S C I E N C E ▪ P A S S I O N ▪ T E C H N O L O G Y

Herzlich Willkommen an der TU Graz
A very warm welcome at TU Graz

BUILDING A SUSTAINABLE FUTURE.

Sustainable Construction: Let's build changes!

Alexander Passer

30. November 2017

BUILDING A SUSTAINABLE FUTURE.

Sustainable Construction: Let's build changes!

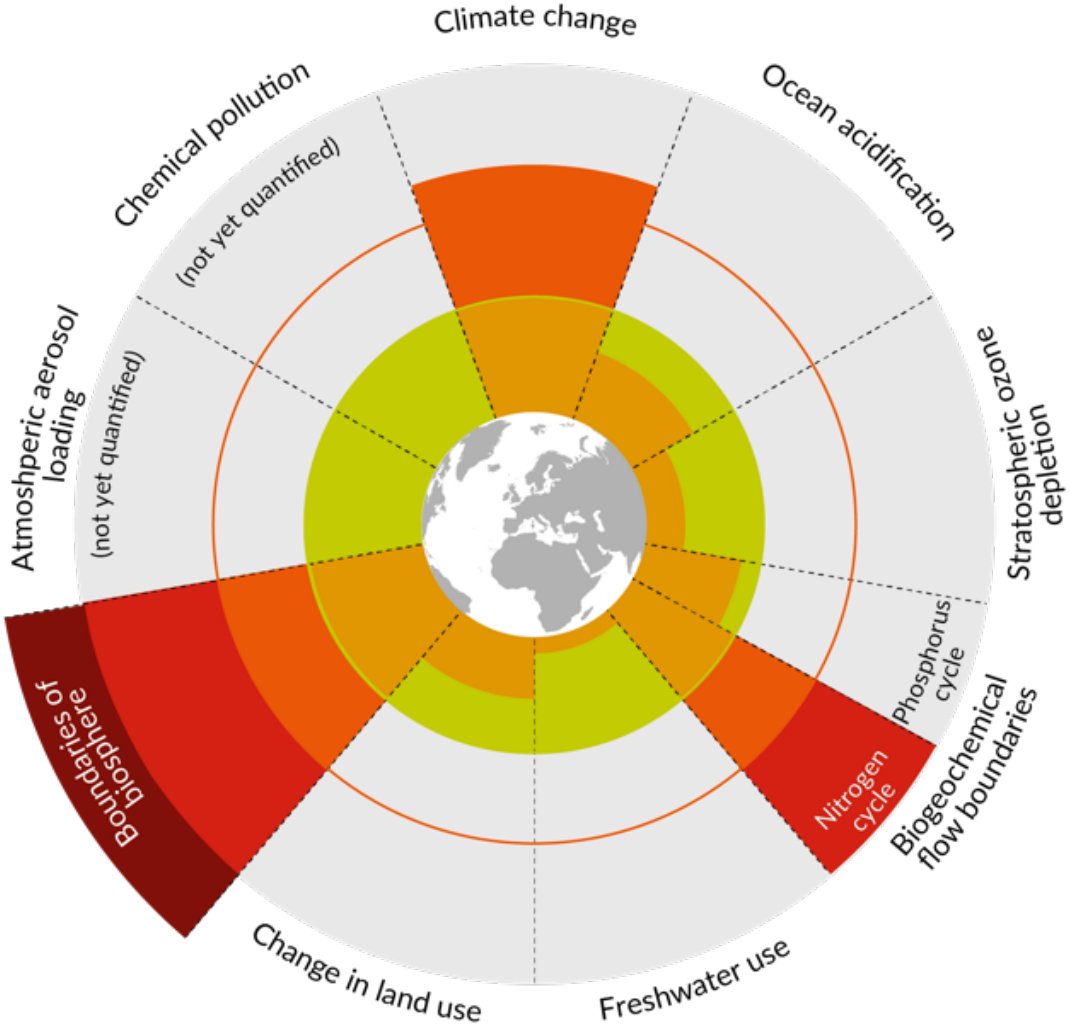
- Chairs for Sustainable Construction
- Graz University of Technology

What is a sustainable building?

香港屬世界最具競爭力營商環境
香港有約10萬人居於劏房，即一個由普通單位分割而成的小房間，平均面積只有40呎，卻同時兼備了客廳、睡房、廚房、更衣間的功能！不少人一家要擠住在這種惡劣境裡，成為了名副其實的「劏房」。我們的城市表面風光，但風光背後，卻有很多一起努力的基層未能共享成果，需要你幫忙改善生活，維護社會公義！
SOCO 香港社區組織協會 www.soco.org.hk/housing


2050
sea level
2030
sea level

Planetary Boundaries



Source: AGNHB according to J. Rockström, et al., "A safe operating space for humanity," *Nature*, vol. 461, no. 7263, pp. 472–475, Sep. 2009.

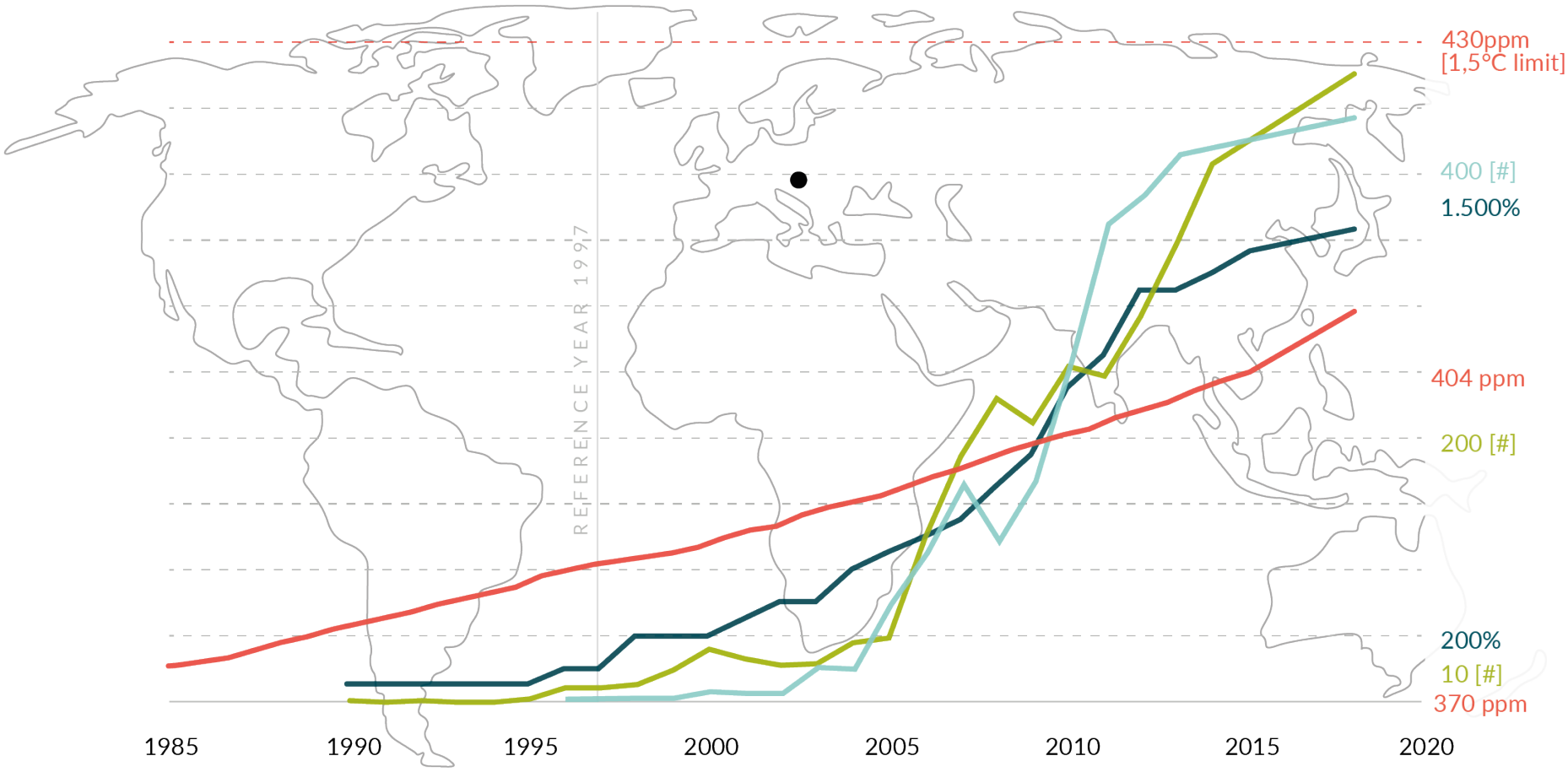
The Focus of Sustainable Construction in Graz

