

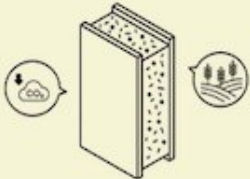
# Gradnja slamom - EcoCocon sustav

Marina Zajec 

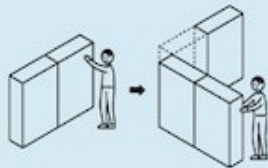


Stručni skup Odbora za održivi razvoj i EU projekte Hrvatske komore arhitekata

Design...  
**01**  
Biomass in  
construction



Design...  
**02**  
Design for  
disassembly



Design...  
**03**  
Good indoor  
climate



Design...  
**04**  
Free of  
toxic chemicals



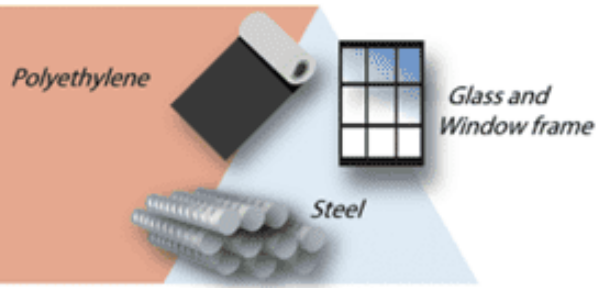
Design...  
**05**  
Reuse of  
local materials



CLIMATE POSITIVE  
CLIMATE NEGATIVE

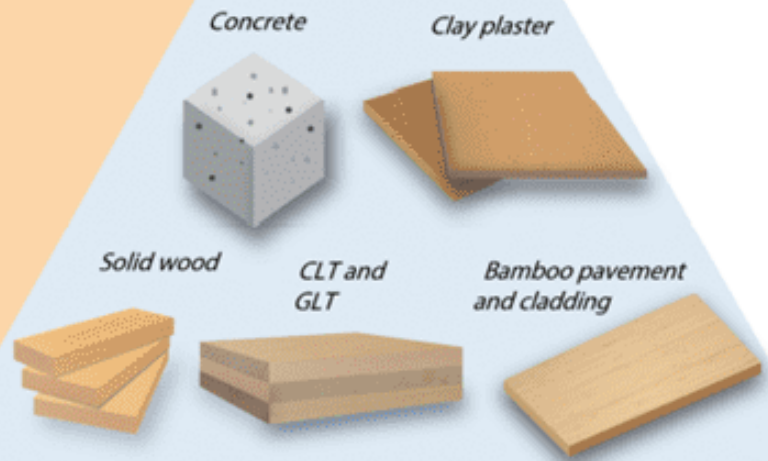
**HIGH-CARBON** *net - GWP > 1 kg CO<sub>2eq</sub>/kg*

- Insulated Triple Glazing (99.89 kg CO<sub>2eq</sub>/kg);
- Wood-Aluminum Window Frame (8.43 kg CO<sub>2eq</sub>/kg);
- PVC Window Frame (8.77 kg CO<sub>2eq</sub>/kg);
- Wood Window Frame (4.18 kg CO<sub>2eq</sub>/kg);
- Waterproof membrane Polyethylene (2.70 kg CO<sub>2eq</sub>/kg);
- Steel (2.22 kg CO<sub>2eq</sub>/kg)



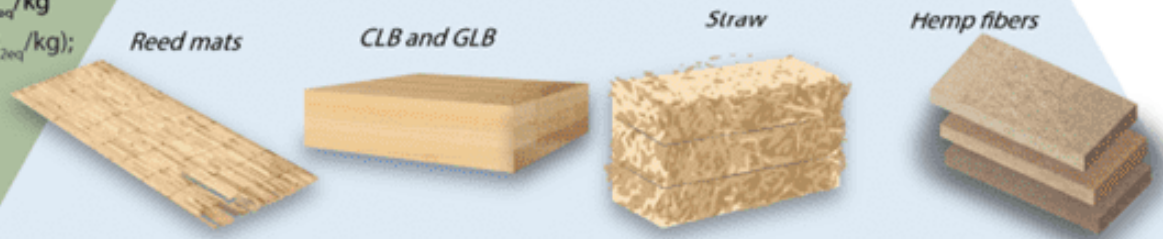
**LOW-CARBON** *0 < net - GWP < 1 kg CO<sub>2eq</sub>/kg*

- Mineral plaster (1.07 kg CO<sub>2eq</sub>/kg);
- Solid wood - softwood (1.05 kg CO<sub>2eq</sub>/kg);
- Ceramic tiles(0.87 kg CO<sub>2eq</sub>/kg);
- Bamboo Cladding (0.75 kg CO<sub>2eq</sub>/kg);
- Bamboo Flooring (0.75 kg CO<sub>2eq</sub>/kg);
- Solid wood - hardwood for finishing (0.41 kg CO<sub>2eq</sub>/kg);
- Gypsum plasterboard (0.39 kg CO<sub>2eq</sub>/kg);
- CLT(0.31 kg CO<sub>2eq</sub>/kg);
- GLT(0.31 kg CO<sub>2eq</sub>/kg);
- OSB(0.29 kg CO<sub>2eq</sub>/kg);
- C30/37(0.18 kg CO<sub>2eq</sub>/kg);
- C25/30(0.16 kg CO<sub>2eq</sub>/kg);
- Concrete deep foundations (0.14 kg CO<sub>2eq</sub>/kg);
- Clay plaster (0.09 kg CO<sub>2eq</sub>/kg)



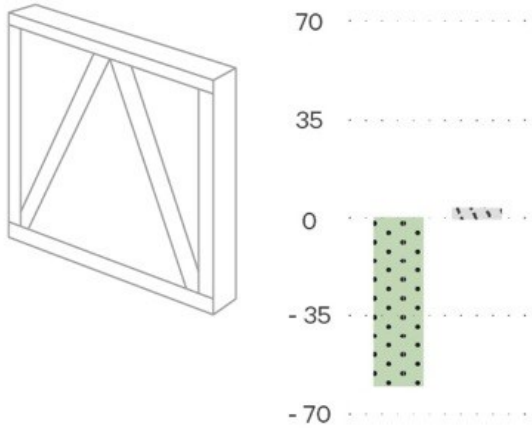
**CLIMATE-NEGATIVE** *net - GWP < -0 kg CO<sub>2eq</sub>/kg*

- Solid wood - hardwood for structure (-0.14 kg CO<sub>2eq</sub>/kg);
- GLB (-0.15 kg CO<sub>2eq</sub>/kg);
- CLB (-0.16 kg CO<sub>2eq</sub>/kg);
- Hemp fiber (-0.44 kg CO<sub>2eq</sub>/kg);
- Reed mats (-0.46 kg CO<sub>2eq</sub>/kg);
- Straw (-0.60 kg CO<sub>2eq</sub>/kg);

