SiEUGreen
Sino-European innovative green and smart cities

Sino-European Innovative Green and Smart Cities

D3.3

Mid-term Showcase deployment report

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Disclaimer

SiEUGreen

The project has received funding from the European Union's Horizon 2020 Research, and Innovation programme, under grant Agreement N 774233 and from the Chinese Ministry of Science and Technology.

Throughout SiEUGreen's implementation, EU and China will share technologies and experiences, thus contributing to the future developments of urban agriculture and urban resilience in both continents.

The project SiEUGreen aspires to enhance the EU-China cooperation in promoting urban agriculture for food security, resource efficiency and smart, resilient cities.

The project contributes to the preparation, deployment and evaluation of showcases in 5 selected European and Chinese urban and peri-urban areas: a previous hospital site in Norway, community gardens in Denmark, previously unused municipal areas with dense refugee population in Turkey, big urban community farms in Beijing and new green urban development in Changsha Central China.

A sustainable business model allowing SiEUGreen to live beyond the project period is planned by joining forces of private investors, governmental policy makers, communities of citizens, academia and technology providers.

Technical References

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2.0	4/05/2020	VILABS	Circulation of Initial Draft to showcases
3.0	15/6/2020	VILABS	Preparation of the pre-final draft version
4.0	18/06/2020	VILABS	Review of the pre-final draft version
5.0	29/06/2020	VILABS	Revision based on review comments and final version to the Coordinator
6.0	01/07/2020	NMBU	Revised version by the coordinator
7.0	05/07/2020	NMBU	Final version submission to the EC
8.0	14/05/2021	VILABS	Revised version according to the guidelines received by the EC during the 2nd Project review meeting in April 2021.
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Executive Summary

The project showcases located across five different countries in Europe (Norway, Turkey, Denmark) and China (Changsha, Beijing) have started the deployment activities sharing the vision to apply the circular economy by adapting the SiEUGreen technologies (green, blue, yellow) and deliver benefits at the local and global level on four main domains: resource use, the environment, the economy and society at large.

The showcases, based on their different characteristics (geographical, climate, cultural), have increased the options of land use for food cultivation and gardening, like unused public land and balconies. They have been using different technologies to take advantage of the available resources (solar, waste, etc.) to improve energy efficiency and produce more healthy food. All showcases have engaged communities in urban agriculture activities, improving the local social, economic and political situation.

After fifteen months of continuous deployment activities, this report presents the current achievements in urban agriculture efforts along with the potential contribution to the community, food production, and energy efficiency. All showcase countries have been affected by the force majeure of COVID-19 lockdown, and deviations for the next period are also elaborated. The current document has been revised according to the comments received by external reviewers during the 2nd Review Meeting that took place on April 2021.

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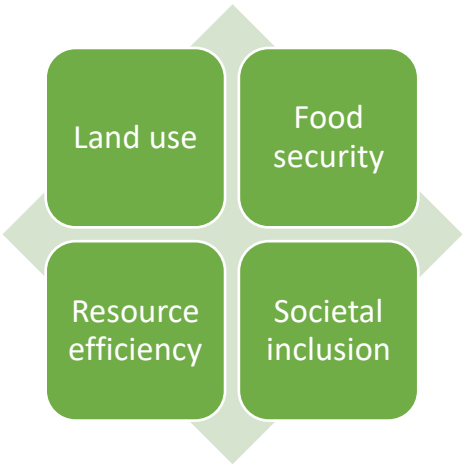
1. Introduction

The requirement plans (D3.1) served as the basis for the showcases to build their individual deployment plans (D3.2) and start the implementation in real environments. All the efforts focus on improving the four-urban agriculture (UA) pillars as shown below[1]:



The mid-term report provides the status of the Showcase after fourteen (14) months of implementation. During this period, the showcases have been reporting their progress and achievements to the WP leader by providing files with qualitative and quantitative data on four urban agriculture pillars on a regular basis. The qualitative data also include information on the challenges and difficulties faced. Also, the progress of the showcases and the knowledge acquired were shared with the consortium through the online consortium meetings and webinars.

This mid-term reporting is substantial because it provides the current results and feeds back to the research and showcases improvements towards the expected impact.

It is planned that after this report, the showcases should continue the implementation for fifteen (15) months. Considering that this report was prepared during the period of COVID-19 restrictions, some showcase activities have been paused based on the local situation in respective showcase countries and will continue after the regulations are eased.

This deliverable presents the mid-term deployment process and does not elaborate on the details of the technical implementation, which are part of WP2.

[1] D1.1 Maps of quantitative and qualitative data for each of the showcase locations - Synthesis report

The current document constitutes a revision of the initial Deliverable report that was submitted in July 2020, according to the guidelines received during the project's second review meeting.

Thus, the current deliverable report provides information on the mid-term deployment processes up until July 2020, as it was initially foreseen by the Grant Agreement and expected by the reviewers, according to comments received and in correlation to the timeframe available for the re-submission. It has to be noted, though, that force majeure situations have applied to the deployment of these showcases, slowing down the deployment progress and thus the contents of this report document, given the world pandemic and, of course, the deployment situations and risks that always apply when piloting activities are foreseen. Additional and updated information on the deployment of the Showcases is provided in the 2nd Official Periodic Report, while updates will also be shared in the upcoming technical periodic reports as well as via the final issue of the WP3 Showcases Deliverable reports, "D3.4: Final Showcase Deployment Report" which will be delivered on the final month of the project. In parallel, an ongoing public reporting of the showcases progress will be available online on the project website, informing the relevant stakeholders and the general public.

In terms of achievements presented in the document report and how those have been measured and recorded; The listing took place via online interviews between the WP3 Leader and the Showcases managers and working staff. For the calculation and the proper recording of the results, a spreadsheet template has been generated and distributed among the relevant individuals in each Showcase. An example of this spreadsheet template is available in Annex. In order to properly evaluate the progress of the showcases, a series of graphical representations of the totally expected vs progress achieved vs mid-term baseline have been generated. It has to be noted that the currently achieved results have been calculated until December 2020 to provide a clearer picture of the current situation.

In addition, we need to point out that the information, along with any multimedia content shared via this deliverable report, follows the guidelines and is in complete line with the GDPR. In cases of images/photos or participants who have not signed a relevant consent form, the image has been subject to digital processing to protect the identity of the ones being depicted. Ending, the document has been reviewed and updated in order to present all symbols, such as separated ones, in a consistent way.

2. Overview of the mid-term showcase deployment

2.1 Summary

The showcase deployment activities can be grouped into four urban agricultures pillars/categories:

- **Land use**: Includes different types of land that have been set up for SiEUGreen urban agriculture activities.
- **Energy efficiency**: Includes the activities for the adoption of SiEUGreen blue, green, and yellow technologies that contribute to resource efficiency.
- **Food security**: Includes the activities to cultivate food using SiEUGreen technologies.
- **Societal inclusion**: Includes activities targeted to engage the stakeholders/communities.

The relevant activities are reflected by the different demonstrations that the showcases are implementing in real environments. The demonstrations are described in detail in Chapter 6.

Showcase	Demonstration
Ås	NMBU campus
Aarhus	Solar-driven toilet and urban farming in Fællesgartneriet
Aarhus	Polytunnels in World Gardens
Hatay	Kisecik Greenhouse
Hatay	Traditional Greenhouses
Beijing	Happy Vegetable Garden
Beijing	Kitchen Waste Reduction and Centralized Disposal
Beijing, Changsha	Balcony Vegetable Garden
Changsha	Futian Cangjun

Table 1: SiEUGreen demonstrations per Showcase

2.2 Baselines and SiEUGreen Targets

According to the SiEUGreen Grant Agreement and the targets identified in the proposal formulation and project initiation of activities, the consortium has the following targets in terms of land use, food security, and societal inclusion. These targets are also used as baselines and indicators that the consortium considers when planning and deploying the project activities.

In terms of Land use:

	Targets
i.	*Unused land reused: 200.000 m^2 (20ha)*
ii.	*Households involved in showcases: 750*
iii.	*Balcony gardens: 90*
iv.	*Organic rooftops: 2*

Table 2 - KPIs on Land Use

In terms of food security:

Targets
Amount of secure food produced in relation to the amount of food produced without the project. *Target: > 50% increase 12.000kg*

Table 3 - KPIs on Food Security

In terms of societal inclusion:

Targets
Engagement and behavior change workshops: 2 in each Showcase
Unemployed individuals: 500
Individuals involved: 5.000
Engagement and behavior change workshops: 2 in each Showcase

Table 4 - KPIs on Societal Inclusion

The aforementioned targets constitute the targets for the whole duration of the SiEUGreen Project. Thus, the consortium has in plan (and in most the cases, despite the difficulties, has succeeded) to achieve these goals along with the full deployment of the project showcases by the end of the project. Under normal circumstances, a mid-term baseline would be in order

and would have been successfully achieved. However, given the Coronavirus outbreak and the COVID-19 disease that has indeed affected the deployment activities, a series of delays is in order.

Bellow, we have a series of graphs based on the KPI targets to be achieved by the end of the project, in correlation with the expectations of the mid-term period report. In addition, the graphs contain the key achievements until December 2020, the last months that partners reported their activities and results, following the reporting schedule agreed at the beginning of the showcase deployment.

It has to be noted that despite all the challenges and barriers, the SiEUGreen consortium has mostly achieved the targets that were set for the first half of the deployment period, even though many activities of the showcases were posted. Below we can see the targets in light green, the achieved in dark green, as well as the baseline for the first half of the deployment period as red lines.

In terms of land use:

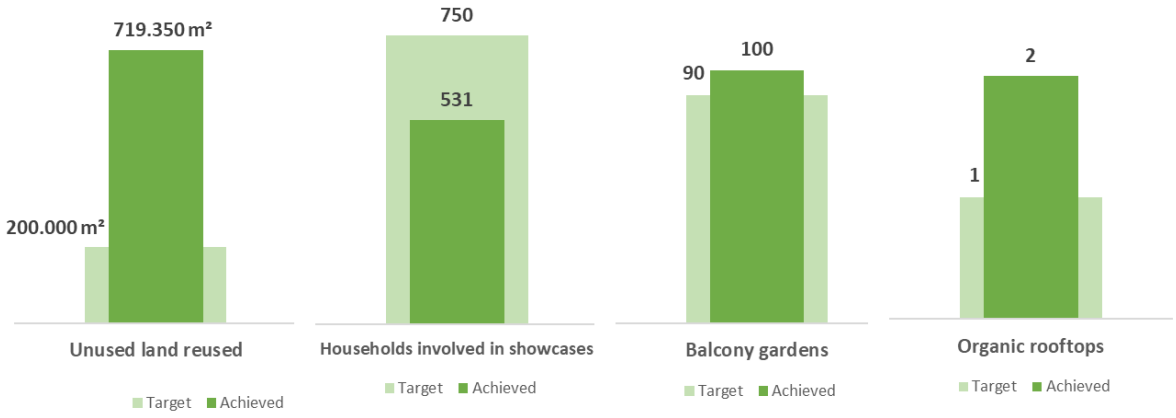


Figure 1 - Overall & Midterm expected and achieved progress on Land Use

In terms of food security:

