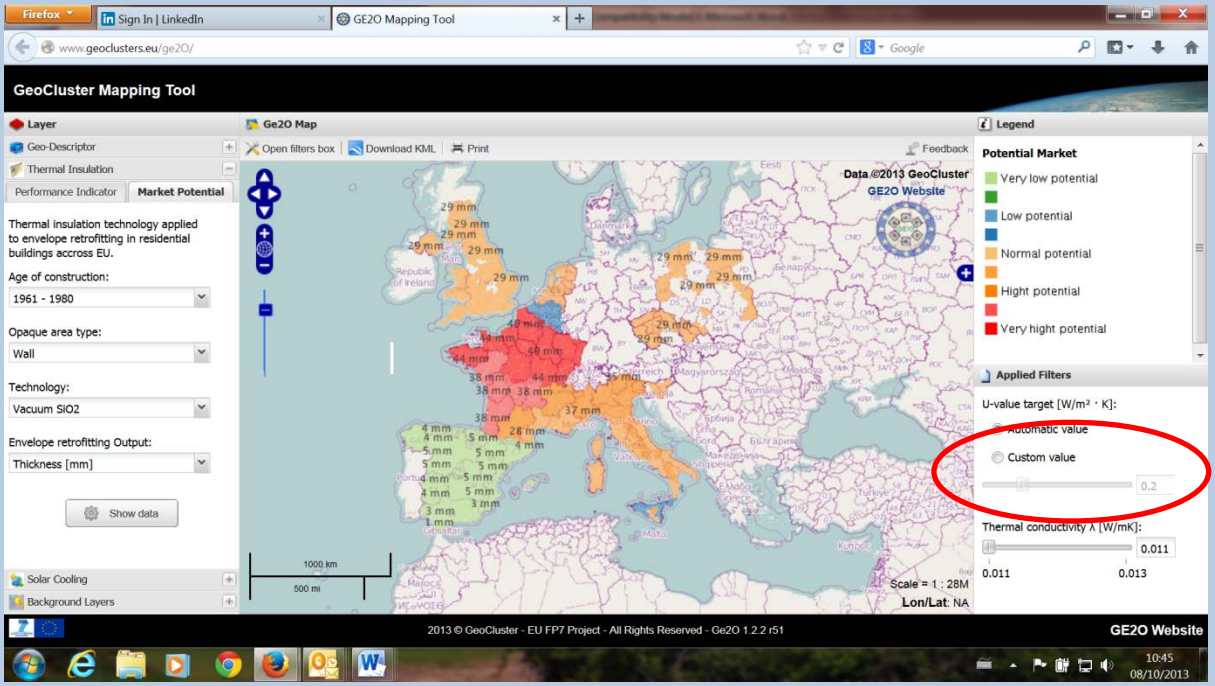
1. **Indication of a principal question of the scenario:**
   [PULL] An ESCO company was invited to cooperation by individual investor who is going to renovate his house and would like to reduce the holistic energy cost of the building at the same time. The building owner is not looking for ambitious goals and advanced technologies as it would be his first investment in energy efficiency solutions. He is thinking about the exchange of elevation in order to upgrade building's market value. It seems that the best solution for ESCO client would be thermal insulation. In order to satisfy clients expectation and to guarantee the commercial profits for ESCO (benefits from the energy savings), an outstandingly effective thermal insulation is needed. The cost of investment is not an issue due to the innovative financing methods delivered by ESCO.
2. **List of queries / needed information:**
   - What is the most effective thermal insulation available on the local market?
   - What is the payback time in case of identified solution?
   - What is the size of energy saved possible to be gained with the used of the solution identified?
   - What are the targets U-values in this particular area?
3. **Required indicators:**
   - Target U-values
   - Reduction in heat losses of particular thermal insulation materials
   - Reduction of CO2 emissions in case of particular insulation materials
   - Payback time
4. **Possible cross relations**
   Not identified.

What is the most effective thermal insulation available on the local market?

We suppose that the concerned region is the Walloon region in Belgium and that the house to renovate has been built in the early sixties.

To choose the most effective thermal insulation, ESCO can compare the lambda values of the different insulation materials in the database. A simple table is not available in the system, but it is possible to find this information by different trials (changing the technology and looking at the lambda). By doing this, he finds the vacuum SIO2 as the most effective. The price being not an issue in this case, he wants to choose this technology.

Data specific to a region are not available: it is not possible to check if this technology is available on the Belgian market.



