# Building and renovating with the most climate-positive techniques possible

31.08.23 Michael Burchert @ https://bauwende.de

BAUWENDE

The density from the straw building guideline is what matters: Simple prefab technique for modules suitable for passive houses, install the last 4 straw bales at once, using "Flutschies".

Bildungswerkstatt

Direct plastered straw building was approved in Germany 2014, Fachkraft Strohbau, Lehmbau (straw, earth) Workshops  Halle 57/ NZNB | https://biwena.de

Bildungswerkstatt

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Young Architects on the roof of the North German Centre for Sustainable Construction, Verden, Deutschland

Norddeutsches Zentrum nachhaltig bauen

NZNB, Norddeutsches Zentrum für Nachhaltiges Bauen http://nznb.de Construction phase.

Norddeutsches Zentrum
nachhaltig
bauen

Right height and density? NZNB, Baudokumentation: https://www.youtube.com/watch?v=ZHI8n42AJzE

Norddeutsches Zentrum nachhaltig bauen

NZNB, Norddeutsches Zentrum für Nachhaltiges Bauen http://nznb.de Highest direct-plastered strawbuilding in europe, World?. Entwurfsverfasser: Architekten für Nachhaltiges Bauen, Dirk Scharmer, Thomas Isselhard, Frido Elbers

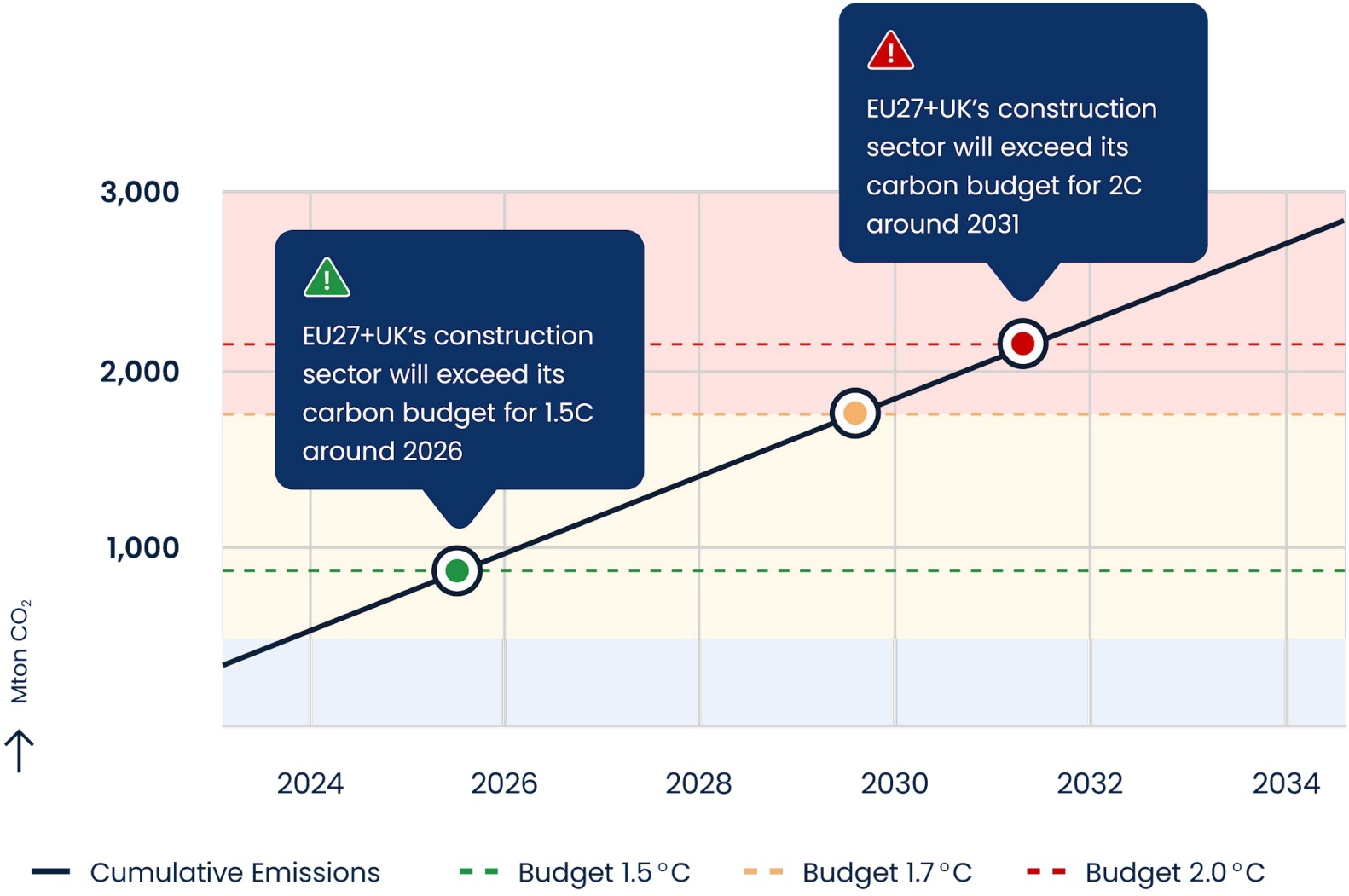
Norddeutsches Zentrum nachhaltig bauen

ESF funded Workshops, Berufsbildung für Nachhaltige Entwicklung. Vocational training for sustainable development @ https://ziel13.nznb.de

Directly from the field, Construction site hands on workshop in Schleswig Holstein

Directly from the field, Construction site hands on workshop in Schleswig Holstein

Occupy Parking Space: Prefabrication with refugees in Berlin on the street.

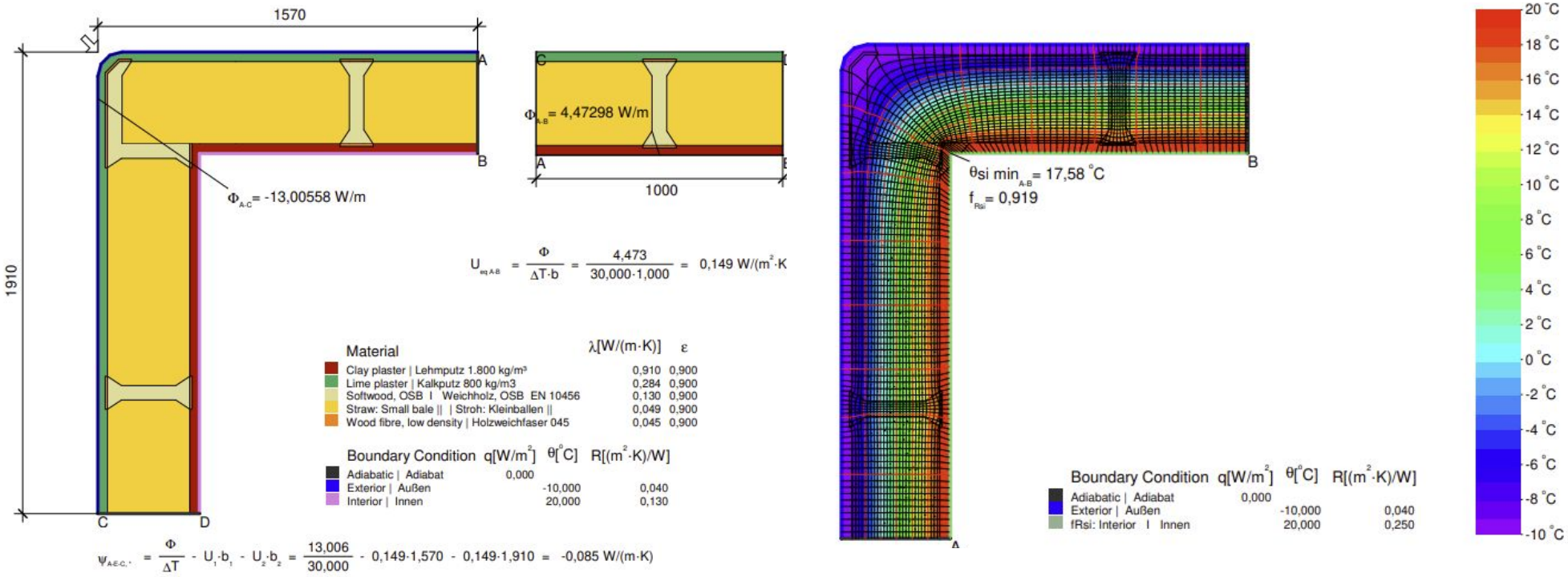



Circular Building Coalition https://www.metabolic.nl/news/circular-buildings-coalition-paves-the-way-for-a-circular-transition-in-the-european-built-environment/

# Still, why straw?

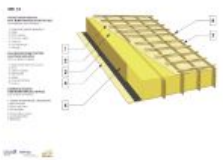
The best building material does not have to be produced, it is already available.