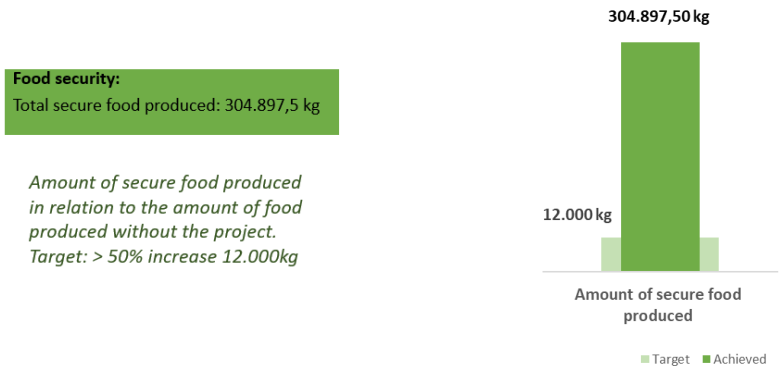
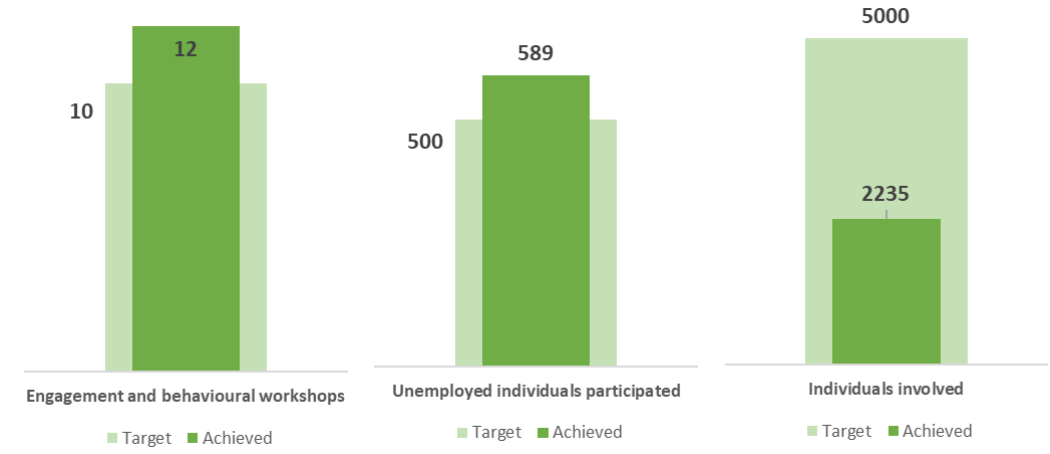


Figure 2 - Overall & Midterm expected and achieved progress on Food security

In terms of societal inclusion:



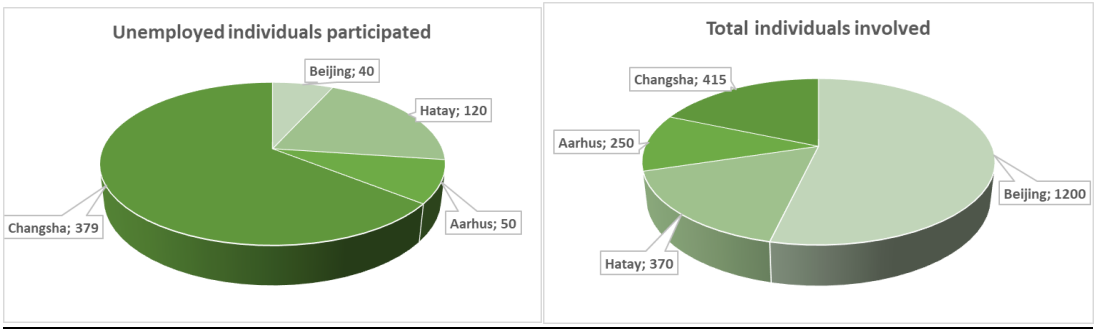


Figure 3 - Overall & Midterm expected and achieved progress on Societal Inclusion

2.3 Land use

Every Showcase has set up different types of land for urban agriculture. The types of land are categorized based on the following criteria defined in the D1.2-*Baseline study, including key indicators and the development of a typology*:

Spatial dimension: Acknowledges the location of sites for UA (e.g., peri-urban and intra-urban)

Governmental: presents the official framework (e.g., official policies and laws, regulations, land-use zoning, leases) introduced by different institutions that regulate the practices of UA and/or the non-official perspectives; not safeguarded by the law– of supporting UA (such as city-wide food plans and UA strategies, the implementation of public programmes).

Functional: refers to how the land is used for agriculture; associated with the technological choices and operational aspects (green, blue, yellow technologies).

Ownership: specifies the ownership of the land where the UA activities take place. The initiatives have been re-classified into three types: public (e.g., parks, schools, and libraries), semi-public (space within residential areas or that belonging to local landowners associations), and private ownership (land that belongs to the private sector).

Type of space: refer to the area type where the UA activities take place: greenhouses, balconies, rooftops, transitional spaces are spaces in development (e.g., construction sites), leftover spaces in public spaces that do not have a clear function, refer to vacant semi-public spaces within residential areas between buildings and edible spaces in public areas where eatable resources can be found.

As the first step in deployment, showcases should build the appropriate facilities to adopt later the SiEUGreen technologies and gather the community. Each Showcase has its own demonstration sites, which are all located in urban areas.

The Aarhus showcase uses public land that is spread among different locations across the municipality area. Aarhus land use has already been described in D1.2- Baseline study, including key indicators and the development of a typology. The overall picture of land use for the remaining demonstration sites is presented in the following table.

Showcase	Demonstration	Spatial	Governmental	Functional	Ownership	Type of space
Ås, NMBUcampus	Micro and paper-based plant growing technology	Urban	Public	Green	Public	Green house
Ås, NMBU campus	Aquaponics	Urban	Public	Green	Public	Green house
Ås, NMBU campus	Hydroponics	Urban	Public	Green	Public	Green house
Ås, NMBU campus	Innovative greenhouse technology	Urban	Public	Green	Public	Green house
Ås, NMBU campus	Biogas	Urban	Public	Blue	Public	Green house
Ås, NMBU/ NIBIO campus	Compost	Urban	Public	Green, Blue	Public	Green house
Hatay	Kisecik Greenhouse	Urban	Private	Green,Blue, Yellow	Public	Green house
Hatay	Traditional Greenshouses	Urban	Private	Red	Public	Green shouse
Beijing, Changsha	Balcony Vegetable Garden	Urban	Private	Green	Private	Balcony

						gardens
Beijing	Happy Vegetable Garden	Urban	Public	Green	Semi-private	Land
Beijing	Happy Vegetable Garden	Urban	Public	Green	Semi-private	Green house
Beijing	Kitchen Waste Reduction and Centralized Disposal	Urban	Private	Green	Private	House holds
Beijing	Sanyuan Farm	Urban	Private	Green	Private	Balcony gardens
Changsha	Futian Cangjun	Urban	Private	Blue, Yellow	Private	House holds
Changsha	Futian Cangjun	Urban	Private	Blue, Yellow	Private	Rooftop

Table 5: SiEUGreen demonstrations land use per Showcase

Unused land reused

Regarding the land use space, due to the complexity of the different demonstrations, the total space is counted by the different types of areas that each demonstration uses (Greenhouses, balcony gardens, etc.). Until the initial delivery of this report, June 2020 the overall land use by all showcases was 680.350 m^2, much more than the initial target set in the Grand Agreement. Until December 2020, according to the last reporting received by the project partners, the overall reused is: 719.350^2

Target: 200.000 m^2 (20ha)	**Mid-term land reused**: 680.350 m^2	**December 2020 land reused:** 719.350m^2

The total land includes balcony gardens, rooftops, greenhouses, and traditional land. The tables below show the type of land used for each demonstration and the corresponding current status (in percentage) towards the completion of each setup.

Balcony gardens

One hundred balcony gardens are prepared as showcases in Beijing and Changsha.

Target: 90	**Mid-term balcony gardens**: 200

Showcase	**Demonstration**	**Number of balcony gardens**	**Status** (set up)
Beijing, Changsha	Balcony Vegetable Garden	100	90%
As and Olso	Balcony Gardens	100	90%

Rooftops

A rooftop in the building of Futian Cangjun in Changsha is being built.

Target: 1	**Mid-term rooftops**: 1

Showcase	**Demonstration**	**Number of rooftops**	**Status** (set up)
Changsha	Futian Cangjun	1 (50m^2)	100%

Greenhouses

Seven Greenhouses are being deployed at four showcases.

Target: 7	**Mid-term Greenhouses**: 7

Showcase	**Demonstration**	**Land (m^2)**	**Status** (set up)
Ås – NMBU campus	Greenhouse	35	See 2.3.1
Hatay	Kisecik Greenhouse	1.500	90%
Hatay	Traditional Greenhouses (4)	800	100%
Beijing	Sanyuan Farm	6.000	100%

Land

Traditional land used for agriculture and the SiEUGreen technologies is located in Beijing, and it has already been set up and running.

Showcase	Demonstration	Land (m^2)	Status
Beijing	Sanyuan Farm	700.000	100%

2.4 Resource efficiency

The SiEUGreen technologies implemented at showcases contribute to resource efficiency, and they are categorized into green, blue and yellow technologies.

Green technologies aim to utilize resources in the city as input to urban agriculture. The technologies use waste resources (blackwater and organic household waste) and produce biogas, growth media, and fertilizer, which impacts electricity consumption, heating, growing vegetables, etc.. The SiEUGreen technologies include: (references are available in D2.1 Green Technology (T1) ready)

- Microgreen and paper-based plant-growing technology.
- Biogas production (using the; UASB bioreactor, AnMBR bioreactor, USBABR, Antec Biofilm Reactor, solid digestate from biogas pilot-scale reactor as fertilizer)
- Production of protein-rich fodder for aquatic systems: Production of insects from organic waste
- Co-composting of organic wastes: Co-composting of organic household waste and solar dry toilet residue.

Green technologies contribute to the reduction of water and energy footprints. It is measured by the methane that is converted into electricity.

Methane converted to electricity

Target: 1.270m^3 Methane used/ year Convert to	**Mid-term measurement:** On M33 only the Beijing showcase had deployed the Green technology that convert methane into

3.190 kWh/year electricity	electricity. The table below includes more information.

The following demonstrations deploy the Green technologies to convert methane into electricity.

Showcase	**Demonstration**	**Technology**	**Status**	**Mid-term-measurement**
Beijing	Kitchen Waste Reduction and Centralized Disposal	Kitchen waste compost	90%	The demonstration has not been completed, therefore data for this particular measurement couldn't be collected yet.

Heat consumption (kWh/year)

The **yellow technologies** include biogas production from waste resources, seasonal solar storage combined with heat and power, and photovoltaic generation of electricity. The demonstrations that deploy yellow technologies include the solar-driven toilet in Aarhus with the photovoltaic panel and a solar collector for heating, the Kisecik Greenhouse with the photovoltaic panels, and the Futian Cangjun in Changsha with the solar photovoltaic streetlamps and the solar water heaters.

Target: 90% - 9.580 kWh/year	**Mid-term measurement:** On M33, the total measurement includes only the measurement from the Changsha showcase (table below).

Showcase	**Demonstration**	**Technology**	**Status** (set up)	**Mid-term measurement**
Hatay	Kisecik Greenhouse	Photovoltaic panels	40% (Currently there are no fully operational PV activities taking place as the Kisecik greenhouse location has been changed after this report was initially submitted. The status is currently in the technical preparation phase.	The whole greenhouse set up has not been completed yet.
Aarhus	Solar-driven toilet and urban farming in Fællesgartneriet	A photovoltaic panel and a solar collector	100%	Not applicable yet, due to delays in training on measurement methods (see chapter 2.6)
Changsha	Futian Cangjun	5 solar photovoltaic streetlamps	100%	Saved 5000 watts of electricity and 200 cubic meters

		2 solar water heaters		of gas from May 2020.

CO_2 for the greenhouse use (m^3)

A greenhouse with special insulation, solar heat storage, and biogas for light CO_2 and heat is being built inÅs. The CO_2 from the combustion will be used in the greenhouse to enhance plant production.

Target: 90%	**Mid-term measurement:** This measurement comes from the Greenhouse at the Ås campus that this period it installation hasn't been completed yet.

Showcase	**Demonstration**	**Type of space**	**Status** (set up)	**Mid-term-measurement** (% of CO_2 (m^3))
Ås – NMBU campus	Innovative greenhouse technology	Greenhouse	50%	The greenhouse hasn't been set up yet.

Following the above, the overall, the reduction of the Showcase's **energy footprints** could be calculated as an average of the above measurements for the methane converted to electricity, the heat consumption, and the CO_2 used for the greenhouse. Since the adequate measurements are not in available yet, this indicator will be reported at the final deployment report, when the showcases will collect the necessary data.

Reduction of the water footprints

The **blue technologies** process organic household/food waste and wastewater, collected from the vacuum and urine-diverting toilet to produce fertilizer products utilized in the balcony gardens and the greenhouses. The treatment system receives blackwater and produces fertilizers and biomass production. The detailed information and references to scientific

publications are described in D2.3 and D2.4. This system will be implemented in the Fredrikstad/Ås Showcase. A dry toilet has been installed at the Aarhus showcase. At Futian Cangjun Low-flush toilets have been installed, grey water treatment system is set up in the basement, and rainwater treatment is set up on the roof.

