

# Future possibilities of green walls in a Hungarian medium sized town – a case study of Kecskemét

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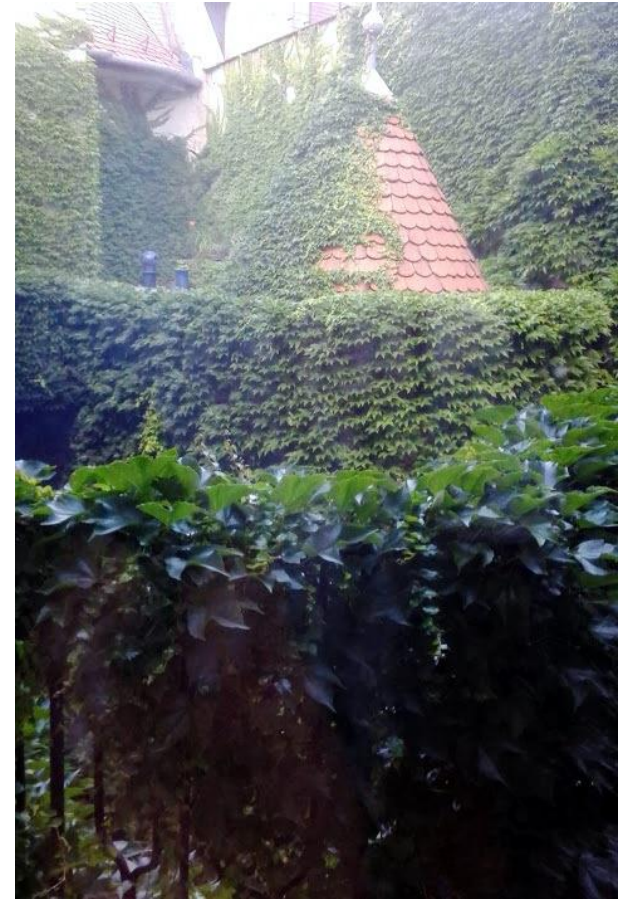
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Network conference of Spa-ce.net, Ljubljana, 27-29. September 2015.



# Aims

- Show the function of green walls as parts of green infrastructure and predict the expected changes of their importance till 2050, based on the example of Kecskemét.
- In our examination we focused on public buildings in Kecskemét. On the basis of number and area of the buildings and size of suitable walls we try to quantify the energy-savings which comes from the lower heating and air conditioning.
- From the theoretic size of green walls we try to estimate carbon sequestration and oxygen emission.
- Follow-up temperature changes of a green walled building.



# Green walls









# Artificial green walls







Bosco verticale Milano – a vertical forest (2014)

# Methods

- We investigated public buildings in Kecskemét.  
Received list from the local government consists of 103 buildings. We did not deal with renovated, modernised structures and tourist attractions such as town hall, churches etc.  
All together we measured 62 buildings.
- Measurement of the buildings: estimate of frontage; it is not mean exact data – but we were able to calculate a value.
- On the basis of the literature we calculated with ivy (*Hedera Helix*) green wall refers to carbon sequestration and oxygen emission.
- Temperature measurements: inside and outside of a green walled building – Clarion Hungary Ltd. in Nagykáta.

## Features of the green wall of Clarion Hungary Ltd.:

- 3D double grid structure
- Drip irrigation
- Vegetation: ivy (Hedera Helix) and honeysuckle (Lonicera)

