D7.4 ECF4CLIM digital platform - Module 2 Simulators space

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Version	1.0

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WHO WE ARE

The ECF consortium consists of ten partners. The project is coordinated by Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas-CIEMAT.

Name	Country	Logo
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas CIEMAT	ES	
Instituto Superior Técnico. University of Lisbon. IST	PT	
Universidad de Sevilla USE	ES	
University of Jyväskylä JYU	FI	
Universitat Autònoma de Barcelona UAB	ES	
Meda Research Ltd MedaResearch	RO	
Instituto de Soldadura e Qualidade ISQ	PT	
Trebag Szellemi Tulajdon Es Projektmenedzser Korlatolt Felelossegu Tarsasag TREBAG	HU	

Smartwatt Energy Services SA Smartwatt	PT	SMARTWATT
Que Technologies Kefalaiouchiki Etaireia QUE	GR	

About the Project

Through a multidisciplinary, transdisciplinary and participatory process, ECF4CLIM develops, tests and validates a European Competence Framework (ECF) for transformational change, which will empower the educational community to take action against climate change and towards sustainable development.

Applying a novel hybrid participatory approach, rooted in participatory action research and citizen science, ECF4CLIM co-designs the ECF in selected schools and universities, by: 1) elaborating an initial ECF, supported by crowdsourcing of ideas and analysis of existing ECFs; 2) establishing the baseline of individual and collective competences, as well as environmental performance indicators; 3) implementing practical, replicable and context adapted technical, behavioural, and organisational interventions that foster the acquisition of competences; 4) evaluating the ability of the interventions to strengthen sustainability competences and environmental performance; and 5) validating the ECF.

The proposed ECF is unique in that it encompasses the interacting STEM-related, digital and social competences, and systematically explores individual, organisational and institutional factors that enable or constrain the desired change. The novel hybrid participatory approach provides the broad educational community with: an ECF adaptable to a range of settings; new ways of collaboration between public, private and third-sector bodies; and innovative organisational models of engagement and action for sustainability (Sustainability Competence Teams and Committees).

To encourage learning-by-doing, several novel tools will be co-designed with and made available to citizens, including a digital platform for crowdsourcing, IoT solutions for real-time monitoring of selected parameters, and a digital learning space. Participation of various SMEs in the consortium maximises the broad adoption and applicability of the ECF for the required transformational change towards sustainability.

LEGAL NOTICE

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1. Executive Summary

The following document – deliverable D7.4 – belongs to task 7.3 of ECF4CLIM project.

The document contains a description about the different tools that are part of the Simulators Space of the ECF4CLIM digital platform, comprising the footprint calculator, retrofitting toolkit and sustainability interventions evaluation. It is provided a detailed description of the type of users, required inputs and results that will be displayed in the digital platform. The current state of implementation is detailed as well as the following steps to be carried out.

At the current stage, the tools provided by CIEMAT are now available in the digital platform in a downloadable format. The Microsoft Power Apps developed by USE is also accessible through the platform, as well as a complementary tool for building sustainable energy consumption evaluation. All the required software developments will continue to be undertaken to fully integrate these tools in the ECF4CLIM digital platform environment.

ECF4CLIM Project has been funded by the European Commission under the H2020-European Green Deal Call, under the grant agreement no. 101036505.

2. Architecture overview

As stated in chapter 5 of deliverable D7.2–Digital Platform, the Simulators Space will follow an architecture as represented in Figure 1.

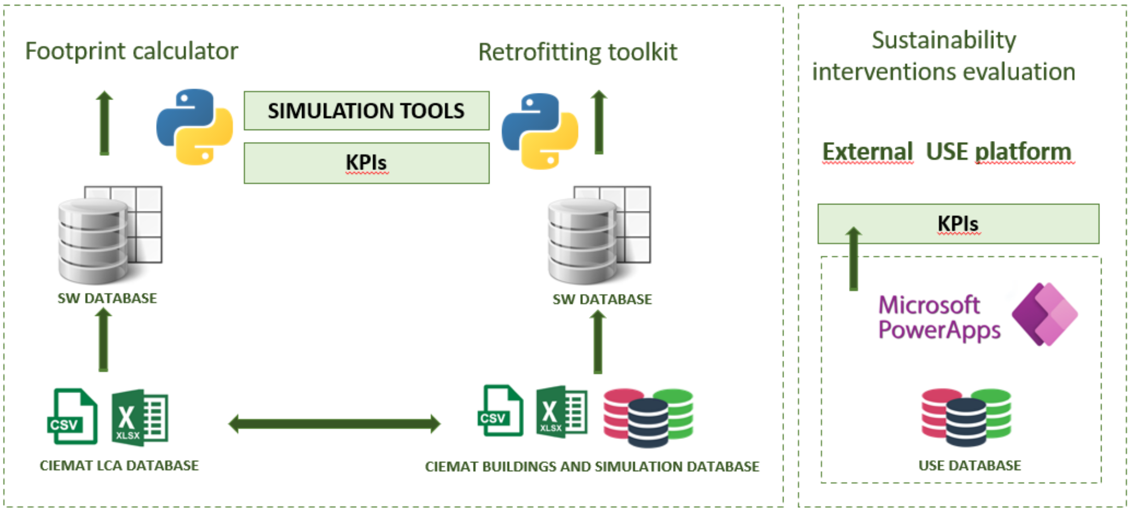


Figure 1 - Overview of the Simulators Space

The simulators space has three main components:

- Environmental footprint calculator
- Retrofitting Toolkit
- Sustainability Interventions Evaluation

For the Environmental footprint calculator and retrofitting toolkit, Smartwatt will have a dedicated database containing all the information collected and provided by CIEMAT. This information is necessary to enable users to make simulations. All the necessary calculations and simulations will be integrated by Smartwatt on the backend layer using technologies such as Python. The user's entry point of information for the simulations will be the Digital Platform, which will be used to display all the results and allow the users to introduce different inputs in the tools. This platform is a web-based application developed using state of the art technologies such as HTML5 and JavaScript.

3. Environmental footprint calculator

In this section the main functionalities of the environmental footprint calculator are described.

The environmental footprint calculator's users will be able to assess performance in terms of the main environmental impacts. The results obtained will enable to self-assess their performance by identifying critical points and environmental potential of improvement.