# Passivhaus-ready



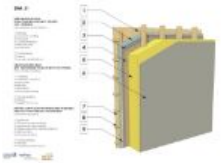

Passivhaus Institut, [https://bau-mit-stroh.de/waermebrueckenkatalog-fuer-strohballenhaeuser/](https://bau-mit-stroh.de/waermebrueckenkatalog-fuer-strohballenhaeuser/)

SBR10 – Straw Bale Infill Roof 10



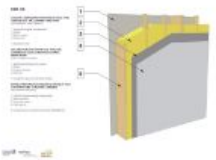
Archicad Model / Sketchup Model other models on bimobject.com

SBW01 – Straw Bale Infill Wall 01



Archicad Model / Sketchup Model other models on bimobject.com

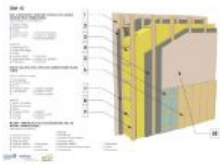
SBW06 – Straw Bale Infill Wall 06



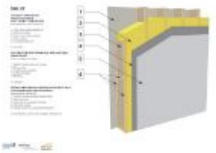
Archicad Model / Sketchup Model other models on bimobject.com

SBW02 – Straw Bale Infill Wall 02

SBW03 – Straw Bale Infill Wall 03



SBW07 – Straw Bale Infill Wall 07



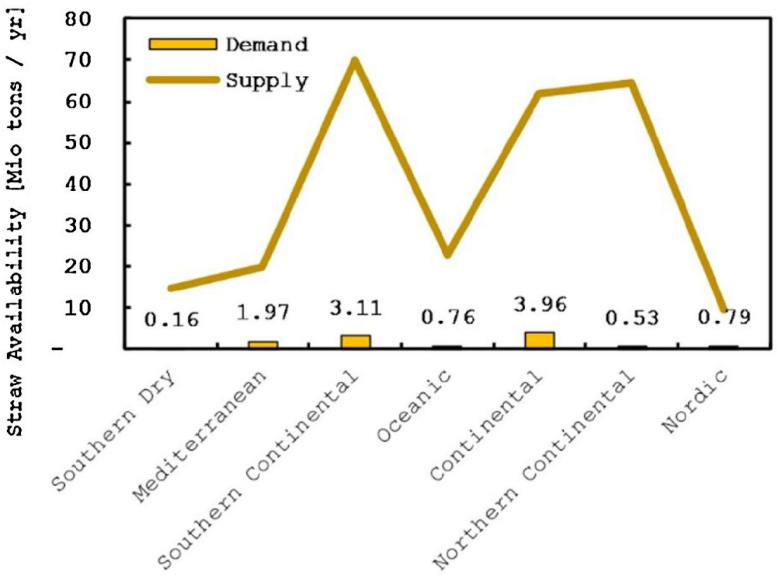
#THERMAL INSULATION #trainer #UP STRAW Project #WRAPPING & RENOVATION

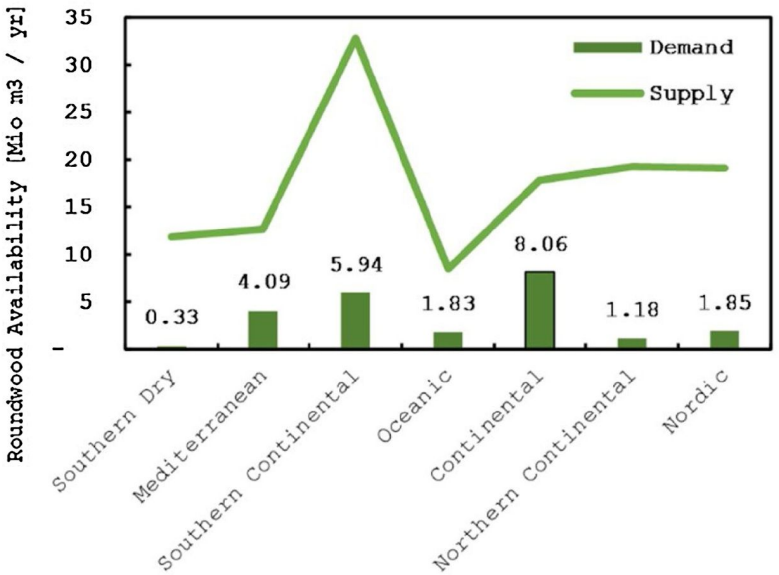
Dokumentation etc. https://strawbuilding.eu/bim-models-for-straw-bale-building/

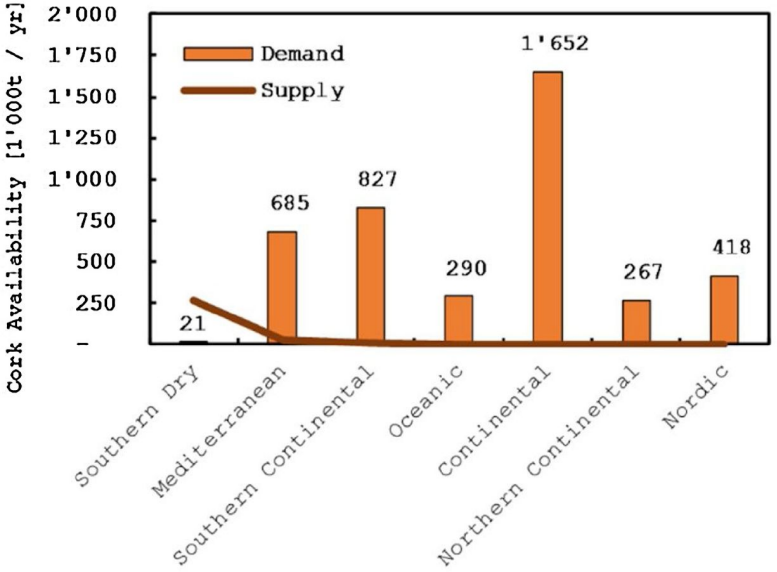
For those who can't build with straw, don't worry.
Other plants also have beautiful fibres...

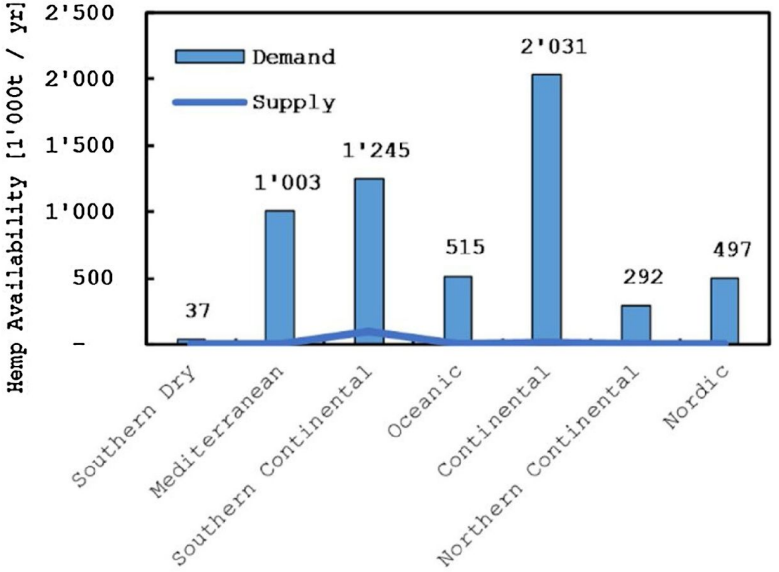
But, do we have enough ...

Yes, but...



