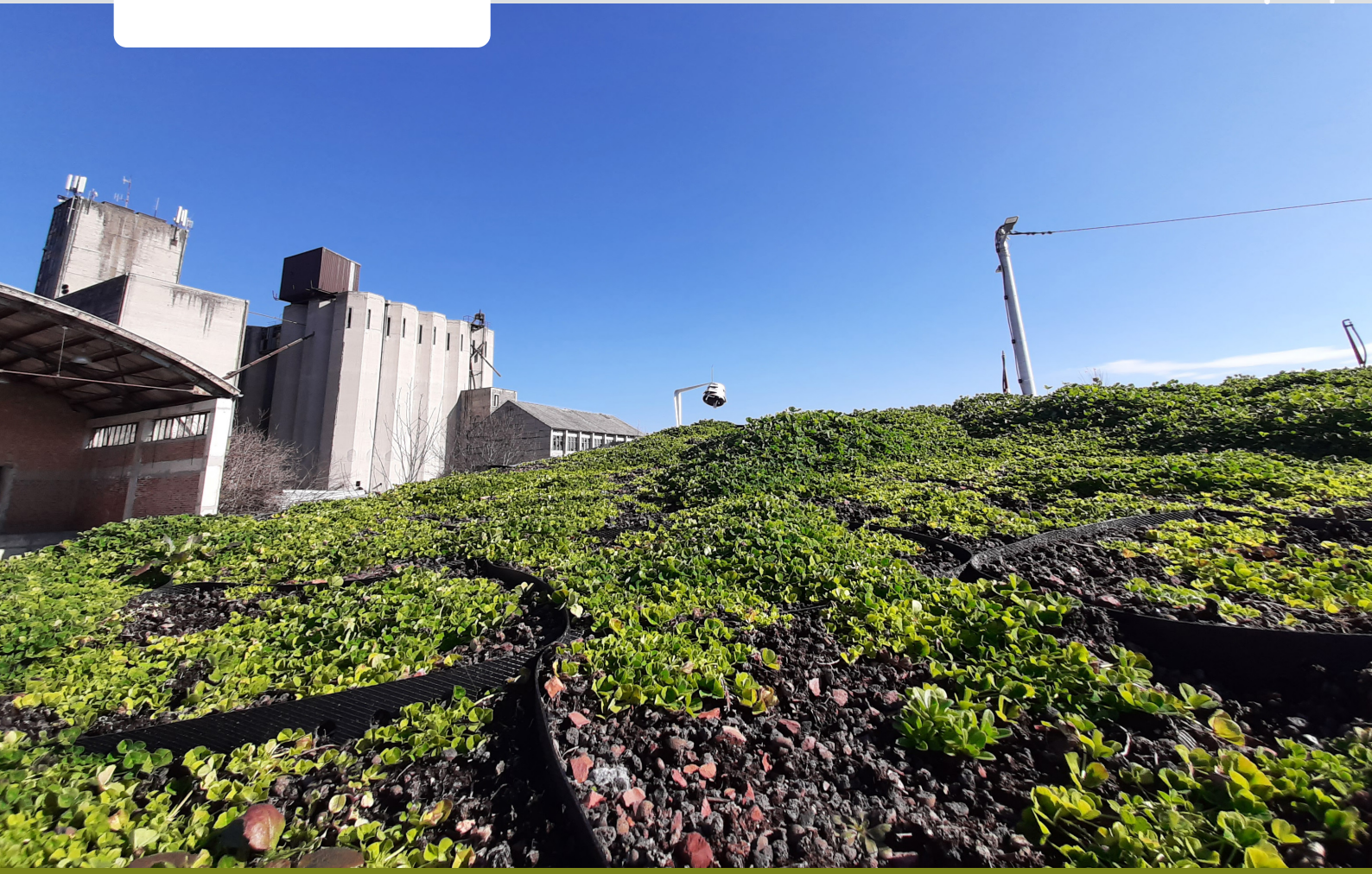
proGIreg

Living Lab Zagreb, Croatia

# NBS 4
# NBS 5

## Aquaponics as soil-less agriculture on polluted sites & Green roofs and walls

## Modular urban farm



## NBS description

The urban farm combines two NBS: A modular container features green wall and roof technologies outside, and a small aquaponics system inside. Either solar panels or a classic electricity fixture generates the needed energy to run the aquaponics system. The green wall and roof significantly reduce the sensitivity of the assembly to atmospheric conditions - insulating the inside of the farm from temperature extremes and absorbing excess rainwater through green roof technology. The NBS represents a green technology centre that is mobile and can change location as needed, e.g. for experimentation at Zagreb University.