Users

The environmental footprint calculator will have two different types of users:

- school representatives/managers, personnel, and staff
- school users (individuals and/or families): students, teachers, personnel, etc.

Digital Platform will ensure the users only see the information according to each type of user.

The first type of users will have a board to introduce information about school, as illustrated in Figure 2. This image is based in the CIEMAT demo and can be slightly different in the final version, even though containing the same information.

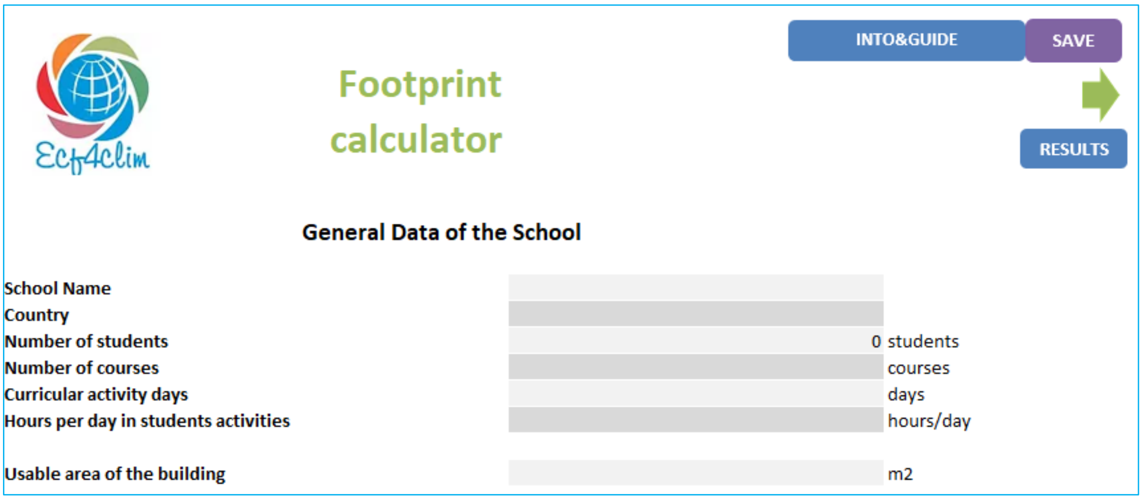


Figure 2 – School user information input

The individual users will have to choose between two options/scopes:

- School System: school and students
    - calculate environmental footprint associated to the school, leaning/teaching activities and collective mobility behavior
- School User: school and home
    - calculate environmental footprint of individuals also including home consumption and results from the user's school obtained from the School System environmental footprint calculator (if available).

For the first option they will also have a board to fill with the corresponding information (Figure 3).

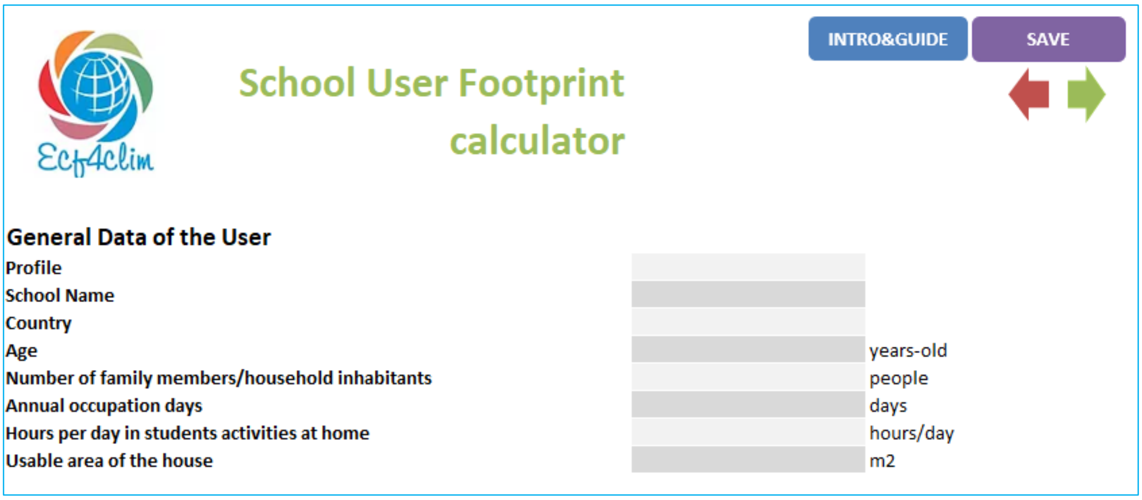


Figure 3 – School and home user information input

Input information

The platform will have different hyperlinks to different three subsystems. Each subsystem will have a connection to the correspondent activities:

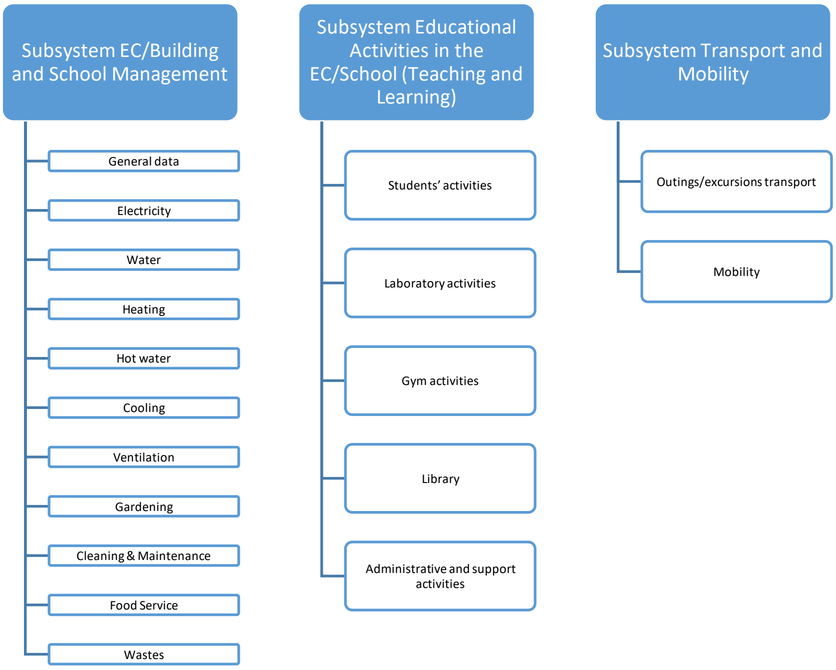


Figure 4 – Subsystems and activities considered to input information

In each of these activities the user will be asked to input their own information. Based on that information, the footprint will be calculated. Figure 5 illustrates the necessary information for the *Heating* activity.