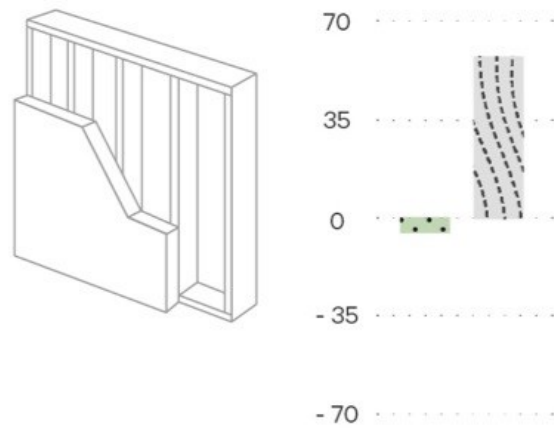




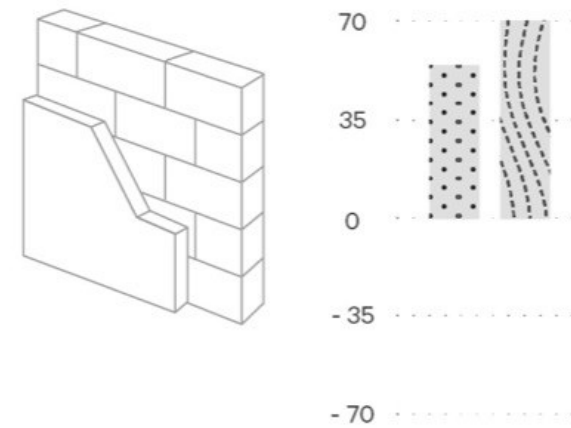
## Paneli od drveta i slame





## Drveni panelni zid



## Zidani zid s izolacijom od stiropora

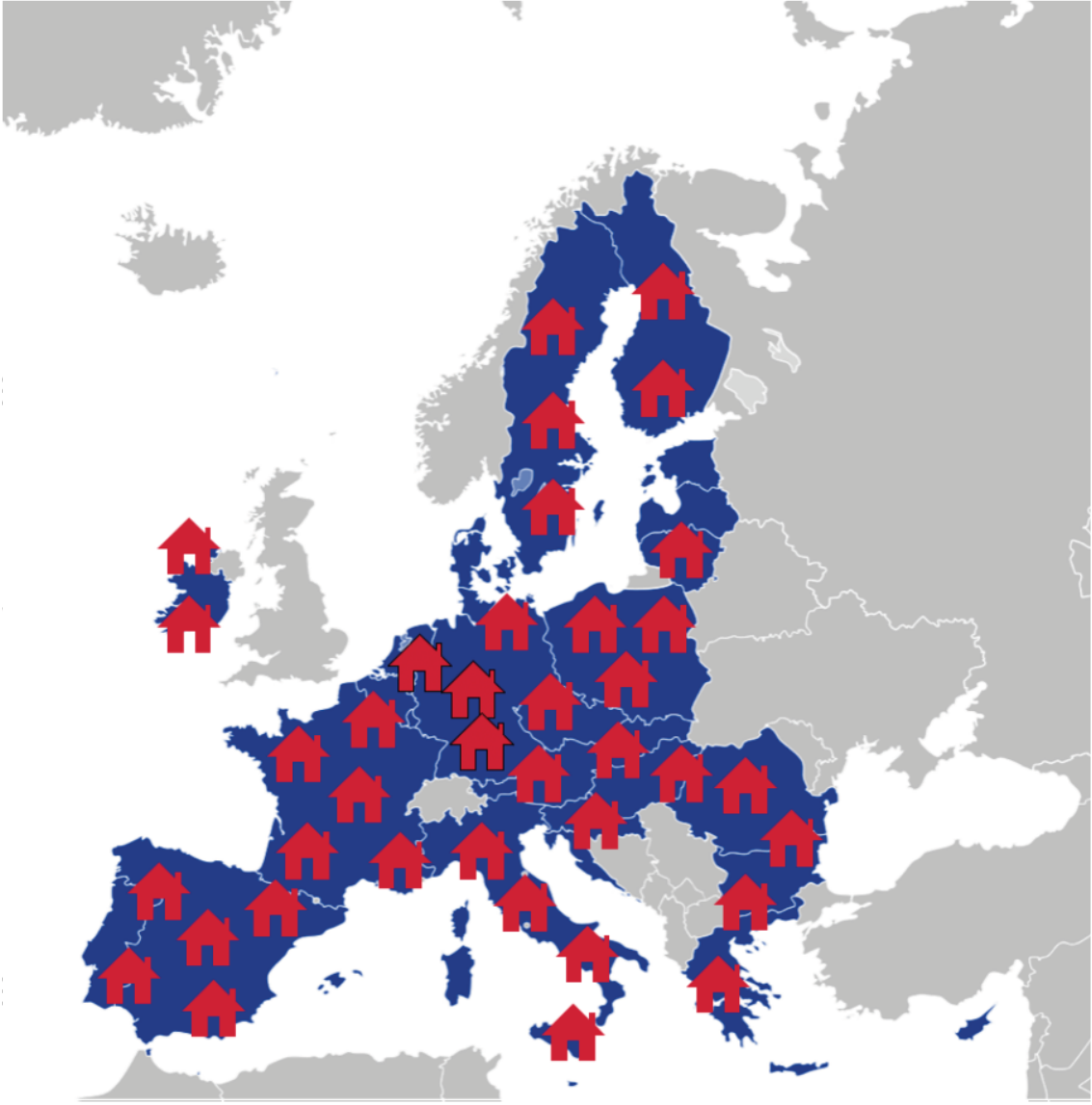


 **CO2 otisak materijala po m<sup>2</sup> zida**  
 **Energija iskorištena u proizvodnji po m<sup>2</sup> zida**

\* PEI in MJ or CO2 in kg





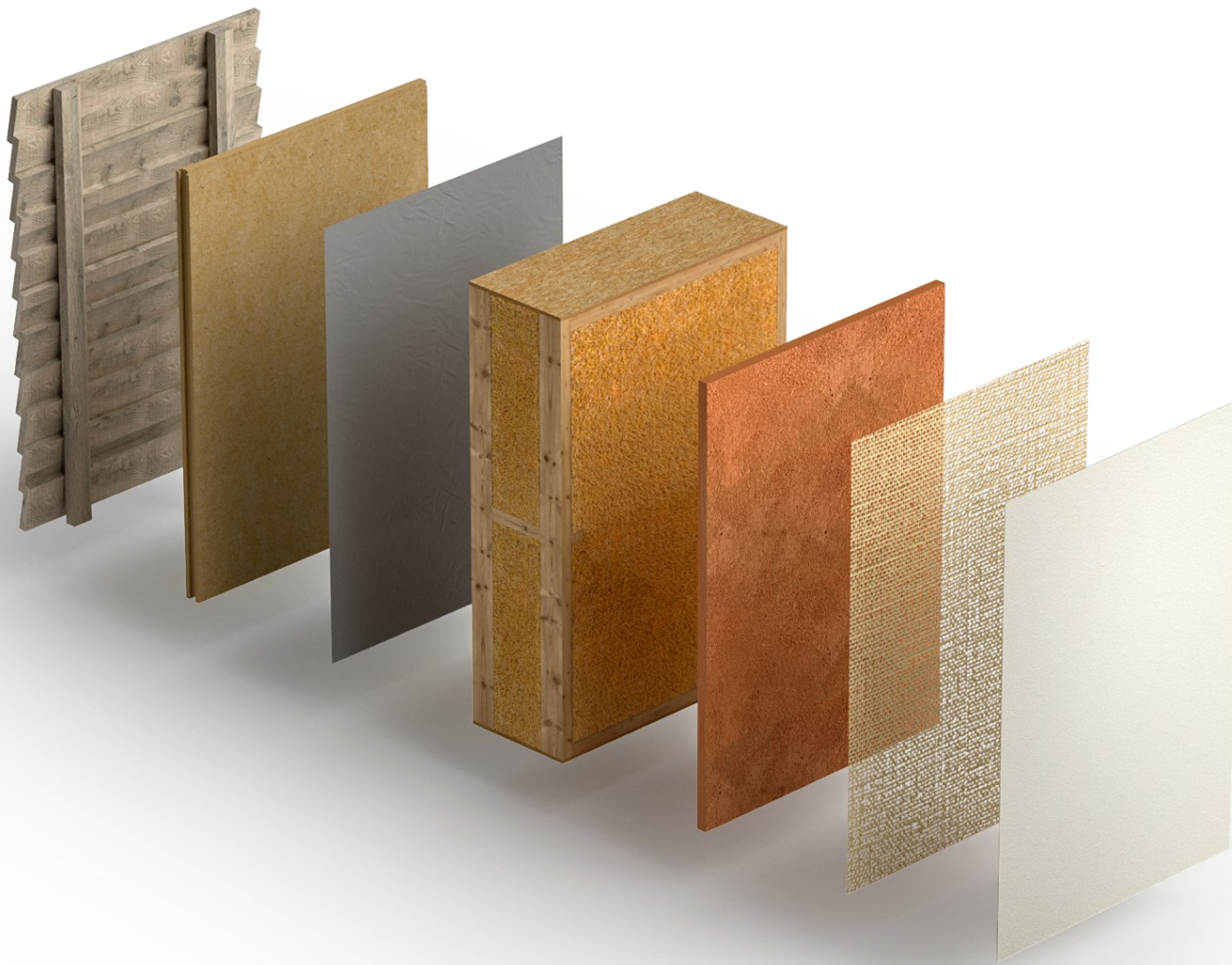




+







## Standardni sastav zida

### VANI

- Ventilirana fasada ili žbuka
- Ploča od drvenih vlakanaca
- Zrakonepropusna paropropusna membrana
- Panel od drveta i slame
- Podložna glinena žbuka
- Fina glinena završna žbuka

### UNUTRA





# EcoCocon Straw Wall System

## COMPONENTS

- 1 A layer of insulating wood fibre board is fixed on the outside to help achieve the Passivhaus standard. It can be rendered or clad with a ventilated facade.
- 2 Airtight diffusion-open membrane prevents heat loss and ensures humidity transfer. It also serves as a weather protection during construction.
- 3 Timber-straw wall panel is both structural and an insulating element. It has a double load-bearing structure made of FSC certified, C24 class wood. The standard thickness is 40 cm. The system is certified together with a moisture-regulating interior clay plaster.



## CHARACTERISTICS

**THERMAL INSULATION**  
 $U=0.123 \text{ W/m}^2\text{K}$   
 $\lambda=0.0645 \text{ W/mK}$

**FIRE RESISTANCE**  
 REI 120 & REI 120ef  
 B-s1, d0

**PRECISION**  
 2 mm over 3 m length \*  
 made in 1 mm increments \*

**CO<sub>2</sub> SEQUESTERED**  
 97.6 kg/m<sup>2</sup>

**AIRBORNE SOUND INSULATION**  
 54 dB

**LOAD-BEARING CAPACITY**  
 Up till 110 kN/m<sup>2</sup> \*