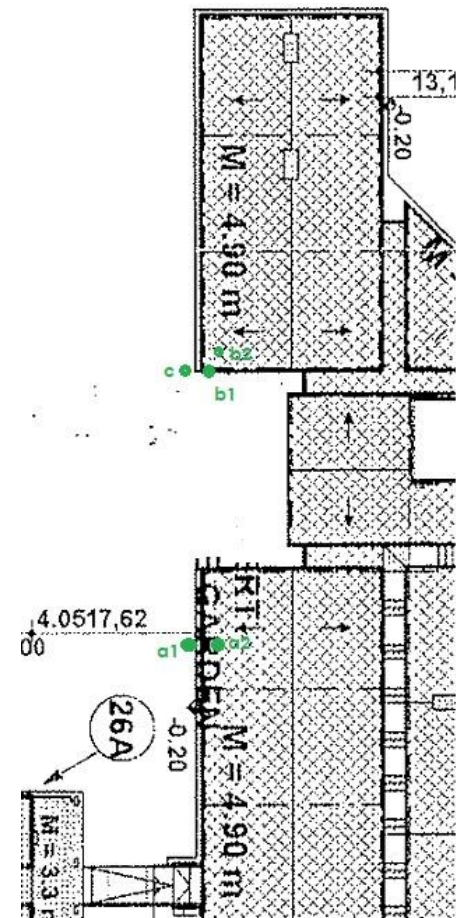




Temperature measurement with VOLTcraft DL-101T type USB temperature data logger, in every two hours.

Measurements parallel with 5 different points:

- Outside of the building without green wall (a1)
- Inside of the building without green wall (a2)
- Outside of the building with green wall (b1)
- Inside of the building with green wall (with and without air conditioning) (b2)
- Inside green wall, in shadow (c)



# Results

- Estimated frontage of 62 public buildings in Kecskemét (without doors and windows) approximately 32 000 m<sup>2</sup>.