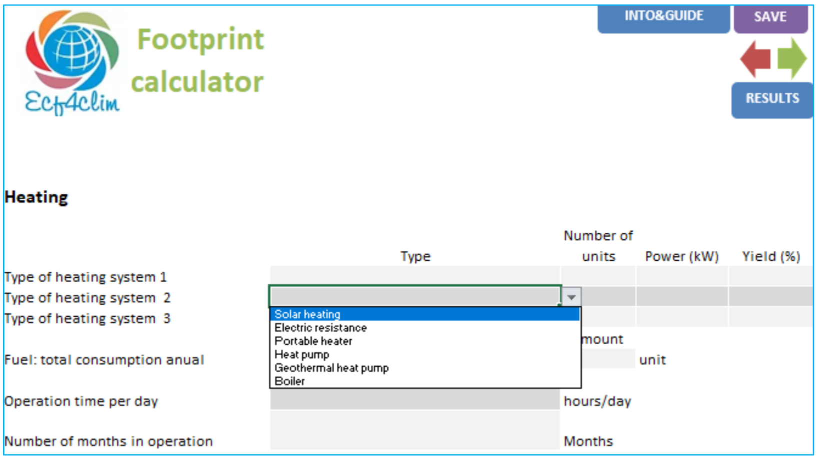
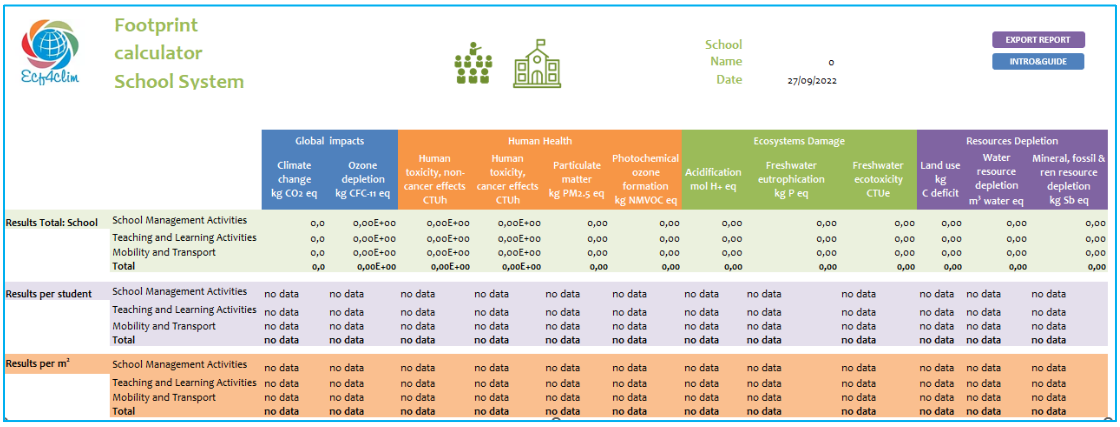


Figure 5 – Example of input structure for Heating activity

Results

After the users input all the information, results will be shown in different formats namely tables and graphs, as represented in Figure 6 and 7.



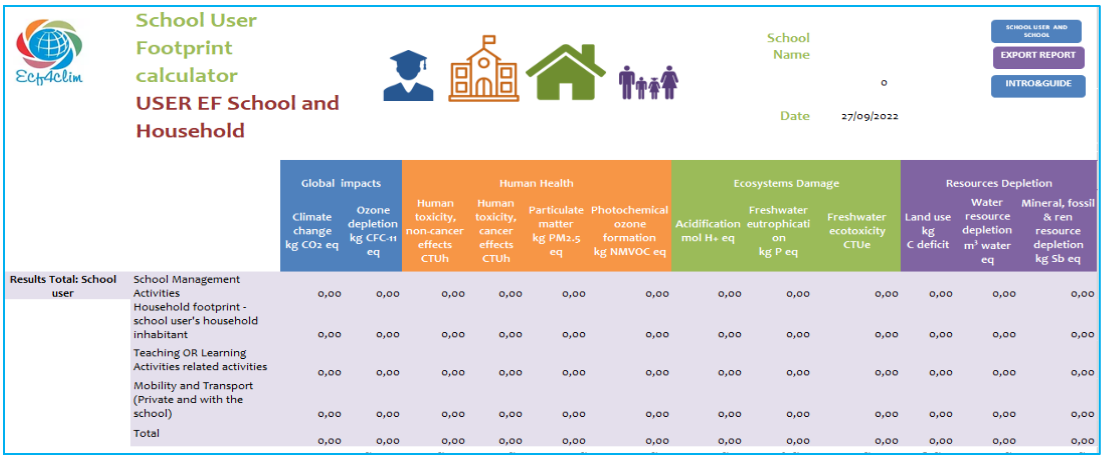
Footprint calculator School System

School Name: 0
Date: 27/09/2022

EXPORT REPORT
INTRO&GUIDE

		Global impacts		Human Health				Ecosystems Damage			Resources Depletion		
		Climate change kg CO2 eq	Ozone depletion kg CFC-11 eq	Human toxicity, non-cancer effects CTUh	Human toxicity, cancer effects CTUh	Particulate matter kg PM2.5 eq	Photochemical ozone formation kg NMVOC eq	Acidification mol H+ eq	Freshwater eutrophication kg P eq	Freshwater ecotoxicity CTUe	Land use kg C deficit	Water resource depletion m³ water eq	Mineral, fossil & ren resource depletion kg Sb eq
Results Total: School	School Management Activities	0,0	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Teaching and Learning Activities	0,0	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Mobility and Transport	0,0	0,00E+00	0,00E+00	0,00E+00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Total	**0,0**	**0,00E+00**	**0,00E+00**	**0,00E+00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
Results per student	School Management Activities	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
	Teaching and Learning Activities	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
	Mobility and Transport	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
	Total	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**
Results per m²	School Management Activities	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
	Teaching and Learning Activities	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
	Mobility and Transport	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
	Total	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**	**no data**

Figure 6 – Example of tabular results representation, for school users.