Tangible Resources

Intangible Resources
(Knowledge)

"It is our task at universities to enable our students to use knowledge and wisdom as an intangible resource to manage tangible resources!"

Improve Link Between Academia and Industry



Source: A. Passer, TU Graz 2017

Intangible resources

Goal
A rapid reversal to meet climate ambitions
NET ZERO GHG Emission!

Method
Life Cycle Sustainability Assessment

People
Students and professionals
And all of you!

How about Chocolate?

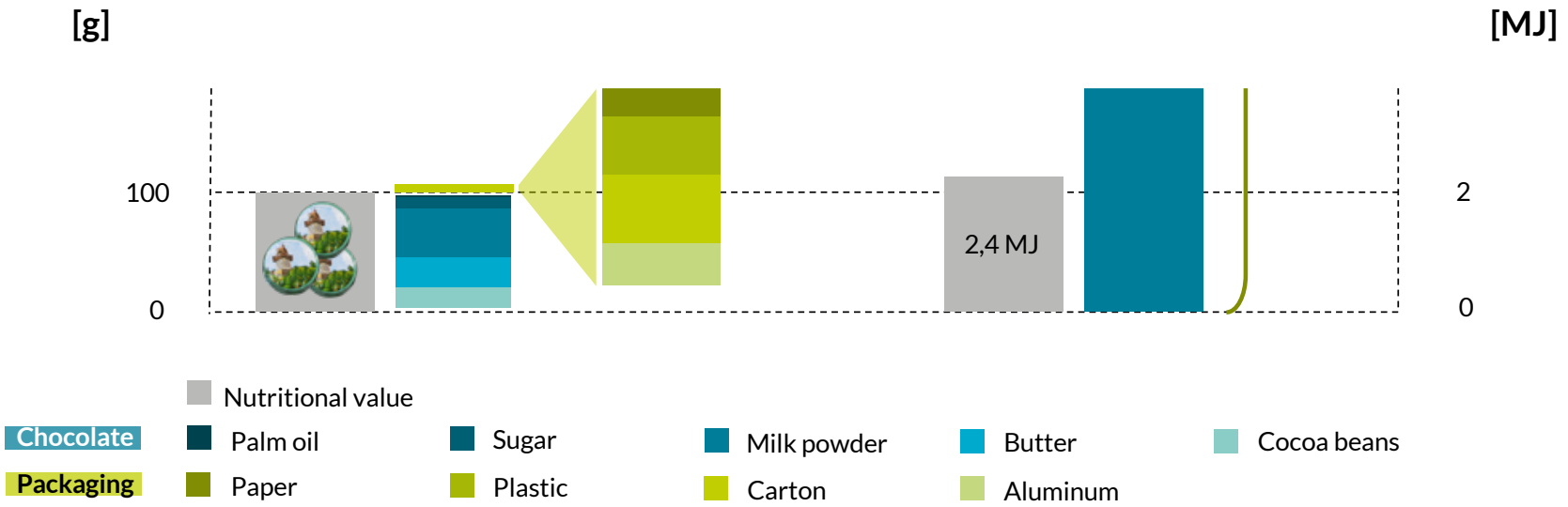
Chocolate (for a consumer) = edible part + packaging

?

Chocolate´s Nutritional Value

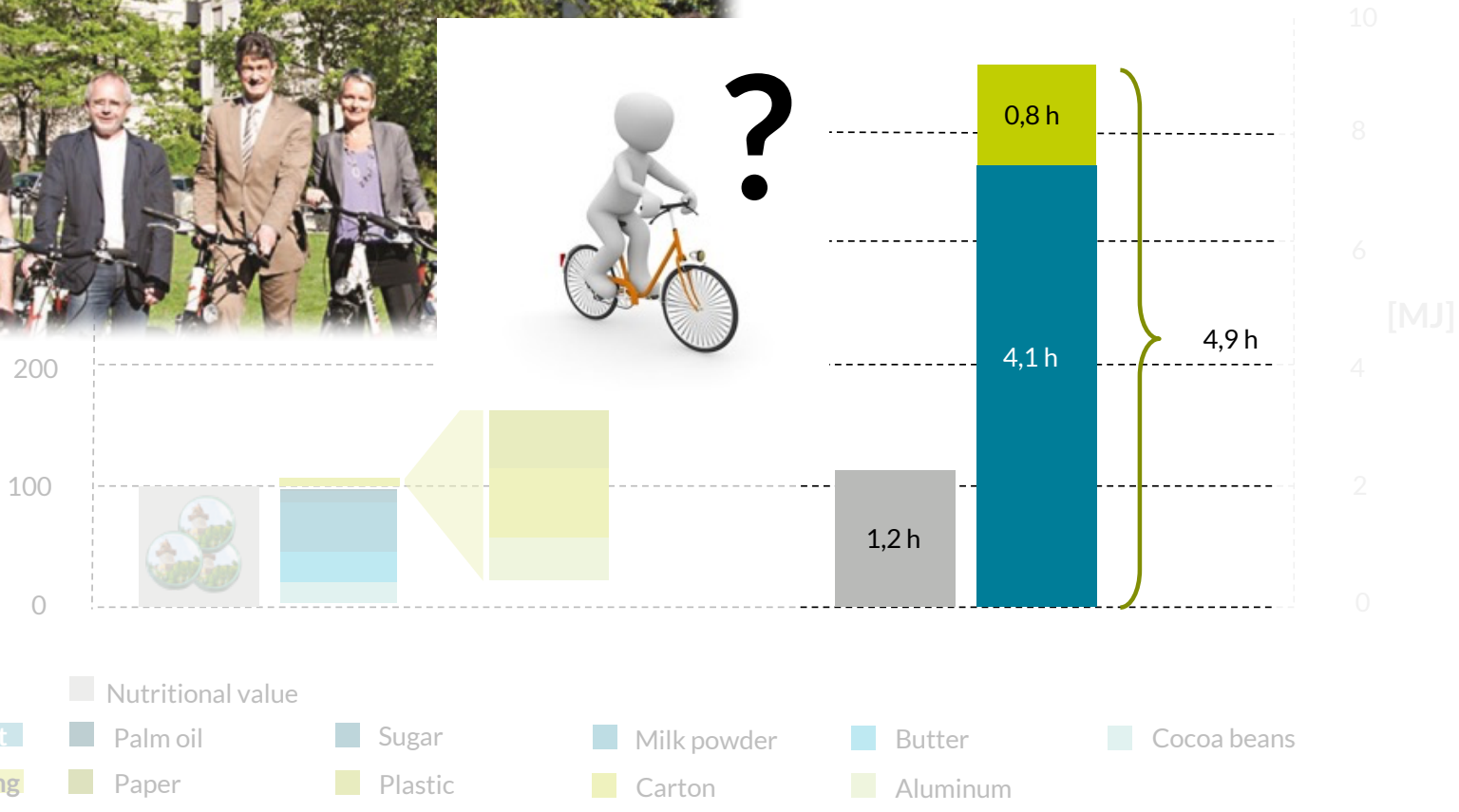
100 g
Nutritional value:
2.4 MJ = 570 kcal