Target: 90%	**Mid-term measurement:** At the moment (M33) the total mid-term measurement comes only from Changsha showcase. The table below includes more details.

Showcase	**Demonstration**	**Technology**	**Status** (set up)	**Mid term-measurement (%)**
Aarhus	Solar-driven toilet and urban farming in Fællesgartneriet	Solar dry toilet	100%	Not applicable because the installation has been set up but due to Covid-19 restrictions the person who is assigned to gather the data and make the analysis was not able to visit the place yet.
Changsha	Futian Cangjun	Low-flush toilets , grey water treatment system at the basement, and rainwater treatment at the roof	100%	By Installing 18 Low-flush toilets in demonstration households to recycle 80% of nitrogen and more than 95% of phosphorus to Prepare 150kg

				fertilizer and 300kg soil conditioner. By the grey water treatment system and rainwater treatment to save water up to 90%.

2.4.1 Fredrikstad/Ås showcase measurements

Due to dramatic change in Fredrikstad showcases which could not be utilized to demonstrate and implement various green and blue technology as stated in the proposal and Grant Agreement (GA), the showcases in Norway were redesigned to be built at Campus Ås, NMBU, Norway. However, the planning and construction of the Campus Ås showcase have taken considerable time. In order to perform the planned T3.3 task according to the Grant Agreement, a quick alternative (plan B) has been identified, assuring the planned activities for T3.3 could be carried out. The solution was to rent a greenhouse facility temporarily at Campus Ås NMBU, and T3.3 activities could be proceeded from January 2021 and are ongoing as described and shown below in the rented greenhouse called **mini-demo Showcase Ås**, despite the fact that this unexpected change has caused some delays in the implementation of Task 3.3. The COVID-19 pandemic has also led to some additional delays because the planned events (seminars/workshops, survey) for Task 3.3 can still not be carried out yet. The mini-demo Showcase includes the following: (1) paper-based microgreen production, (2) hydroponics, (3) aquaponics, and (4) Composting of kitchen wastes at mini- and large scales (the mini composter is located inside the mini-demo Showcase while the large composters are installed outside the mini-demo Showcase due to the space limitation.

Figure 4 - NMBU greenhouse facility to provide a feasible mini-demo showcase

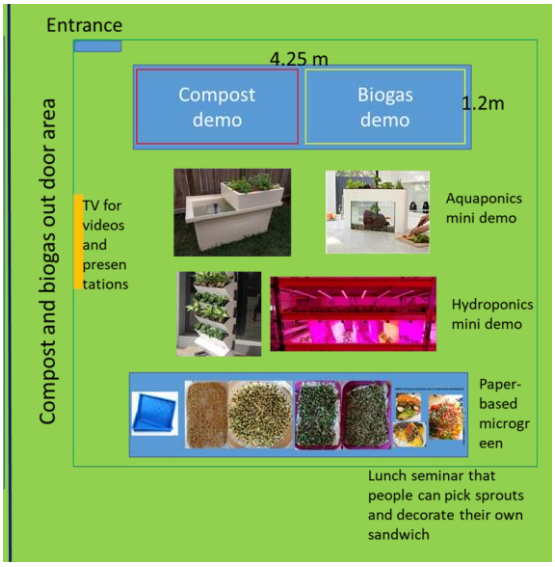


Figure 5 - Schematic presentation of the mini-demo Showcase Ås to replace Fredrikstad showcase for T3.3 and implementation of the green technologies

Figure 6 - Self-watering systems are implemented at mini-demo showcase Ås, and vigorous growing tomato plants are shown in this photo which was taken on April 12, 2021

As a result of the delays that have been applied in the Fredrikstad case due to the contractor as well as due to COVID-19, the biogas production has not been initiated in the Showcase

originally located in Fredrikstad. However, results from tests undertaken at NMBU and similar works done elsewhere are used to predict the expected amount of methane production from blackwater (BW) and food waste (FW) co-digestion at the Showcase. The potential methane production in the Showcase depends on the performance and efficiency of the bioreactor to be used in the Showcase (as a modified version of a biogas reactor is planned to be used), the volumetric organic loading, the amount and composition of food waste (depends on the residents feeding habit) and the ratio of BW to FW. The average total COD varies a lot from 5.532 mg L^{-1} (Melesse 2019) to 8.900-11.400 mg L^{-1} (Todt 2015) at NMBU and from 9.500-19.000 mg L^{-1} in the Netherlands (de Graaff et al. 2010a, Zeeman et al. 2008). With 200 g p^{-1} d^{-1} organic kitchen waste production (Kujawa-Roeleveld et al. 2003; Wendland, et al. 2007) the organic loading of combined BW and FW can be raised more than 25000 mg L^{-1}.

Methane yield, from the Ås showcase, produced through the use of SiEUGreen Green technologies (Biogas production using modified USABR or UASB) for the 14 flats (3 persons per flat) is estimated.

	Methane production L $p^{-1}d^{-1}$	**Methane produced for 14 flats m^3 per year**	**Converted to electricity KWh per year**	**Converted to heat KWh per year**
Blackwater	12.5	192	133[a]; 760[b]	1.138[b]
Blackwater-Foodwaste	28	429	297[a]; 1.700[b]	2.550[b]

[a] using Thermal Electric Generator (TEG) electricity efficiency of 7%. [b] using Combined Heat and Power with electric efficiency of 40% and heat efficiency of 60%

Treatment systems at Ås showcase have not started yet. Electric and heat consumption has not been determined yet, and the reduction in energy footprint will be therefore determined later. The reduction in water footprint is estimated to be about 25%. This is only from the use of the vacuum toilet. If treated greywater and harvested rainwater is used for a non-potable purpose, the reduction in water footprint could be more than 90%.

Once the biogas reactor and access to the blackwater are in place at NMBU (and if the COVID-19 restriction is lifted), valuable data will be generated for methane production. Further electric and heat production and consumption can be calculated. Moreover, the byproducts

from the digestate, such as liquid and solid biofertilizers and detailed resource use efficiency will be presented.

2.5 Food security

The showcases produce food in a healthy and attractive urban living environment using the SiEUGreen **different green technologies recycling various resources**. Green technologies are summarized below and are detailed described in detail in D2.2: Evaluation of crop techniques.

- **Paper-based crop cultivation techniques:** Paper-based microgreen production
- **Hydroponic and aquaponic crop cultivation techniques**
    - NFT system
    - Floating systems with different light conditions
    - The floating system and rock wool
    - Hydroponic system for the kitchen bench “Den Lille Gartner.”
- **Soil-based crop cultivation techniques**
    - Buckets with a drip irrigation system for balconies or rooftop
    - Self-watering systems for balcony and rooftop
    - Pallet frames for rooftops or backyards
    - Compost as an alternative to peat
    - Effect of kitchen waste compost
    - Maxi system for the kitchen bench -” Den Lille Gartner.”
    - Urine-based recycling fertilizers

The table below presents each showcase demonstration, the type of food that is/will be produced in the next period, along with the green or blue technology adopted. The production status specifies whether the food has been produced during the mid-term deployment period (in progress) or the production will start in the forthcoming months (not started yet) when the demonstration set-up is ready.

Showcase	Demostration	Food	Green technology	Blue technology	Production status
Hatay	Kisecik Greenhouse	Lettuce	NFT system	-	not started yet
Hatay	Kisecik Greenhouse	Tomato	Paper-based crop cultivation techniques	-	not started yet

Aarhus	World gardens	Crops in the polytunnels : Garlic Spinach 3 types of salads Green peas	Polytunnels	-	in progress
Aarhus	Brabrand	Crops	Compost as an alternative to peat		not started yet
Ås	Greenhouse	microgreen	Paper-based crop cultivation techniques	Paper-based crop cultivation techniques	not started yet/planned
Ås	Greenhouse	Crispy lettuce, Butter head lettuce	Aquaponics		not started yet
Ås	Greenhouse	Vegetables	Hydroponics		not started yet
Beijing	Happy Vegetable Garden	Vegetables	Paper-based plant growing technology		In progress
Beijing	Happy Vegetable Garden	Seveal leaf vegetable varieties	Soil-based traditional plant growing		in progress
Beijing	Kitchen Waste Reduction and Centralized Disposal	Vegetables	Effect of kitchen waste compost		In progress
Changsha	Futian Cangjun	Vegetables	Vegetable production, sprout production	Greywater treatment Struvite precipitation from black water	in progress
Changsha	Balcony Vegetable Garden	Vegetables	Buckets with a drip irrigation system for balconies	-	in progress

Amount of secure (FAO) food produced in relation to the amount of food produced without the project.

At some demonstrations (Aarhus – Polytunnels, and Beijing - Happy Vegetable Garden) the food is produced for the first time, but there are also demonstrations that produced food in the past, and now they produce it using the SiEUGreen technologies. Therefore, the food production comparison before the use of project technologies and after may present the impact only for the first cases.

Target: Food produced in relation to the amount of food produced without the project: > 50%	**Mid-term measurement:** 20%
Amount of food produced during the project: 12.000kg	302.100 kg

The amount of food produced is expressed in weight (kg) for the relevant type of food, e.g., potatoes, vegetables, etc. The Aarhus World garden demonstration is at a public space and several citizens are engaged and collecting food. Therefore, it has been difficult to get the exact weight of the food from citizens. The measurement in the table above is a proximate number because it comes from the food that the leaders of this demonstration managed to weight, but of course, there should also be some additional weight from citizens who collected food and didn't report the weight.

However, for other types of food (e.g., herbs), the measurement expressed in weight basis (kg) for calculation or comparison may not be applicable. It is more important to focus on the first measurement (in terms of %). For example, in the Aarhus World garden, all the crops are grown approximately 20% faster than without polytunnels. This percentage comes from empirical observations, and it is based on the following reasons. In the polytunnels, it is warmer, and it is more humid, which brings out another advantage. The polytunnels do not need to be watered as often as the plants in pallets without polytunnels. An additional factor we must consider in this category is the harvest season.

Showcase	**Demonstration**	**Food**	**Technology**	**Food produced (kg)**	**Food increase (%)**

Ås	Greenhouse	Tomato	Self-watering container to grow food in the balcony garden	1.000	22%
Aarhus	World gardens	Potatoes Garlic Spinach 3 types of salads Green peas	Polytunnels	50-100	20%
Aarhus	Brabrand Fallesgartneriet	All sort of vegetables Potatoes Salad	Solar dry-toilet. The waste will be used after treatment (at least one year) as a fertilizer to grow food in a testbed. At the moment no food has been produced using this technology	0	0%
Hatay	Traditional Greenhouses	Strawberry Lavender Juniper	Soil-based traditional plant growing	3.085.000 (seedlings) 4.500 (bushes) 7.250 (bushes)	30%
Beijing	Happy Vegetable Garden	Seveal leaf vegetable varieties	Soil-based traditional plant growing, aquaponic	(3.000kg/700 m^2 per year)	n/a
Beijing	Happy Vegetable Garden	Seveal leaf vegetable varieties, and fishes	Soil-based traditional plant growing, aquaponic	9.000	54.5%
Changsha	Balcony Garden	Vegetables	Buckets with drip irrigation	500	25%

			system for balconies		

2.6 Societal inclusion

Societal inclusion is an outcome of urban agriculture and has three dimensions: economic, social, and political (see D1.1). The showcases have identified the local challenges and have started to implement activities to improve societal inclusion. Chapter 3 of the present document describes all engagement activities that every Showcase implemented. The summary of achievements includes:

Engagement and behaviour change workshops

Showcases organize workshops to gather the targeted audience and inform them about the local demonstration(s) the SiEUGreen technologies, engage them in the upcoming activities and influence their behaviour towards urban agriculture activities.

Target: **10** (2 in each showcase)	**Mid-term measurement: 11**

Showcase	**Number of workshops:**
Ås	3
Aarhus	2
Hatay	3
Beijing	1
Changsha	2

Individuals involved in showcases

The individuals' term stands for every person who has been involved in Showcase's urban agriculture activities.

Target: 5000	**Mid-term measurement: 2.335**

Showcase	**Number of individuals**
Ås	100
Aarhus (World Gardens)	50
Aarhus (Brabrand)	200
Hatay	370
Beijing	1.200
Changsha	415

Number of disadvantaged involved in the activities

The showcases carry out activities to engage the individuals, putting more emphasis on including elderly people, long-term unemployed, and vulnerable groups to use urban land and grow food.