School User Footprint calculator USER EF School and Household

School Name: 0
Date: 27/09/2022

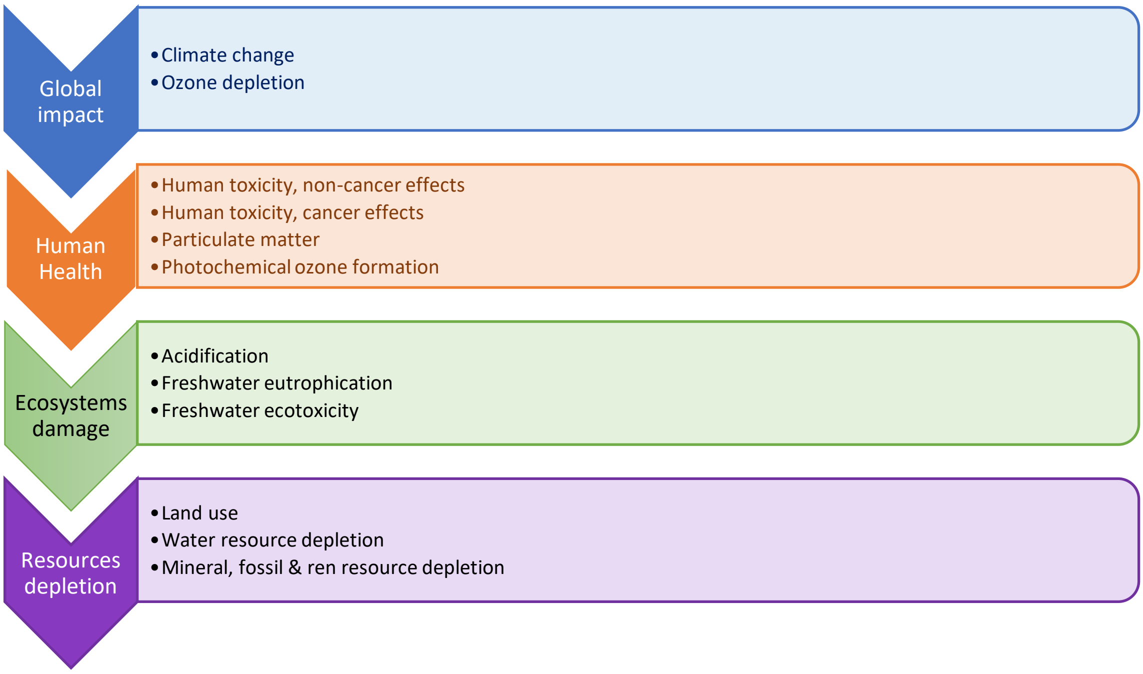
SCHOOL USER AND SCHOOL
EXPORT REPORT
INTRO&GUIDE

		Global impacts		Human Health				Ecosystems Damage			Resources Depletion		
		Climate change kg CO2 eq	Ozone depletion kg CFC-11 eq	Human toxicity, non-cancer effects CTUh	Human toxicity, cancer effects CTUh	Particulate matter kg PM2.5 eq	Photochemical ozone formation kg NMVOC eq	Acidification mol H+ eq	Freshwater eutrophication kg P eq	Freshwater ecotoxicity CTUe	Land use kg C deficit	Water resource depletion m³ water eq	Mineral, fossil & ren resource depletion kg Sb eq
Results Total: School user	School Management Activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Household footprint - school user's household inhabitant	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Teaching OR Learning Activities related activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Mobility and Transport (Private and with the school)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Figure 7– Example of tabular results representation, for school users (individuals and/or families)

The final version in the digital platform may be different, but always respecting the expected outputs.

The results will be organized according to a set of environmental impact factors:



This analysis, according to the key impact factors, will be presented for each of the subsystem described in Figure 4.

Also mention that the results will be displayed for different levels/ units of analysis, that may vary according to the subsystem and type of user. For school users (individuals and/or families) the impact will be present per school user and inhabitant and for school system users the results will be presented per school, per student and usable m^2 (Figure 6).

4. Retrofitting Toolkit

The main functionalities of the Retrofitting toolkit are described in this section. The digital platform will have available two different tools:

- Maps for building energy retrofitting proposals
- Dynamic building energy performance tool

The results obtained from these tools are very useful in the decision-making process to plan effective policies that consider the climate impact on the built environment of the selected schools and universities.

Maps for building energy retrofitting proposals

This tool is developed to provide climate and bioclimatic information, and it is carried out in three sections:

- Climate maps, showing static results for each climate input.
- Bioclimatic strategies adapted to the climate zone of the school, showing static results for each climate input.
- Heating and cooling estimation, showing dynamic results for each climate.

Users

This tool is available with the same level of access for all types of users: school managers, personnel, and school users (students, teachers, etc.).

Input information

The climate of an area can be characterized by analysing the most representative meteorological variables recorded over a long period of time in a specific area, generating a typical meteorological year (TMY). The TMY models the weather patterns and is used as input information to calculate the maps for building energy retrofitting. One of the most relevant climate files applied to energy calculations are developed by ASHRAE and provided by EnergyPlus (EPW). This EPW format is used as input file in this tool.