Life Cycle Assessment



Source: A. Passer, TU Graz 2017

Life Cycle Assessment



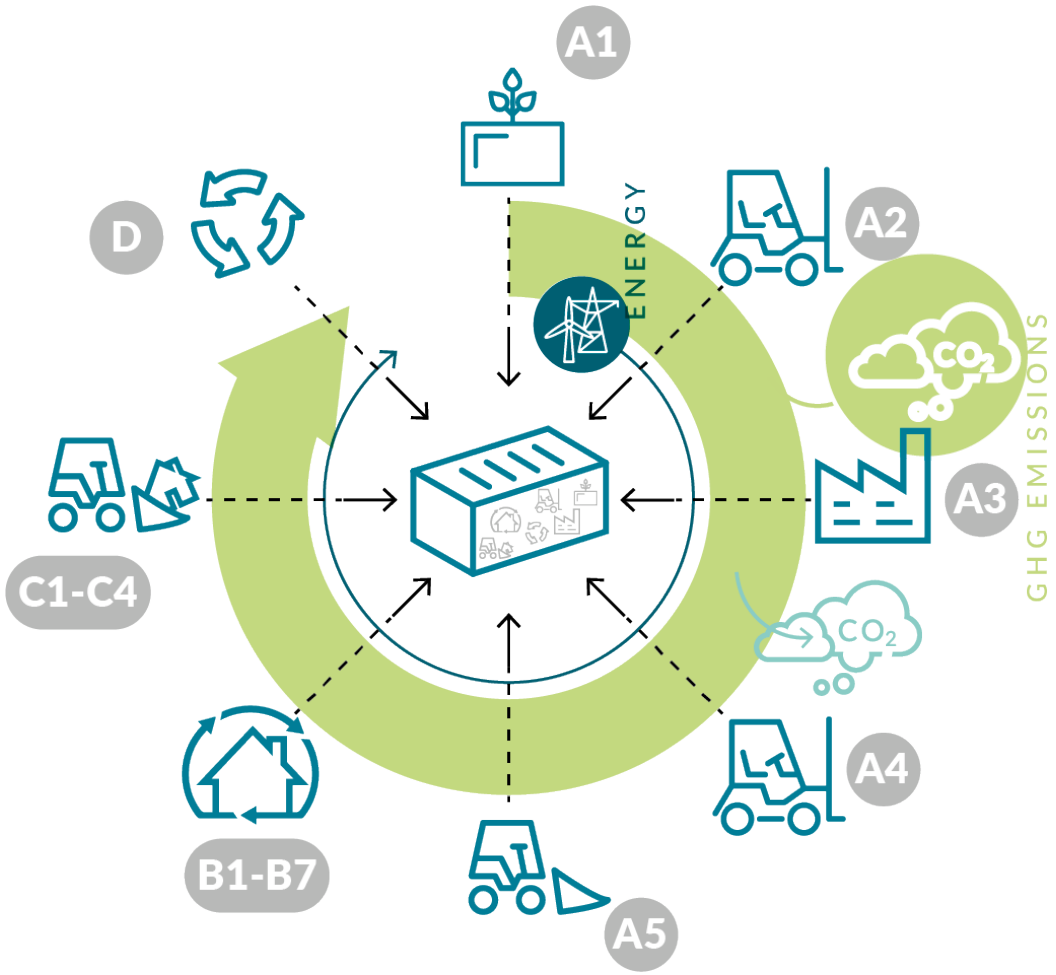
Source: A. Passer, TU Graz 2017

Lessons Learned

Environmental Performance

Source: A. Passer, TU Graz 2017

Life Cycle Stages of Construction Products



- A1 Raw material supply
- A2 Transport
- A3 Manufacturing
- A4 Transport
- A5 Construction — installation process
- B1-B7 Maintenance, repair & operation
- C1-C4 Deconstruction, transport, waste processing & disposal
- D Recovery, reuse, recycling potential