The system is open to the public, and its accessibility enables the participation of all interested parties. The modular urban farm convinces by:

- simple operational management of the system,
- clear measurement of efficiency and benefits,
- can be transported to new locations, thus ensuring its sustainability beyond proGIreg's project duration.

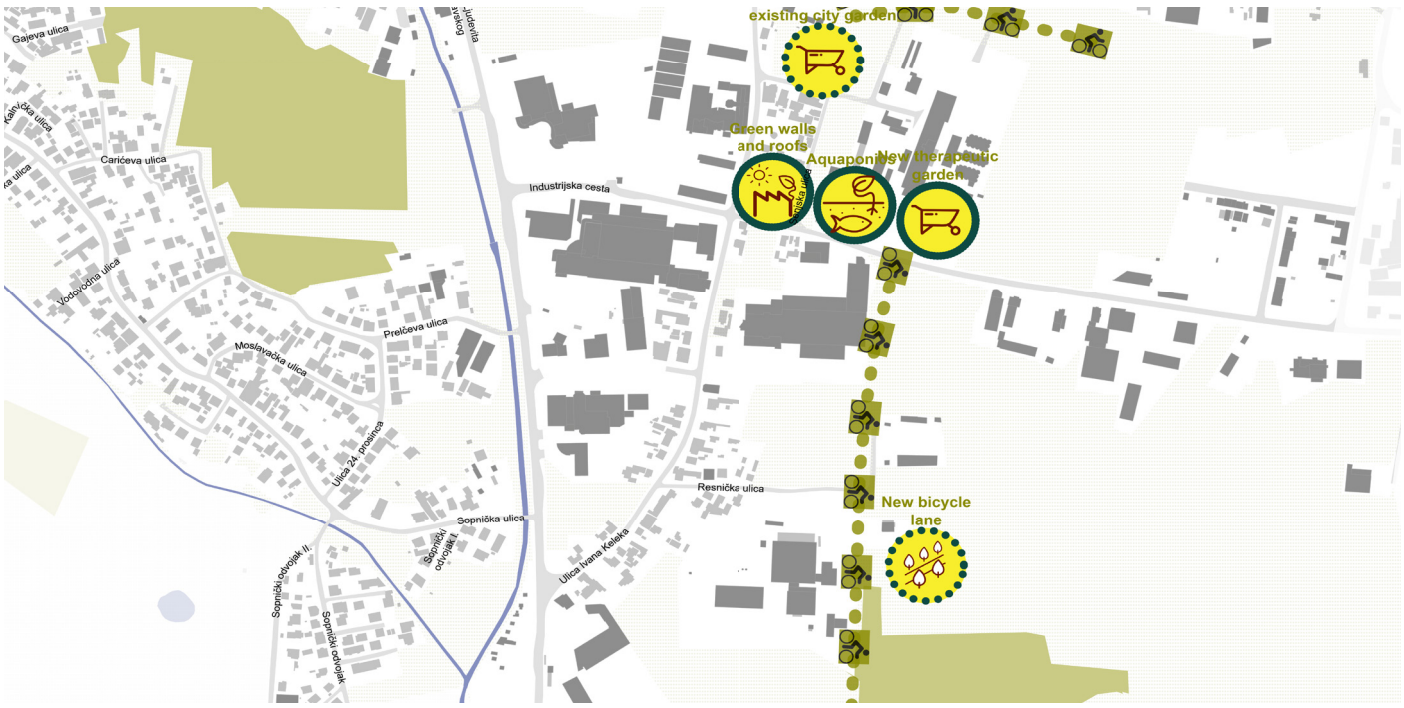
## Aim & goals

The modular urban farm is a platform for presenting modern food production technologies to the interested public and the local community. It provides direct access to and close encounter with applications and practical features of green technologies. Key goals include:

- Increasing local food production throughout the year independent of climate and whether conditions.
- Presenting modern food production technologies to interested citizens.
- Experimenting with keeping a constant temperature in the container and its power supply given the green wall and roof acting as natural insulation.
- Offering educational and scientific learning while harnessing synergies with the users of the therapeutic garden.