F	G	H	I	J	K	L	M	N	O
lour	Tout (ºC)	Tdew (ºC)	Igh (Wh/m2)	Ibn (Wh/m2)	Idh (Wh/m2)	RH (%)	Vw (m/s)	Dw (º)	Pr (Pa)
1	9,70	7,40	0,00	0,00	0,00	85,00	7,20	250,00	95700
2	9,70	6,90	0,00	0,00	0,00	82,00	7,40	250,00	95700
3	9,50	6,20	0,00	0,00	0,00	80,00	7,70	270,00	95700
4	9,20	5,40	0,00	0,00	0,00	77,00	7,20	270,00	95700
5	8,80	4,60	0,00	0,00	0,00	75,00	4,80	270,00	95700
6	8,30	3,70	0,00	0,00	0,00	73,00	2,40	270,00	95700
7	7,00	1,00	0,00	0,00	0,00	66,00	0,00	0,00	95700
8	7,30	1,10	0,00	0,00	0,00	65,00	1,70	0,00	95800
9	7,70	1,30	2,00	0,00	2,00	64,00	3,40	0,00	95900
10	8,00	1,40	20,00	0,00	20,00	63,00	5,10	290,00	96000
11	9,30	3,60	126,00	68,00	107,00	67,00	4,80	290,00	96000
12	10,70	5,50	263,00	268,00	164,00	70,00	4,40	290,00	95900
13	12,00	7,20	368,00	520,00	144,00	72,00	4,10	240,00	95900
14	12,20	5,70	352,00	415,00	167,00	65,00	3,80	240,00	95900
15	12,50	4,10	271,00	211,00	184,00	57,00	3,40	240,00	95800
16	12,70	2,30	152,00	32,00	142,00	49,00	3,10	240,00	95800
17	11,90	3,40	105,00	85,00	87,00	56,00	3,10	240,00	95800
18	11,00	4,40	20,00	0,00	20,00	63,00	3,10	240,00	95900
19	10,20	5,30	0,00	0,00	0,00	72,00	3,10	250,00	95900
20	10,00	4,00	0,00	0,00	0,00	66,00	0,00	0,00	95900
21	9,30	4,80	0,00	0,00	0,00	74,00	1,60	0,00	95900
22	8,60	4,50	0,00	0,00	0,00	76,00	3,30	0,00	95900
23	7,80	4,30	0,00	0,00	0,00	78,00	4,90	0,00	95900
24	7,10	4,00	0,00	0,00	0,00	80,00	6,60	0,00	95900
25	6,40	3,70	0,00	0,00	0,00	83,00	8,20	260,00	96000
26	6,20	4,10	0,00	0,00	0,00	87,00	6,80	260,00	95900
27	6,00	4,50	0,00	0,00	0,00	90,00	5,50	260,00	95900
28	5,80	4,90	0,00	0,00	0,00	94,00	4,10	160,00	95900
29	6,00	5,00	0,00	0,00	0,00	93,00	3,10	170,00	95900
30	5,70	5,00	0,00	0,00	0,00	95,00	2,60	170,00	95900
31	5,40	5,00	0,00	0,00	0,00	97,00	2,10	190,00	95800
32	5,90	5,60	0,00	0,00	0,00	98,00	2,10	190,00	95800
33	6,50	6,20	1,00	0,00	1,00	98,00	2,10	190,00	95800
34	7,00	6,70	20,00	0,00	20,00	98,00	2,10	190,00	95800
35	8,10	7,00	62,00	0,00	62,00	93,00	2,80	190,00	95800
36	9,30	7,30	98,00	0,00	98,00	87,00	3,40	190,00	95800
37	10,40	7,50	120,00	0,00	120,00	82,00	4,10	240,00	95700
38	10,90	7,40	125,00	0,00	125,00	79,00	4,10	240,00	95700
39	11,30	7,20	113,00	0,00	113,00	76,00	4,10	240,00	95600
40	11,80	7,00	84,00	0,00	84,00	72,00	4,10	240,00	95500
41	11,10	7,10	44,00	0,00	44,00	76,00	4,80	240,00	95500
42	10,50	7,20	7,00	0,00	7,00	80,00	5,50	240,00	95500

Figure 8– Example of EPW input climate file

The first step for users is the selection of the school location in order to identify the climate characteristics. This selection is applied to the three tool sections (climate maps, bioclimatic strategies and thermal estimation). Additionally, in the section 'Heating and cooling estimation' one more input is required. Users can select set point temperatures for both heating and cooling conditions in order to estimate the thermal necessities based on ambient conditions.

Results

The maps for building energy retrofitting's users will be able to assess performance in terms of the main climate trends as well as identify the most adapted bioclimatic measures to the ambient conditions. The results obtained will enable to self-assess their performance. This tool provides different analyses adapted to the schools' locations.

- Section Climate maps.

Evaluate the hourly distribution of the main climatic variables during the year, surface mappings must be developed. Three main variables are analysed: temperature, relative humidity and solar global radiation.

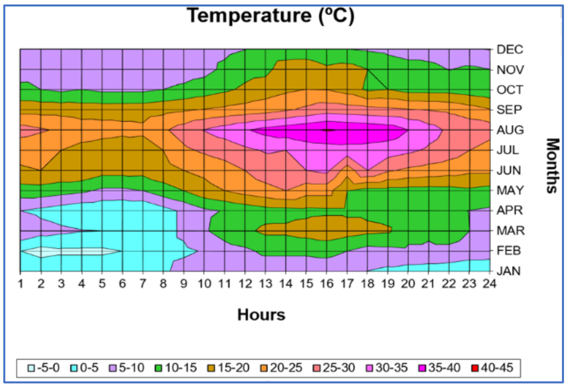


Figure 9 – Example of Temperature map

- Section Bioclimatic strategies adapted to climate.

A quantification of different passive bioclimatic strategies will be done in order to improve the thermal comfort conditions inside schools in different climate zones. Bioclimatic maps are defined to propose the potential strategies for an optimized thermal design based on human thermal requirements and local climatic conditions. These diagrams determine the comfort zone in relation to air temperature, humidity, solar radiation and wind speed. In this methodology the tool is applied to predict what strategies are needed to achieve the comfort sensation inside the schools: increase or decrease humidity, consider natural or mechanical ventilation, solar or conventional heating, including air conditioning, giving a particular importance to passive heating or cooling conditioning.

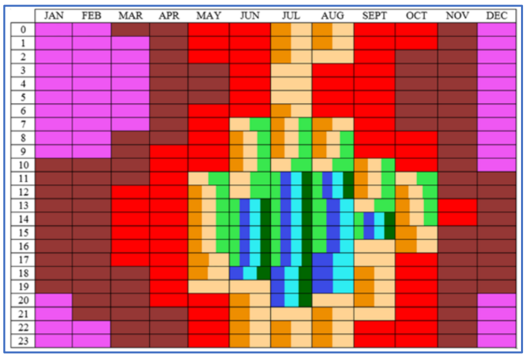


Figure 10– Example of bioclimatic strategies map

- Section Heating and cooling estimation.

The tool carried out a qualitative study to estimate how climate influence the requirements to thermal conditioning the schools using the Degree Days methodology. Heating Degree Days (HDD) and Cooling Degree Days (CDD) are the calculated variables representing how external temperature fluctuations affect thermal needs in schools, giving the “hourly degrees” required to achieve a comfortable indoor environment. Base indoor comfort temperatures are initially set to 22°C and 25°C in HDD and CDD, respectively. This set points can be adapted by users for each schools' requirements.