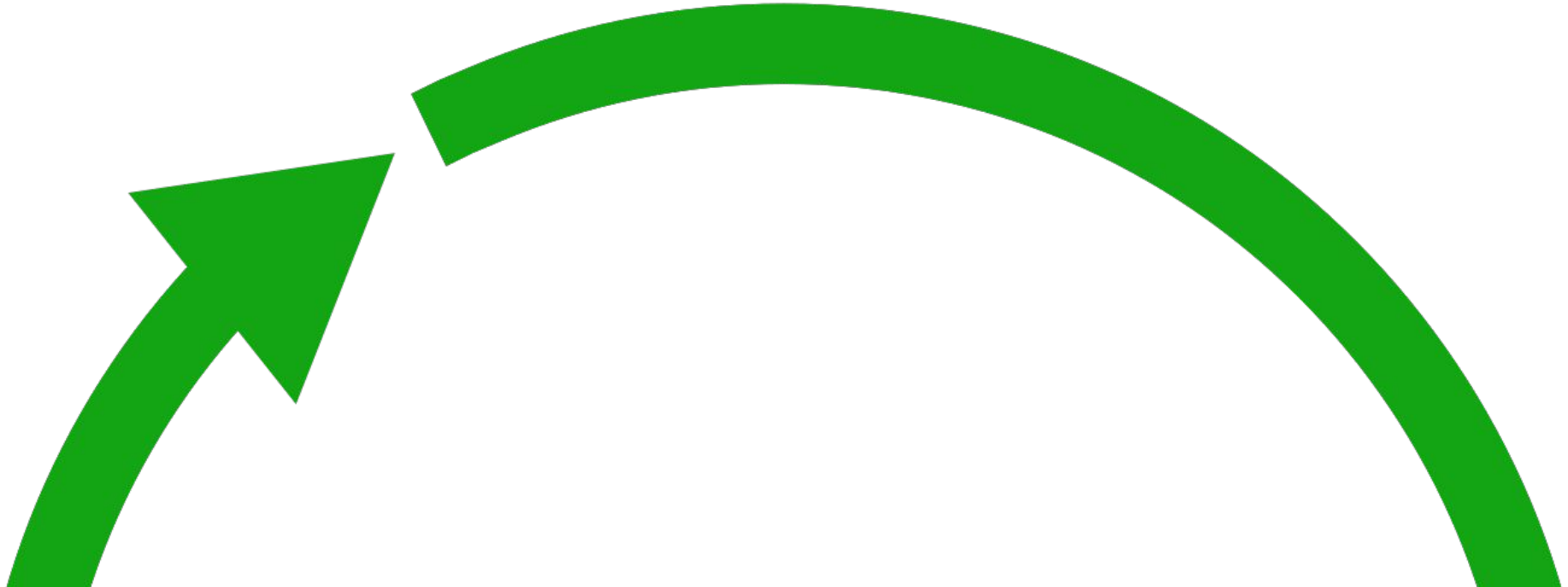




Göswein, 2021, Land availability in Europe for a radical shift toward bio-based construction p.8

https://www.sciencedirect.com/science/article/pii/S2210670721002158?via%3Dihub

*Homework: national straw potential, please download and pick your desired harvest share or CO2 storage*

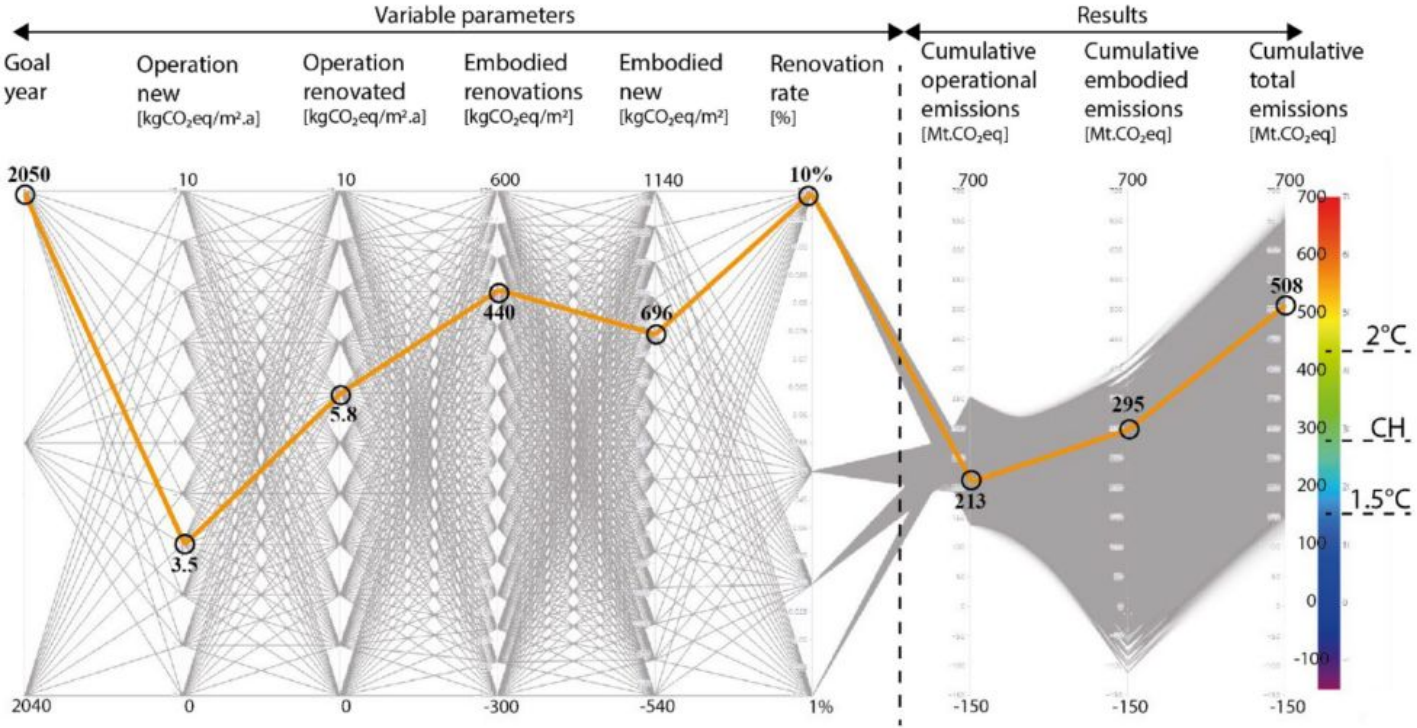
https://docs.google.com/spreadsheets/d/1WGmCwrm3KkOINmJ8VkyIPAPMy-rGjJYrodSSQIRqTRQ/edit?usp=sharing



# What is the best renovation scenario?

**If we increase renovation rate**

*(which is currently the EU and Swiss green deal strategy)*




**We don't change anything compared to business as usual**



Sce: Priore et al. 2020. Exploring long-term building stock strategies in Switzerland in line with IPCC carbon budgets. IOP Conf. Ser.: Earth Environ. Sci. 1078 012023