Target: 500	**Mid-term measurement: 589**

Showcase	**Category**	**Number of individuals**
Aarhus	A group of citizens from the neighbourhood: Save the Children's nature club (civil society with children from vulnerable socio-economic circumstances, e.g., having unemployed parents, single-parent families, families involved in crimes, and many siblings).	50

	Very few families in Gellerup are from the middle class, so that means that the users are, in general of, low-income segments. Civil society group called "Baba" includes fathers from the area.	
Hatay	Syrian Refugees	120
Beijing	Unemployed	40
Changsha	Unemployed	379

Households involved in showcases

In some demonstrations (Ås, Aarhus, Beijing), households are involved in showcase activities and deploy SiEUGreen technologies to grow plants in their apartments.

Target: **750**	**Mid-term measurement: 631**

Showcase	**Number of households**
Ås	100
Aarhus	314
Beijing	100
Changsha	18 households deploy blue technologies, and 100 households deploy Green technologies
Beijing and Changsha (Balcony Vegetable Garden)	100

2.7 Deployment deviations due to COVID-19

In Changsha and Beijing **(China), COVID-19 had no impact** on the research progress, and activities were proceeding smoothly as planned. On the contrary, **all the European showcases have been affected** due to the force majeure COVID-19 lockdown that affected their countries.

The table below presents the risks that Ås showcase faced, along with the corrective actions taken and any relevant consequences.

Risk	Corrective actions	Consequences
Due to dramatic change in Fredrikstad showcases, the showcases in Norway are planned to be implemented on Ås (NMBU/NIBIO) campus instead. This change has caused some delays in the implementation of Task 3.3. The Covid-19 pandemic has also led to some additional delays in the planned events.	We expect to implement the mini demonstration showcases in Ås in June/July 2021.	Delays in the implementation of Task 3.3 (seminars, workshops, surveys)
To mitigate the delay for the implementation of blue technology in Fredrikstad, NMBU decided to build the full-scale treatment system in NMBU facilities in Ås. When the systems are ready, the system can be moved there. But because of the COVID-19 the building process in Ås also has been stalled. This might delay operationalization of the Showcase as planned.	We expect that the lab will get functional at NMBU in August. We will try to expedite the building process.	Delay in the building and testing of biogas reactor
Limitations on the growing seasons	Since the delay of Fredrikstad showcase gives only one growing season for the green technology, plan B has been developed for green technology. In addition to the one season in Fredrikstad. Urban farming projects in Oslo and Ås will participate.	For green technology, we do not see any problems with meeting the goals and providing sufficient input to the different deliverables.

As informed by the developer, the construction work, including the installation of the vacuum toilet, has been affected. The supplier of the vacuum system has not been able to deliver the equipment because of the factory lockdown. This might delay the construction, and thus building might not be ready for the residents to move in by the planned date of December 2020.	The developer will expedite the building process to meet the deadline	Delay in the building and transporting the system to Fredrikstad/Ås

Table 6: Fredrikstad/Ås showcase deployment deviations due to COVID-19

The table below presents the risks that Hatay showcase faced along with the corrective actions taken and any relevant consequences.

Risk	Corrective actions	Consequences
Services provided by the Municipality:		
Municipal Services that facilitate the precautions for COVID-19 were given priority.	After the normalization process is started in June, it will continue its project work as in the period before COVID-19.	SiEUGreen and other EU projects were on 2nd priority
The Municipality had to reschedule the current Crisis management processes, including EU Projects, according to COVID-19.	Municipality rescheduled services according to short / medium / long term crisis management plans in order to mitigate the crisis effects	There was a delay of several months in municipal services.
Municipalities' goods and services purchases were postponed (Tenders were stopped and were on hold)	Tenders were postponed until the normalization processes to be started in June.	There was a delay of 2-3 months for the purchases to be made for showcase studies.
Project work between Hatay Metropolitan Municipality and the European Union has been postponed. Showcase deployment was stopped during the curfew.	After the normalization process is started in June, it will continue its project work as in the period before COVID-19.	Showcase works will be delayed for 2-3 months.
Supply service:		
Cancellations and delays occurred in the procurement services due to the COVID-19. The local and international suppliers were unable to produce and ship the necessary products for greenhouse instalments	After the normalization process is started in June, supply services will continue as in the period before COVID-19.	The Hatay showcase works of the SieuGreen project will be delayed for 2-3 months.

Logistics restrictions over countries and cities.	Logistics companies will start to serve their customers in June.	The Hatay showcase works of the SiEUGreen project will be delayed for 2-3 months.
Human Resources		
Mandatory permissions were given to municipal employees to work from home.	Until normalization processes were completed, Sieugreen project personnel were allowed to work from home. The project is expected to continue within the time frame declared, as before the COVID-19 period.	Municipal activities are delayed for 2-3 months.
Curfew was declared. Employees in the greenhouse could continue for the instalments.	Special permits were obtained for the personnel working in the greenhouse, and a shift work system was introduced for this personnel.	Production of plants grown with traditional agriculture continued in the Showcase.
Syrian refugees and disadvantaged groups could not go out on the streets due to the curfew and restrictions.	The training activities to be given to this group were postponed until the normalization process to be started in June to be intensely carried out in order to compensate for the delays.	Training activities will be delayed for 3-4 months

Table 7: Hatay showcase deployment deviations due to COVID-19

The table below presents the risks that Aarhus showcase faced along with the corrective actions taken and any relevant consequences.

Risk	Corrective actions	Consequences
World gardens: Cannot make larger gatherings such as events.	Make videos to inform and inspire people. The volunteers may stay longer at the polytunnels so visitors/participants can join, but fewer at a time. Maximum 10 people may gather.	
Corona virus is spreading quicker in low SES-areas, due to their exposure to corona in their daily jobs.	10-person limit is kept in this area.	Everything has slowed down in terms of holding workshops
		Positive impact - time for slower learning
The meeting with the responsible person for the solar-dry toilet should be postponed.	A video meeting between Aarhus and NMBU	Since maintenance of the toilet is a practical issue, it

	representatives will take place later.	has been difficult to make it via digital means instead. Many things had been easier to do at the site. Researchers from other countries have not been able to come to Brabrand to instruct.

Table 8: Aarhus showcase deployment deviations due to COVID-19

3. Ås showcase mid-term deployment

3.1 Overview

The vision of the Showcase in Ås is to demonstrate a resilient climate, environment, and human-friendly urban development, with near-zero emissions, a circular economy, and a low climate and water footprint.

The showcase demonstration is being developed during the project progress, designed to adapt the SiEUGreen Blue, Yellow, Green, and Red (engagement) technologies. The greenhouse infrastructure is located at the NMBU campus which will house the different mini-demonstration showcases.

The objectives that aim to achieve the implementation of the Showcase are several:

- Establish circularity: reduce water consumption and recycle resources from the households (blackwater and organic household waste) for UA and for the production of biogas.
- Establish circularity: Prudent use of natural resources, energy, and agricultural inputs.
- Change perceptions and attitudes of residents in cities towards the use of land for UA
- Promote SiEUGreen technologies to use efficiently more land in urban areas. Comprehensive plans and strategies should be included.
- Identify and promote the most appropriate plant growing techniques for each location in their cities / metropolitan areas in a cold climate.

- Facilitate access to healthier and more fresh food (pesticides-free, consumed within a few days after harvesting).
- Increase the quantity of food produced locally.
- Decrease GHGs emissions.

3.2 Demonstration

Camp and Ås Area

The NMBU Climate Center has rented NIBIO a greenhouse room, which is 35 m2 (5.6 m x 6.2 m). The following SiEUGreen technologies will experiment with there. The main scope will be to implement the technologies and evaluate them from a technical point of view. The greenshouse is located in the University campus due to its educational scope.

Green technologies[2]

Innovative greenhouse technology

It is a Greenhouse technology with special insulation, solar heat storage, and biogas for light CO_2 and heat. A substantial amount of food can be produced using greenhouse technology, particularly in a cold climatic region like Norway, where the growing season is short. Biogas production and greenhouse technology will be combined to achieve resource efficiency and circularity. The biogas generated will be burned continuously in a combined heat and power (CHP) unit so that no gas is stored. The heat will be used to heat the greenhouse during the cold season. CO_2 from the combustion will be funnelled to the greenhouse to increase plant production.

[2] Scientific refereces and more details are available in D2.1 Green Technology (T1) ready

Figure 7 - Ås Greenhouse Balcony gardens

The balcony garden technology will utilize the space in the balconies for food production. Innovative self-watering containers will be used for the balcony system to efficiently apply the water and the liquid nutrients. Liquid nutrients will be recovered from digestate, and from urine can replace commercial fertilizer, thus promoting circularity.

Paper-based plant growing technology

This technology has been tried in China, but it is limited to being used elsewhere. The paper-based technology will make it easy in the Park to cultivate and utilize unused spaces indoors or on balconies, thus enhancing food production. They are resource-efficient as they do not necessarily need soil or peat and use little water.

Soil-based traditional plant growing

The recycled organic waste from the kitchen (apartments) will be composted and will be used as fertilizer in soil-based traditional plant growing for resource efficiency and circularity.

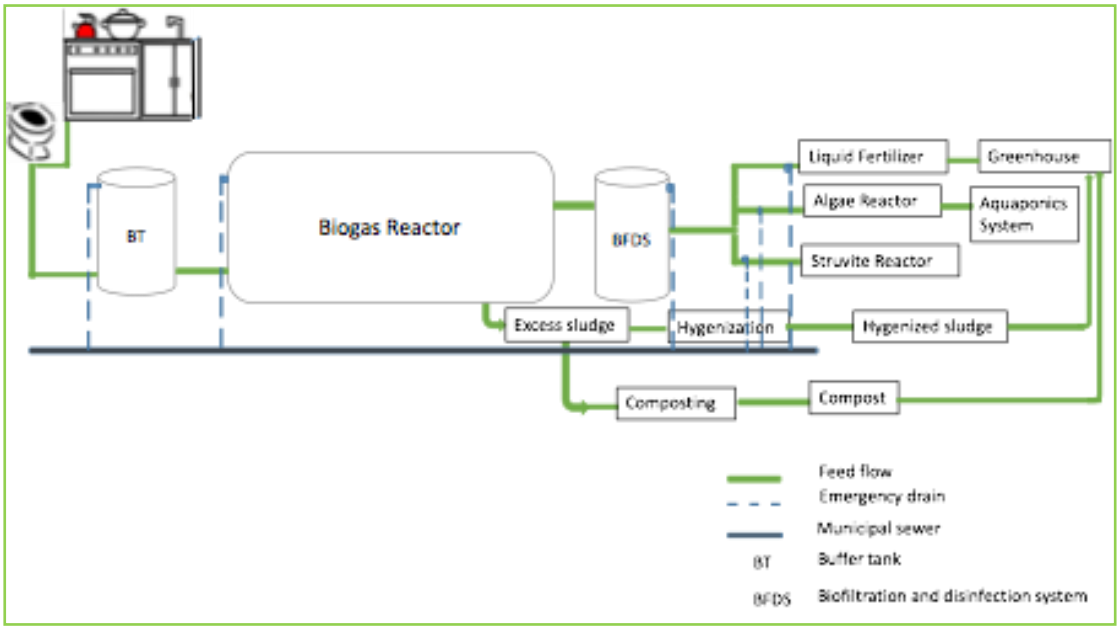


Figure 8: Fertilizer production

Water-based hydroponic culture[3]

This technology will be adopted by the Park households. In hydroponic cultures, the fertilizers are dissolved in water and compared to soil-based technology, regarded as more resource-efficient. Nutrients are obtained from the digestate from the biogas reactor and the "soil" media from compost from the organic matter in the household. This promotes circularity.

Self-watering containers

This technology was to be deployed in the balcony gardens. Complimentary activities with this technology would have run parallel until the people were moved into the Cicgnon Park project by December 2020. This will be initiated in households in Ås and Oslo (see chapter 3.4 plan B).