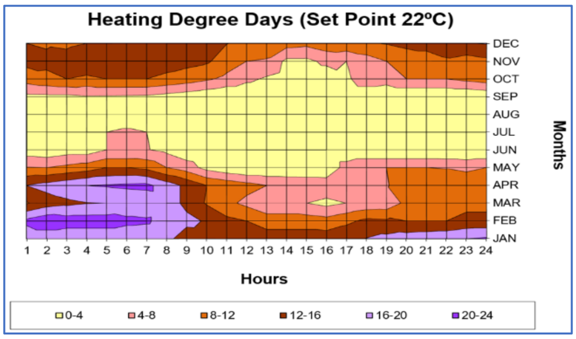


Figure 11– Example of Heating estimation map

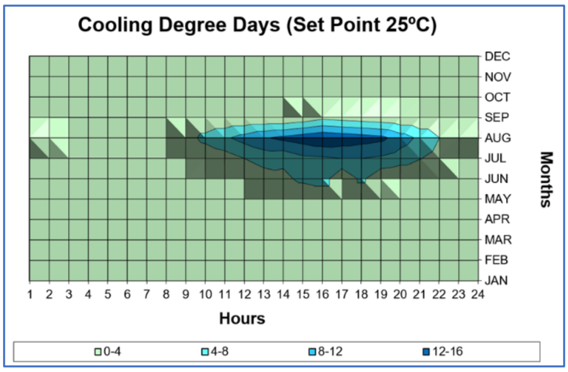


Figure 12– Example of Cooling estimation map

Dynamic building energy performance

This tool seeks to quantify the annual thermal demands of a classroom based on the climatic characteristics of the school location, the position of the classroom in the building and the construction and use characteristics. These analyses will be carried out through dynamic simulation tools, which allow the variation of parameters (climate, construction characteristics…), input variables (set point temperatures, ventilation rates...) and boundary conditions (classroom position, shades…).

Users

This tool is available with the same level of access for all types of users: school managers, personnel, and school users (students, teachers, etc.).

Input information

The location of the classroom, the construction characteristics, the shade devices or the selected set point temperatures have a significant influence on its thermal demands, quantified through a parametric study. With this aim, a dynamic simulation program will be coupled with a parameterization program to generate a database that will be used as input file in the form of data inlet matrix.

Simulation	Qheat (kW/m2)	Qcool (kW/m2)	Qtot (kW/m2)	Year Constr	Weather	Position	ShadeSouth	ShadeNorth	Ventilation	Schd ventila	Set Point Heat	Set Point Cool
1	91,90005056	25,73761944	117,63767	1	1	1	0,25	0,25	1	1	21	25
2	10,2122532	40,16814116	50,38039437	2	1	1	0,25	0,25	1	1	21	25
3	2,544092604	37,96650236	40,51059497	3	1	1	0,25	0,25	1	1	21	25
4	73,60743388	21,42895548	95,03638935	1	1	2	0,25	0,25	1	1	21	25
5	6,057035202	33,69217028	39,74920548	2	1	2	0,25	0,25	1	1	21	25
6	1,350207395	32,13551648	33,48572388	3	1	2	0,25	0,25	1	1	21	25
7	65,40589837	19,4782583	84,88415667	1	1	3	0,25	0,25	1	1	21	25
8	4,484185075	30,80574266	35,28992774	2	1	3	0,25	0,25	1	1	21	25
9	0,923434149	29,53357272	30,45700687	3	1	3	0,25	0,25	1	1	21	25
10	88,95022824	29,78058205	118,7308103	1	1	1	0,5	0,25	1	1	21	25
11	8,239997039	47,87540493	56,11540197	2	1	1	0,5	0,25	1	1	21	25
12	2,195773023	43,84915341	46,04492644	3	1	1	0,5	0,25	1	1	21	25
13	71,03752057	24,39924845	95,43676902	1	1	2	0,5	0,25	1	1	21	25
14	4,825520086	38,81204935	43,63756944	2	1	2	0,5	0,25	1	1	21	25
15	1,143293606	36,1088074	37,252101	3	1	2	0,5	0,25	1	1	21	25
16	63,10518288	21,97012194	85,07530482	1	1	3	0,5	0,25	1	1	21	25
17	3,589106163	34,86904316	38,45814933	2	1	3	0,5	0,25	1	1	21	25
18	0,778339927	32,73773008	33,51607001	3	1	3	0,5	0,25	1	1	21	25
19	87,49386242	33,95381059	121,447673	1	1	1	0,75	0,25	1	1	21	25
20	7,158366132	57,37617074	64,53453687	2	1	1	0,75	0,25	1	1	21	25
21	2,068807079	50,59915315	52,66796023	3	1	1	0,75	0,25	1	1	21	25
22	69,4255295	27,41852229	96,84405179	1	1	2	0,75	0,25	1	1	21	25
23	4,119406958	44,96625809	49,08566505	2	1	2	0,75	0,25	1	1	21	25
24	1,061942797	40,56675774	41,62870054	3	1	2	0,75	0,25	1	1	21	25
25	61,52832759	24,47428516	86,00261274	1	1	3	0,75	0,25	1	1	21	25
26	3,061552096	39,63492489	42,69647699	2	1	3	0,75	0,25	1	1	21	25
27	0,721812233	36,19433517	36,9161474	3	1	3	0,75	0,25	1	1	21	25
28	97,61980265	27,25089667	124,8706993	1	1	1	0,25	0,5	1	1	21	25
29	11,15829736	43,18322574	54,34152309	2	1	1	0,25	0,5	1	1	21	25
30	3,40564584	40,21759032	43,62323616	3	1	1	0,25	0,5	1	1	21	25
31	77,75157031	22,59523281	100,3468031	1	1	2	0,25	0,5	1	1	21	25
32	6,620352129	35,9131041	42,53345623	2	1	2	0,25	0,5	1	1	21	25
33	1,814374443	33,81015626	35,6245307	3	1	2	0,25	0,5	1	1	21	25
34	68,83980451	20,47946066	89,31926518	1	1	3	0,25	0,5	1	1	21	25
35	4,888630465	32,65554407	37,54417453	2	1	3	0,25	0,5	1	1	21	25
36	1,240231072	30,9359551	32,17618617	3	1	3	0,25	0,5	1	1	21	25
37	94,8515809	31,10961781	125,9611987	1	1	1	0,5	0,5	1	1	21	25
38	9,160633467	50,80179932	59,96243279	2	1	1	0,5	0,5	1	1	21	25

Figure 13 – Example of data inlet matrix file

The user will select the characteristics of the studied classroom with respect to climate, position of the classroom in the building, construction values, building operational values and building use. This selection will identify the heating and cooling needs provided by the data inlet matrix.