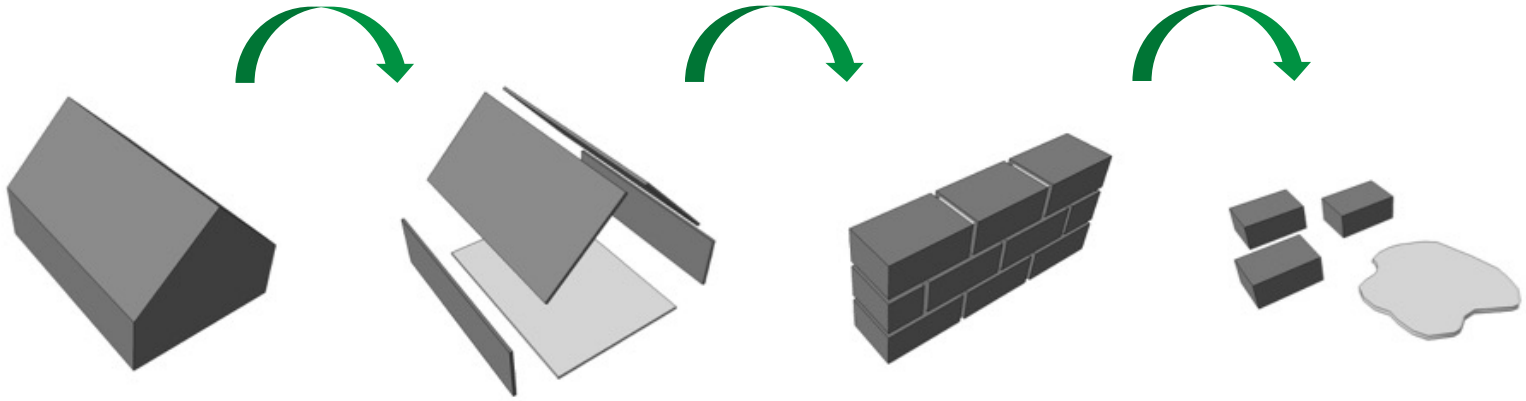
Source: A. Passer, TU Graz 2017


TU Graz
European Commission
PEF4Buildings
vito
KU LEUVEN

Data Inventory – Work Flow

Structuring of the data collection

- Hierarchical decomposition of the building



Building

Level 0

Building - elements

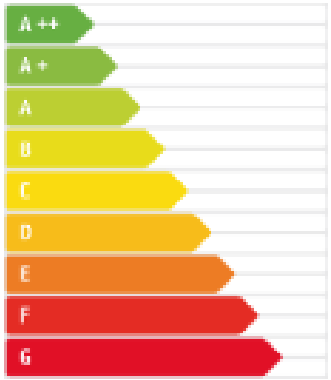
Level 1

Building – sub-elements

Level 2

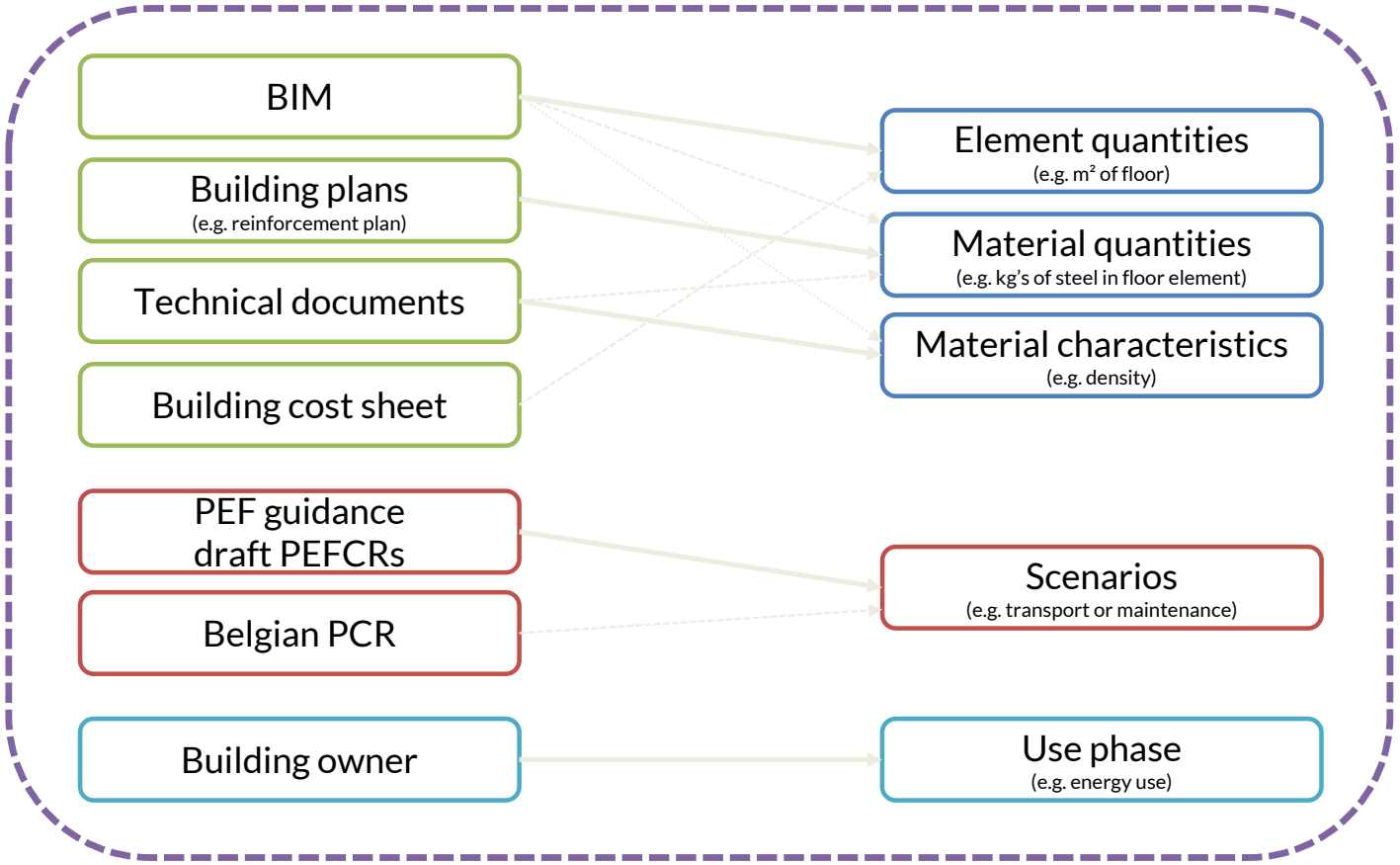
Building materials

Level 3



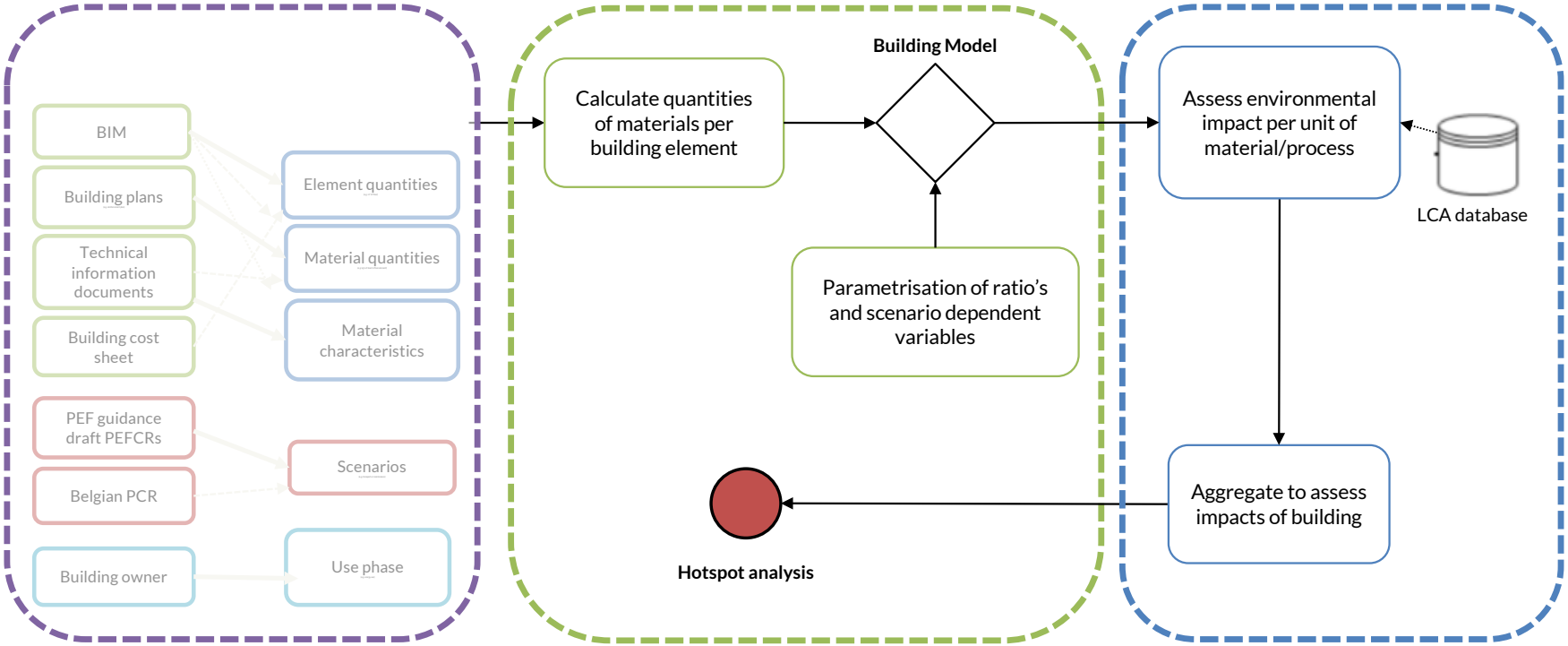
Source: D. Trigaux, PEF4Buildings-Project