Blue technologies

[3] More details and scientific references are available in D2.3 Blue technology (T2) Ready - 1 and D2.4 Blue technology (T2) Ready - 2

Biogas production from Biogas pilot-scale reactor

Blackwater and grinded organic household waste will be collected via a vacuum system and led to a biogas reactor. The byproducts of the biogas reactor are biogas and liquid digestate. The biogas produced will be used for heating a greenhouse through and generating electricity unit, thus promoting resource efficiency. The liquid digestate will be used for plant production in the hydroponic system in the greenhouse. The liquid will be checked for the content of harmful substances such as microorganisms, heavy metals, and pharmaceutical residues, and the digestate treatment system will be designed to remove these. Therefore, the system will contribute to food production as well as optimise resource recycling (for food production).

A biogas pilot-scale reactor with a capacity for 14 apartments is under construction and will be tested at NMBU.

Treatment of Biogas digestate by biofiltration

Biofiltration of digestate can produce a nutrient-rich liquid suitable for local recycling. A prototype testing will be carried out on a laboratory scale, and the results from the prototype testing will be used in the Showcase for demonstration on a large scale. In the Ås showcase a demonstration unit will be installed in a visitors room to demonstrate the recovery of struvite from biogas digestate. Struvite is a mineral fertilizer rich in nitrogen and phosphorus.

Struvite precipitation from biofilter percolate

Recovery of struvite by chemical precipitation from the biofilter percolate will be tested in the laboratory scale. The struvite produced is an excellent slow-release fertilizer that can be used in local UA and also for export. Experiments with full-scale problems of simple (local) and industrial struvite precipitation methods were performed.

Use of organic waste products to produce insects in connection with the aquaponic system

The use of household waste as feed for insects will be tested small scale in showcases with aquaponics systems. Harvesting of worms from vermicomposting for fish feed will also be tested small scale in these showcases. Worms and insects as fish feed have been tested small scale, but still need to determine the best species for each situation, as well as upscale.

Biofiltration of urine

Oxidation and stabilization of source-separated urine by biofiltration or by using an anaerobic reactor will be tried on a laboratory scale to improve the fertilizer and storage properties. Removal of urea and oxidation of NH_4 to NO_3 is important for the reduction of smell, which is important when used in local gardens and urban greening applications. Oxidation can also

remove specific organic substances. Active Research and Development (R&D) is initiated with analytical and laboratory studies.

Vacuum low flush toilets

Vacuum toilets use less water and produce a concentrated liquid waste that will be fed to the biogas reactor. Saving a significant amount of water, It contributes to resource efficiency.

Greywater treatment using a biofilter/filter bed treatment system

The experiences with greywater treatment in biofilter/filter bed are good, with high and stable removal of organic matter and suspended solids. Phosphorus removal can also be high if special filter media with high P-binding capacity is used. Greywater can be reused for flushing or for irrigation. Thus, the reuse of greywater will contribute to resource efficiency as it will save freshwater.

Wetland /pond system for stormwater disposal

Stormwater retention in wetlands and pond systems will reduce the load to the downstream stormwater system during a storm event. It will also help to reduce urban flooding events.

Wetland/infiltration system for stormwater disposal

The stormwater infiltration system will reduce the volume of wastewater to be treated in the centralized treatment, consequently saving resources used for treatment.

Yellow technologies

Photovoltaic panels (PV)

Due to dramatic change in Fredrikstad showcases that could not be utilized to demonstrate and implement the yellow technologies as stated in the proposal and Grant Agreement (GA) , the showcases in Norway are planned and were redesigned to be built at Campus Ås, NMBU, Norway.

Combined heat and power (CHP) from biogas

A thermoelectric generator (TEG) will be used to generate electricity from the heat generated when biogas is burnt. This simple bimetal device can convert up to 10% of the energy to electricity. Engineering feasibility is fully demonstrated in the actual system application.

3.3 Community engagement

The engagement activities during the mid-term deployment period focused on introducing the showcase concept and informing about its expected impact on the local community, including all different interested stakeholders; NGOs through a Public hearing in Fredrikstad (November 2017), researchers through the Public hearing in Fredrikstad (October 2018), politicians and civil servants through a Seminar (September 2019), the public through the presence of SiEUGreen in the national media.

3.4 Challenges and mitigation actions

The deployment time-plan has been delayed for two main reasons, construction work and COVID-19 crisis. As reported in the D3.2: Common implementation framework, the original time-plan was to complete the infrastructure construction and have people move in by M24 (December 2020). However, the construction process experienced further delays, and in December 2020, the showcase leaders were informed that there would be further delays. Now the first 14 flats will only be occupied from M36. Since there will be less time to test the blue technology and as well as one growing season will be available for green technology, a plan B has been developed.

As a plan B for Green technology, the self-water container is distributed to 100 households is distributed so that the residents will grow tomatoes on their balcony, rooftop and small-scale greenhouse. The food production in the self-watering container would also be used to test: peat versus recycled compost; struvite versus organic fertilizer from insects.

Besides, as part of plan B, NIBIO will also start testing the microgreen (sprout) production in private households.

As for Plan B for Blue technology: Since there will be no water and waste for the treatment system until M36 (when the residents were to move in) in Fredrikstad, a plan B has been proposed. To mitigate this delay for the Blue technology, a full-scale treatment system (biogas reactor and greenhouse) will be built in NMBU facilities in Ås. This includes the biogas reactor for the downstream treatment of the digestate and the greenhouse. This will enable showcase leaders to have progress that fulfils the requirements for a testing period. When the systems were supposed to be ready, and there are water and waste to treat in Fredrikstad, the system could have been moved there. The plan was to start building the systems from M27 (March

2020). However, because of the COVID-19, this process also has been stalled. A further delay of about three months in the process of building and testing the biogas reactor was expected.

Overall, due to the COVID-19 - the time has been further pushed by three months. The Fredrikstad showcase Original and Plan B is presented in detail below:

Technology	Initial Plan (reported in D3.2)	Plan B (prior to COVID-19)	Plan B Adjustment (because of COVID-19)	Comment
Green Technology				
1.Innovative greenhouse technology using special insulation, solar heat storage, and biogas for light CO2 and heat	M24	M28 (start building the system in Ås latter to transfer in Fredrikstad)	M31	Part of Plan B
2. Soil-based traditional plant growing	M24	M36	M39	
3. Water-based hydroponic culture	M24	M28 (start building the system in Ås as part of greenhouse and latter to transfer in Fredrikstad)	M30	Part of Plan B
4. Paper-based plant growing technology	M24	M30 (start distribution to households as Plan B)	M30	Part of Plan B
5. Balcony gardens *Self-watering containers for balcony gardens and small scale green houses*	M24	M30 (start distribution to households as Plan B)	M30	Part of Plan B
Blue Technology				
1. Biogas production from Biogas pilot scale reactor	M25	M28 (start building the system in Ås latter to transfer in Fredrikstad)	M31	Part of Plan B
2. Treatment of Biogas digestate by biofiltration	M28	M28 (start building the system in Ås latter	M31	Part of Plan B

		to transfer in Fredrikstad)		
3. Struvite precipitation from biofilter percolate (digestate)	M28	M28 (start building the system in Ås latter to transfer in Fredrikstad)	M31	Part of Plan B
4. Use of the organic waste product for the production of insects in connection with the aquaponic system	M24	M30 (start distribution to households as Plan B)	M30	Part of Plan B Organic fertilizer from insects will be used in the balcony garden UA – not in aquaponic
5. Vacuum- /low flush toilets	M24	M36 (expected to complete before people move into the apartment)	M39	
6. Greywater treatment using a Biofilter/Filtered treatment system	M24	M36 (expected to complete before people move into the apartment	M39	
7. Wetland/pond system for stormwater disposal	M24	M36 (expected to complete before people move into the apartment)	M39	
8. Wetland/infiltration system for stormwater disposal	M24	M36 (expected to complete before people move into the apartment)	M39	
Yellow technology				
1. Photovoltaic panels (PV)	M22	M36 (expected to complete before	M39	

		people move into the apartment)		
2. Combined heat and power (CHP) from biogas	M29	M28 (Will be part of Greenhouse system in Ås latter to transfer in Fredrikstad)	M31	Part of Plan B

Table 9: The Fredrikstad showcase Original and Plan B

3.5 Lessons learnt

During the period of the mid-term deployment, the following lessons have been learnt:

- While developing the showcase plan, the unforeseen scenario should have been considered.
- The risk identification and mitigation plan for showcase deployment were weak. A contingency plan should have been better formulated for the Showcase Fredrikstad, which has to be developed from scratch.

4. Aarhus showcase mid-term deployment

4.1 Overview

The city of Aarhus, where the Showcase is located, is popular for its urban agriculture initiatives driven by the 'Taste Aarhus' Program and organized activities to bring people together and activate underutilized spaces around the city and engage people in the practice of growing their own food. At present, it counts more than 280 initiatives[4]. In SiEUGreen, the Showcase demonstrates in real environments the polytunnels' Green technology and the combination of Blue and Yellow technologies through the installation of the solar-dry toilet. Based on experience, engagement activities are taking place tailored to increase residents' awareness of the circular economy model through the use of SiEUGreen technologies and attract them to participate in the relevant urban agriculture activities.

The showcase vision is to create a more socially inclusive and sustainable community through the promotion of urban agriculture. In particular:

- Reduce, reuse, recycle waste: Establish circularity
- Increase the possibilities of cultivating edible crops in Aarhus Municipality, among other things, by supporting the establishment of new urban gardens and edible urban spaces.
- Make use of UA as an integration strategy for refugees and migrants.
- Contribute to changing perceptions and attitudes towards the use of land for UA
- Promote technologies for more efficient use of land for UA. Increase the land used for UA
- Facilitate access to healthier and more fresh food (pesticides-free, consumed within a few days after harvesting)
- Increase the quantity of food produced locally

The Showcase has started its deployment as planned in mid-2018, the technologies have been installed, the planting of food with Green Technology has started, and the solar-dry toilet will be soon operated.

[4] Details in D1.2 Baseline study including key indicators and development of a typology – Appendix E

4.2 Demonstrations

Solar-driven toilet and urban farming in Fællesgartneriet

Århus has installed at Brabrand, Faellesgartneriet the solar dry toilet (Blue technology) with a photovoltaic panel and a solar collector (Yellow technology) for the heating. This toilet processes human excreta (organic household waste) and extracts Compost. Urine is diverted separately[5].

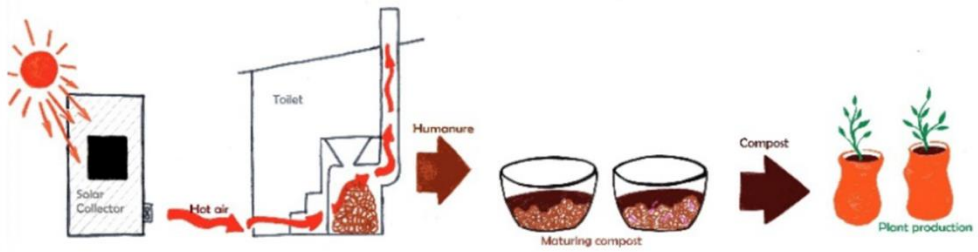


Figure 9: The toilet function design

In terms of deployment progress, the toilet was installed in September 2019. The toilet facility was planned to be opened to visitors in April 2020, when the growing season starts. But because of the good weather and early arrival of visitors, the toilet has been open for use since January 2020. The researchers from NMBU will visit the toilet site to evaluate the performance of the toilet. The compost produced will be tested for suitability to be used in vegetable gardens to assure the community of the safe use of recovered soil amendment products in their gardens. The visit was scheduled for April 2020, but it has been postponed because of the lockdown due to COVID-19.

[5] Details at D2.4 Blue Technology (T2) Ready 2

Figure 10: Solar dry toilet - Brabrand, Faellesgartneriet

Polytunnels in World Gardens

World Gardens community has designed and constructed the polytunnels using recyclable materials. The community has also been preparing to install the polytunnels in several other places. It is worth mentioning that the World Gardens has placed a model of the polytunnels in the Planning Department for exhibition. This has helped to communicate the SiEUGreen initiative to the wider community.

This process started in September 2019 and was completed by February 2020, when food planting started. Currently, the crops produced in the polytunnels are:

- Garlic
- Spinach
- Three types of salads
- Green peas

All these crops have grown approximately 20% faster than without polytunnels. The growth is probably expedited because of two reasons; it is warmer in the polytunnels, and also because it is more humid, which brings out another advantage – the polytunnels do not need to be watered as often as the plants that are in pallets without polytunnels.