Results

The dynamic building energy performance tool will be able to assess building performance of each studied classroom giving as results annual heating and cooling needs. It allows the users to compare and to appreciate the effect of different parameters considered for the energy demand estimation, and at the same time link the results of Tool 2 to the ones of Tool 1, where strategies to reduce demand are proposed.

5. Sustainability Interventions Evaluation

This section describes the main functionalities of the sustainability interventions evaluation tool.

Microsoft PowerApps

Using Microsoft PowerApps environment, an interactive tool has been developed. The aim of the tool developed is KPIs calculation and energy evaluation for the schools involved in the project.

Both apps' solutions have two different main screens: Data and Calcs. In each menu, it is possible to see different buttons that refer to the six environmental sectors (green procurement, water, transport, green spaces, waste and indoor air quality) included in the analysis.

In the Data screen (Figure 14) the users will input data related to the characteristics of their school and their behavior regarding the forementioned factors. Data will be filled using forms.

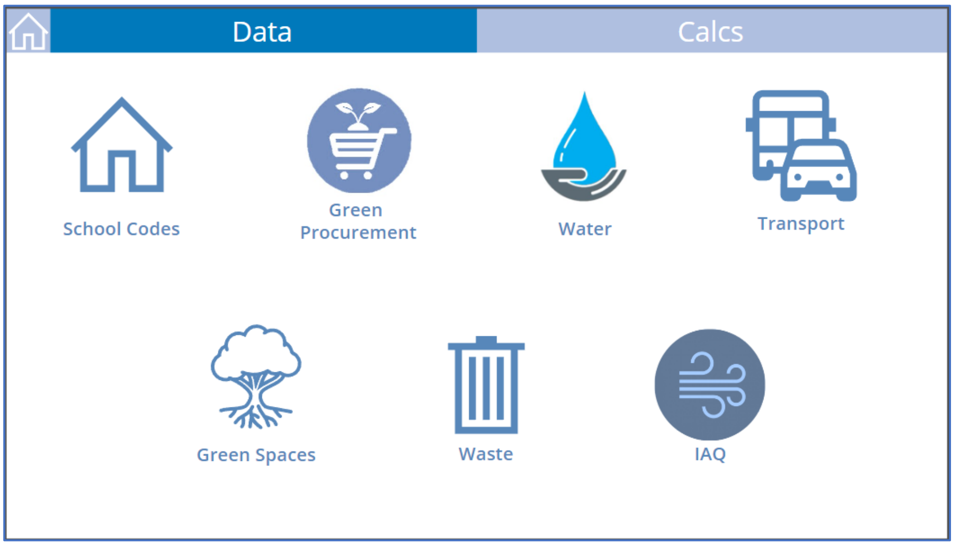


Figure 14 – *Data screen.*

Results will be displayed in the second screen, Calcs (Figure 15). Graphs and other relevant data will be provided to the users to make an evaluation of the environmental performance for each of the key factors analyzed.

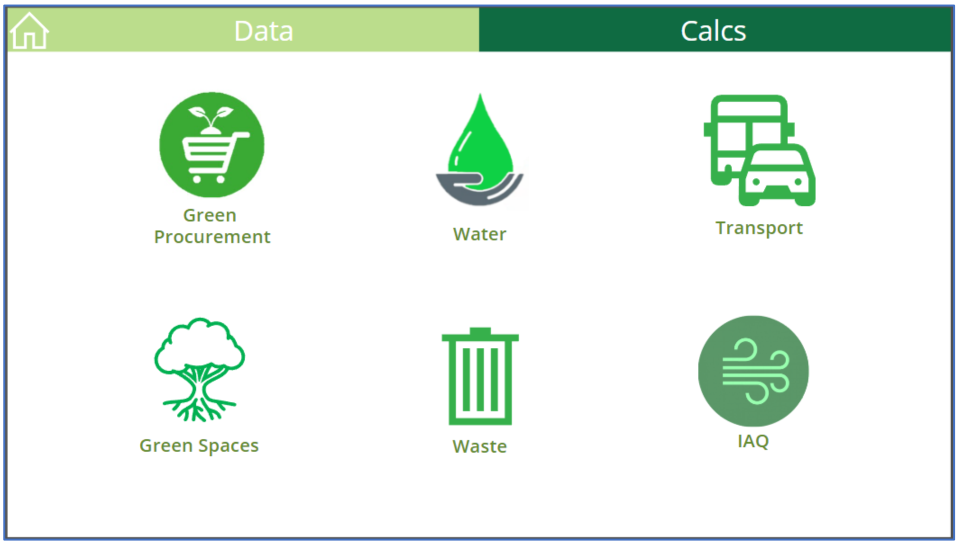


Figure 15 – Calculations screen.

Simulation tool for buildings

For detailed calculations about energy aspects (7th factor), an executable excel file, to be run in the individual server, has been developed. This Excel file approach has the aim of performing all the calculations involved in the energy study of the schools with a reasonably computational load, avoiding overload the main server. The information can be obtained in two ways:

- using the energy app
- filling the information in an appropriate excel template and saving it in a csv file.

The results of the calculations obtained in Excel can be exported to a csv file and uploaded to the Energy App to visualize the results. On the other hand, the user can use the excel results and build customized graphs and metrics.

Types of users and interaction

Both applications will have three different kinds of users:

- Administrator: the developer account and some selected profiles will have full permissions and access to the apps to guarantee that schools properly upload the information involved in the calculation part;
- Normal user: this kind of user is destinated to allow schools to upload the necessary data for doing the auditory. It requires a certain level of detail in the data

- Basic User: This kind of user will not be able to enter the specific database. The required data is reduced, and many steps are based on assumptions, reducing access to specific data. This type of user is oriented to generate general qualitative studies to identify qualitative aspects. The application will request some fundamental information looking for active participation by alums.