# The only strong contraint to stay below 1.5°C is to control embodied emission

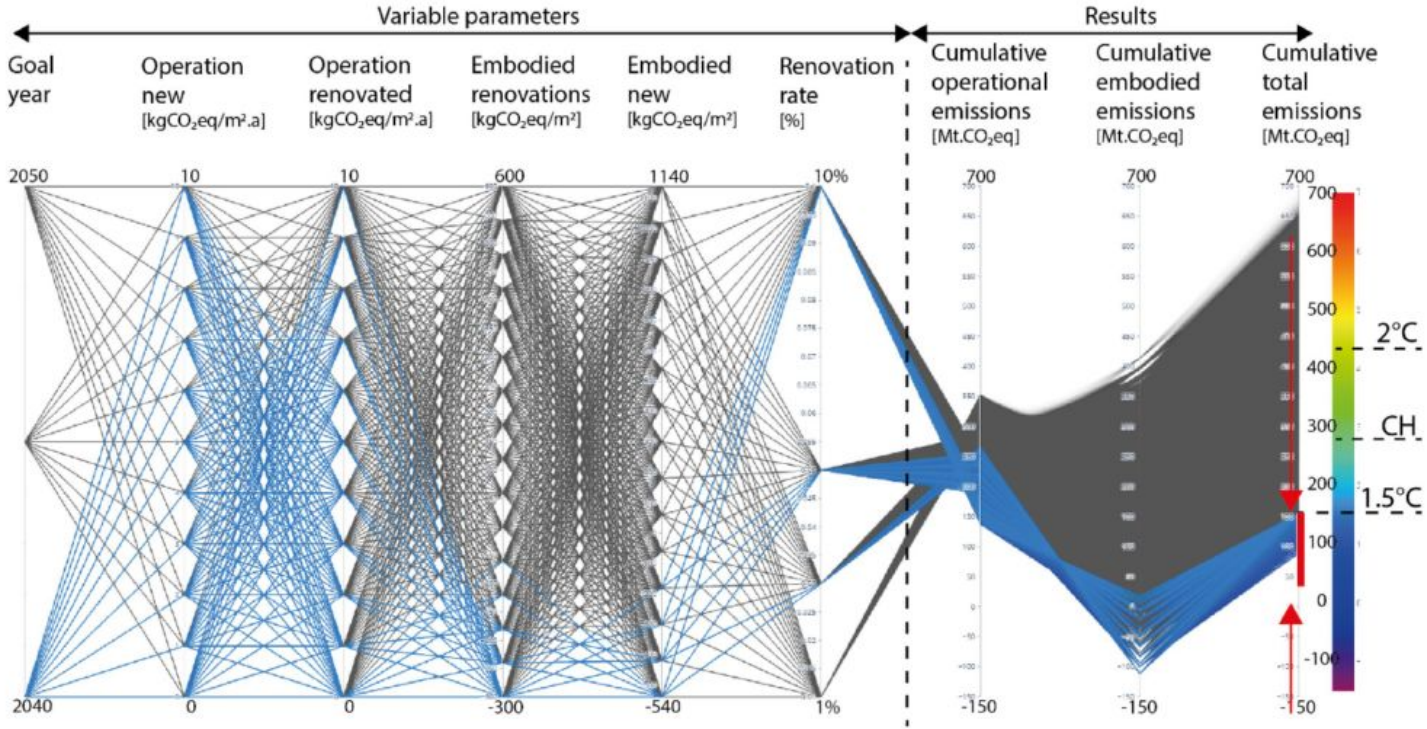


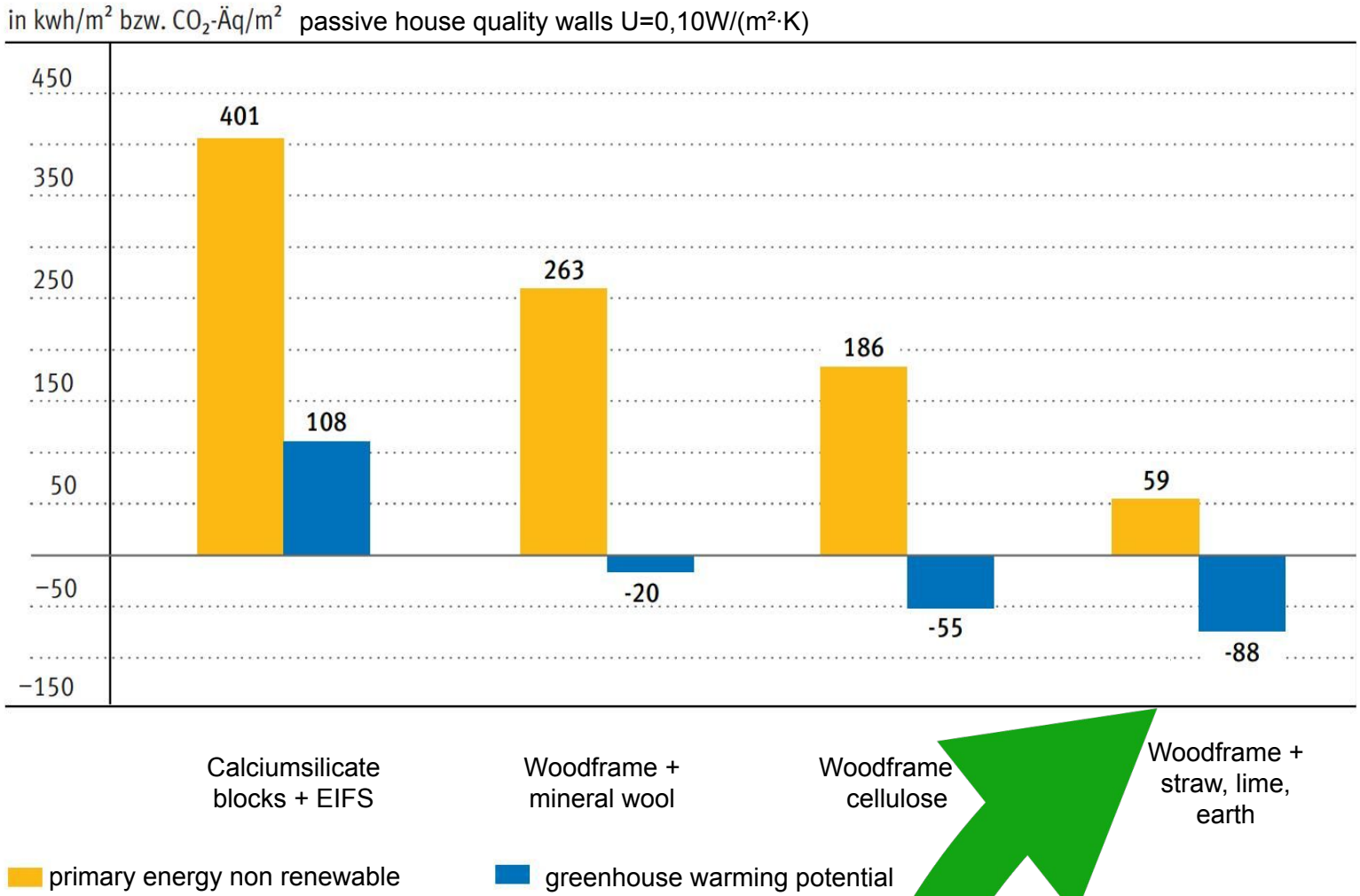

**Table 4.** Range of possible values for a 1.5°C goal.

| | Goal year | Operation new | Operation ren | Embodied ren | Embodied new | Renovation rate |
|---|---|---|---|---|---|---|
| **Max** | 2040 | 10 | 10 | -120 | -180 | 10% |
| **Min** | 2040 | 0 | 0 | -300 | -540 | 3% |



Sce: Priore et al. 2020. Exploring long-term building stock strategies in Switzerland in line with IPCC carbon budgets. IOP Conf. Ser.: Earth Environ. Sci. 1078 012023

# ÖKOBILANZVERGLEICH




Strohgedämmte Gebäude, FNR 2014
https://docplayer.org/56257792-Strohgedaemmte-gebaeude.html

## It’s possible to build climate neutral buildings

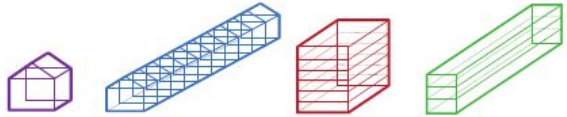
## We just have to change our material diet

*Less carbon intensive material, more vegetables..*

optimised
Reinforced concrete

+ 50 - 100 cm
Straw walls

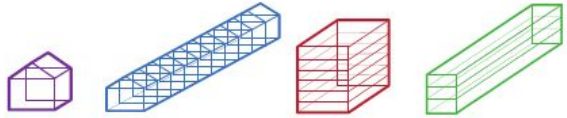
= Climate neutral building



Timber
structure

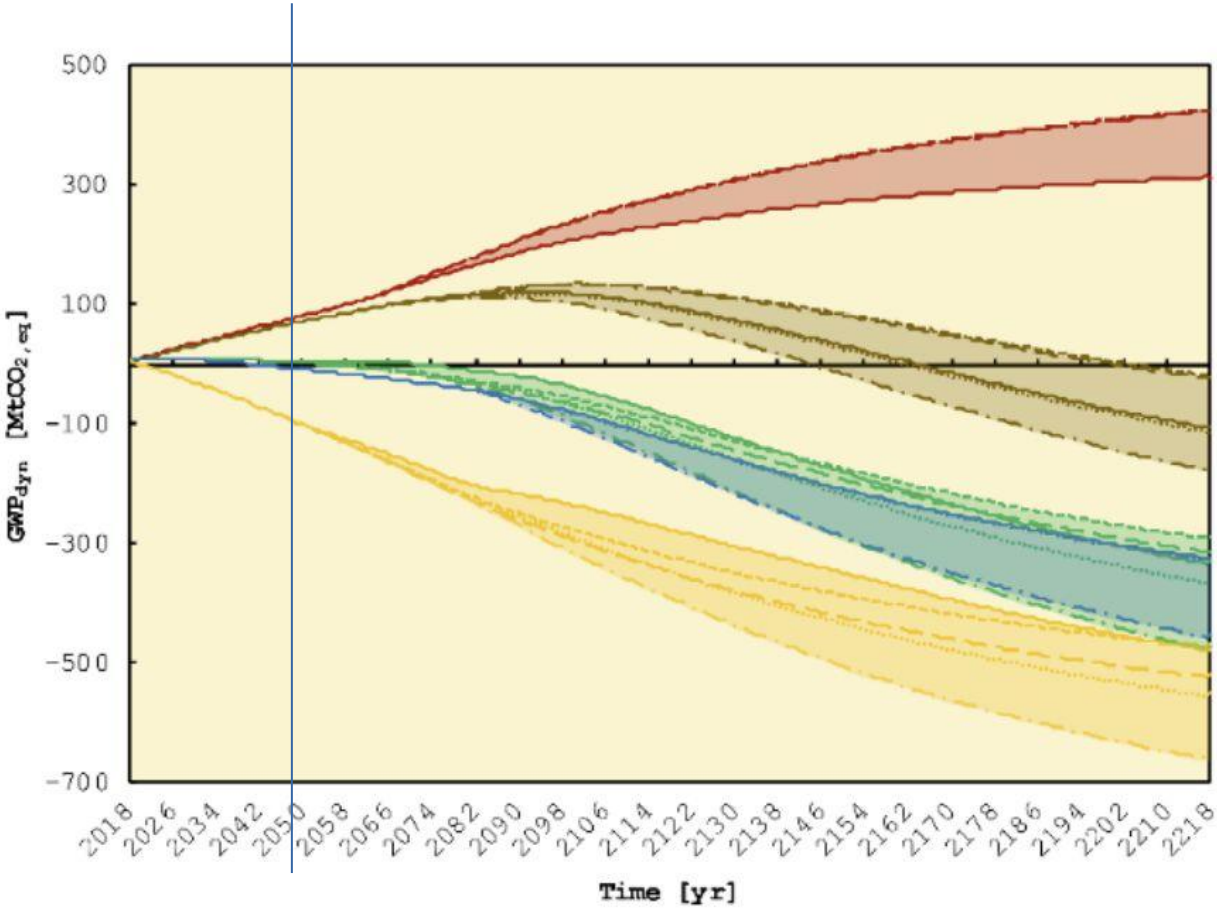
+ 30 - 60 cm
Straw walls

= Climate neutral building



Adapted from: Carcassi et al., 2022. Material diets for Climate-Neutral construction. *Environmental Science and technology*