## Area of implementation

The modular urban farm is implemented next to the therapeutic garden on the former meat processing plant area in the Living Lab of Sesvete district.




GPS coordinates: 45°49'14.5"N 16°06'28.4"E

## Target groups

- Local farmers
- Interested public and Sesvete residents
- Local schools and families of the neighbourhood
- Company owners wish to benefit from green technologies

## Stakeholder constellations

### Main responsible partner

City Office of Economy, Environmental Sustainability and Strategic Planning of Zagreb is the main responsible partner and coordinator of activities of the therapeutic garden.

- coordinated planning, implementation, use and maintenance of the modular urban farm

### ProGIreg partners involved

NGO Green and Blue Sesvete (ZIPS)

- providing the link to the local community of Sesvete.

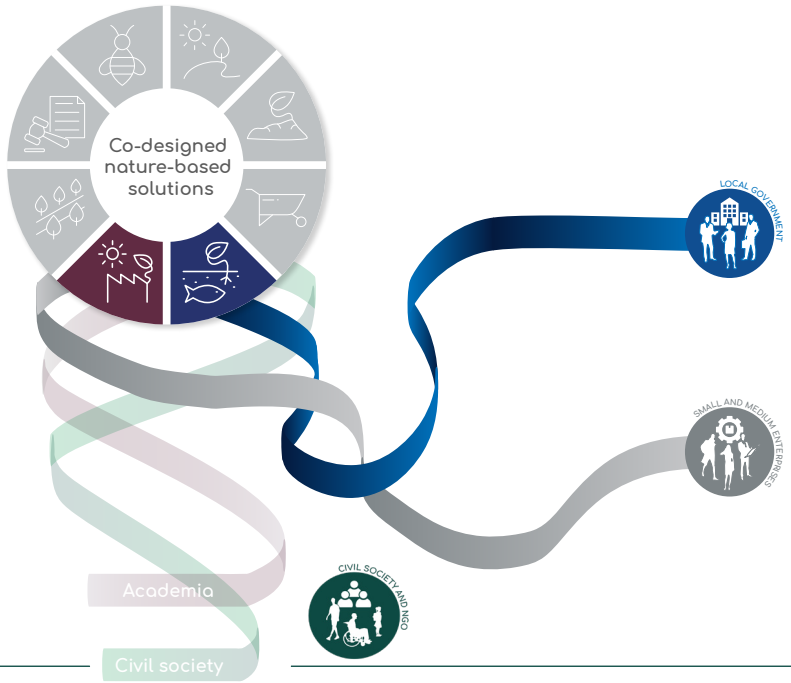
### Other stakeholders involved

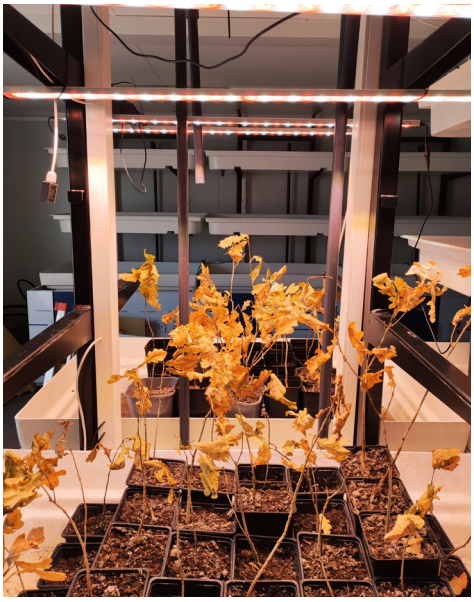
Vesela Motika („The Happy Shovel" ) - small food technology company that designs green solutions for buildings and digital solutions for contemporary indoor food production.