What is the payback time in case of identified solution?
Not available from the model. You can find on the tool economic data from a general level but not specific to one project in particular. To evaluate a payback time needs precise data about initial cost, energy savings and incentives… at the specific level of the house.

What is the size of energy saved possible to be gained with the used of the solution identified?
Same answer as before. This tool is not calculation software.

What are the targets U-values in this particular area?
Normally, it is possible to have the target U-value in the case of renovation

How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)? To what extend the tool provides me with the required information?
The tool is no use in this scenario, as it concerns the renovation of a specific building. The tool gives a lot of data at regional level, but cannot be used as calculation software for a specific renovation work.

SCENARIO nº11 MARKET RESEARCHER PARTICIPATING IN EUROPEAN PROJECT

Responsible Partner: ASM
Technology: THERMAL INSULATION

1. **Indication of a principal question of the scenario:**
   [PUSH] A market researcher participating in a large European project aimed to exploit the developed innovative thermal insulation material on European market is responsible for the investigation of the market potential of the developed solution. The researcher is obliged to verify the market opportunities for the invented thermal insulation and select the most promising markets.

2. **List of queries / needed information:**
   Is the developed solution in accordance with the existing law regulations?
   Does the developed solution correspond to existing trends among the potential investors?
   What are the actors participating in the decision-making process of investing in thermal insulation?
   What is the attitude towards energy efficient solutions of Europeans taking into account their country of residence, age, sex, position occupied, salary etc. – who are the potential buyers?
      Are people prone to invest money in solutions which are more eco but more expensive at the same time?
      Can we observe a growing interest in European society in the problems of the impact of human activities on the environment?
   What are the key drivers when applying energy efficiency solutions – commercial and/or non-commercial?

3. **Required indicators:**
   Law regulations referring to thermal insulation presence/absence
   Financial incentives that might boost the level of investments in thermal insulation solutions
   People awareness of environmental issues
   Average income in particular areas
   Competitive thermal insulation systems available on the market – their cost and effectiveness

4. **Possible cross relations**
   Not identified.

5. **How the GE2O mapping tool satisfy my needs as a potential user (according to the guidelines given above)?** To what extend the tool provides me with the required information? *(to be completed by the responsible partner after the testing process)*

   Despite the fact that the tool is able to provide the user with some socio-economic data allowing for assessment of the market potential (gas/electricity prices, households' income) and markets' size (residential-single, residential-apartment flats), the information describing more ***'softer' issues like potential investors' awareness/attitudes towards innovative construction materials is lacking.*** *The mentioned issues are very important aspects of market potential analysis – pure statistical data is not enough to assess the market potential in a*

comprehensive way. There is no doubt that such data might be difficult to be presented with the tool, however, some links redirecting to the available reports/analysis dealing with mentioned issues might be useful (e.g. sources of Eurobarometer, European Social Surveys and etc.). Apart from those softer issues, the tool might be updated with some statistical data which might support the decision on the most promising markets' selection – ***'building permits'*** *and* ***'import value/import quantity'*** *(indicators described briefly in document: ASM's feedback…)*

From marketing point of view also the ***information referring to the existing market competitors would be required.*** *The ideal situation would be if we can identify the market competitors operating in particular areas and if a range of their offer might be investigated by the tool's users. Of course it would be enormous work to gather such information so the best solution would be if the mentioned data is delivered to the tool and updated by market players on their own. That would be possible only on condition that the fact of being included into the tool would be prestigious and (or) beneficial for manufacturers - only further stages of the GE20 tool are likely to have such functionality.*

Summing up, more socio-economic data included in the tool are recommended in order to guarantee a multidisciplinary approach and greater impact.

4. General conclusions and main findings

According with Task 3.2' objectives, two activities have been planned and developed during the project. The most part of these activities have been translated (temporally) at the end of the project time, to work with and advanced version of the tool. This has given a more tight vision on the results at the end of the project but also a short time for refinement activities. In that sense, the conclusions compiled in this chapter, explained what kind of comments have been implemented in the project framework and those which are defined as future needed developments with different levels of interest/urgency.

Free use of the tool exercise have shown the most part of use or data errors while Scenarios exercise have introduced the most part of future needed developments, as it will be explained, most of them related with the necessity of providing a closer approach to real market and regional specificities.

One case study was expected for each pilot cluster. At the end 11 have been performed, allowing identifying how far existing data of the tool could answer to specific queries according with different users common/ habitual needs.