Data Gathering– Work Flow



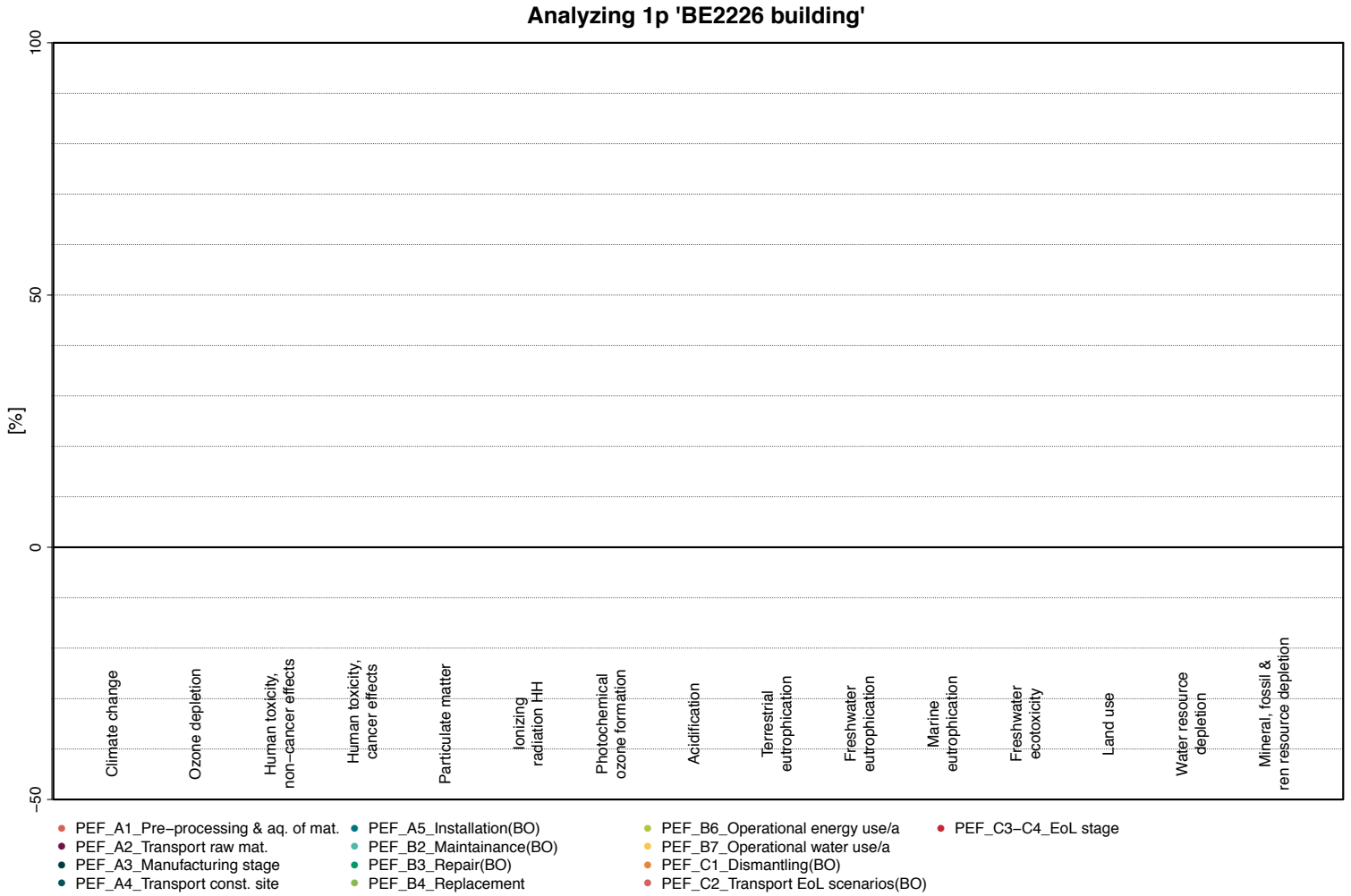
Source: PEF4Buildings-Project

Building Assessment Model



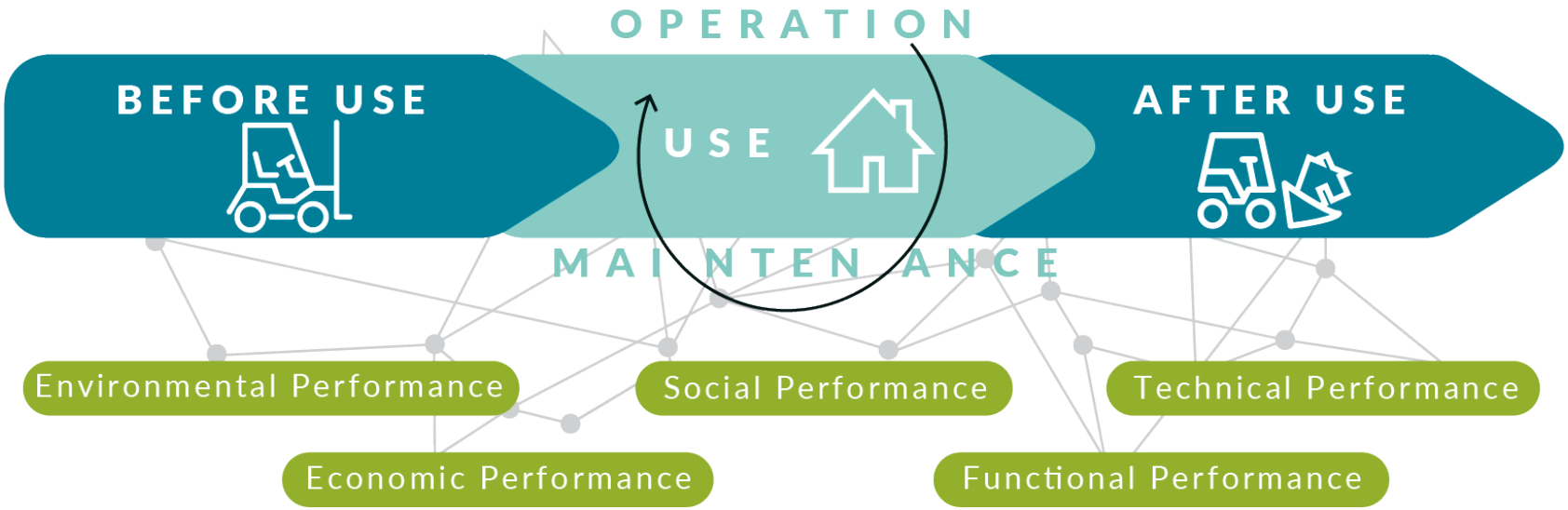
Source: PEF4Buildings-Project

Climate Change, PEF_A1



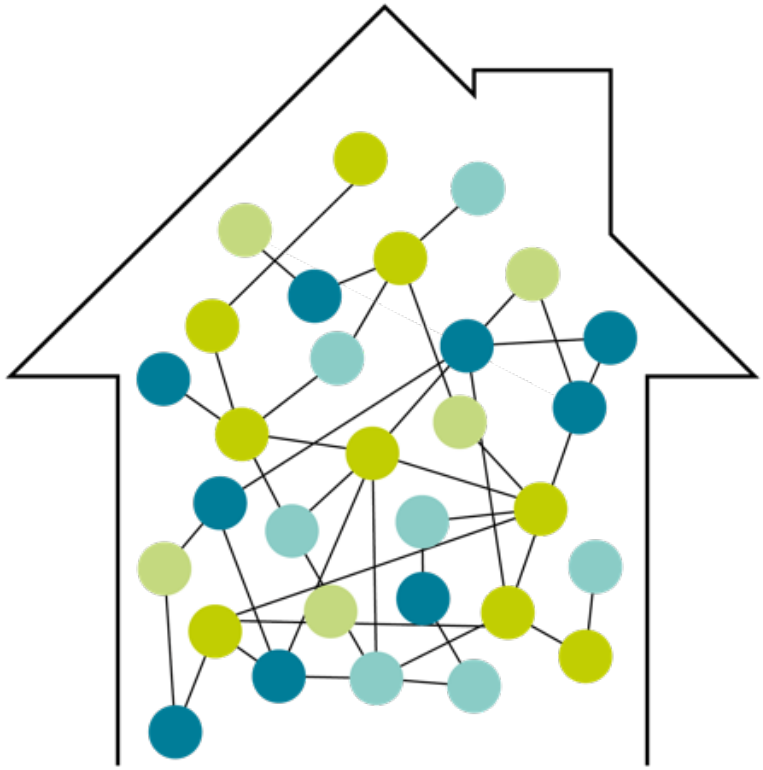
Source: PEF4Buildings-Project

Holistic Approach Needed!



Source: A. Passer, TU Graz 2017