- Approximate carbon sequestration (calculated with ivy) is 54 400 kg, oxygen emission is 73 600 kg per year for this estimated 32 000 m<sup>2</sup>.

For comparison: 1 hectare forest's oxygen emission is 15 000 kg and 13 500 kg carbon sequestration per year (Radó 2001) – this values comparable to results achieved by the green walls.

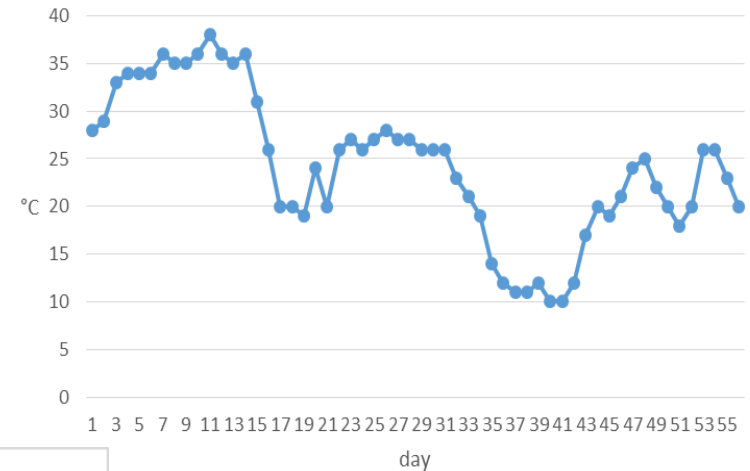
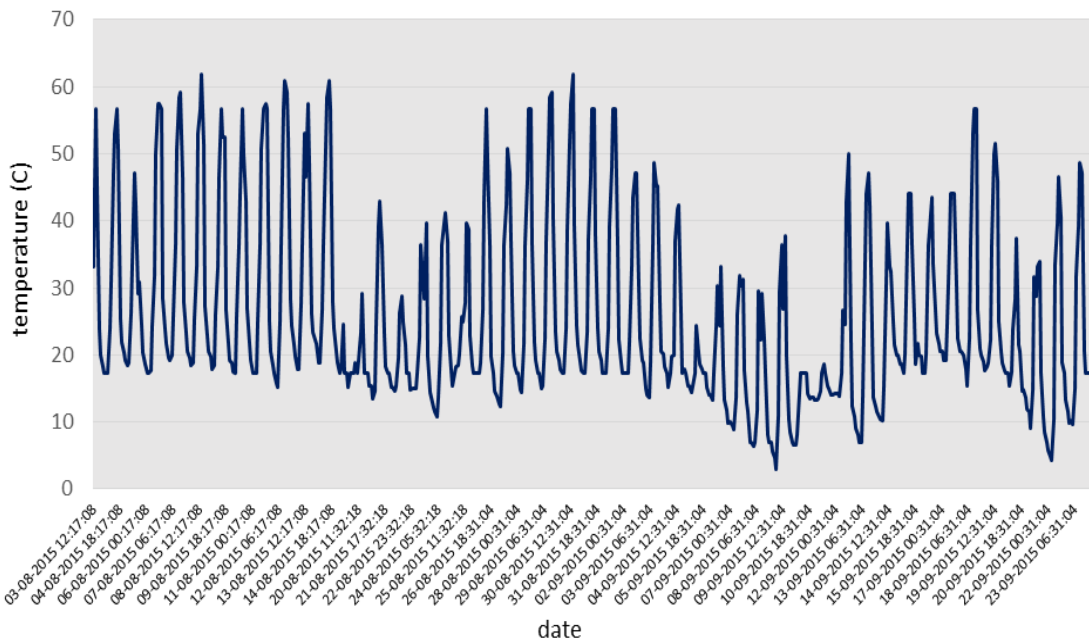
- Possible energy-savings: Energy savings are expected from modernization of public buildings in Kecskemét – with architectural modernization (means wall insulation) – 509 677 Euro per year (calculation by local government).