# What if...




EPS*

Timber*

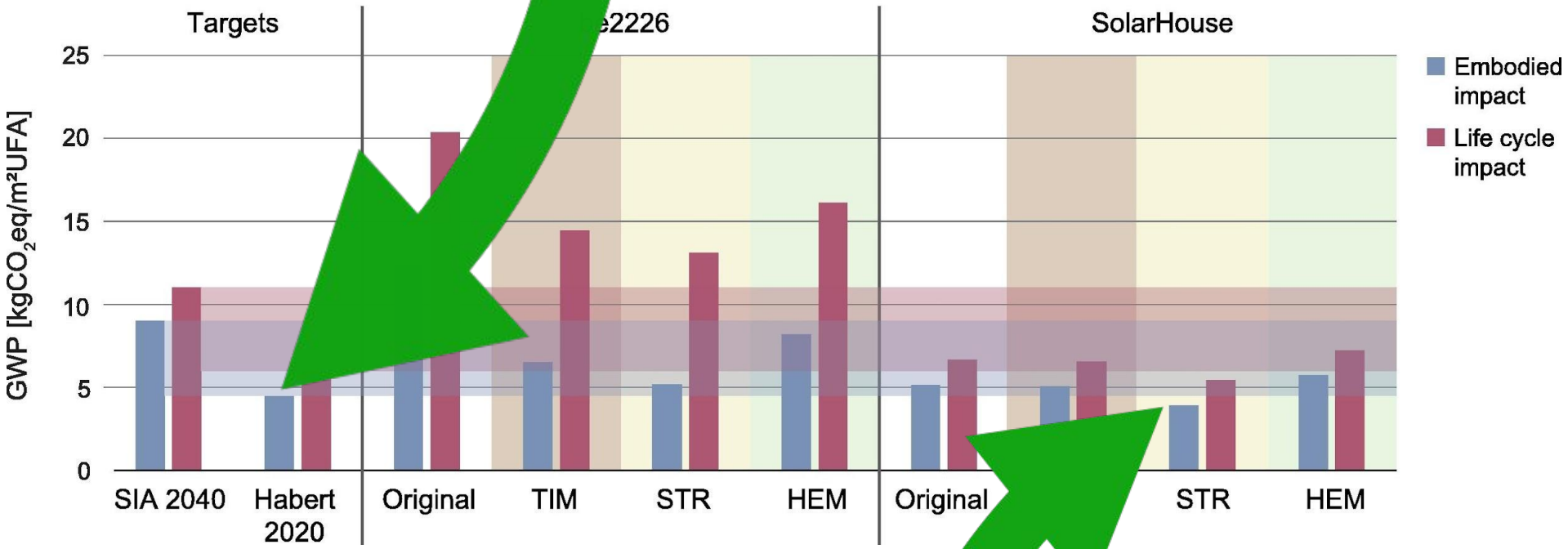
Hempcrete*

Straw*

„[Straw*] showed the most promising potential, being the <u>only one</u> able to remove by 2050 3% of the CO2-eq emitted from all sector in 2015“

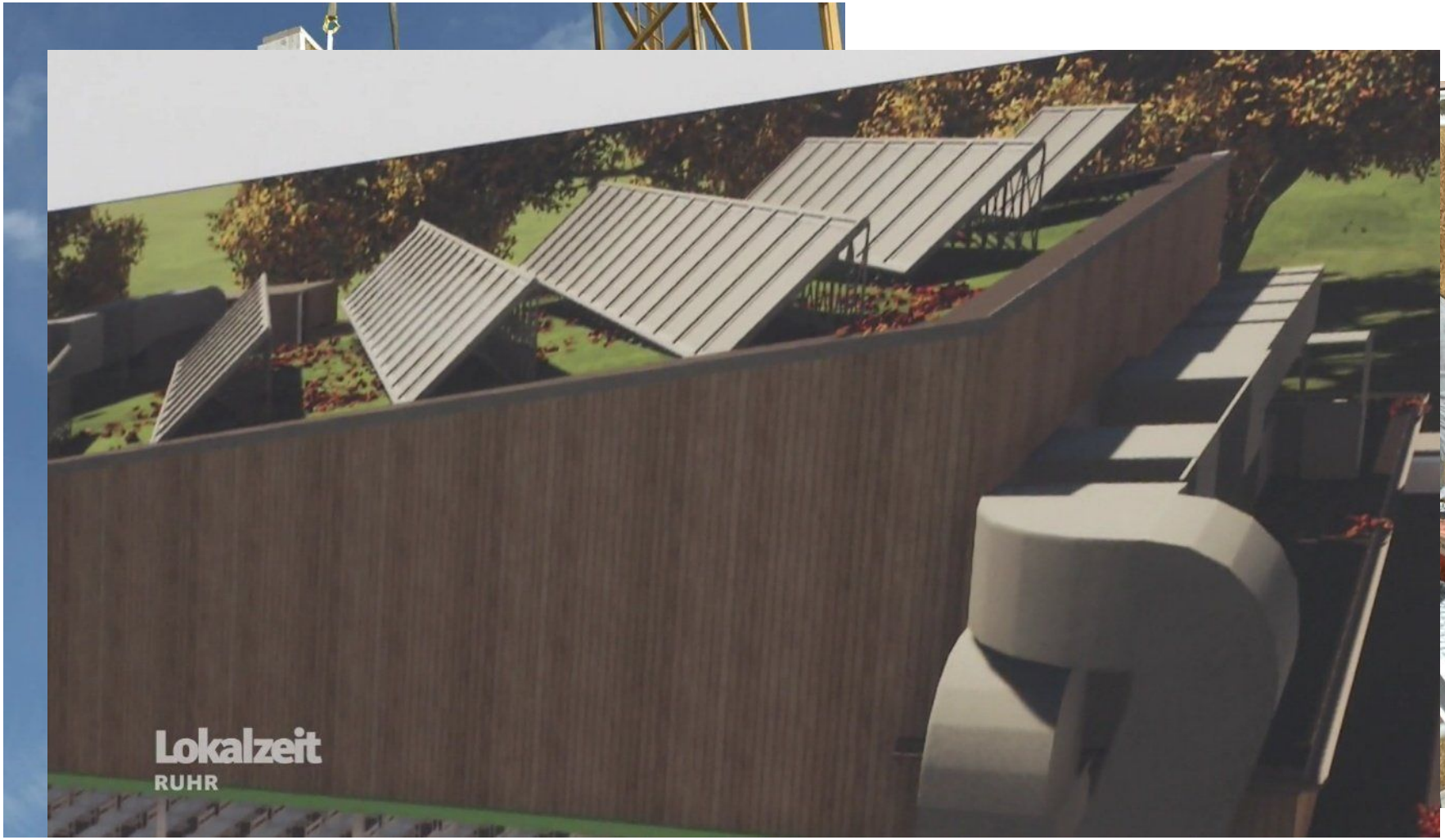
*Functional Units, see article
Figure 4. Dynamic GWP for all scenarios
Pittau 2019, A Life-Cycle Approach to Building Energy Retrofitting: Bio-Based Technologies for Sustainable Urban Regeneration
https://iopscience.iop.org/article/10.1088/1755-1315/290/1/012057/pdf

