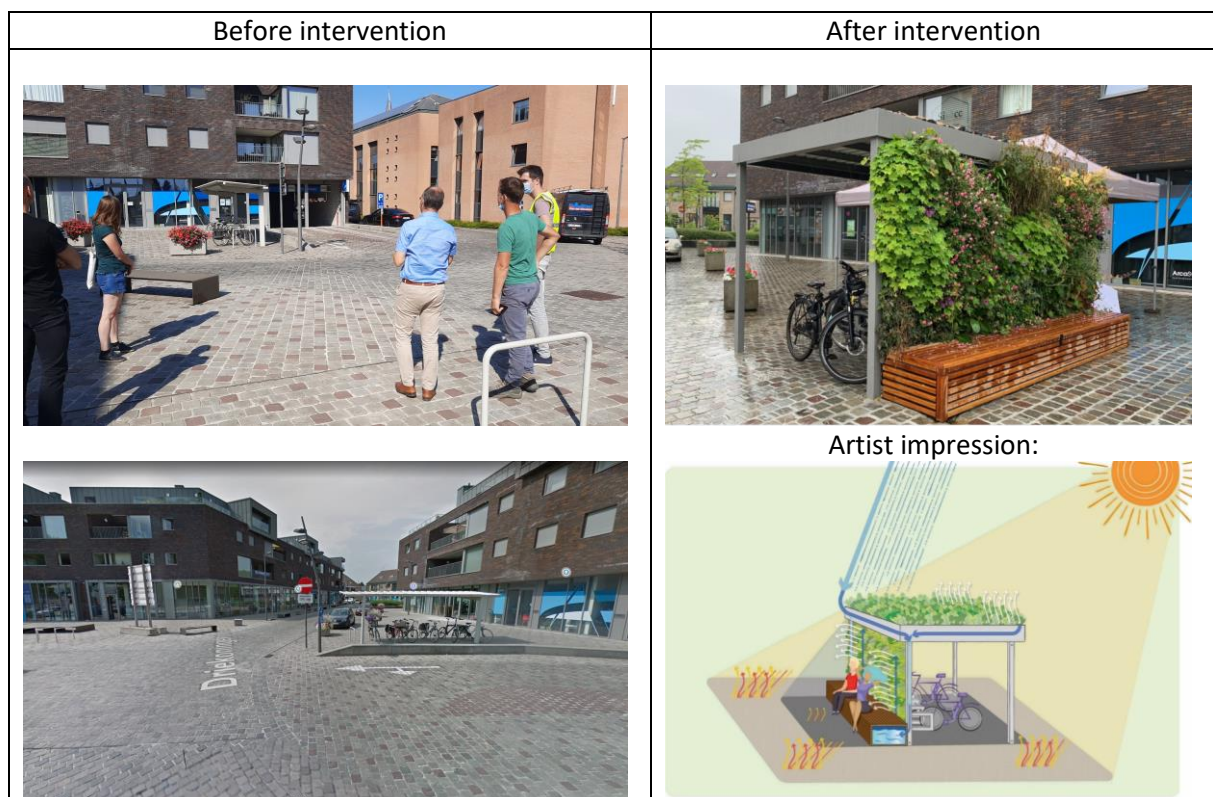




Installing a green bike shed with green wall and roof in a city square

Summary

- A town square (“*Driekoningenplein*”) in Merelbeke centre, is an open, fully paved area surrounded by businesses and apartments overhead. It is completely paved with impermeable cobblestones and has no green. There was an existing metal bike shed that provided little shade and was in fact so high and narrow that it did not keep the bicycles dry. All rainwater falling in the square is directed into the sewers.
- The new green (e-)bike shed provides more shade and has an aesthetically pleasing cooling green wall. Additional beneficial features are the seating area (4 m wide), rainwater storage in the bench (1.8 m³), a green roof (10 m²), a green wall (7.5 m²), and 5 e-bike charging stations.



Location

Merelbeke, a municipality in East-Flanders, Belgium, harbours a population of 25 000 on 37 km². About 20% of the population are senior citizens. Although much of the territory is rural and suburban, its proximity to the city of Ghent causes rapid urbanisation of the northern districts which house most residents and thus also highest numbers of seniors. The centre is heavily paved, resulting in heat stress during the summer.