Green walls contribute to the insulation of buildings, thereby a big part of the necessary investment expenses (~8 926 000 Euro) can be replaced.



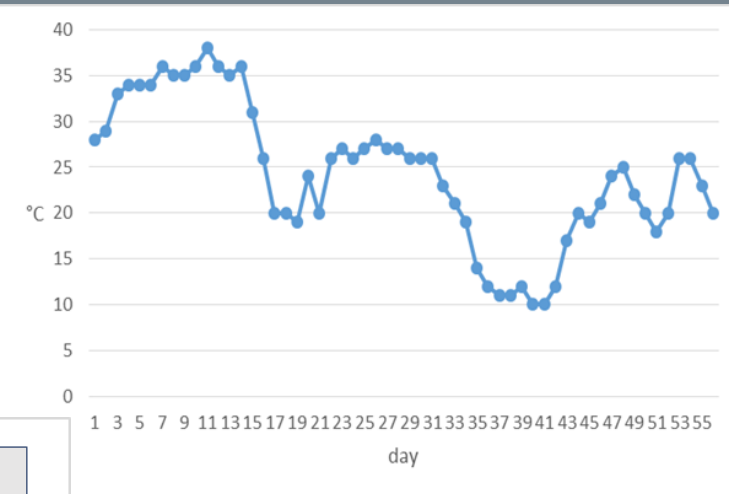
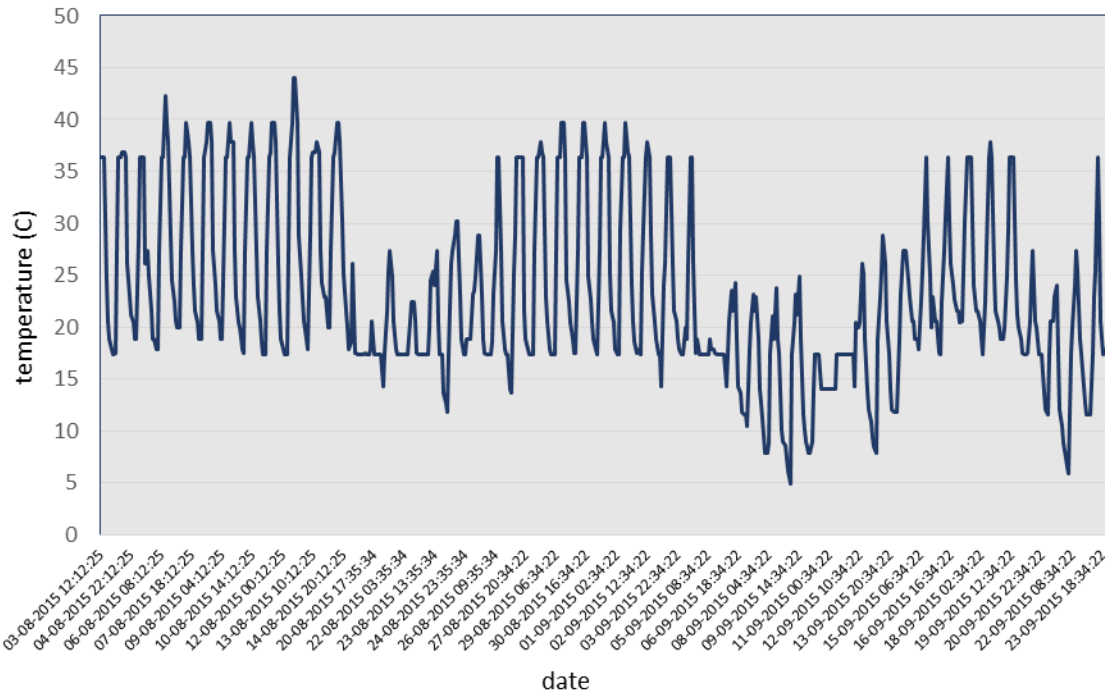
# Results of temperature measurements