Figure 11: Polytunnels

4.3 Community engagement

Community engagement is part of the daily activities in Aarhus. Activities focusing on the engagement with the SiEUGreen technologies include:

- Public meetings every Tuesday and Thursday are open for everyone, taking place in the gardens.
- Three days exhibition for the polytunnel model has been organized in the Planning Authority.
- A movie has been posted about the community garden, including the SiEUGreen dry toilet installation for pilot testing.
- A SiEUGreen article has been published to the community in the "ghetto news" China, Europe, and Gellerup.

4.4 Challenges and mitigation actions

The table below presents any challenges faced during this period, along with the corresponding solutions.

Challenge	Solution
Aarhus World Gardens container was put on fire.	Aarhus municipality reimbursed the World Gardens so that they could replace their tools etc. and would not lose the spirit
Brabrand: Delays setting up the solar toilet due to formal paperwork, taxes, etc. must be done.	The toilet was transported from Norway to Denmark. The toilet was, therefore, delayed by one year.

Handling the toilet and toilet waste was also a challenge to find out how to do in practice.	It took some time to get the right instructions told in a language that is possible for practitioners to understand. So, instructions came in place only in spring 2020.
Decision within the project showcase on who would be responsible for taking care of the maintenance was also a challenge.	The responsibility for monitoring and taking care of the toilet has been assigned to a person.
Long-term maintenance of the solar toilet.	Will it stay in Brabrand after the end of the project period? No plan for this at this point.
Culture clash when it comes to using dry-toilet. In Norway, it is such a normal thing, but in Denmark, it is totally controversial. In Denmark, it is very unusual to use a dry toilet.	A lot of communication between the Norwegian and Danish partners about how to communicate.

4.5 Lessons learnt

- Instead of measuring on a weight basis (kg), it is more useful to count the variety of crops that can be grown, taking into consideration the growing season.
- The polytunnels are an excellent way to reuse material (for making the polytunnels) and using the polytunnels to create community engagement.
- Supporting a local initiative with some financial resources can make a great impact.
- The empowerment of being part of a large EU project that is putting attention to what local groups are doing and using them as an international example.
- People from various cultures seem to apply technology in different ways. The solar-driven dry toilet is a perfect example.

5. Hatay showcase mid-term deployment

5.1 Overview

The region of Hatay has 3.000 hours of sun and five (5) m/s of wind potential per year. With SiEUGreen project, the Hatay Metropolitan Municipality aims to maximize the use of renewable energy and minimize the energy of resources to become a sustainable practice.

The Municipality implements a showcase to replace the traditional cultivation with hydroponics and aquaponics cultivation systems that will be applied in greenhouses. In Turkey, the energy is mostly produced from fossil fuels; therefore, the circular economy model application will minimize the energy footprint.

The Showcase also acts directly or indirectly to urban life and is also an educational project for Syrian refugees and disadvantaged citizens, offering them the opportunity to grow their own healthy and organic foods in traditional greenhouses.

The Showcase started in 2018 with the building of four traditional greenhouses and a greenhouse with aquaponic systems. The implementation of the four traditional greenhouses started in December 2018, while the implementation of the greenhouse is expected to be completed in October 2020.

5.2 Demonstrations

Kisecik Greenhouse

A new greenhouse with hydroponic, aquaponic system and photovoltaic panels aims to integrate green, blue, and yellow technologies. Its land is 200 x 200$m^{2,}$ and it is in the peri-urban area of Antakya. The idea is to move towards a circular economy to use the natural resources (energy and agricultural inputs) and increase the quantity and quality of food produced based on the model depicted below:

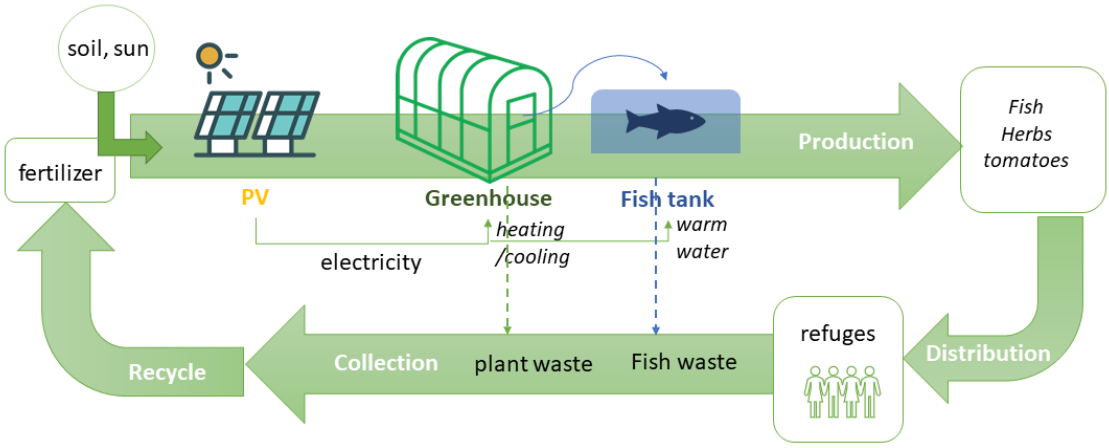


Figure 12: Hatay showcase circular economy model

As of June2020, greenhouse constructions are ongoing with the slight delays of the virus outbreak. The electricity needed for the greenhouse system and the equipment requirements were calculated. A water supply system for the aquaponic system (Green technology) to be installed in the greenhouse was constructed.

Because of the lack of expertise with the Municipality in the construction of such a system and to resolve the technical problems that were encountered during the construction process, a consultant (associated Prof. who is working as a water-product engineer at the Akdeniz University in Antalya and implemented the system in the University's campus) was hired. The technical problem was resolved with the help of the consultant.

Regarding the equipment for the aquaponic system (Green technology) and the fish tanks; orders have been placed to the suppliers, and the tendering processes are ongoing. The procurement and the installation of the systems are expected to be finalized by the end of summer 2020. The greenhouse with the aquaponics and hydroponic systems (Green technology) is planned to be put into service in late summer (in October 2020). Regarding the blue and yellow technologies, Hatay Municipality is currently working on the technical details and preparations of PV systems (yellow technology) and organic waste (Blue technology) products for insects to be commissioned in the next term. An operating office was established; to facilitate communication with the responsible persons and for the management of the greenhouse.

The greenhouse demonstration is an innovative one that envisions to prove that using the technologies will provide **healthier and more fresh food in larger quantities in comparison to one without it.** The food that **will be produced in the greenhouse using the SiEUGreen technologies will be healthy.** The greenhouse as infrastructure prolongs the farming period.

The usage of organic waste in comparison with fertilizers used in open fields will be an important reason for healthier food but also for larger quantities in comparison to farming methods without fertilizers. The plan is to have catfish and/or tilapia in the fish tanks and grow herbs and tomatoes.

To ensure the sustainability of the greenhouse in terms of long-term operation, the Hatay municipality has set up a management structure; with a director and officials with the responsibility to respond to the implementation & maintenance of the UA technology, the human resources, the financial issues, and planning, and a communication manager for the social and communitarian activities (workshop, courses, beneficiaries of food production).

Hatay has also set up an executive board, with the participation of representatives from different departments of Hatay Municipality (Parks and garden, education, health, international relation, waste treatment), other relevant local/regional institutions (e.g., university), and stakeholders (women's cooperative manager, representative of the refugees, local farmers, community, among others). When the greenhouse is ready, the board members will meet at least once every three months and deliberate about upcoming activities, financial planning, and other issues.

Figure 13: Hatay greenhouse with the aquaponic system

During and after the implementation, it is planned that the greenhouse will be a demonstration site that university students and researchers can visit to see the aquaponics and hydroponics systems. Hatay municipality will be the first applicator of these practices in Turkey. For this purpose, it is aimed to cooperate with the universities at every stage of the installation and implementation works to spread the know-how. With this respect, the greenhouse is planned to facilitate a learning centre for educational practitioners.

Traditional Greenhouses

Near the aquaponic greenhouse, the Hatay showcase has developed four (4) traditional greenhouses. The goal is to **facilitate access to healthier and more fresh food.**

The construction of four (4) traditional greenhouses with drip irrigation systems were started in August 2018 and was completed in November 2018. The total unused land has been 10ha and reused for four traditional greenhouses, 5.000 m^2 each.

The plant growing technique used has been the soil-based one to cultivate ornamental, medical, and aromatic plants. To **increase the quantity of food produced,** the community that has been engaged in farming at the traditional greenhouses is comprised of 120 Syrian and 250 women who were trained by the cultivation unit of the Municipality.

Seeds and saplings have been distributed to the community, including:

- 7.350.000 Seasonal flowers seeds
- 3.085.000 strawberry seedling
- 450.000 different kinds of fruit saplings and olive saplings
- 4.500 Lavender bushes
- 7.250 Juniper bushes
- 3000 Rosemary bushes

At this stage, Hatay plans to grow lettuce in aquaponics and strawberry in the traditional greenhouses. The NFT paper-based food production will also be provided within the greenhouse.

Figure 14: Hatay traditional greenhouse

5.3 Community engagement

The engagement strategy of the Hatay showcase is described in Chapter 9 of the SiEUGreen Deliverable D1.5 Engagement Strategy – planning and in Annex 9.5 of the D3.2 Common

implementation framework. This chapter presents the current achievements with regard to the individual action plan.

The Hatay showcase target community includes a) policymakers, b) residents (refugees, disadvantaged groups), and c) civil society (NGOs). The community engagement focuses on societal inclusion, and the actions taken involve workshops, meetings with community members, social media, and the COMMURBAN app. Such activities aim to:

- make use of urban agriculture as an integration strategy for refugees and migrants.
- increase the understanding of the social and economic potentials of Urban Agriculture
- increase knowledge of organic gardening practices
- train the disadvantaged women (Syrian refugees and local women)

Hatay has organized three workshops targeted at local women and Syrians, which attracted 120 people. Hatay plans to implement two workshops in the next period. The first workshop will be held after the completion of the installation of the aquaponic and hydroponic system. At the beginning of plant cultivation, technical and practical training will be provided with a full-day workshop program. On the same day, a technical trip structure is foreseen in the showroom.

The second workshop is planned to be held with the same participants in the near term of the plant harvest. During this period, project promotion activities were mentioned by the mayor in local press and news channels. Project dissemination activities were carried out in events organized by the Municipality and at the fair participation. In addition, SiEUGreen project objectives, activities, and expected outcomes are presented in kindergartens.

Until the mid-deployment period, 120 Syrian refugees and 250 local women (working for Women Cooperative Foundation) get trained in the growing technical branch to increase their understanding of the social and economic potentials of Urban Agriculture. The women have been growing seasonal flowers for the Hatay municipality with approximately annual 4 million flowers.

The flowers were given to these women as a grant by Hatay Municipality. A team of agricultural engineers provided regular training and consultancy services to female producers at every stage of flower production.

The COMMURBAN app has been used by the Hatay showcase to increase the knowledge of organic gardening practices. Six (6) DIY projects have been uploaded as a Hatay Metropolitan

Municipality. More are planned including DIY project that showcases work with disabled intern high school students who are studying in the agriculture department of the school.