Systemic Interdependencies

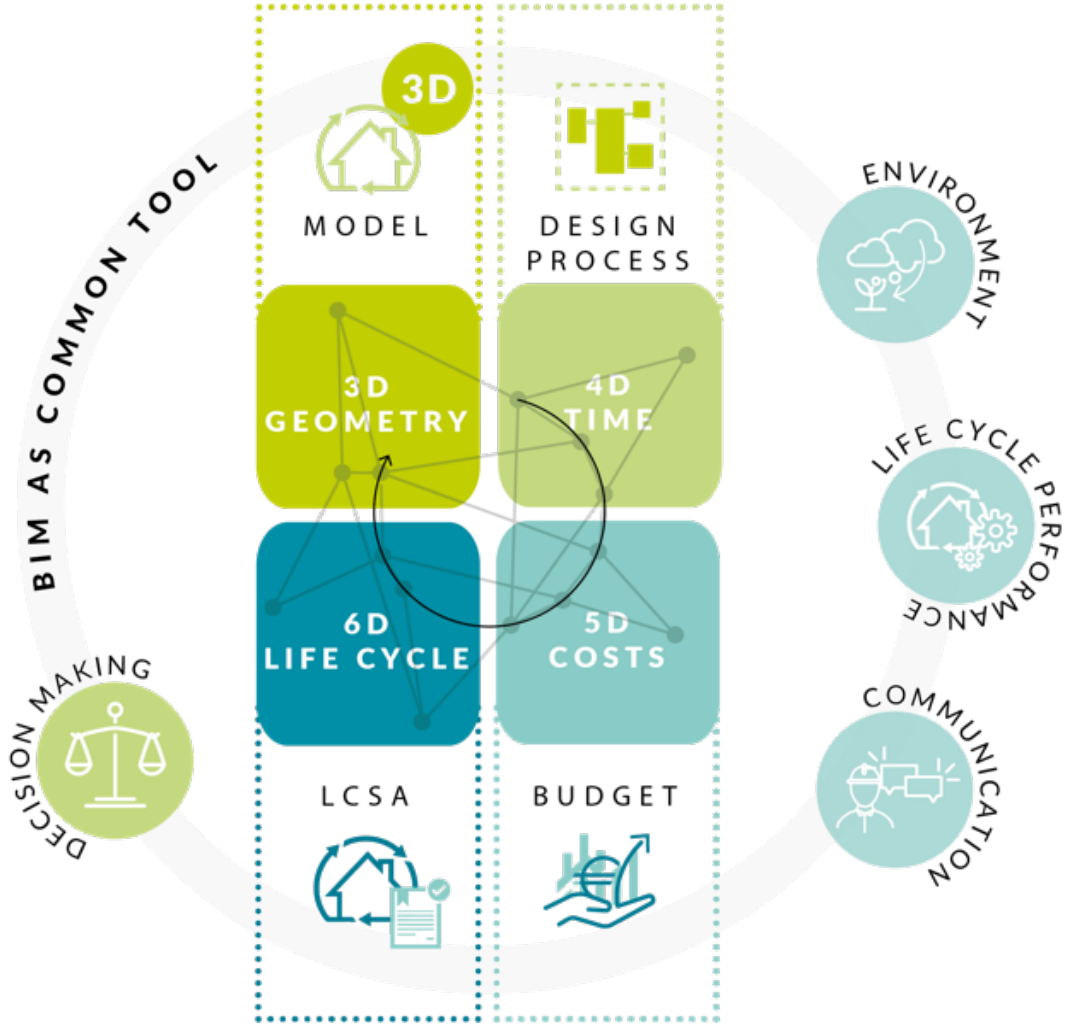


Object performance

Process performance

Source: A. Passer, TU Graz 2017

BIM for Life Cycle Sustainability Assessment

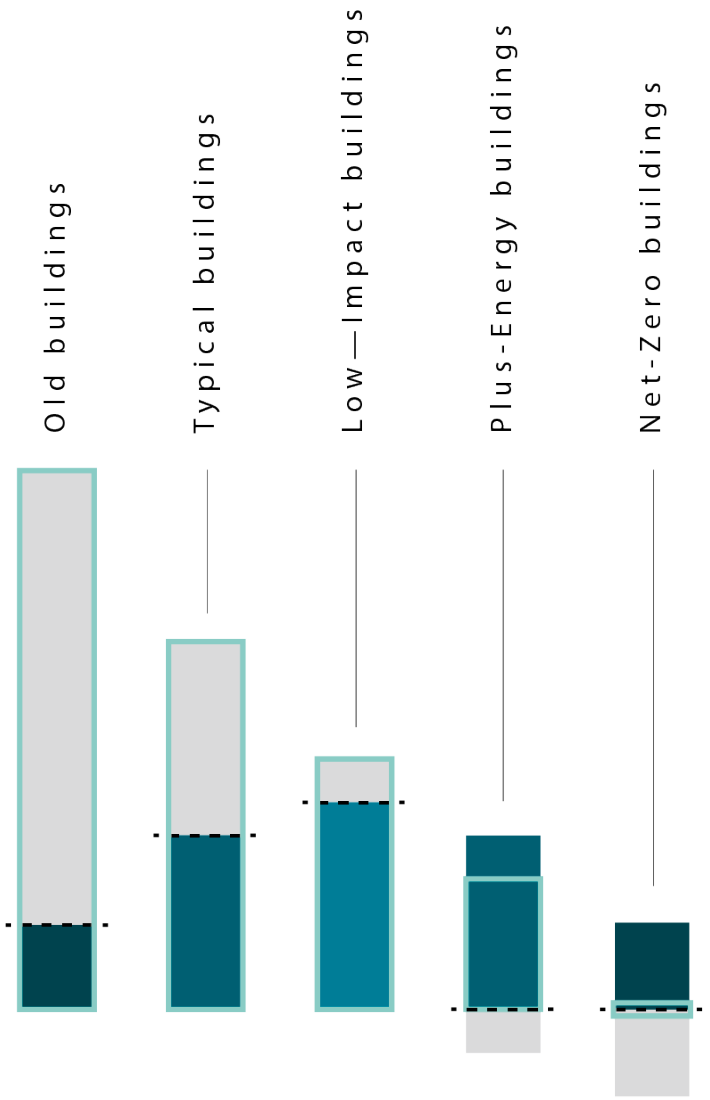


Source: A. Passer, Habilitation thesis: To the operationalization of sustainable construction, TU Graz 2016

Achieving Our Goals!