Results

Using PowerApps ecosystem the user can benefit from an intuitive and user-friendly interface. Such interface also allows users to perform simulations. This structure of calculation is dynamic in the sense that all the information gathered allows to increase the knowledge base for future simulations. Also the connection with the excel script allows the user to choose the output results formats and the level of data and accuracy for the calculations.

6. Digital Platform - current state

The tools developed by CIEMAT are USE are now accessible through the platform – Figure 16, in the following link: https://ecf4clim.smartwatt.net/simulators-space/simulators-space.html.

Figure 16– Simulators Space in ECF4CLIM digital platform

The footprint calculator tools are available in the excel format provided by CIEMAT – Figure 17. There are two options to download the files: school system and school user.

It is also available a questionnaire, and respective user guide, that help users to understand and calculate the information they need to input in the footprint calculator.

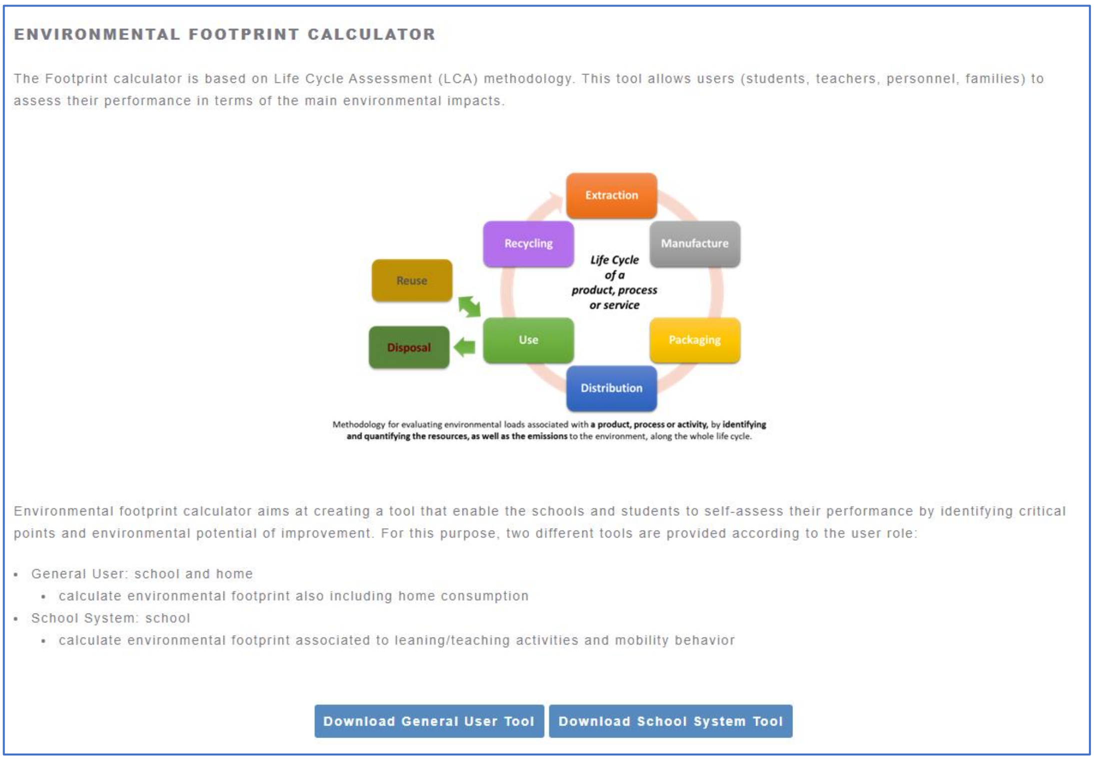


Figure 17 – Simulators Space (CIEMAT) in ECF4CLIM digital platform

The Microsoft power apps tool developed by USE is also accessible through the digital platform for all the users with the appropriate permissions, granted by USE. The second tool develop by USE – energy simulation tool for buildings - is downloadable in excel format (Figure 18).

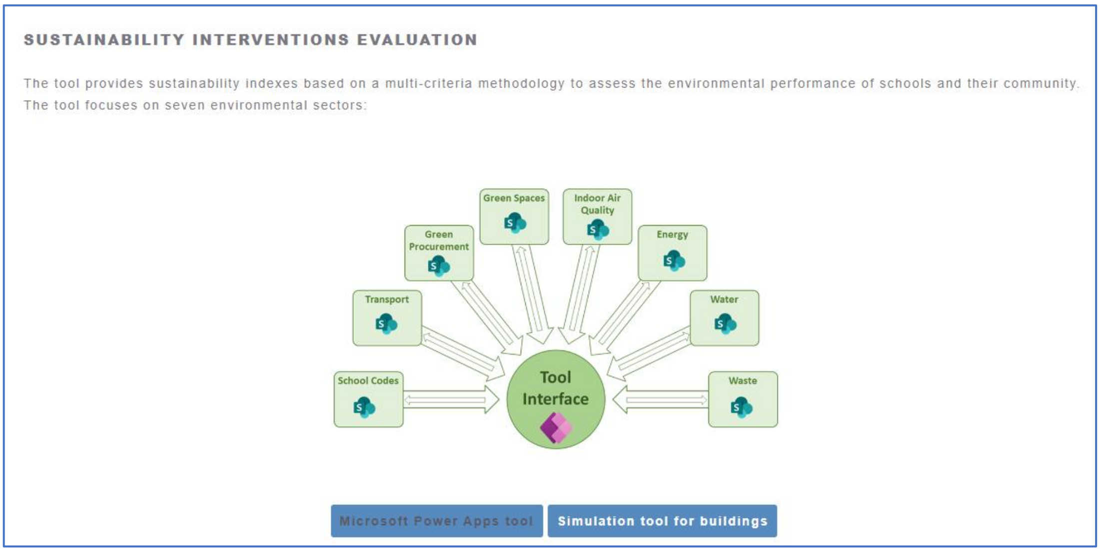


Figure 18 – Simulators Space (USE) in ECF4CLIM digital platform

The retrofitting toolkit is still being developed by CIEMAT and when a final version is ready it will be uploaded to the digital platform in a downloadable version.

7. FUTURE STEPS

Regarding the next steps, Smartwatt will include all the available information in the databases and proceed to automatize all the necessary rules and calculations using different technologies like Python. At the same time all the web application will continue to be developed:

- create different accesses to different types of users
- create the different views for each subsystem/activity
- create the input forms for each subsystem/activity