**STRAW DENSITY**  
 110 kg/m<sup>3</sup>

**ASSEMBLY TIME**  
 20-40 min/m<sup>2</sup>

**eco  
cocon**

[www.ecococon.eu](http://www.ecococon.eu)

\* EcoCocon panels only

PRODUCED AND CERTIFIED IN THE EU | CERTIFICATE NO. NTJ-01-061:2020







## SLAMA - MATERIJAL BUDUĆNOSTI

- obnovljiv materijal
- jednogodišnja biljka
- biorazgradiv materijal (nema otpada)
- nusprodukt proizvodnje hrane
- potencijal regenerativne poljoprivrede – mogućnost pohrane dodatnog CO<sub>2</sub> u tlo
- tradicija korištenja slame u gradnji
- mogućnost razvoja lokalne proizvodnje
- minimalna obrada tijekom proizvodnje - 98% materijala u prirodnom stanju
- panelna drvena konstrukcija koja štedi šumske resurse
- panelni sustav – mogućnost gradnje 6 etaža / više etaža moguće u kombinaciji sa drugim sustavima (npr. clt konstrukcija)
- specifična stanična struktura – dobra izolacijska svojstva, gustim prešanjem dodatno se poboljšavaju izolacijska svojstva
- postiže se standard pasivne kuće - sa vanjskim i unutarnjim slojevima (drvena vlakanca, zrakonepropusna membrana i glinena žbuka)
- paropropusna zrakonepropusna konstrukcija zida, bez toplinskih mostova - mogućnost prilagodbe projektu – izrada po mjeri
- izvanredna kvaliteta unutarnjeg zraka
- dobra svojstva otpornosti na požar – može dostići REI120







EcoCocon tvornica, Voderady, Slovačka







EcoCocon tvornica, Voderady, Slovačka







Feldballe škola, dogradnja, CO<sub>2</sub> neutralna građevina, Danska, Henning Larsen

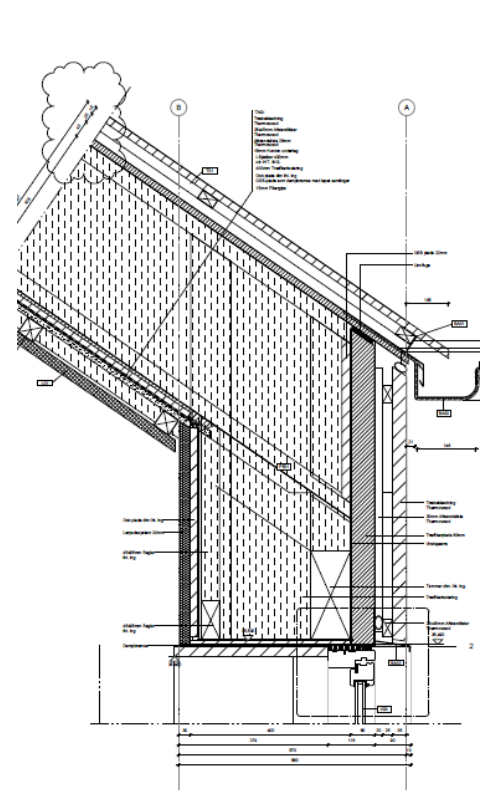
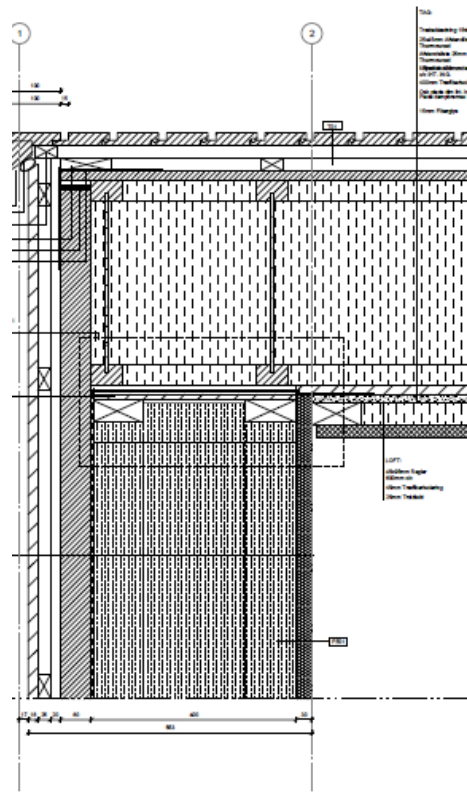
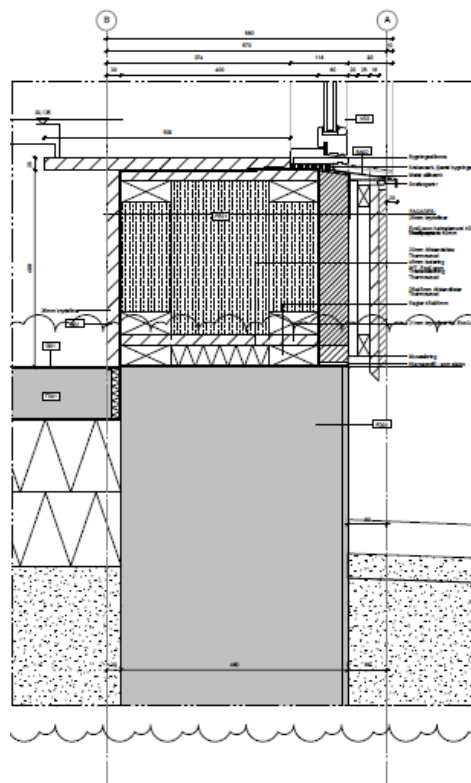
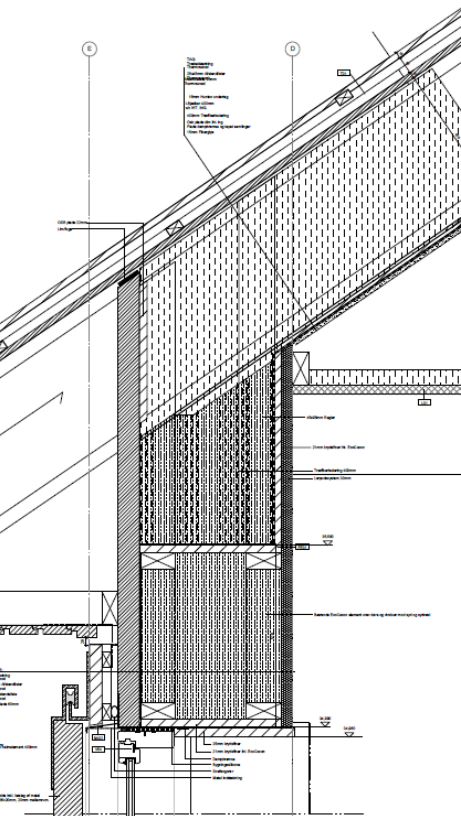