Site Description

The *Driekoningenplein*, lies adjacent to the main street and is the access point for the underground car park, the cultural centre, town hall, library, and many local stores and businesses. It is almost completely enclosed by buildings, which reduces air circulation. The dark brickwork, cobblestone pavements and streets store a lot of heat. The central location is ideal for local awareness raising. The green e-bike shed

comprises many elements of the municipality's climate mitigation and adaptation plans as it deals with sustainable mobility, greening the environment, rainwater storage and reuse, creating shade and providing cool resting places. It also improves the aesthetic quality of the square.

The decision-making journey

The municipality's climate adaptation, green service, and infrastructure teams identified the need to green the square and surrounding area while maintaining accessibility and usability for occasional markets and fairs, public celebrations, and events. The municipality owns and manages the public square. The living wall solutions of SIOEN, offer a way of implementing vertical green that does not entail excessive construction costs and does not take up much space. It could also be fitted onto existing structures. However, the living wall requires electrical power, periodic water supply and a firm structure, such as the wall of a building.

Initially a movable green bench with water reservoir was designed so it could be placed at various locations (both on and off the square) and could easily be moved out of the way when the full surface of the square was needed. However, due to the corona crisis, the development process was halted and eventually a new subcontractor was assigned. In further discussions on the design, the interest shifted towards a more permanent construction that also serves other purposes next to aesthetical and thermal improvements, such as a bike shed. The municipality service teams, and alderman were involved from the start and weighed in on location selection in the town centre and design to optimise the benefits at the chosen location. Surrounding businesses were consulted as stakeholders when deciding on the location of the green e-bike shed. Their input resulted in an alternative location for the structure as concerns were raised the structure would reduce visibility of some of the shops.

In a collaborative venture, the province East-Flanders, SIOEN, Merelbeke and Atribo (a Belgian subcontractor) developed the concept of a green e-bike shed with a green bench. These structures can be installed directly onto the paving, if this is loadbearing, and a power supply is available. The Merelbeke infrastructure team developed the substructure to guarantee seamless integration of the green e-bike shed elements, whilst avoiding damage to the waterproofing membrane of the underground parking garage underneath. Feedback from local stakeholders (stores and inhabitants) were received and considered in the final design, including the green wall and bench. The inclusion of a water reservoir means the structure should be self-sustaining autonomous for dry periods of up to six weeks. The reservoir naturally refills when it rains resulting in another 6 weeks of self-sustained operation, whereas flowerpots require frequent watering in summer.

Implementation

The costs of this pilot were split, with Merelbeke contributing €5000 to the cost of the structure, and installation; the municipality also dealt with all permits required and prepared the site for the structure (i.e. supplied foundations). East Flanders co-ordinated the project and supplied the INTERREG information panel. SIOEN contributed to the structure cost and supplied all living wall associated materials. Some issues were experienced late in the planning process concerning accessibility of the power lines. This was resolved by using a powerline from a nearby street lantern. As this was a pilot project and none of the partners had dealt with this concept before, there was a steep learning curve and some challenges were encountered (see "*Reflection*").

Indicative costs: please note that costs have been rounded and, while accurate at the time of implementation, can only be used as an indication of cost. All costs exclude VAT.

| Capital Cost | € | £=1.19€ |
|--|--------------------|-------------------|
| Installation cost | 2,250 | 1,890 |
| Greentec-Strikta (=Bike shed with bench and reservoir) | 14,490 | 12,171 |
| Living Wall 6.8 m ² | | |
| <ul style="list-style-type: none"> GreenTecStyle (€ 140 / £ 117.6 per m², standard panel measures 126cm x 180cm) Plants (pre-grown on the GreenTecStyle € 155/ £130.2 per m²) Irrigation structures and pump unit (incl. timer) | 952 1054 905 | 799 885 760 |
| Extra cost to make structure enough loadbearing so a green roof could be added | 750 | 630 |
| Green roof (10m ² , consisting of sedum cassettes) | 450 | 378 |
| Foundations (20m ² , € 54 / £ 45.4 per m ²) and electricity supply (4m cable) | 1100 | 924 |
| Total (excl. green roof) | 19,040* | 15,993* |

* The municipality bore € 5,000.00 (£ 4,200.00) of the capital costs + the laying of the foundations and electricity works and placement of the green roof.