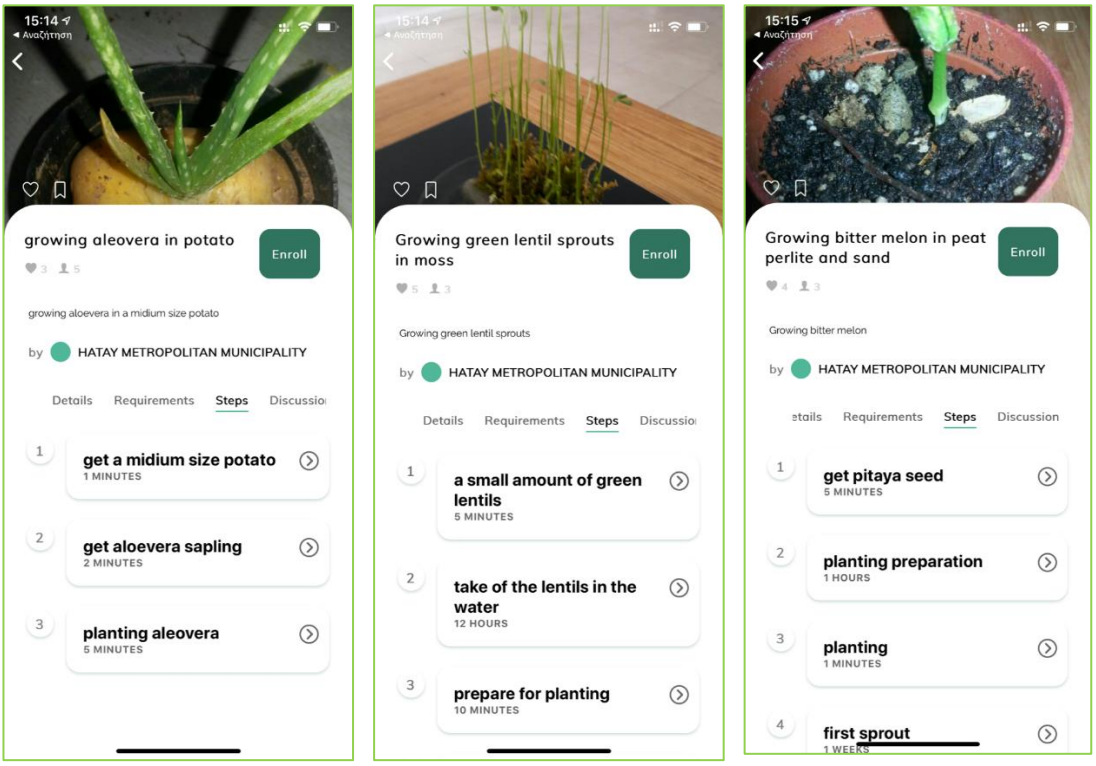


Figure 15: Screenshots of DIY projects at COMMURBAN app

Future activities of the SiEUGreen project work will be integrated into the social media accounts of the Municipality.

5.1 Challenges and mitigation actions

During the current period of implementation, the following challenges have been faced, and mitigations actions have been taken, as shown in the table below.

Challenge	Solution
Sustainability of aquaponic greenhouse, landless agriculture systems.	Educational training for the technical team (at least 4 persons)

High expenses of high technology-related equipment (solar panels and automation systems)	Because of the financial crisis that we faced it limits the Municipal contribution.
Technical problems with the Aquaponics	Hired consultant for technical support
Not enough attention from farmers and investors	To get the farmers, and investors' attention and awareness, making some differentiation on plant species and implement the process facilities

5.2 Lessons learnt

Important lessons learnt during the mid-term deployment period include:

- It is important that more locals' growers – farmers will participate.
- Increased awareness may influence any negative issues that arise in the organisation's processes.
- It is crucial that more local growers – farmers should participate in these actions for the adaptation and mainstreaming of new farming technologies in Turkey. It has been understood that further training programs, integration studies, workshops, and dissemination activities are required by the Municipality in order to ensure participation.
- Lack of preliminary work: Delays and lack of information were identified in the technical support process as there are no similar systems in Turkey regarding the systems to be implemented. It was understood that the municipalities and other institutions that will apply these systems should create guiding documents, train experienced personnel, and carry out preparatory and infrastructure studies before they are put into practice.
- A financial and operational model for the greenhouse was identified in order to ensure social integration and refugee participation. While the greenhouse is being set

up, managerial studies such as the operating model and the determination of technical personnel are also required.

6. Beijing showcase mid-term deployment

6.1 Overview

Beijing residents' demand for urban agriculture has progressively increased in recent years. More residents are interested in creative agriculture, experience agriculture, and leisure tourism. Families and especially the elderly population, have strong demand for family balcony agriculture. The landless farmers in the process of urbanization want to reduce food expenses. Young people are more concerned about food safety and the urban heat island effect. People are aware of the importance of planting at home during Covid-19.

The Showcase is deploying SiEUGreen Green technologies at the Beijing Sanyuan Farm and at 20 balcony gardens (in conjunction with the Changsha showcase to reach 100 households). Moreover, it deploys the Kitchen waste compost system to 100 households. The showcase vision is threefold:

- Allow the people who are living in the city to feel the joy of farming. They will not only be able to eat healthy vegetables but also exercise in farming. The residents will obtain their own fruits, and therefore, they will increase their sense of happiness.
- Increase resource efficiency and turn waste into a resource. In this way, urban waste will be reduced.
- Cultivate vegetables without fertilizers and implement fish farming that does not pollute the water, thus ensuring food safety and improving production efficiency.

The showcase deployment started in January 2019, and currently all technology has been deployed.

6.2 Demonstrations

Happy Vegetable Garden

The Beijing Sanyuan Farm covers an area of more than 200 mu (1 mu = approx. 670 m^2), and it is equipped with farm tools, seeds, organic fertilizers, and composting equipment. It can be used by 600 to 800 households as vegetable gardens. In this demonstration, the following SiEUGreen Green technologies are deployed:

- Paper-based plant growing technology: Bud seedlings belong to the short growth cycle, do not need any pesticides, machinery, or equipment, use special seedlings seeds for

paper planting, can be harvested 7-15 days, sowing daily harvesting cycle growth, and seedling vegetable waste can become fertilizer.

- Soil-based traditional plant growing: Chosen several leaf vegetable varieties are produced which have high quality.

Inside the Farm is located a Greenhouse which provides a suitable growing environment for crop growth, which is not affected or less by the external weather environment.

In addition, the Farm residents can bring kitchen waste to compost for vegetable cultivation.

During the mid-term deployment phase, more than 1.000 individuals have been involved (including 40 unemployed people), and 3.500kg of food has been produced.

Kitchen Waste Reduction and Centralized Disposal

Residential areas in Beijing have been selected to deploy the SiEUGreen Green technology of Kitchen waste compost. In this respect, in terms of technology, the showcase team:

- Developed a household garbage disposer that can make use of the microbial fermentation, odourless material pretreatment and drying recycling technologies to transform household kitchen waste into organic fertilizer, which can be used for growing green plants and vegetables in houses; and established a green space layout for kitchen waste recycling to realize the reduction of kitchen waste and reuse of waste.
- Screened out the desired urban soil recycling materials, studied the application of fermentation products of kitchen waste in urban soil and soilless substrate crop cultivation, mixing ratio with other types of fertilizer, formulation of soilless culture substrates, etc.

One hundred households have been selected to equip the green spaces with a kitchen waste disposer. The household kitchen waste will be recycled in the form of credits exchange and sent to the green space for centralized disposal into fertilizers. Residents can exchange credits for gifts, and fertilizers are applied to vegetable cultivation in the suburbs, thus realizing waste reduction and recycling.

Balcony Vegetable Garden

Additional families (20) located in the urban area of Beijing have been selected to deploy balcony gardens (see more at the Changsha showcase below). On the balconies are deployed the cultivation facilities or equipment to plant some leaves and fruit vegetables. The cultivation facility or equipment controls the water and nutrients that are provided to the

plant for growth and promotes vegetable growth. The cultivation facilities can be recycled and reused to guarantee the sustainable harvest of vegetables.

6.3 Community engagement

At the Beijing Sanyuan Farm, parents, in their spare time, take children with them to weed, water and harvest together. They can not only experience the pleasure of farming and harvesting but also eat fresh vegetables.

At the Farm took place the Aquaponic System demonstration. The NIBIO Aquaponic System has been introduced Norway to further improve and optimize the aquaponic technology in the greenhouse and establish the best aquaponics ecosystem. The excrement produced by fish can be transformed utilised by vegetables planted.

The household garbage disposers are intelligent garbage cans and kitchen waste disposers that residents can use to dispose of the kitchen waste into organic fertilizers at home or bring garbage to garbage disposal sites in the community. To engage the community to use this technology, the showcase team organized door-to-door recovery of fertilizers for vegetable cultivation suburban farms. The vegetables produced have been given back to the residents who produce fertilizers to establish a sound agricultural recycling system. For this action have been selected 300 households as samples to operate the above model so that fresh vegetables will be made available to each family and contribute to solving the problem of kitchen waste pollution.

6.4 Challenges and mitigation actions

The table below presents any challenges faced during this period, along with the corresponding solutions.

Challenge	Solution
Find the best technical partner	Examined more options and the best one was identified.

6.5 Lessons learnt

It is very important to find a like-minded partner. Everyone is moving towards the same goal and gaining happiness in cooperation.

7. Changsha showcase mid-term deployment

7.1 Overview

The Showcase develops urban agriculture in the populated area of Changsha in China. It adopts the European SiEUGreen Blue, Green, and Yellow Technologies to improve resource efficiency: reducing water consumption,reusing and recycling waste, replacing minerals with organic fertilizer, and utilizing solar energy. Through these means, the local community produces healthier food that is gradually accessible. The Showcase envisages also implementing the project engagement strategy to engage more people from the community.

The places where the Showcase is deployed in real environments consist of a unit building of Futian Cangjun with 18 households and 100 households with a balcony garden in Changsha.

The Showcase started on M12 January 2019 with activities to renovate the unit building of Futian Cangjun and experiments with yellow and blue technologies. At this moment of mid-term reporting, the renovation building has been completed and delivered to the householders who will reside after 2020.

7.2 Demonstrations

Futian Cangjun

The Futian Cangjun, Changsha includes 18 households for the demonstration to implement circular economy through the deployment of SiEUGreen Blue and Yellow technologies. In addition, the green roof that covers an area of 50 m^2 and a room for greywater treatment is also used for urban agricultural irrigation.

Figure 16: The Futian Cangjun building

The blue technology is deployed in each household where low-flush toilets are installed and used to save toilet water. The pipelines are transformed to separate highly polluted water sources.

During the mid-term implementation period, the following activities have taken place:

- Low-flush toilets have been installed in 18 households in the Demonstration Building in Futian Cangjun Community, and the inspection Wells that collect the blackwater of these 18 households have been renovated. The blackwater of these 18 households can be collected and stored.
- Experiments for struvite precipitation from black water have been completed. The optimal reaction conditions have been obtained, and a method of nitrogen and phosphorus recovery combining the crystallization of magnesium ammonium phosphate with an adsorbent has been formed. The adsorbent adopts zeolite and bentonite, which has a certain slow-release effect on nitrogen and phosphorus and has a conditioning effect on the soil. After black water treatment, more than 80% of nitrogen and more than 95% of phosphorus can be recycled.
- For the formed Struvite, SEM(scanning electron microscope) and XRD(diffraction of x-rays) were carried out. According to the analysis results, the struvite is a three-rhomboid column, and the purity can reach 95%. Has applied for 1 PCT and 1 Chinese invention patent.
- Struvite is added with other materials to form a slow-release ecological fertilizer. Carrying out the study struvite fertility for the lettuce and cherry radish, results shows that it has long-lasting fertilizer efficiency, high nutrient utilization, large yield increase, improved crop quality, and no impact on the environment. Have prepared 150kg fertilizer now and applied it in Futian Cangjun.
- Struvite is added with other auxiliary materials to form a soil conditioner. Carrying out the study effects of soil conditioner on heavy soil metals. Experimental results show that Comprehensive test results show that this struvite soil conditioner has the effect of improving the acidity of acid red soil and reducing the effective content of the soil. Have prepared 300 kg soil conditioner now and piloted in 1 company’ s soil remediation project. Has applied for 1 PCT and 1 Chinese invention patent.
- The Greywater treatment using a biomembrane system has been completed. The manufacture of relevant equipment has been assembled. The greywater treatment process is a trial operation. The biological treatment system treats the greywater (washing water, kitchen water) produced by the households and partially rainwater to

bring the treated water quality up to make the greywater reach the drinking water standard and realise the recycling of greywater.

- The technical rainwater solution is to lay 50 square meters of lightweight water retention material on the roof to mitigate the impact of heavy rain for the 18 residents. Using the biological and physicochemical effects of the constructed wetland to remove the organic matter optimizes the water quality and then enters the reverse osmosis to reach the drinking water standard. Finished 350m^2 wetland construction and paved 60 tons of zeolite fillers, and planted 4 kinds of purifying plants. Paved 50m^2 of light-weight water-retaining materials and plants to form a green roof.