## Contextualisation of embo and life cycle GWP results with climate targets for ildings from literature

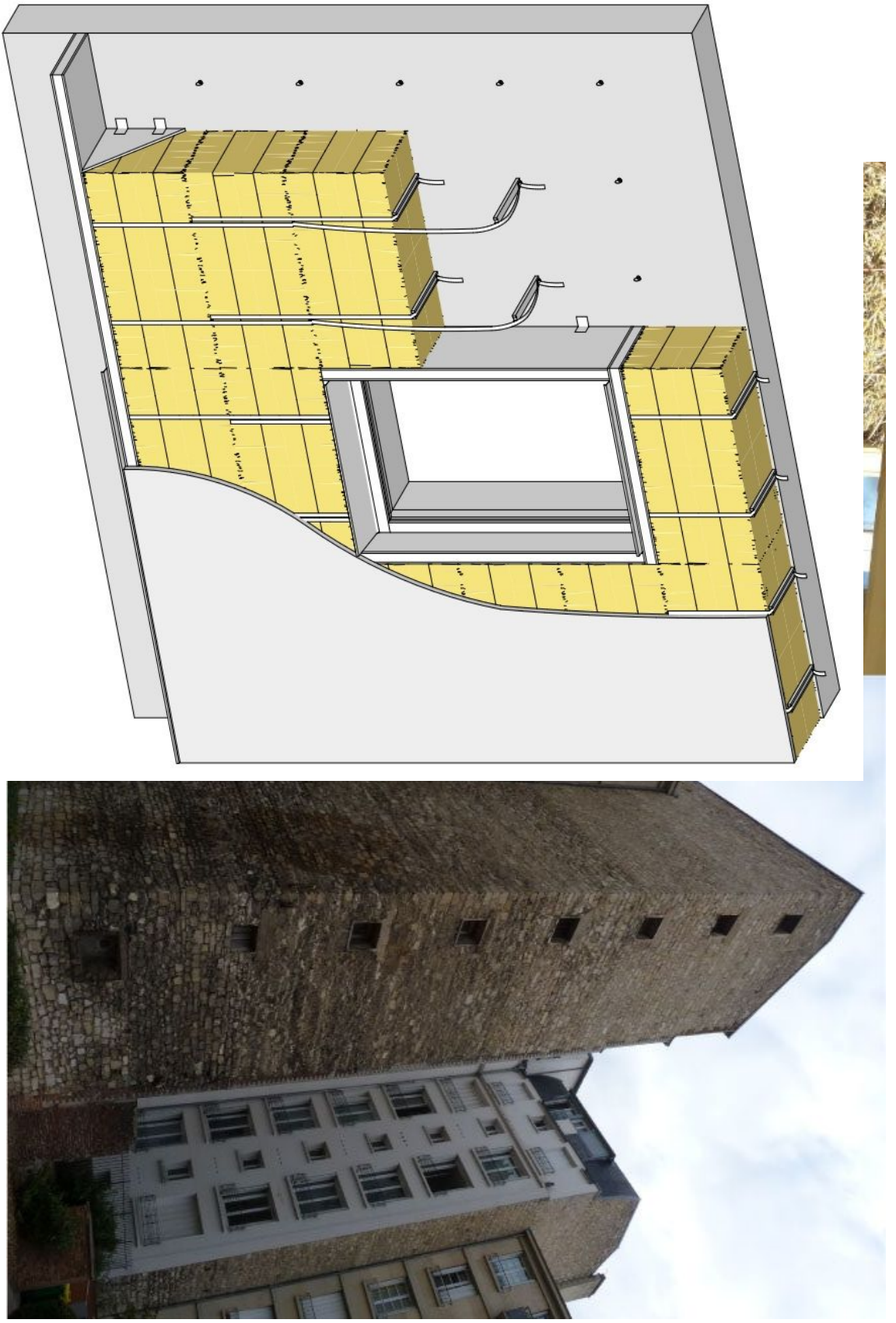



Luise Mouton, Damien Trigaux, Karen Allacker, Martin Röck,
Low-tech passive solar design concepts and bio-based material solutions for re life cycle GHG emissions of buildings – Life cycle assessment of regenerative design strategies (2/2),Energy and Buildings,Volu 2,2023,112678,ISSN 0378-7788,https://doi.org/10.1016/j.enbuild.2022.112678.

Atelier Werner Schmidt, Photos: Lucia Degonda / AWS https://www.atelierschmidt.ch/sanierung-susch



https://lorenzsysteme.de and https://www1.wdr.de/nachrichten/ruhrgebiet/stadt-oberhausen-daemmt-schwimmbaeder-mit-stroh-100.html



https://www.batirama.com/article/34010-de-la-paille-pour-l-isolation-par-l-exterieur-d-un-immeuble-existant-en-plein-paris.html and https://iledefrance.constructionpaille.fr/blog/le-chantier-dite-paille-fait-sa-rentr%C3%A9e/

Biogenic construction materials Architecture tectonics, Cinark, Royal Danish Academy 2023
https://issuu.com/cinark/docs/til_issuu_23.03.2023_biogenic_construction_bg_fina/1?ff&experiment=last-page

HANFFASER
UCKERMARK

https://www.hanffaser.de/uckermark/index.php/bauvorhaben/an-wanddaemmung

HANFFASER
UCKERMARK

https://www.hanffaser.de/uckermark/index.php/bauvorhaben/an-wanddaemmung

Ups, sorry!

Schönthaler
Betonsteinwerk und
Baustoffhandel seit 1964.
Manufatti in cemento e
Commercio materiali edili dal 1964.
DE Home
Pflastersteine
Betonfertigteile
Deckensysteme
Betonsteine
Regalsysteme
Schalungssysteme
Betonpfähle
Hanfsteine
Baustoffe
S A L E - günstig einkaufen
Neue Produkte
Kontakt
IT Home
Mattonelle
Manufatti in calcestruzzo
Sistemi solaio
Blocchi in calcestruzzo
Scaffalature
Sistemi per casseforme
Schönthaler
Betonsteinwerk und
Baustoffhandel seit 1964.
Manufatti in cemento e
Commercio materiali edili dal 1964.
Vinschgauer Straße 33
I - 39023 Eyrs
Tel.: +39 0473 739 937
info@schoenthaler.com