| Estimated Maintenance Costs per year | € | £=1.19€ |
|--|----------------|----------------|
| Green wall 7.5 m ² | | |
| <ul style="list-style-type: none"> Maintenance products Addition of water during drought (€10 or £8.4 each, number depends on duration of drought, here we estimated that this would occur 5 times) Trimming (1/year, €35/hr or £29.4/hr) | 30 50 35 | 25 42 29 |
| Green roof 10 m ² (Estimated at 1 man-hour) | 35 | 29 |
| Estimated Total | 150/year | 126/year |

| Concerns raised during the public consultation: | Reactions after completion |
|--|---|
| <ul style="list-style-type: none"> “a large bike shed cannot be placed anywhere, a moveable green bench is more widely applicable” “we are afraid of the visual impact of the structure” “It cannot be placed central in the square. It has to be close to the garage entrance so it does not impede visibility for the local businesses.” “Be cautious – it is not clear how much the roof of the underlying parking garage can bear” | <ul style="list-style-type: none"> “It is convenient to be able to recharge my electric bike between my errands and also at a place where there is shade” “we hope that there will be more rechargeable bike racks in the future” “It is a good start, but even more green and plants would be nice.” “It was not smooth sailing, especially with the construction error (initial leak), but it is a nice addition to the square” |

Reflection:

- We were able to develop and implement a new concept with multiple co-benefits
- Thanks to the participation process a consensus was reached on the type of intervention and its location.
- Due to Covid-19 the project was delayed multiple times and a new constructor had to be found which also resulted in a new concept. The many and long delays caused some friction between the partners.
- None of the partners had previous experience with this novel design. We encountered challenges in the construction and transportation process along with some miscommunications and misconceptions (the foundations were initially laid tilted in the same way as that area of the square instead of level as needed). Many of these issues now count as “lessons learnt” to facilitate future projects. During instalment a leak was caused in the construction leading to a heavy water loss and thus the necessity to refill the reservoir every 2 days instead of every six weeks until the leak was repaired.

| MEASURE OF SUCCESS | EVIDENCE |
|--|--|
| reduction of PET value (baseline vs result values, comparison with reference point) | Green wall: 1.1°C Green roof: 21.4°C |
| size of the area (m2) with improved heat resilience (the total area that benefits from the measures approximate this by using the same approach used for the initial estimation in the application form) | >12 m ² shade 10 m ² green roof 7.5 m ² green wall |
| number of daily users benefitting from the intervention (if relevant/available: are there specific times of day or the year when there is heavy use?) | <ul style="list-style-type: none"> • Depends on day and time of day. Use of bench is weather dependant. • Heavy use when there is a performance in the cultural centre on the fringe of the square. • Bike shed is used by 25-30 people per day |
| co-benefits achieved (e.g. biodiversity, pollution reduction, economic benefits, influence on property value, long-term savings, aesthetic improvement, psychological impact etc.) | <ul style="list-style-type: none"> • aesthetic improvement: • <i>“Dull grey square has an eyecatcher now”</i> • rainwater capture & reuse • encourages sustainable mobility • biodiversity: <i>“insects seem to be drawn to the green wall”</i> |

References

<https://greentecstyle.eco/nl>

For Technical specifications please see following page

Technical data

- Structure:
 - Name: Greentec-Strikta
 - Supplier: Aribro NV
 - Measurements: 3950mm (l) x 3300mm (w) x 2300mm (h)
 - Bike shed: 3950mm (l) x 2500mm (w) x 2300mm (h)
 - Bench with reservoir: 3950mm (l) x 700mm (w) x 450mm (h)
 - Roof: steeldeck
 - Eaves: sendzimir steel plate
 - Substructure: 4 thermally galvanised metal pillars (90x90x3mm)
 - Superstructure:
 - 2 trusses (2500mm) and 4 beams (4000mm) HEA-100
 - 3 purlins IPE-100
 - Backside: perfo steel plate 4000mm (l) x 1800mm (h) – information panel will be placed on inside, Living Wall on outside.
 - Four integrated double sided bicycle racks with integrated sockets
 - Fixed onto the foundation by chemical anchors
- Living Wall:
 - Name: GreenTecStyle®
 - Supplier: SIOEN Industries NV
 - 3 panels, each 1260mm (w) x 1800mm (h)
 - Irrigation structures
 - <https://greentecstyle.eco/nl>
- Bench:
 - Material: hardwood, durability class 1
 - Invisible attachment
 - Seating area opens as lid to underlying reservoir
- Reservoir:
 - Plastic reservoir with two compartments (1 for water, 1 for pump and electricity supply), embedded in bench structure
 - Thermally galvanized (EN ISO 1471-1)
 - Contains heating element
- Green Roof:
 - was placed by the municipality without further involvement of Cool Towns.
 - 10m² extensive green roof
 - Built out of sedum cassettes 450mm (l) x 495mm (w) x 85mm (h).