It must be said that a big cooperation of all partners is reflected in the work done. Differences between countries is also a benefit for the project but also a proof of the complexity and ambitious objectives settled for the GE2O project and the **great difficulty involved on data management when reflecting a wide range of spatial realities.**

The most positive aspects, as a general common conclusion, refers that the tool is valuated as a **nice and user friendly system**. The general first impression is positive. There is a wide agreement about the relevance and quality of **climate data**, which is very well valued by most part of participants.

However, the **actual level of development of the tool is not enough to show the full potential of the tool.** The lack of some key information makes it not possible to achieve now a complete scenario and the tool seems quite far from application in real situations. Also is considered that the tool should provide more close answers as it is now requiring a high level of user expertise to build their own information. Anyway, the tool gives that opportunity what is considered of great usefulness.

Comments of partners could be grouped in three categories: corrections and errors; future data needs and future exploitation needs.

At the end of the chapter there is a reflexion on the proof of *geocluster concept* it shelf. *It is useful for European Energy Efficiency Policies development? It is demanded by stakeholders?*

Next chapter shows all this conclusions in a matrix of SWOT analysis.

4.1 Project framework implementations

In October 2013 results were presented to DAPP in order to introduce as many corrections as possible during the project period. As a resume, based on most repeated answers, the **refinement of the tool on the short term** (before the end of the project) has included next issues:

- Technical problems and data loading speed
- Missing data for some NUTs or errors in boundaries

- Formulas: units; presentation of absolute or relative data

Other developments, new formula and indicators were under debate within the consortium**. One of the main agreements was to solve all identified errors before including new data**, but also some new improvements were accepted as they were considered achievable on time and valuable for the project conclusion:

- Downloads possibilities: .pdf; .jpeg; .tif …
- User manual (as a project result included in WP4) and in general, to work in the extension of tips and explanations
- Inclusion of the clusters identified in Del 2.1.
- Inclusion of the list of all technologies identified by the project and described in the DEL 2.2., with a brief description of each one.
- Financial incentive indicators must be implemented before the end of the project. As it was done for regulation indicator, a link with the BPIE project can be established (Financial instruments) at least for the pilot technologies.

Furthermore, **cost is considered a critical element in supporting decisions and is considered underdeveloped during the project time framework**. After valuating different alternatives, it has been taken the **decision on developing some technical maps reflecting cost analysis of the two pilot technologies (solar cooling and thermal insulation) and they were developed in the short term and were included in the mapping tool.**

4.2 Future data needs

As detected by partners involved other indicators are considered priority relevant for the future routes of tool development. Financial incentives, costs and legal framework, considered critical are explained separately:

- More combination of parameters & indicators and correlated data are missing
- Extension to all European countries data is essential.
- Parameters related to rain in climate data would be interesting
- More precise building stock data e.g. U values and energy performance measures such as SAP ratings (Standard Assessment Procedure) are considered of importance. There is perceived a lack of detail and precision on constructive elements.
- Data on types of roofs (e.g. flat roofs) and types of walls (e.g. cavity walls) could be interesting; maybe also green roofs and even facades.
- It would be worthy to complete the tool with 'Building permits' indicator. Values of the mentioned indicator might influence future markets' size as it might be used as a market potential indicator as it allows for estimating future trends in construction sector. The indicator is updated on a regular basis in case of the whole European Union and available at EUROSTAT statistics databases (buildings permits – percentage change; building permits - 2010=100). The number of permits given in particular countries is usually published by the national statistical offices.
- MARKET ORIENTATION: It would be beneficial if the tool is developed further in a marketing direction - more detailed possibilities for market potential analysis would be required.
- Correlation on technology performance and national regulation is missed.
- A mayor number of tips to go on with the most innovative solutions is needed.
- Another indicator allowing for estimation of success on particular markets of any technologies/products is 'Import value/import quantity' of particular materials/products in

particular countries. The mentioned indicator indirectly indicates the potential of particular areas/countries – the bigger import, the bigger demand of reporting country. National import data is available at EU Export Helpdesk: http://exporthelp.europa.eu/thdapp/display.htm?page=st%2fst_Statistics.html&docType=main&languageId=en

Financial incentives, costs and legal framework:

As it was proved on Scenarios Exercise, all users in different situations considered critical for their queries in case studies COSTS ANALYSIS, FINANCIAL INCENTIVES & LEGAL FRAMEWORK. When this information will be present the approach to local specific market will be better.