Feldballe škola, dogradnja, CO<sub>2</sub> neutralna građevina, Danska, Henning Larsen





Feldballe škola, dogradnja, CO<sub>2</sub> neutralna građevina, Danska, Henning Larsen





Škola de Morges, nadogradnja, Švicarska, SHIFT







Sportska dvorana Tegelen, Venlo, Nizozemska, 2.0 Architects







Ecoespai, zgrada javne namjene, Montroig del Camp - Tarragona, Španjolska





**Stambeno naselje Fælledby, Copenhagen, Danska / Tegnestuen LOKAL**



**Stambeno naselje, Eindhoven, Nizozemska / architecten en I en**











Projekt Hyllie, stambeno-poslovna građevina, 12 etaža, Malmö, Švedska / Belmon Bygg AB







Stambeni toranj Salix, Eindhoven, Nizozemska, 60 stanova s dodatnim sadržajima, 14 etaža/ architecten en I en

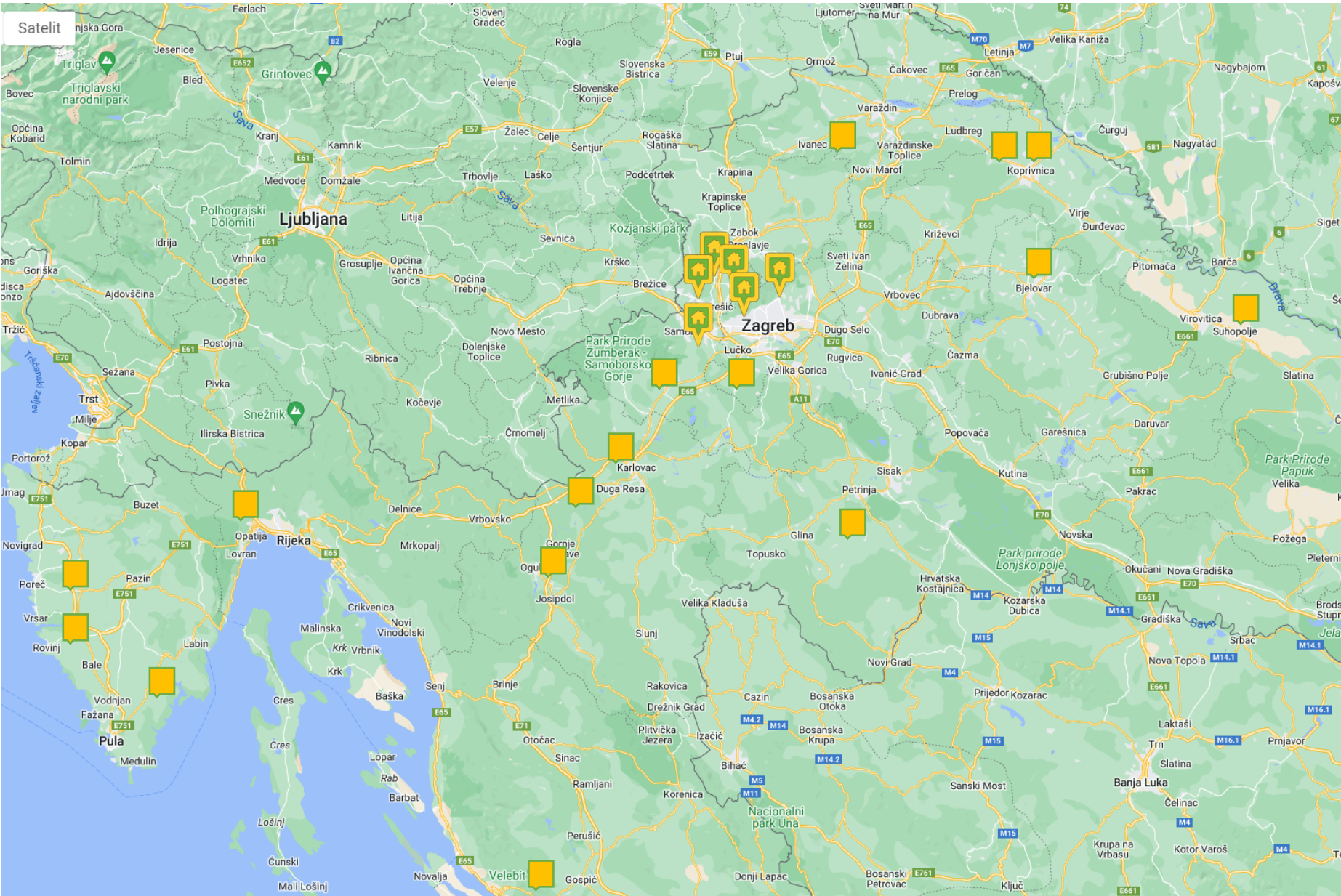






**Distributivni centar, bgp 20 000 m<sup>2</sup>, Nizozemska, Henning Larsen**

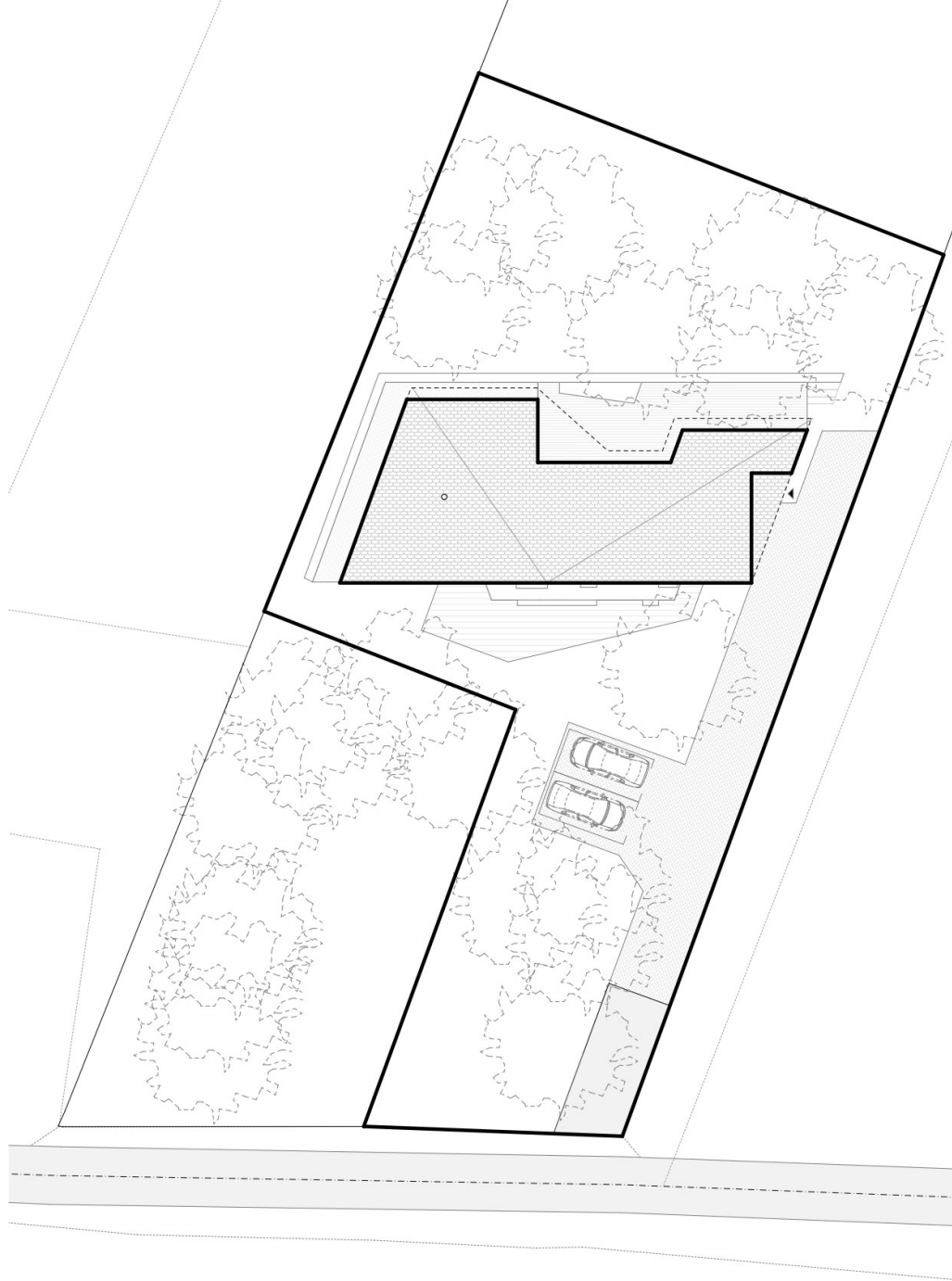