- manages and operates the urban modular farm



## Co-design activities, stakeholder engagement, and pre-implementation activities





Oak seedlings in aquaponics system

## Planning and preparatory activities (administrative and technical procedures)

Originally, the Faculty of Architecture had drafted the concept design of a HUB building in Sesvete by refurbishing the existing administration building, combining green wall and roof technologies with the installation of an aquaponics system on the roof. However, following the earthquake in 2020, the City of Zagreb suffered budgetary cuts. As a consequence, the implementation of the HUB building during proGIreg had to abandoned.

The City of Zagreb ordered a study on implementing the NBS in the former factory area of the Vesela Motika (VM) company to substitute the initial project idea and created the info center instead.

### Implementation budget

**Total implementation budget:**
**176.000 €**

Funds by EU Horizon 2020 project **proGIreg:**
**168.000 €**

Other funds:
City of Zagreb:
**8.000 €**

## Co-design and engagement activities

The City of Zagreb as the leading local partner coordinated the co-design phase by involving relevant local stakeholders. The co-design meetings took place in Sesvete in 2018 and 2019. Engaging the right partners ensured the successful NBS implementation and its longevity.
Since the original location at the HUB building was abandoned, the City administration ordered a feasibility study "Research of sustainability of NBS implementation and involvement of the local community". The study identified the option to implement a small-scale solution that combines aquaponics and green walls and roofs.

## Key achievements and implementation results

The modular urban farm has been in operation since September 2021, experimenting with the combination of green walls and roof technologies with aquaponics and photovoltaic. In the process, several suitable roof and wall plants have been tested for the Zagreb climate to be recommended for wider use. Prior to the installation of the aquaponics system, detailed analysis resulted in drawing up realistic business models, thus making it appealing to local residents. The installed modular urban farm container provides a showcase for application and practical features of such technologies.

Vesela Motika organised a series of educational modules on gardening and composting at the therapeutic garden. The local community, the local self-government, and institutions related to the nearby NBS 3 - Therapeutic garden implementation attended the events.

Together with partners, VM developed on-site hands-on NBS education modules:
MODULE 1: Circular economy and sustainability of urban environments using NBS
MODULE 2: Greening urban areas using NBS
MODULE 3: Food production in urban areas and short food supply chains
MODULE 4: Technological aspects of solutions based on NBS
The education modules are based on national strategy documents. Thus forming the base to develop an educational program, dissemination of the documents to foster better understanding.

VM conducts performance measurements of the green roof and green walls independently. Data collection is on-going, possibly resulting in a scientific paper. VM explored the possibility of growing Oak tree seedlings in a controlled environment with promising results. Growing Oak seedlings in a container farm would facilitate the distribution to local areas.

## Critical implementation issues and barriers encountered

Given the modular urban farm is an innovative model, a number of critical issues arose:

- Adapting to existing regulations required extensive communication and explanation processes among partners to proceed.
- The farm currently operates on solar electricity; however, this has put the aquaponics system on hold due to difficulties of obtaining suitable electricity fixtures.
- VM and partners researched different plant cultures to use on green roofs and walls. Outdated literature posed a key obstacle in this field of research, requiring serious efforts by larger numbers of institutions. Current blue-chip companies' commercial solutions are not environmentally-friendly, but are promoted by the construction materials sector. New substrates offered on the time market need further research and development to make green roof and wall substrates more accessible for wide implementation price-wise. Otherwise, the technology are for high budget projects only.

## Synergies with other proGIreg activities

NBS 3 City gardens and Therapeutic garden: linked to the city gardens project run by Zagreb municipality.

The pilot nature of the modular urban may be utilized for NBS 7 – New protocols and local environmental compensation processes to initiate necessary legislation changes.

## Links with other external projects or activities

Vesela Motika is engaged in complementary projects to the modular urban farm:

- Bio Composter - based on composting process of biowaste implemented close to the farm.
- University of Split approached VM (Zvonimir Jukic, project Manager at Student Business Incubator @EFST), running a small company UniCompoST that provides solutions and education for biowaste & indoor gardening. Together, a fully automated biowaste composter, including hardware design, electronic, software, and automatization was developed.