Outside air temperature in front of the building without green wall (°C)



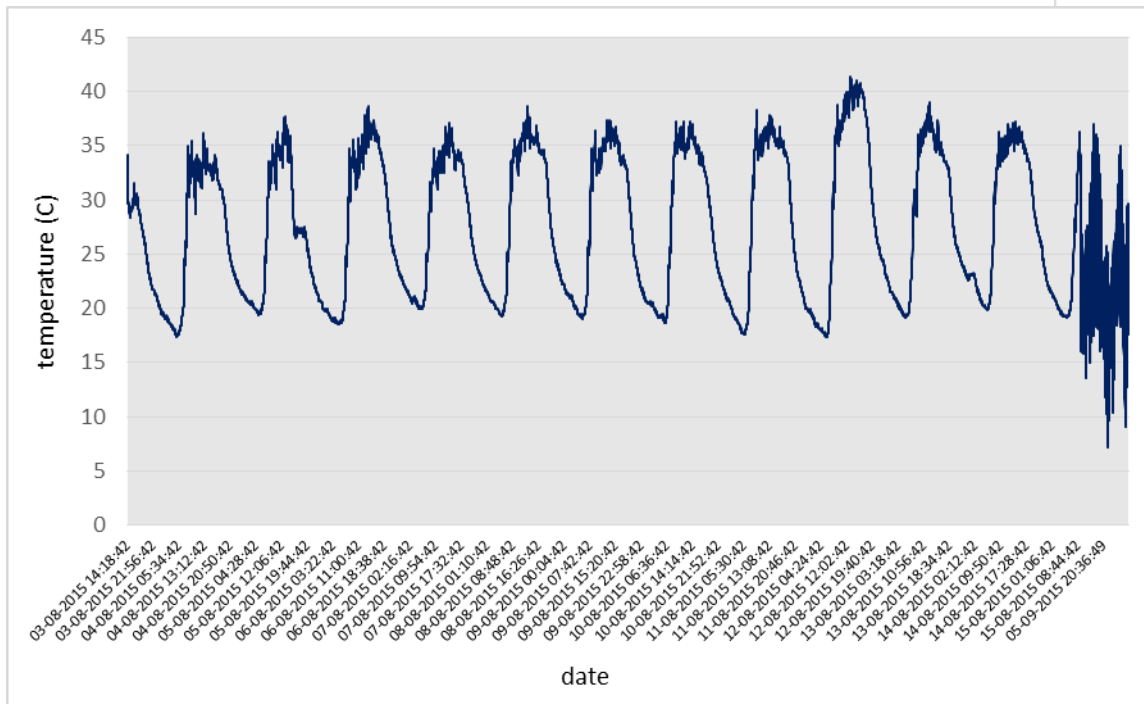
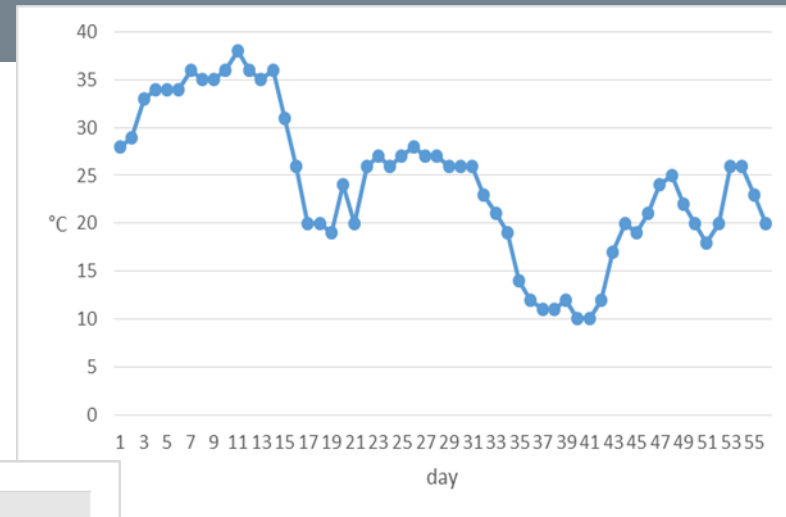
Maximum daily temperature in Jászberény (near Nagykáta) (°C)