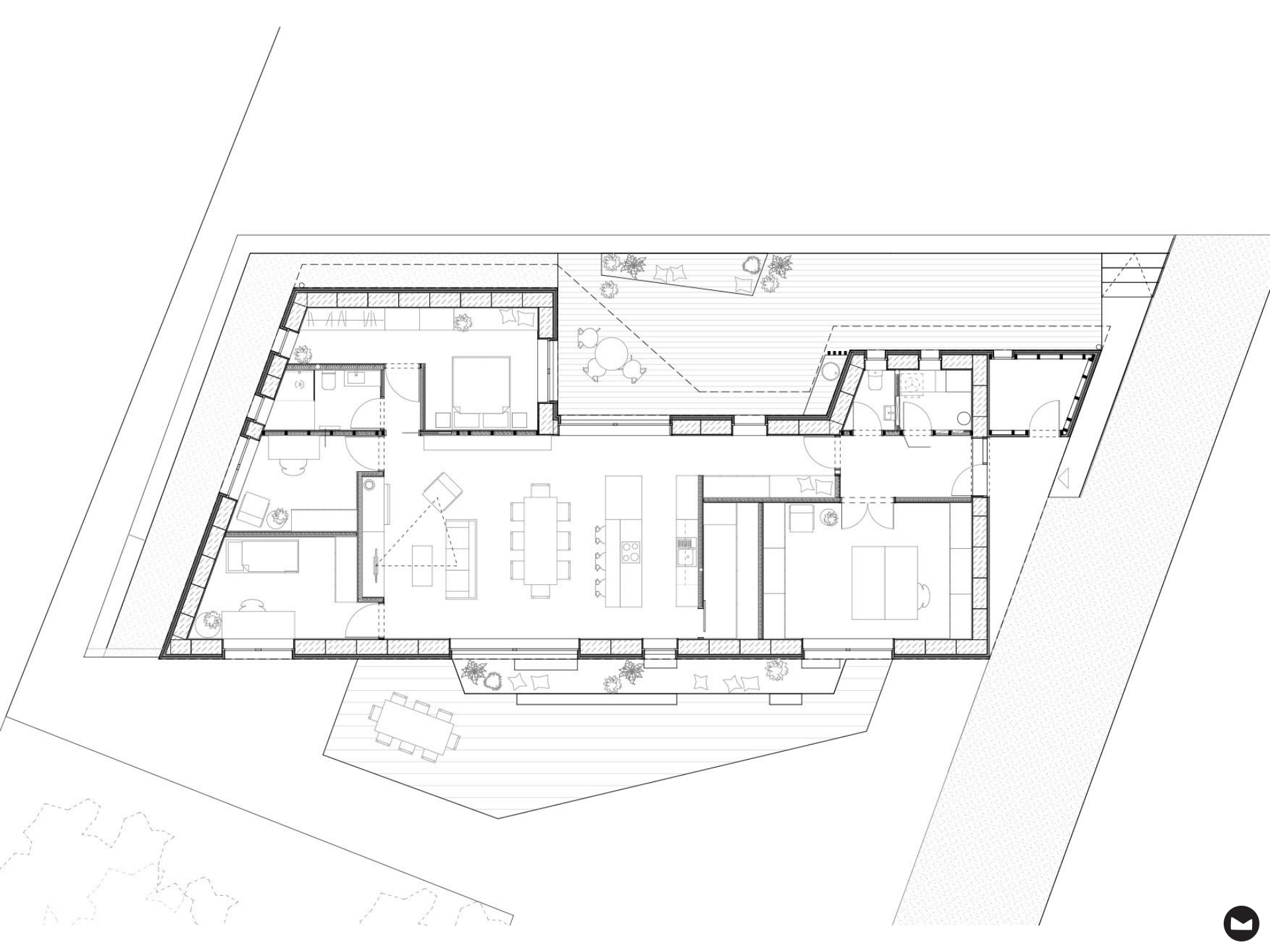


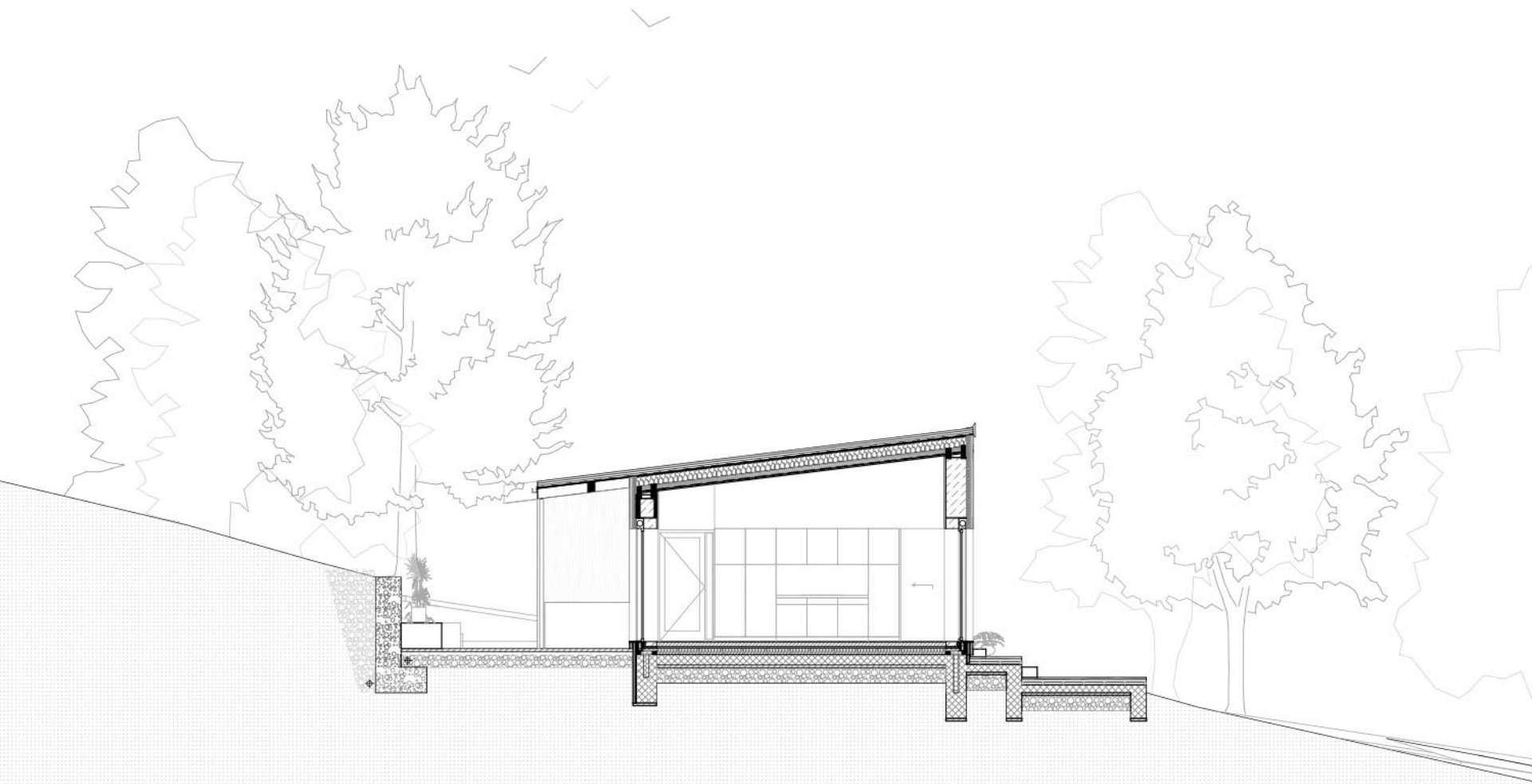








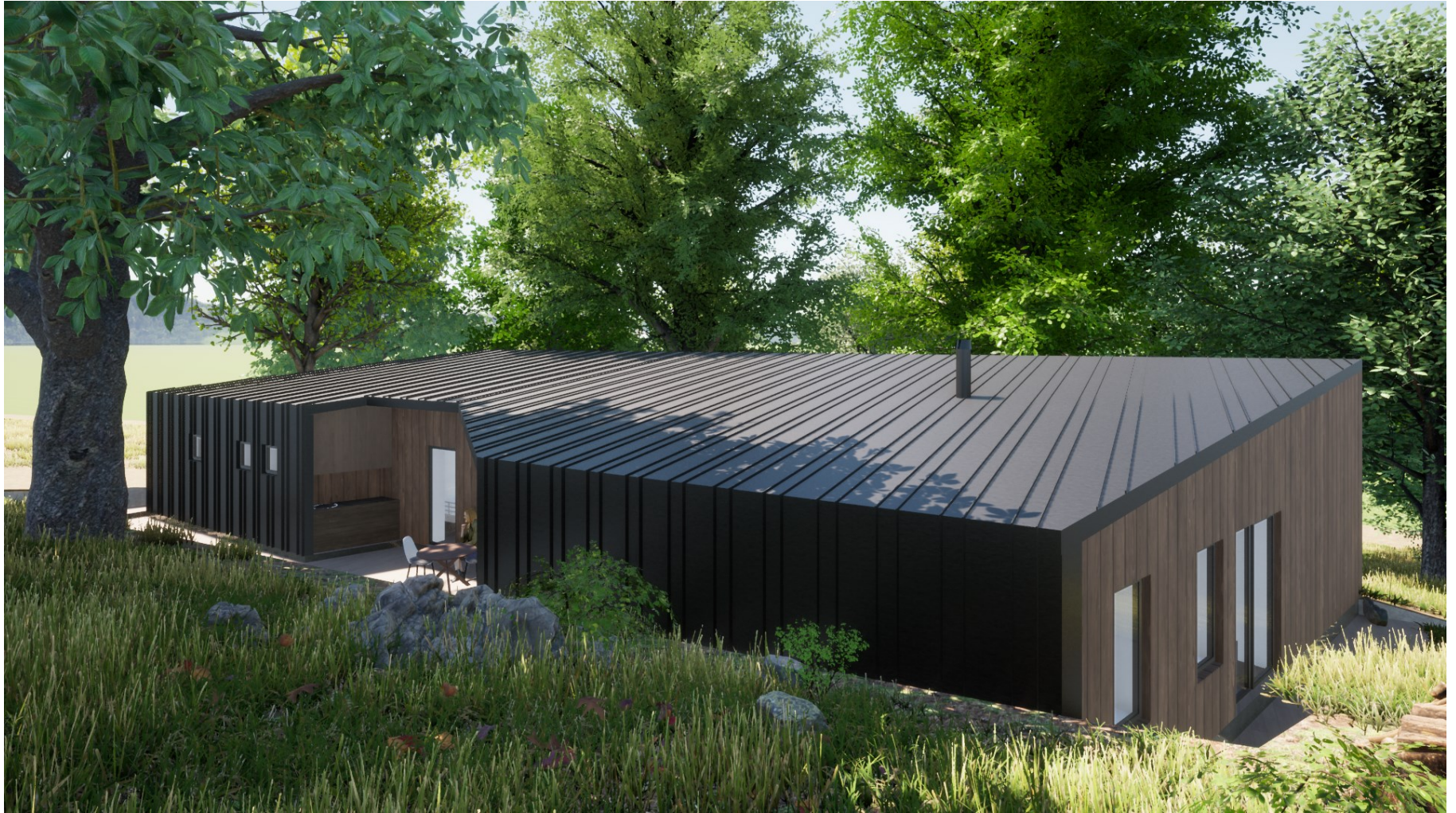
















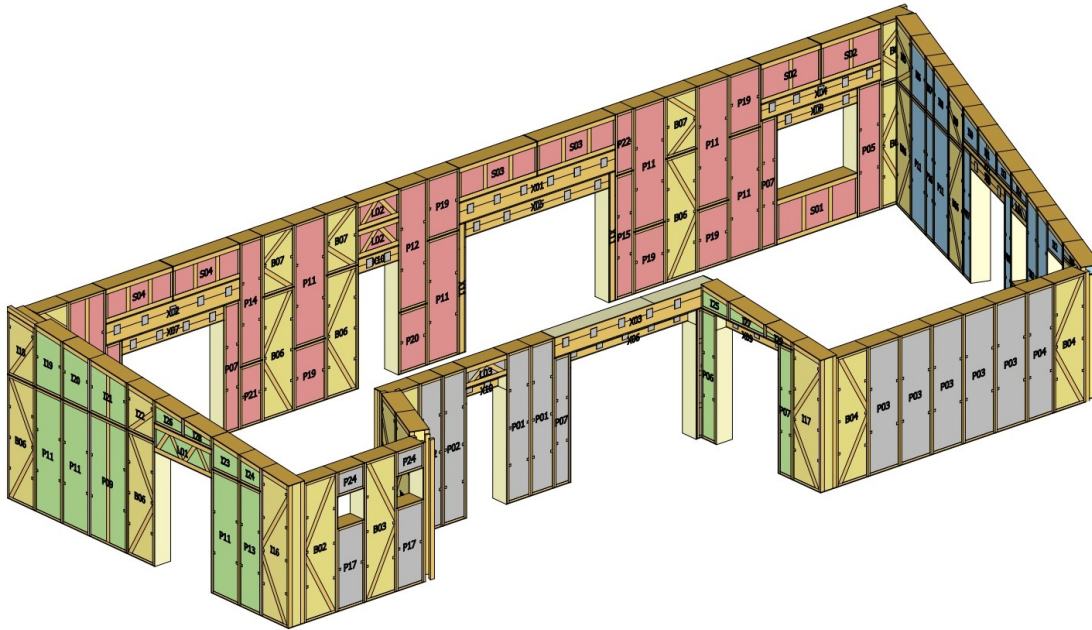


Figure 1. 3D view A, panels

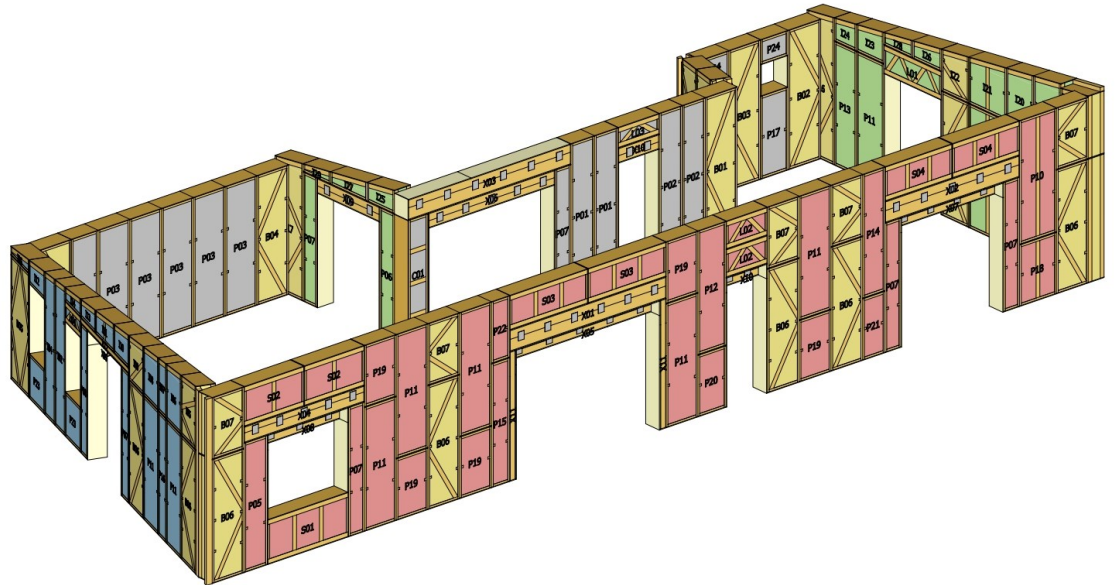


Figure 2. 3D view B, panels







Package ID (assembly)

- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08
- 09
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21



Figure I. 3D view A of pack numbers, assembled panels