- Meta Building project modular bio green roof project. Market leading Italian company producing bio and eco fertilizers approached Vesela Motika to develop a green roof element model in the size of a pallet for easier operation, enabling the implementation with machinery and prefabricated modules: five workers could implement approx. 200m² in one day. The modular set-up could be more ergonomic for maintenance. The partner's biostimulants reduce substrate height and stimulate plant growth. The Italian construction association gave positive feedback and are looking for research development financing and go-to-market strategy.
- Knowledge sharing and opportunity analysis with the European Federation of Green Roof & Wall Associations for potential future projects. VM is in the process of becoming a EFB member.

## Maintenance & Sustainability beyond proGIreg

The modular farm is planned to continue to be operated and maintained by Vesela Motika. Sustainability and replicability are of utmost importance, therefore, the research outputs are communicated locally and beyond to attract interest.
Upscaling this NBS in Sesvete is the topic of the EU Horizon project UP2030, starting January 2023.

## Communication activities

Constant dissemination is crucial to ensure activity while raising awareness of the importance of NB among the local community:

- lectures of all project activities at the Info point in Sesvete
- exhibitions, discussions, film projections and other events,
- Info point programme published in local media
- social media channels (facebook and website)
- publishing activities of the urban farm on Zagreb information channels and through Vesela motika network
- 20 companies visited the Living Lab to explore the potential of green technologies
- public sector and NGOs visited locations to discuss opportunities

## NBS benefits for the Living Lab Sesvete

The NBS has multiple benefits ranging from climate adaptation, improving green infrastructure to producing producing food locally, and enhancing social interactions and well-being while offering business opportunities.

## NBS 4+5 benefits and co-benefits

Fact Sheet

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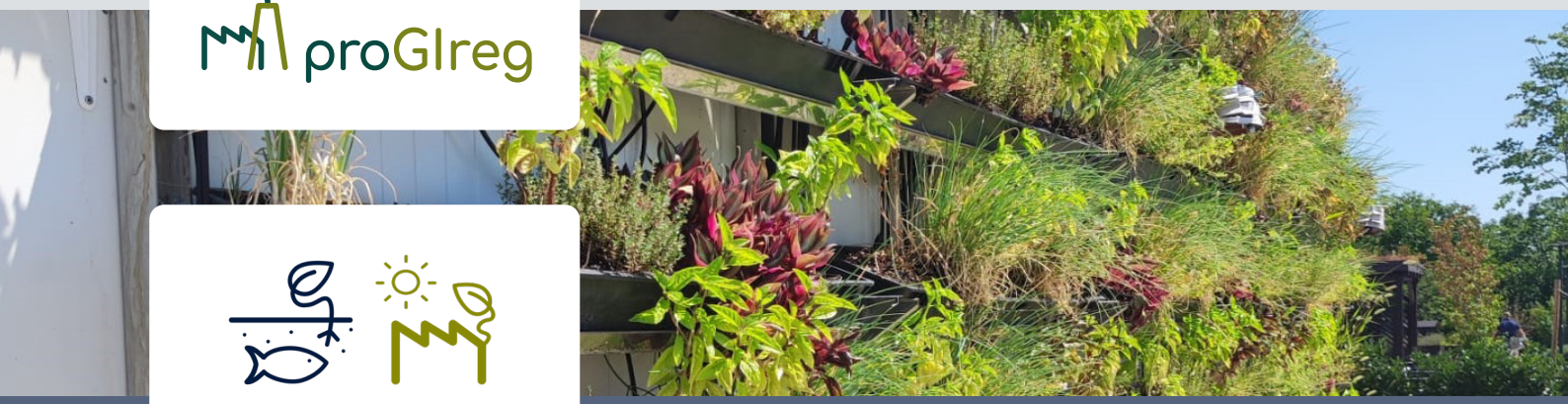

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Contact:
matija.vuger@zagreb.hr
iva.bedenko@zagreb.hr
www.zagreb.hr


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## Partners

CITY OF ZAGREB
City Office for Strategic Planning and Development of the City

VESELA MOTIKA




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