# Outside air temperature in front of the building with green wall (°C)

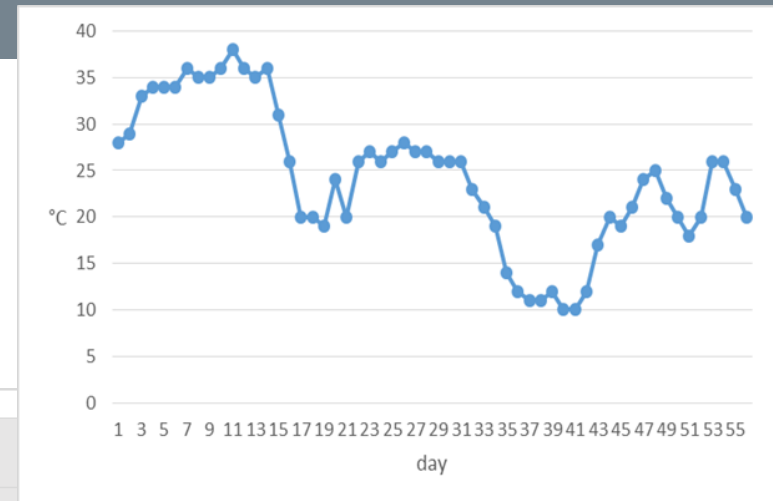
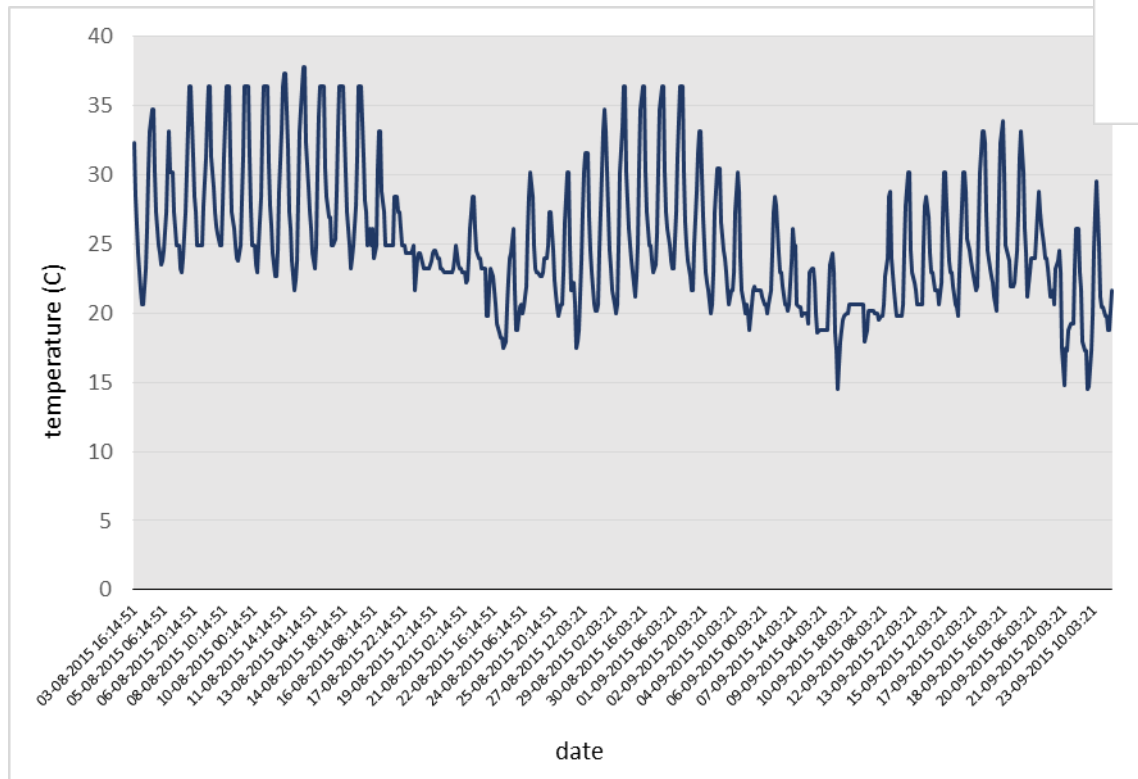