Figure 17: Low-flush toilets, Radish pot experiment,Lettuce pot experiment, Struvite slow-release ecological fertilizer, Struvite soil conditioner(left to the right)

Figure 18: Crystalline form (SEM), Integrated equipment, Wetland (left to the right)

In the forthcoming period, the following experiments will take place.

- The next step black water are to prepare 200-350kg of high-quality slow-release ecological fertilizer from black water and use them in urban agriculture of residential areas.
- The next step for greywater treatment and rainwater treatment is to operate the system to meet the drinking water standard.
- The next step for balcony garden is timely tracking the 180 households.
- The next step in Business model promotion

  isto integrate the concept of Greenergy and UA with stereoscopic ecological, innovative architecture and extend it to more real estate projects and cities

With regards to the yellow technologies, Five solar lamps have been installed near the demonstration building in Futiancangjun, and two sets of solar water heaters have been put into use on the roof. These yellow technologies are put into operation from May 2020, and they have saved 5.000 watts of electricity and 200 cubic meters of gas from May 2020.

Figure 19: Photovoltaic panels (left) Solar collectors for heating water (right)

The main structure, pipeline renovation, and water treatment facilities of the building have been completed and have been delivered to the householder in April 2020. The residents will move to the households until the end of 2020, when the grey and black water treatment technology will be ready for operation.

Balcony Vegetable Garden

There are 100 s with balcony gardens in Beijing and Changsha Showcase, which are selected to build balcony vegetable gardens. The area of each balcony is 3m^2. The Showcase provides residents with the balcony vegetable garden technology, equipment and materials. The showcase leaders conducted more than 500 online questionnaires to analyze the popularity of urban agriculture. Changsha showcase has promoted 180 households' balcony gardens in Futian Cangjun. Fruit and vegetable planter, Succulent planter, Mushroom planter and Sprout planting rack are distributed. Moreover, each household gets the necessary planting and technical directions to grow and consume healthy vegetables and make the balconies green, beautiful and pollution-free.

Figure 20: Fruit and vegetable planter ,Mushroom planter,Succulent planter,Sprout planting rack

(left to the right)

Business model promotion

The company fully integrates the total Greenergy concepts with the parent company's (Futianxingye) real estate development project. The project name is "Stereoscopic Ecological Innovative Architecture". The difference from the existing residential houses in Chinese cities is that each owner will purchase a house with a large balcony ranging from 30 to 100 m^2. The balcony will be combined with UA and vertical greening technology to create a living micro ecological courtyard. It will also combine the concept of water resources recycling with blue technologies to create new water-saving buildings. Integrating the total Greenergy concepts with this real estate development project. And there is a DIY area reserved for the owner in the sky courtyard to be a balcony garden to develop urban agriculture. Currently, Now projects cover 3 cities with more than 3.000 households. At present, the company is vigorously promoting architecture. Nine projects are negotiating cooperation, involving 10 million $m^2$of development and construction area.

Figure 20: Appearance of Futiancangjun Project,Appearance of Futiancangjun courtyard,Internal layout of Futiancangjun courtyard, Appearance of Futiancheng courtyard,Appearance of stereoscopic ecological innovative architecture demonstration base

7.3 Community engagement

An engagement and behaviour change workshop has been organized and attracted 600 people. About 500 people have already agreed to participate in the demonstration with their balcony gardens. The project deployment already involved more than 150 participants (including builders and practitioners). The construction of the households at the Futian Cangjun building and the renovation of the pipeline providing employment opportunities for more than 300 people until March 2021.

7.4 Challenges and mitigation actions

The table below presents any challenges faced during this period along with the corresponding solutions.

Challenge	Solution
China has no policy to support urban decentralized domestic sewage treatment	Carry out more demonstrations and communicate more with the government
It's high technology content, so it's hard to transfer long-term management system	Arrange for technicians to be responsible for the demonstration and go to the showcase site frequently

7.5 Lessons learnt

During the period of the mid-term deployment, two main lessons have been learnt:

- Frequent communication with the government and residents is important.
- Actions to expand the scope of the SiEUGreen project concept are necessary to attract more urban residents can participate.

8. Showcases overall outcomes and lessons learnt

During the first deployment period covered in this deliverable, the project showcases have made great progress and have generated an amazing amount of knowledge that exceeds the one that was foreseen, or that could be correlated only with the showcases' areas of implementation. After the original submission of the current document (June 2020) (and the updates that have been made in May 2021, which however, were made only to provide a better understanding of the activities of that period), another 15 months implementation period will be in order, capitalizing on the situation established and knowledge generated during the period relevant to the current report.

The current document provides the following important information both for internal as well as external use.

A. First showcases implementation period (preparation and steps to be followed, progress of deployment)
B. Deployment deviations that showcases have and may follow during deployment:
    i) Challenges and difficulties due to the nature of the pillars of implementation
    ii) Challenges and difficulties due to "growing' seasons
    iii) Cultural differences between the members of the consortium
    iv) Challenges and difficulties due to bureaucratic procedures (call for tenders although there is only one supplier) and different bureaucratic rules and procedures between the consortium countries.
    v) Subcontractors were not able to successfully complete their tasks and execute the contract properly (financial issues – and abandoned ship off the Fredrikstad showcase.
C. Force Majeure Situations: Last and most important of all, Coronavirus and COVID-19 disease, which has affected the whole deployment process and has put on hold most of the deployment activities along with the rest of the planet. Governments, Unions of States, and national and international entities have either seized their activities or refocused them on coping and curing COVID-19 disease. Such events could not have been foreseen but should be considered as part of the risks, and a series of mitigation actions should be considered. The current document, together with similar others, could work as a case. A concrete list of the deployment deviations due to COVID-19 is provided under section 2.6, along with suggestions on the corrective actions and the consequences that the project consortium has foreseen. In addition, challenges and

mitigation actions have been identified, besides the COVID-19 situation, for each Showcase, and they are provided as the fourth sub-unit under each Showcase.

Important lessons learnt during the mid-term deployment period, and should be considered for the upcoming period, include:

- Instead of measuring on a weight basis (kg), the consortium found it more useful for the project to count the variety of crops that can be grown, taking into consideration the growing season.
- The polytunnels are an excellent way to reuse material (for building the polytunnels) and use the polytunnels to create community engagement.
- Supporting a local initiative with some financial resources can make a great impact both on the implementation of the project deployment activities as well as on the community engagement.
- Being part of a large EU project that is paying attention to what local groups are doing and using them as an international example is very engaging and empowers the involved parties.
- People from various cultures seem to apply technology in different ways. The solar-driven dry toilet is a perfect example. Such a collaboration, like SiEUGreen, provides a different glance and perspective and can support the scientific community to explore and discover new ways to apply the SiEUGreen technologies.
- It is important that more local growers – farmers will participate as this will lead to the creation of an actual community that will be involved in the project activities. In addition, local growers – farmers should participate in these actions for the adaptation and mainstreaming of new farming technologies. However, it has been understood via the Hatay case that further training programs, integration studies, workshops and dissemination activities may be required by the local authorities in order to ensure their participation.
- Increased awareness may influence any negative issues that arise in the organisation's processes. This is a given at any time and situation as action provokes a reaction. Thus, it is important to always follow a detailed plan, and have established from the very beginning of the project activities very distinct roles along with crisis communication and management plan so that the consortium can not be affected by any negative issue or bad targeted press/communication attacks.
- Lack of preliminary work: Delays and lack of information were identified in the technical support process as there are cases where no similar systems to the ones to

be implemented were available. It was understood that the local public authorities and other institutions that will apply these systems should create guiding documents, train experienced personnel, and carry out preparatory and infrastructure studies before they are put into practice.

- A financial and operational model for some of the deployment activities was identified in order to ensure social integration and refugee participation.
- Frequent communication with the government and residents is important.
- Actions to expand the scope of the SiEUGreen project concept are necessary to attract more urban residents to participate.

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ANNEX I – Reporting spreadsheet examples

The image below, along with the following table, are examples of the reporting and listing systems that have been used for reporting as well as for the interviews that have been organized between the WP3 leader and the relevant leading Showcases partners and individuals involved in the implementation of the showcases activities, per Showcase.

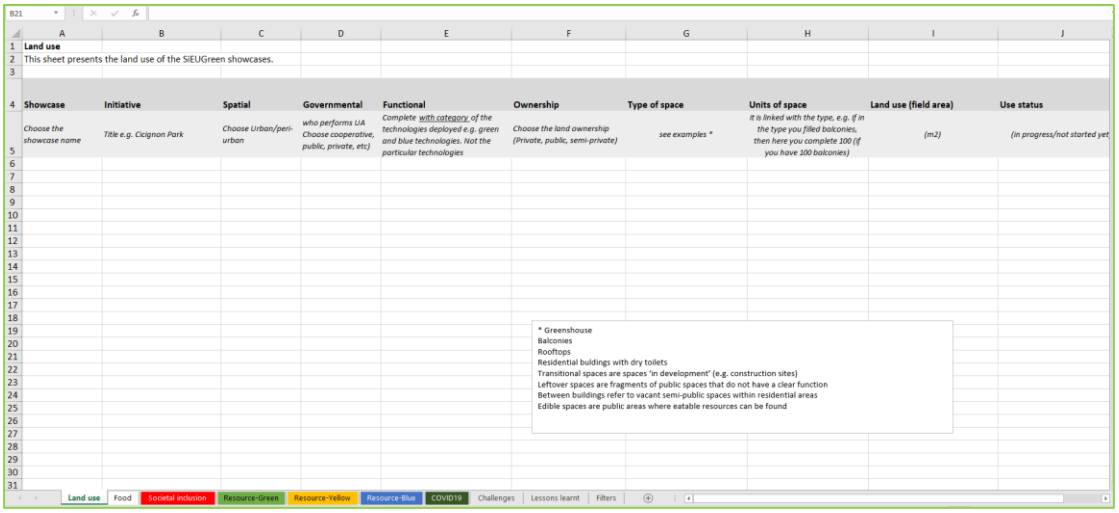

Figure 21 - Spreadsheet reporting table for showcases

Land use										
This sheet presents the land use of the SiEUGreen showcases.										
Showcase	**Initiative**	**Spatial**	**Governmental**	**Functional**	**Ownership**	**Type of space**	**Units of space**	**Land use (field area)**	**Use status**	**Comments**
Choose the showcase name	*Title e.g. Cicignon Park*	*Choose Urban/peri-urban*	*who performs UA Choose cooperative, public, private, etc)*	*Complete with category of the technologies deployed e.g. green and blue technologies. Not the particular technologies*	*Choose the land ownership (Private, public, semi-private)*	*see examples * *	*it is linked with the type, e.g. if in the type you filled balconies, then here you complete 100 (if you have 100 balconies)*	*(m2)*	*(in progress/not started yet)*	*if any*

Table 10 - Spreadsheet reporting table for showcases/ land use

Food Production								
This sheet presents the food that showcases produce through the use of SiEUGreen technologies.								
						If Column E checked in progress, then complete these columns		
Showcase	**Food**	**Green technology**	**Blue technology**	**Food production infrastructure**	**Production status**	**Food produced before the project**	**Food produced during the project**	**Food produced in relation to the amount of food produced without the project**
Choose the showcase name	*Name of the food you produce*	*Choose the technology you apply to produce the food*	*Describe the technology you apply to produce food*	*e.g. Greehouse, balconies, etc*	*(in progress/not started yet)*	*(kg)*	*(kg)*	*(%)*

Table 11 - Spreadsheet reporting table for showcases/ food production

Resource efficiency									
This sheet presents the Resource efficiency that showcases produce through the use of SiEUGreen **Green** technologies.									
			Methane converted to electricity electricity		**Heat consumption**				
Showcase	**Green technology**	**Use status**	**Methane used**	**Electricity produced**	**Before SiEUGreen project**	**With SiEUGreen project**	**CO2 for the greenhouse use**	**Reduction of the water footprints**	**Reduction of the energy footprints**
Choose the showcase name	*Choose the technology you apply*	*(in progress/not started yet)*	*(m^3)*	*(kWh/year)*	*(kWh/year)*	*(kWh/year)*	*(m^3)*	*(%)*	*(%)*

Table 12 - Spreadsheet reporting table for showcases/ resource efficiency

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SiEUGreen
Sino-European innovative green and smart cities