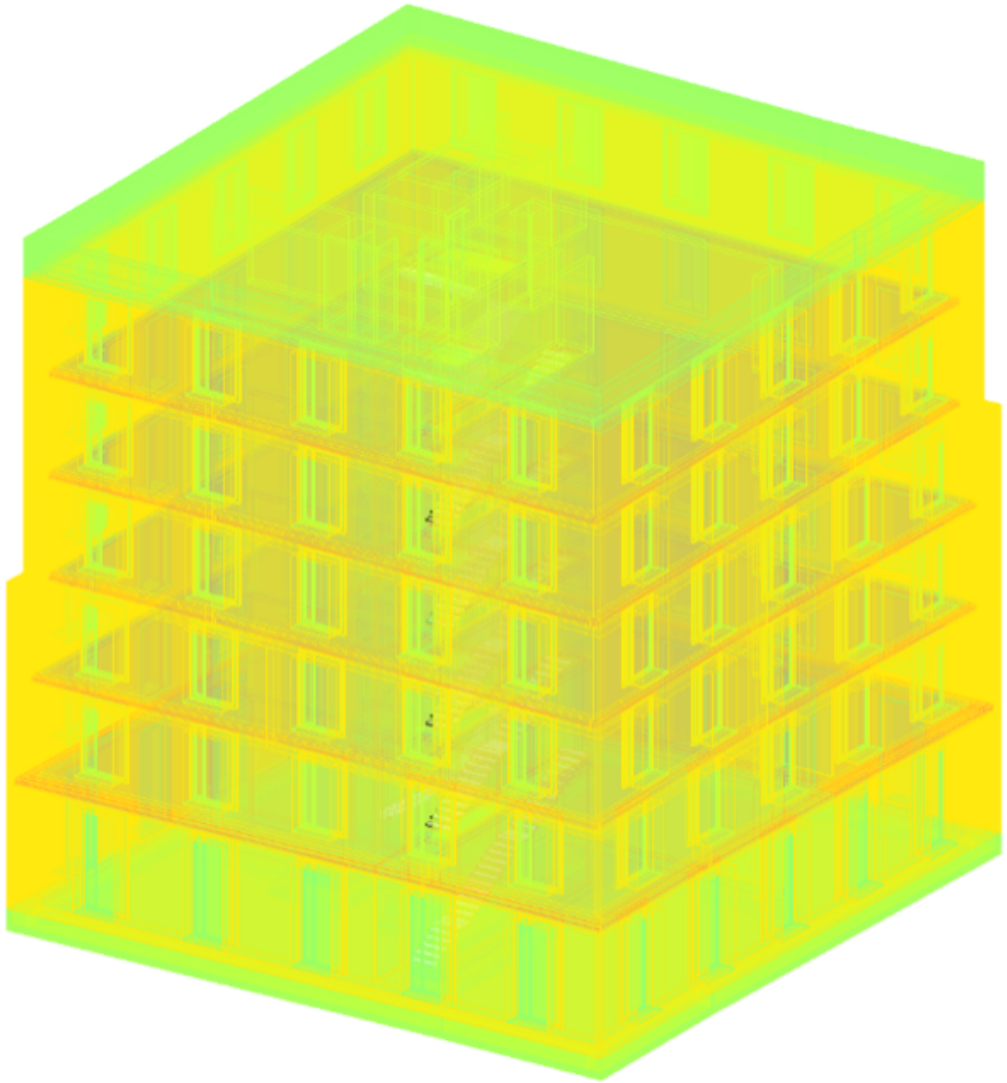
Global Alliance for Buildings and Construction

COP23 FIJI
UN CLIMATE CHANGE CONFERENCE
BONN 2017



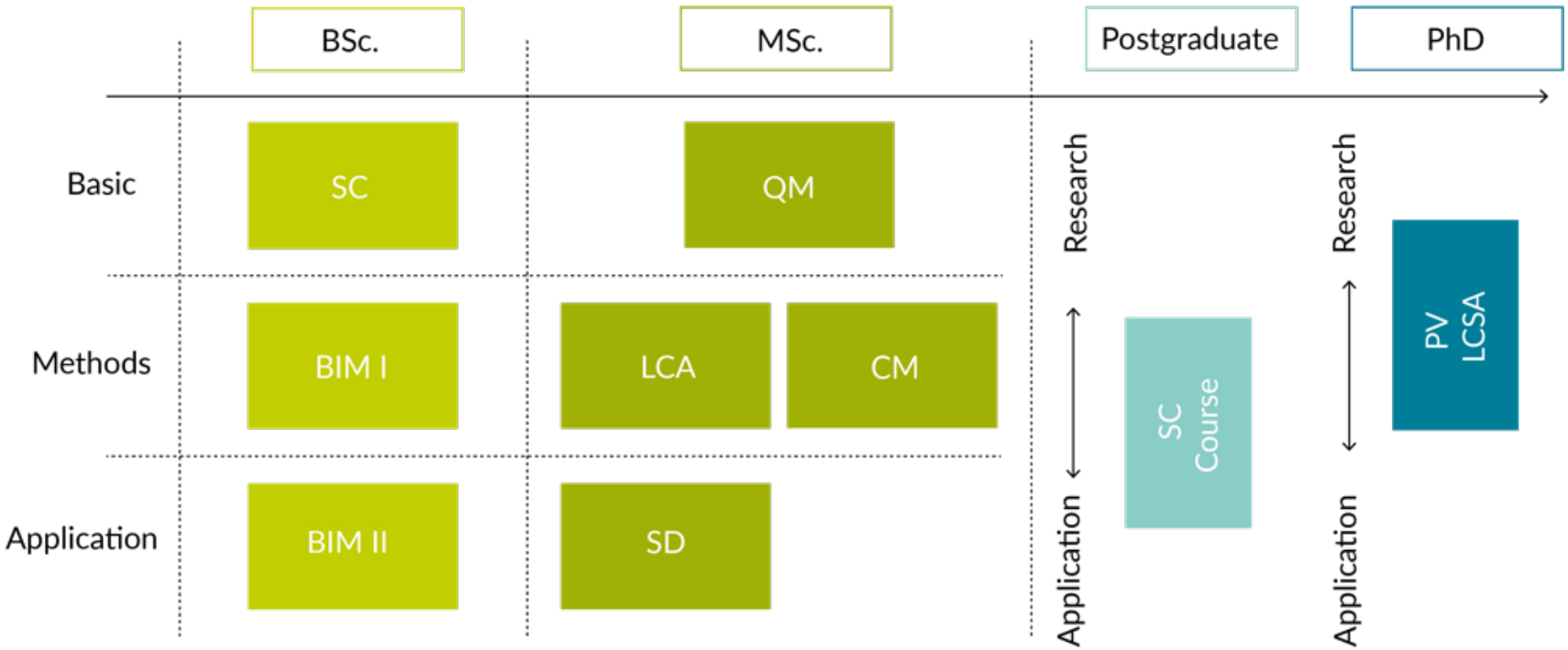
Source: A. Passer, TU Graz 2017

Exploiting Intangible Resources through Research



Source: M. Röck, AGNHB, TU Graz 2017

Exploiting Intangible Resources through Research-Based Teaching



SC: Sustainable Construction
BIM: Building Information Modeling

QM: Quality Management
LCA: Life Cycle Assessment
CM: Complexity Management
SD: Sustainable Design