Figure II. 3D view B of pack numbers, assembled panels







NOTE: The planned loading layout is for indicative purposes only, slight alterations during loading may be needed due to unforeseen circumstances.

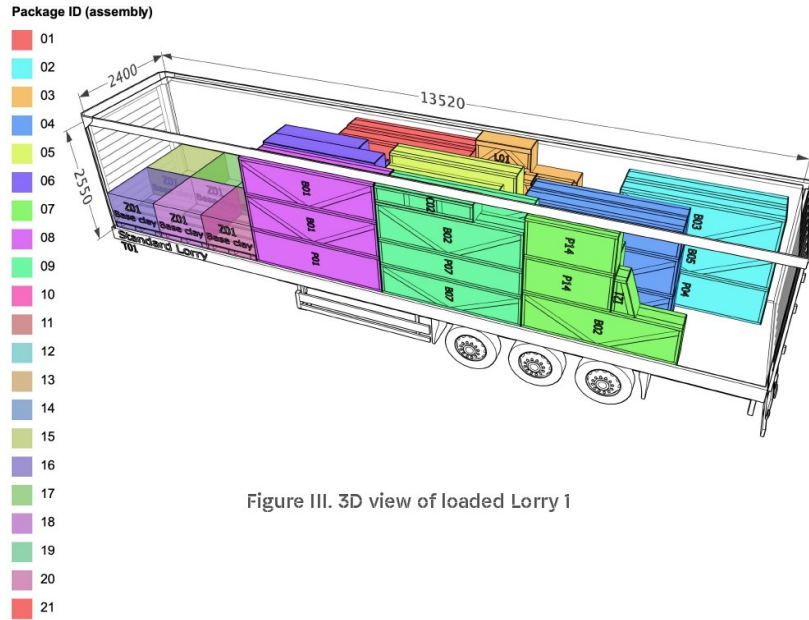


Figure III. 3D view of loaded Lorry 1



NOTE: The planned loading layout is for indicative purposes only, slight alterations during loading may be needed due to unforeseen circumstances.