# Better.

Schönthaler
Betonsteinwerk und
Baustoffhandel seit 1964.
Manufatti in cemento e
Commercio materiali edili dal 1964.
DE Home
Pflastersteine
Betonfertigteile
Deckensysteme
Betonsteine
Regalsysteme
Schalungssysteme
Betonpfähle
Hanfsteine
Baustoffe
S A L E - günstig einkaufen
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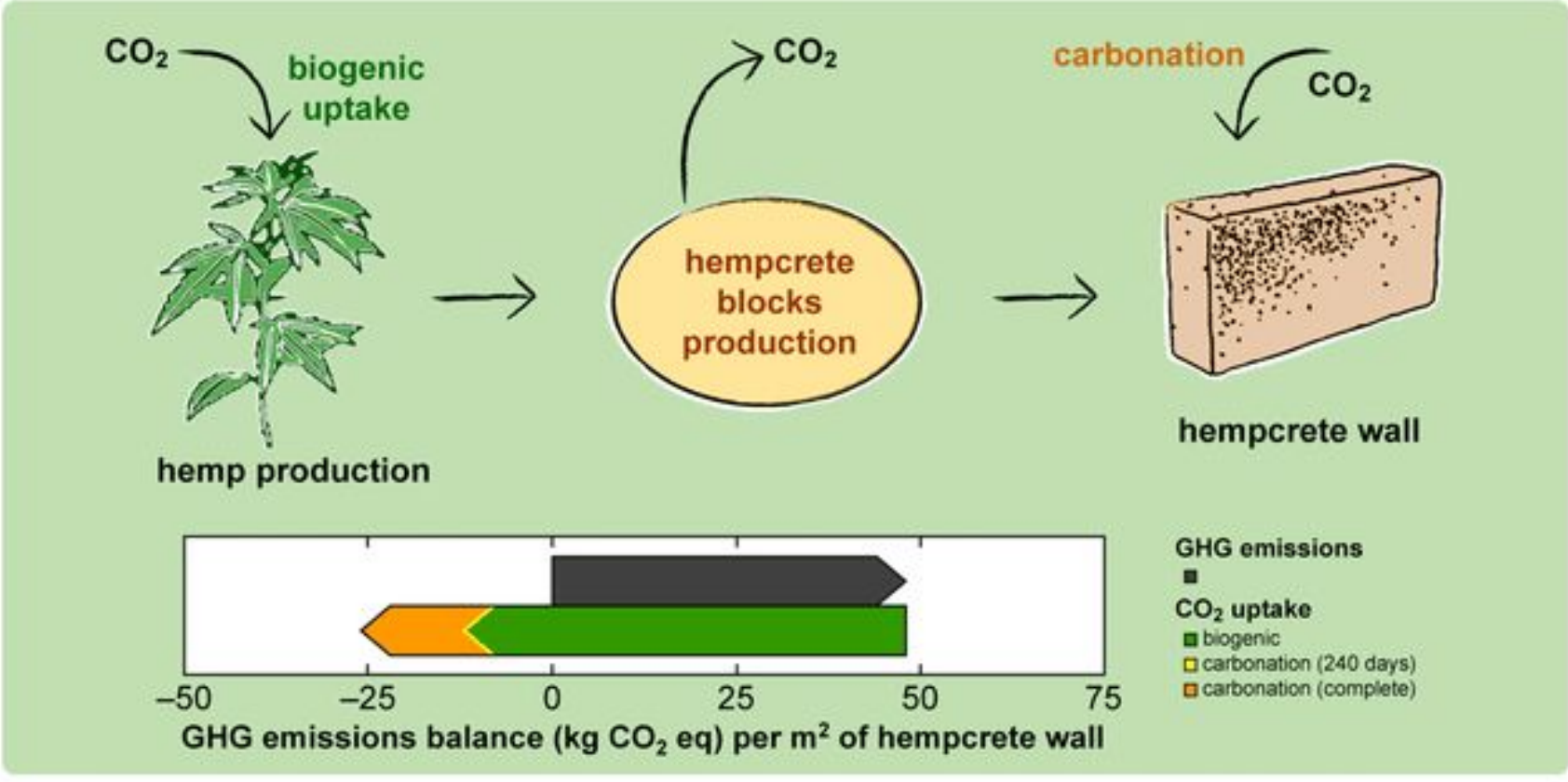
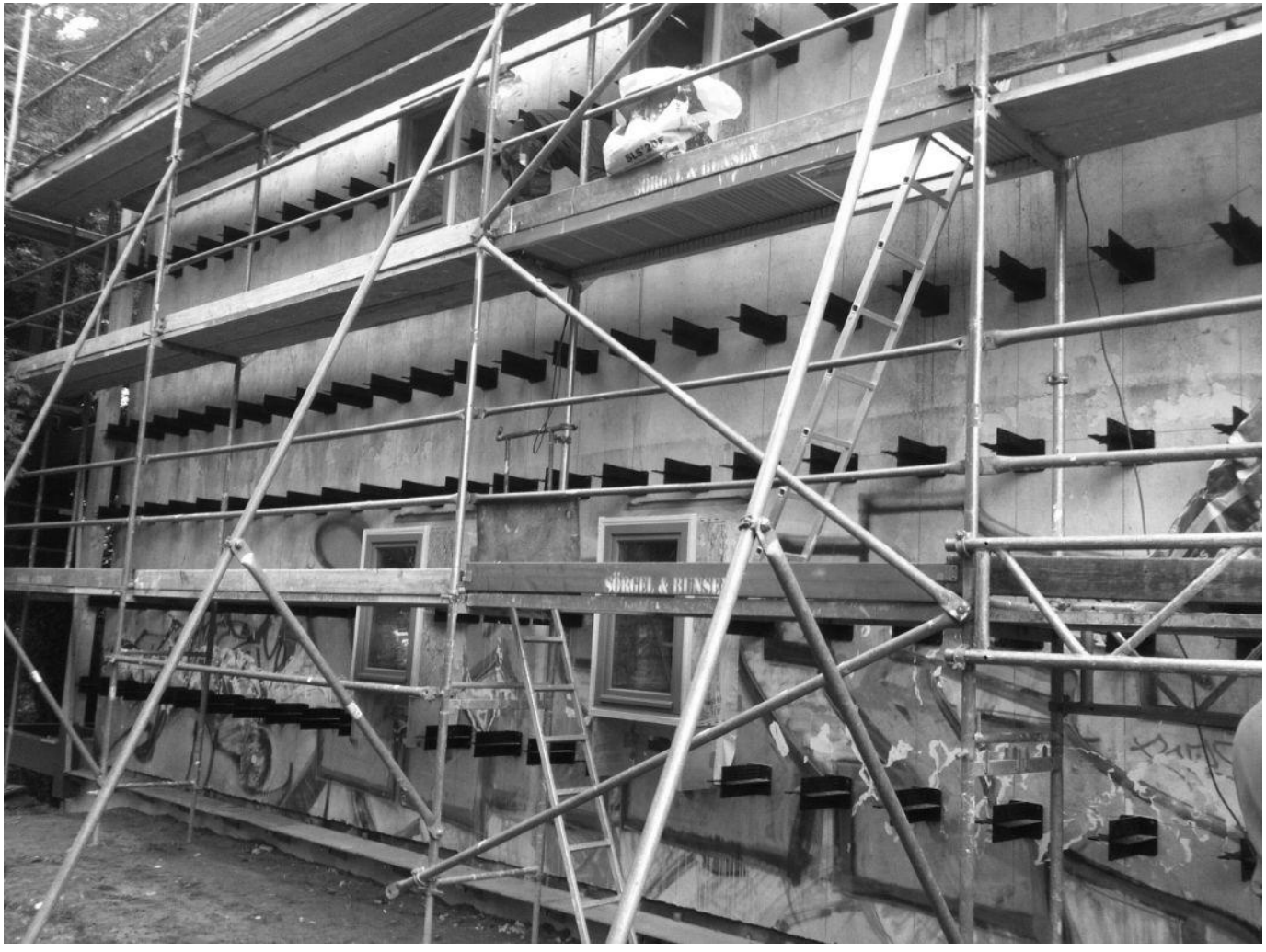
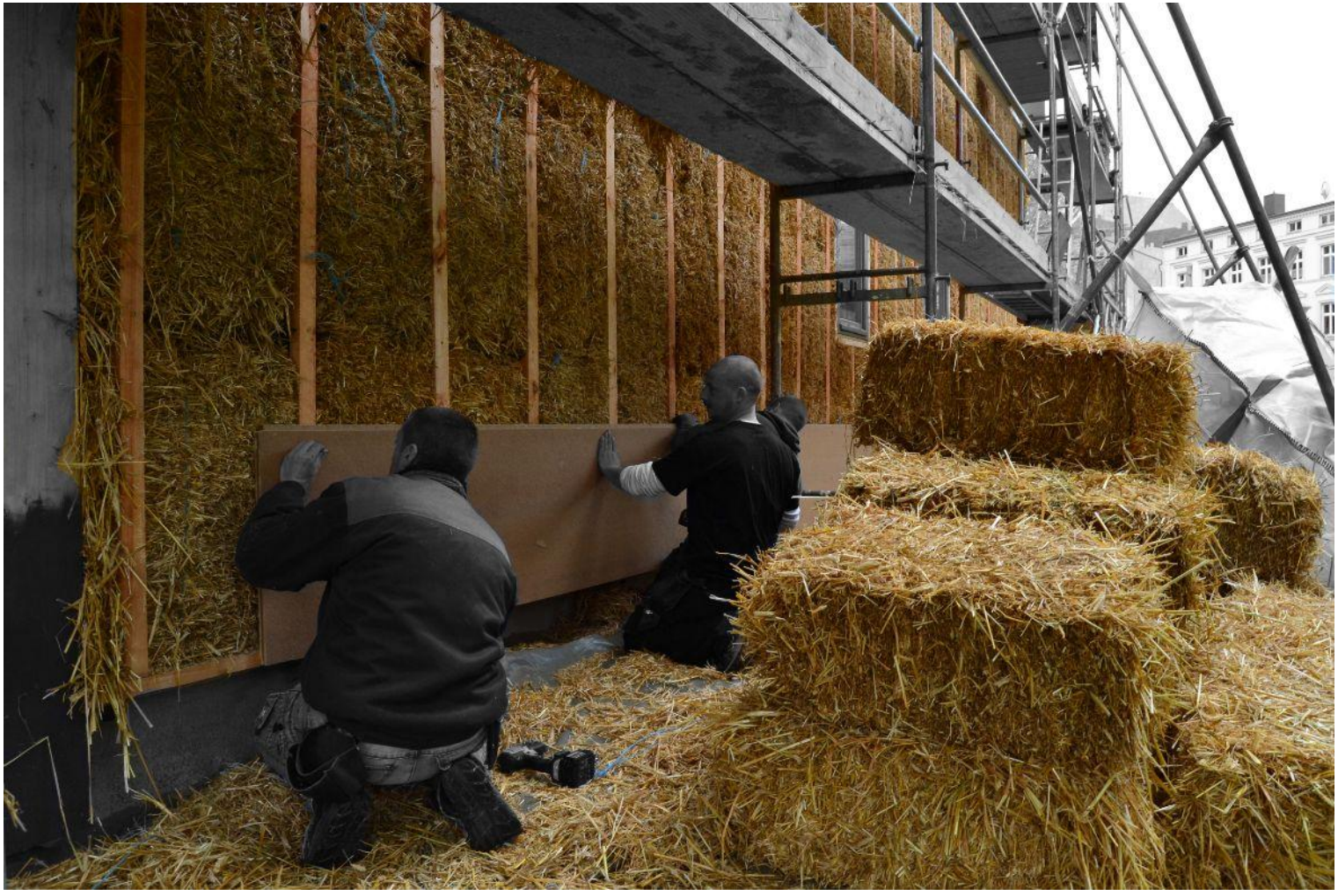



https://www.researchgate.net/profile/Alessandro_Arrigoni and
https://www.researchgate.net/publication/313961941_Life_cycle_assessment_of_natural_building_materials_the_role_of_carbonation_mixture_components_and_transport_in_the_environmental_impacts_of_hempcrete_blocks/link/5bc0313492851c88fd652462/download