UC: University Course

PV: Research Seminar

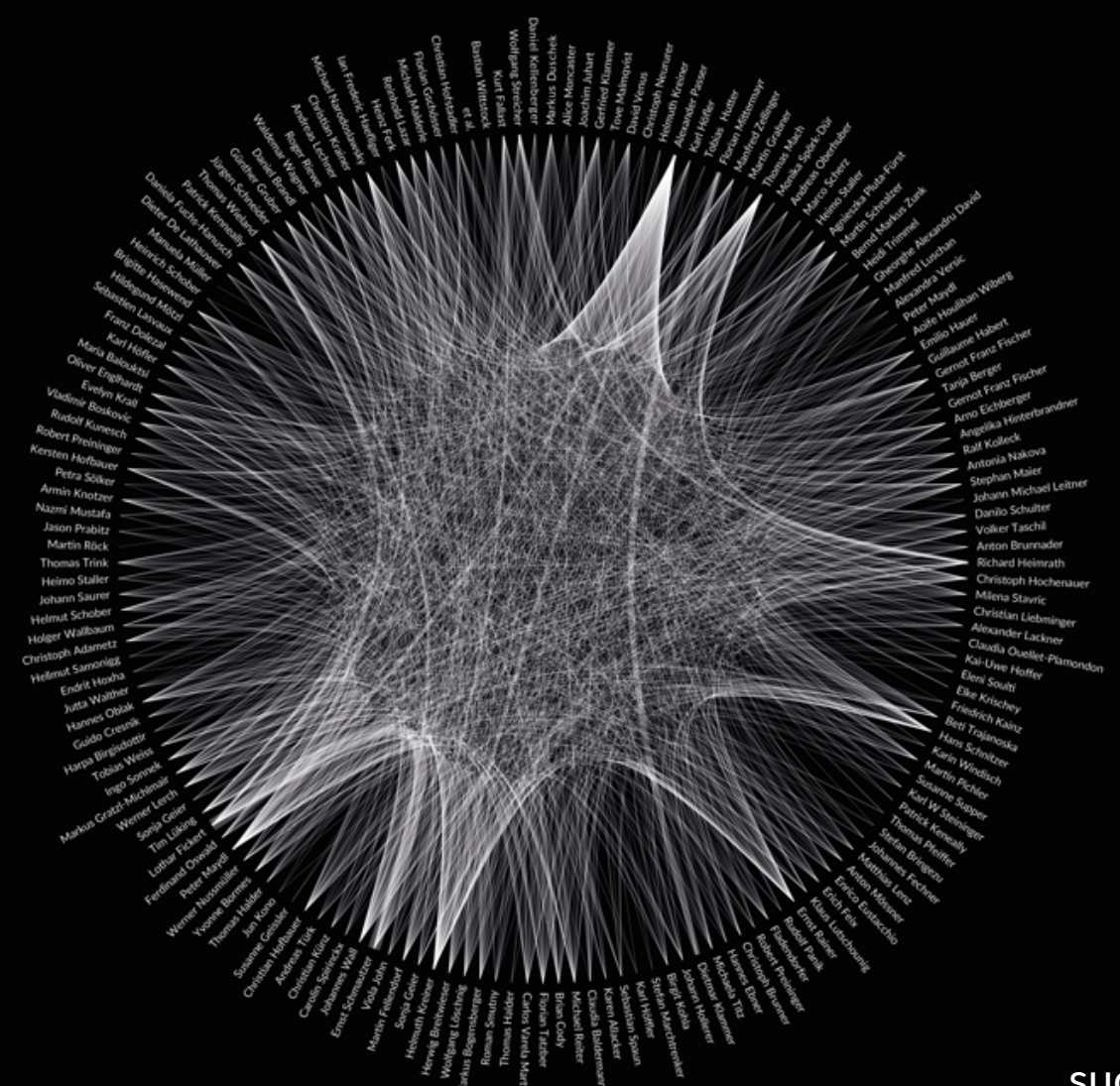
Source: A. Passer, TU Graz 2017

More Opportunities at TU Graz

Alliance of SUSTAINABLE UNIVERSITIES in Austria

BUILDING A SUSTAINABLE FUTURE. Sustainable Construction: Let's build changes!

Thanks to everyone
who worked with us!



Looking forward to
successful transformation!

Source: pure.tugraz.at, 12.2016

S C I E N C E ▪ P A S S I O N ▪ T E C H N O L O G Y

TU Graz

SCIENCE ▪ PASSION ▪ TECHNOLOGY

▶ www.tugraz.at

Working Group Sustainable Construction

Graz University of Technology

"Our research is dedicated to sustainability assessment methods and the workflows within the building design process to improve the applicability of assessment methods in the built environment as well as their successful implementation within full scale demonstration projects.

In our interdisciplinary projects our foci lie on the optimization of the environmental and economic performance by the use of life cycle assessment, life cycle costing, system analysis and multi- criteria assessment methods within digital design processes."

Visit: http://agnhb.tugraz.at/

Sources

(3) "DEATH TO STOCK" / creative commons free licence

(4) https://upload.wikimedia.org/wikipedia/commons/1/12/Colosseum_exterior%2C_inner_and_outer_wall_AvL.jpg

(5) https://i.pinimg.com/originals/a4/f6/00/a4f600fab32d1d15478e995996847403.jpg

(6) AEE INTEC & TU Graz; https://nachhaltigwirtschaften.at/en/hdz/projects/e80-3-buildings-reconstruction-concepts-towards-energy-plus-house-standard-with-prefabricated-active-roof-and-facade-elements-integrated-home-automation-and-network-integration.php

(7) Picture credits: Eduard Hueber

(8) https://redtreetimes.com/2014/04/22/amid-the-density/

(9) Pixabay_ CC0 Creative Commons

(10) One prediction of where rising sea levels will end up at Cottesloe Beach, Western Australia. Copyright: go_greener_oz (Flickr); Photo Credit: One prediction of where rising sea levels will end up at Cottesloe Beach, Western Australia.

(11) AGNHB according to J. Rockström, et. al, "A safe operating space for humanity," Nature, vol. 461, no. 7263, pp. 472–475, Sep. 2009.

(21) Picture credits: Eduard Hueber

(22) Hierarchical de-composition of the building (D. Trigaux et al., 2014)

(23 & 24): PEF4Buildings: http://www.energyville.be/en/project/pef4buildings-application-product-environmental-footprint-pef-method-newly-built-office

(30) Visualisation of embodied impacts; WSBE17, M. Röck et al., 2017)

(34) Pure.tugraz.at

All other graphics: Passer, A. & AGNHB – TU Graz

Content and research for the presentation "BUILDING A SUSTAINABLE FUTURE Sustainable Construction Let's Build Changes!" have been developed by Passer A. within the Working Group Sustainable Construction (AGNHB) of Graz University of Technology (TU Graz). A special thanks goes to Angelika Hinterbrandner for the development of our corporate identity and the graphic guideline.