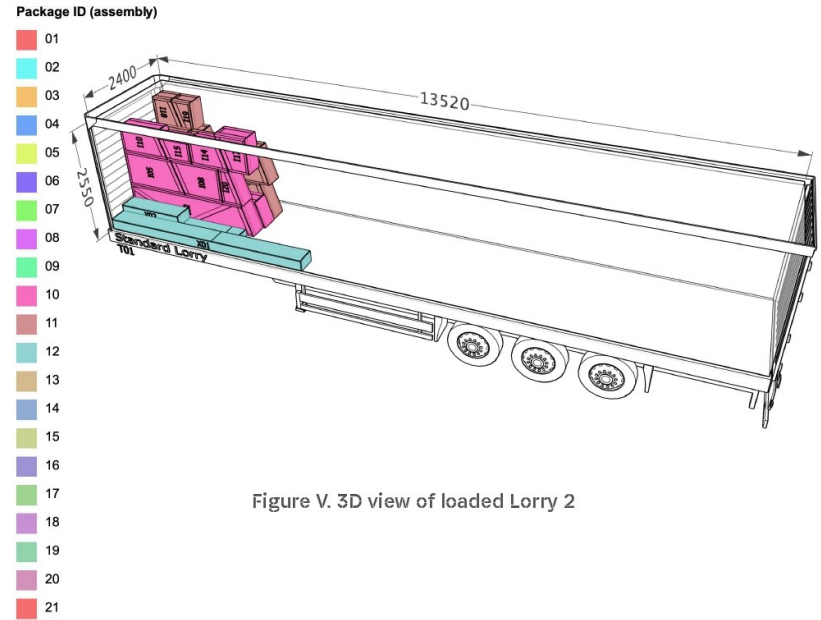


Figure V. 3D view of loaded Lorry 2

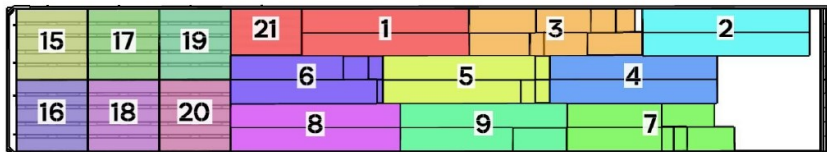


Figure IV. Top view of loaded Lorry 1

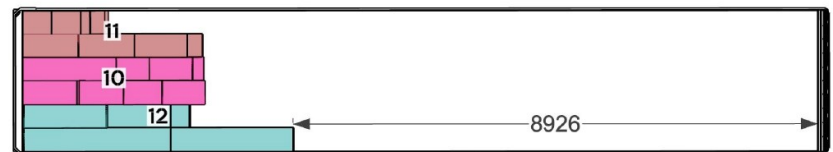


Figure VI. Top view of loaded Lorry 2









EcoCocon UAB (Production) Gedimno 30E Kybartai LT-70421 Lietuva

**P11-07**

Serial number:  
221642-P11-07-1

**MAREJA**

**Mareija - Koprivnica**

800 x 2585 x 400 mm

Well section:  
**A-07**

Production date:  
2023-06-22

Lorry Pack:  
**0-7 A-3.1**































**VULKAN**  
GRAĐNJA

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**WÜRTH**

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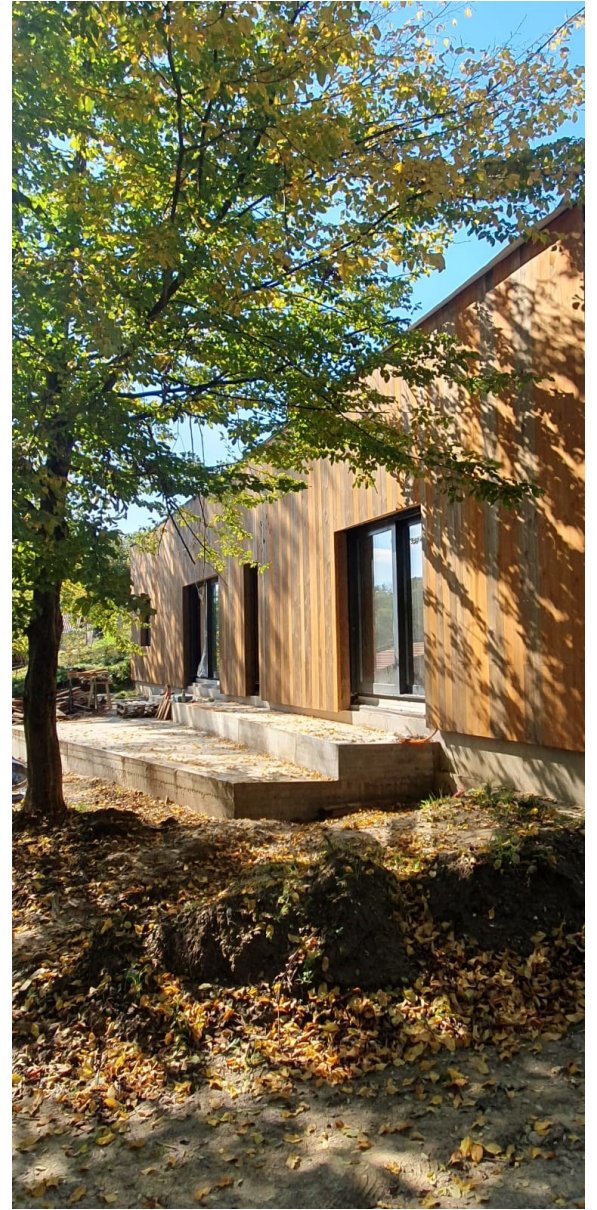
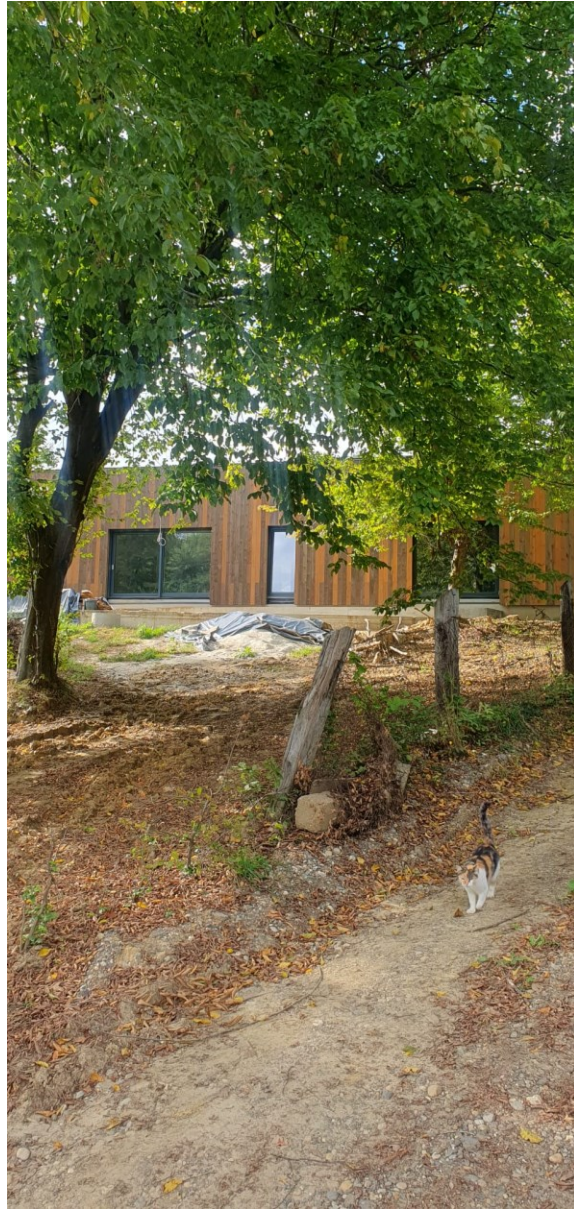




































# National Biobased Building Approach

From farmland to  
building material

8 November 2023









# Gradnja Slamom - EcoCocon sustav

Marina Zajec 

Stručni skup Odbora za održivi razvoj i EU projekte Hrvatske komore arhitekata