# Air temperature inside the green wall (°C)



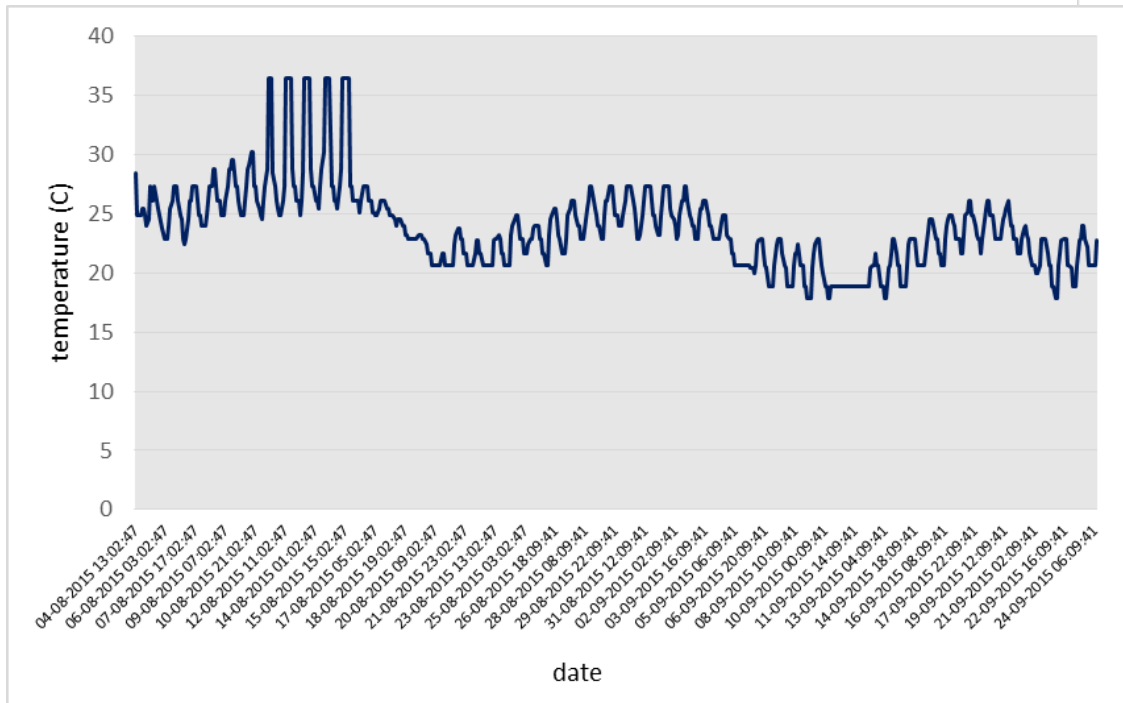
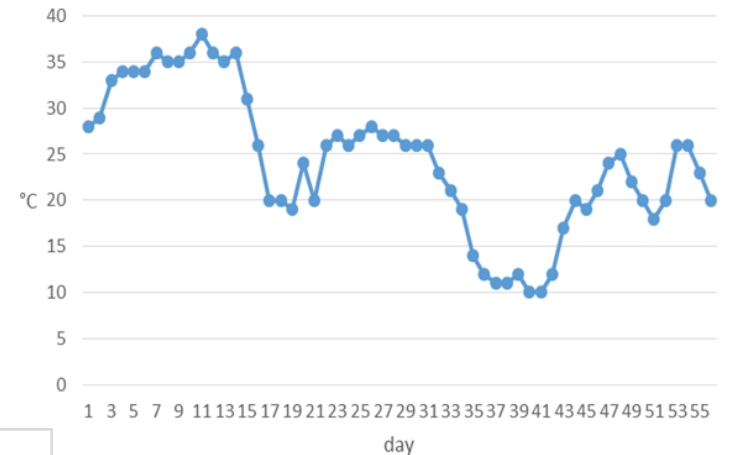
# Inside air temperature of the building without green wall (°C)





# Inside air temperature of the building with green wall (°C)

(period without air conditioning:  
08. 08. 2015. – 21. 08. 2015.)



# Summary

- **Green walls potential of Kecskemét is significant** (approximately 32 000 m<sup>2</sup> public buildings + private and other buildings).

Green infrastructure – including **green walls** – **can greatly contribute to the reduction of carbon sequestration** (which is important from the point of view of climate change); their oxygen emission **improve urban air quality** and **reduce** negative impacts of **urban heat island** (UHI).

- Based on the initial results of temperature measurements in case of greenwalled buildings the **difference between temperature with and without green walls can reach 20 °C**. This difference between internal temperatures was not detected, but in cold weather condition the minimum temperatures are higher with green wall, that without it – insulating effect.

Plus: energy for air conditioning in greenwalled part of the building is only 2,2 % of the total energy consumption of the building.



- **Energy-savings** (in case of public buildings in Kecskemét) feasible with **replacing** the estimated **cost of the insulation**, and **reducing heating and cooling costs** during the operation of buildings.
- Important part of the **adaptation to the climate change** is the reaction of the cities to the challenges of nowadays.  
One obvious **answer** for it is application of plants. It means not only city parks, roadside alleys or green roofs, but „vertical” greening also, for example **increasing the number of greenwalled buildings**.

Thanks for the help:

Clarion Hungary Ltd.

Greenwall Garden Horticulture Ltd.

„The Long-term socio-economic forecasting for Hungary project benefits from a €175,000 grant from Iceland, Liechtenstein and Norway through the EEA Grants”



Thank you for your attention!