Cost was not available in the tool when the exercise was realized. Further development of technical maps based on tools are been developed before the end of the project and the final version of the tool (Dec 2013). Anyway is a key issue that should be further developed and that will be dependent on current markets, location, and installation and maintenance costs. Information on payback periods should come from cross related data and is also very important to exploit the real potential of the tool.

Financial incentives are not yet available from model (several proposals have been done by partners to deal with the difficulty of providing living and actualized data). These incentives will vary across countries and in time. However this is a very important indicator. Financial incentives are considered critical as they are needed to stimulate demand, develop the market and reduce costs as volumes increase.

From the point of view of the Legal Framework there is a connection with Building Technical Codes for the countries included in the map till now. A wider correlation of this information and the performance of the technologies is needed.

4.3 Future exploitation needs

These comments were discussed in connection with exploitation of the project activities (WP5). Here are presented as questions as they are not already solved and depending on agreements out of the project framework. If the reader is interested should complete this information on WP5 project public results as different answers should come from different exploitation routes:

- Which will be the mechanisms for maintaining and updating data?

- As including costs references (investment, maintenance, exploitation, labour cost…) will be a key issue in future development, it is possible to implement this information keeping the tool independency and exactitude without a direct participation of producers? Financial criteria will have to be included if we want to highlight the importance of life cycle cost analysis.

- How it would be possible to refine the real applicability of each technology in each country? A filter showing only applicable technology in a region could be an added value, because no all technologies are applicable in all regions due to different ways of construction

- Is it possible to implement the tool at lower level (local level)?

- How could we deal with external stakeholder's participation providing a high quality control on data?

- Integration with other GIS tools – how easy would it be for users to add other layers or integrate with other GIS tools?

4.4 Conclusions on the proof of concept of the *GEOCLUSTER CONCEPT*

Firstly introduced by E2BA in its "Scope and Vision" document, Geo-clusters are virtual trans-national areas where strong similarities are found in terms of climate, culture and behaviour, construction typologies, economy, energy price and policies, gross domestic product…..

There is understood that innovation will be the key for sustainable development and competitiveness of the regions, amplifying resources productivity. In that sense, Geo-clusters definition will support the definition of a coherent set of solutions in energy efficiency technologies for buildings, tackling both technological and non-technological barriers and maximising the business potentials. In that context, geoclustering, as a scientific analysis methodology, offers a holistic perspective and knowledge.

The GE2O project aimed to proof the concept of surfacing integrated regions by considering multiple technological and non-technological factors as climatic conditions, main socio-economic and political references providing information about how and where to introduce energy efficiency technologies in the most suitable and productive way.

It could be said that testing the tool both internally (consortium partners) and externally (stakeholders invited to participate in workshops, interviews and surveys) have reinforce the importance of this concept.

When using GE2O tool there is a general and very repeated comment: MORE PRECISE APPROACH TO REAL MARKET IS NEEDED. And what involves "real market" perception? A deep knowledge on specificities and differences of each territory as it is demanded by tool users for their decision support.

5. SWOT analysis of main findings

Free use of the tool and study cases performed of the pilot cases have been analysed in a matrix of **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats. Even not being the usual procedure for this technic, for the project objectives has been added a temporal perspective, considering Strengths and Weaknesses about the present situation of the tool (prototype development and proved concept) and Opportunities and Threats reflects future needs and tool potential, in line with conclusion explanations given in Chapter 4.

	Positive (for the objective)	Negative (for the objective)
PRESENT SITUATION	**STRENGTHS (S)** User-friendly visual tool with intuitive operation Provision of extensive climate data Flexibility to develop user's own queries, with adjustable parameter searches Professional experience and knowledge provided by consortium partners from complementary organisations in a wide range of countries General agreement on the perceived potential for market development Errors and corrections completed within project time.	**WEAKNESSES (W)** Final version is still a prototype. Several EU countries with significant market opportunities are missing Existing information doesn´t yet reflect the real market conditions or regional/national specificities for some of the layers. Key indicators are missing: financial incentives; cost analysis and LCA data; legal framework. High level of expertise is required to interpret information
FUTURE EXPECTATIONS	**OPPORTUNITIES (O)** The project proves the importance and usefulness of aggregating technical information across Europe. The tool could be developed and implemented for a wider range of technological and socio-economic variables Further requirements of potential users could be included	**THREATS (T)** Great difficulty involved on data management when reflecting a wide range of regional/national realities. Quality control & Independence of the tool (technical rigour)