Ext or Int wall insulation system https://www.huppenberger-naturbaustoffe.de/fileadmin/huppenberger-naturbaustoffe/4-0-Referenzen/strohdaemmplatte_schamer_altbausanierung_entwurf.pdf




Building Stock Challenge. Strohbauanker https://Schelfbauhuette.de

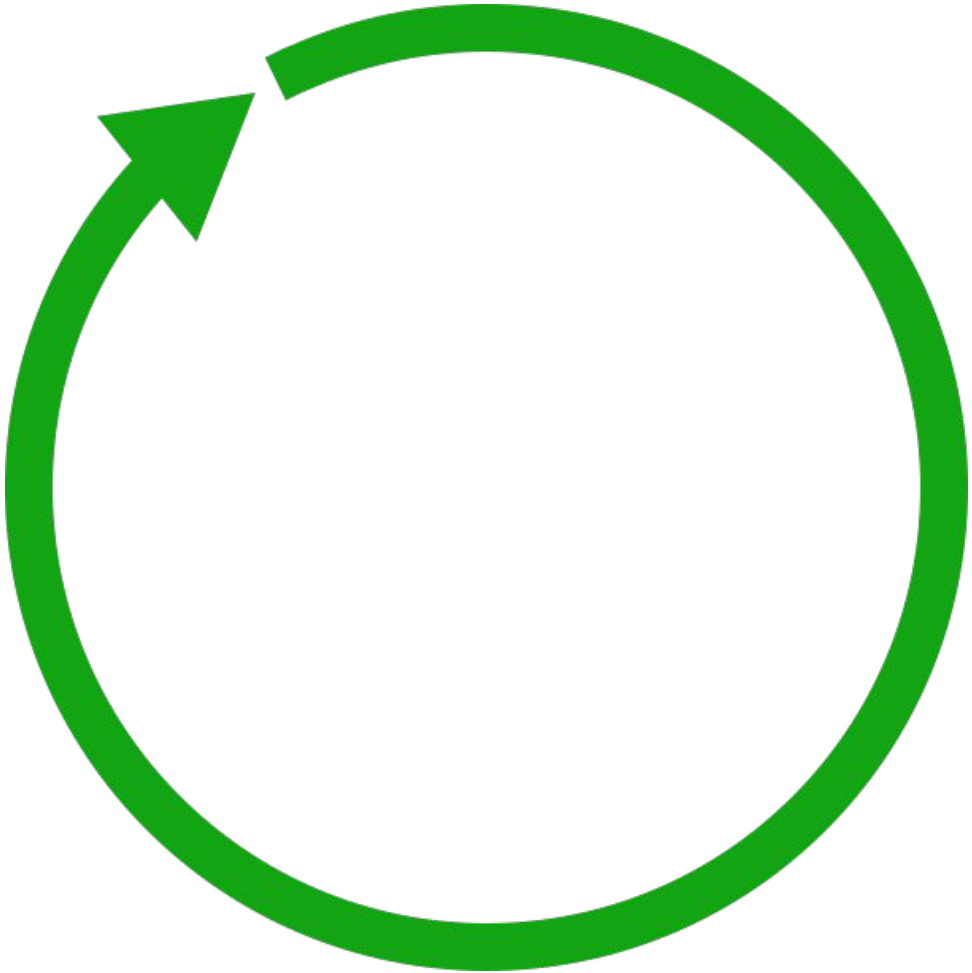


Building Stock Challenge, Strohbauanker https://Schelfbauhuette.de

Building Stock Challenge, Strohbauanker https://Schelfbauhuette.de

Building Stock Challenge, Strohbauanker https://Schelfbauhuette.de

Deep Retrofit Complemedis GmbH https://www.atelierschmidt.ch/



BAUWENDE

Michael Burchert | burchert@bauwende.de | https://twitter.de/@burchertmichael

# Bonus

STEP Training and practical workshops
and further technical information:

STEP Training: https://baubiologie.at/strohballenbau/step-straw-bale-training/

Practical-Workshops: https://www.strohnatur.at/next-workshops-how-you-can-join-us/

Registration-Form in general: https://baubiologie.at/strohballenbau/step-anmeldung/

Registration-Form in Detail: https://forms.gle/xp8e4v8RqBbq4GyT6

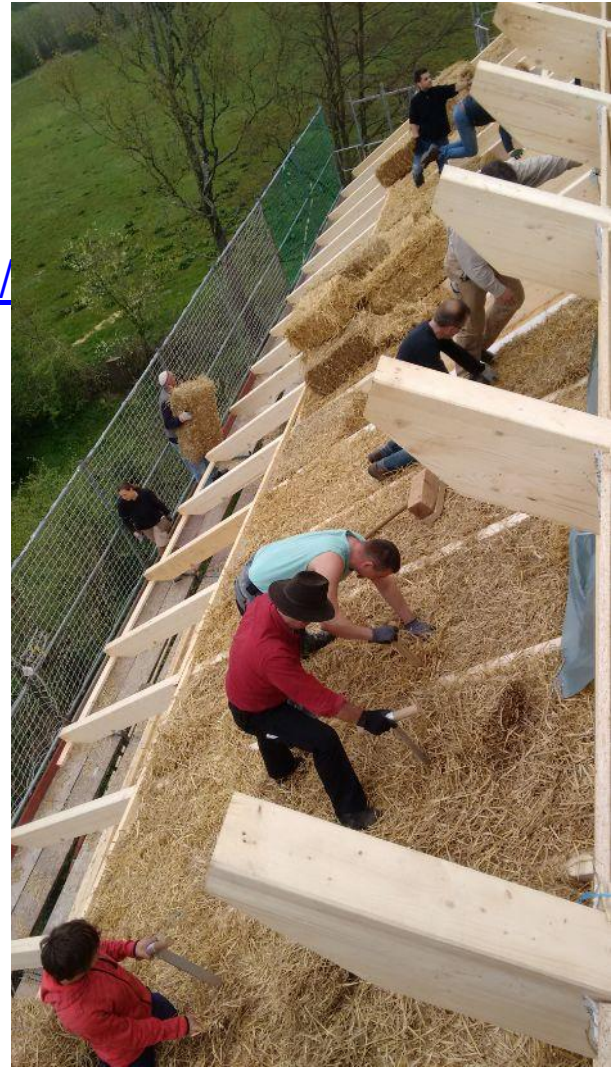
YouTube-Info about STEP: https://youtu.be/ciKRw5vFcXM

Workshops in Germany: https://biwena.de | https://nznb.de

German Strawbale Building Association: https://fasba.de

Construction Material authorization for Strawbales in Germany: https://baustroh.de

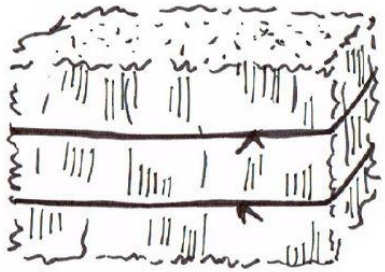
Further Technical Information: https://www.zotero.org/groups/2187655/upstraw



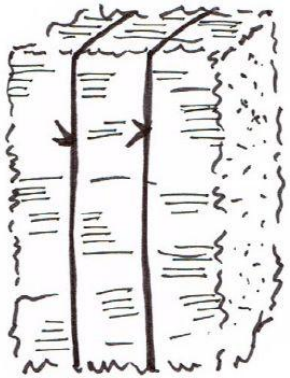
# https://fasba.de STRAW BALE BUILDING GUIDELINES 2020,

# key takeaways, you can do it:

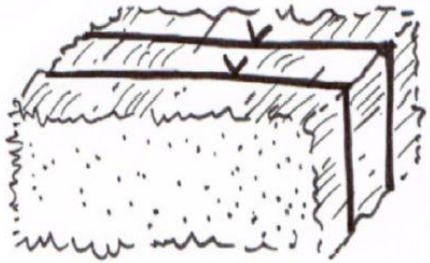
- >85kg /m³ Strawbale = class E
- >8mm clay plaster on both sides = B, s1, d0 in timber stud wall, more with lime (up to F90-B)
- λR, Germany = 0.049 W/(m·K) with Stalk orientation predominantly vertical to the heat flow. So Bale vertically or horizontally on Edge (...not flat)
- wheat and rye are particularly well-suited, whereas oat must be viewed as unsuitable
- Stud width <1m
- +10% compression in frame
- Gapless, settlement proof
- Airtight, windtight
- Smells good
- Clean site, happy site



vertical on edge



horizontal on edge



flat

# Resilience,

## classic timber construction rules:

- Large Hat
- High Boots

- new:
- Warm Coat
- Plan with future water damage