IGLC 2021
LIMA, PERÚ - 29TH ANNUAL CONFERENCE
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION

TAKTING THE SUSTAINABILITY OF CONSTRUCTION PROCESSES: AN ENVIRONMENTAL ASSESSMENT METHOD

Benjamin Slosharek, Janosch Dlouhy,
Patricia Schneider-Marin and Werner Lang

AGENDA

- Introduction
  Relevance of construction works for sustainable building
- Theory
  Lean Construction / Takt Planning and Life Cycle Assessment
- Framework
  How to connect resources and impacts to construction processes
- Results
  Example results of one process
- Discussion
  Scalability, limitations and further research
- Conclusion

INTRODUCTION

36%

Global energy consumption

39%

global emissions

50%

of total waste in Germany

LIFE CYCLE PHASES

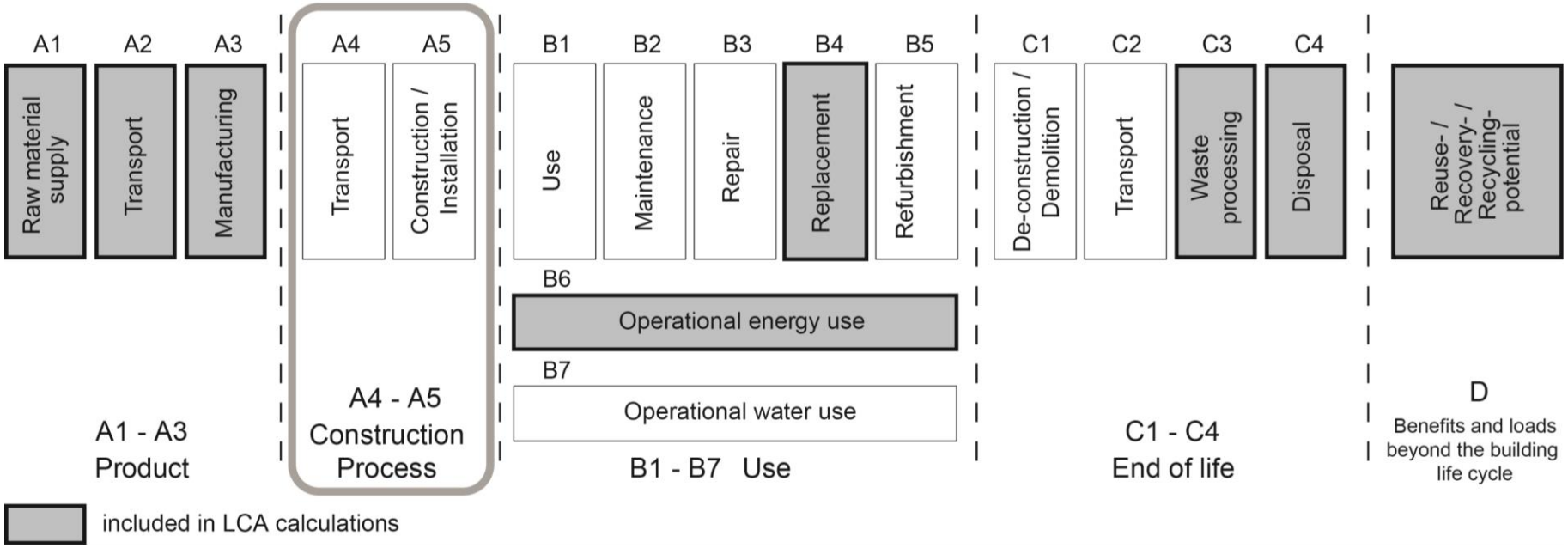


Figure 1. Life cycle phases of a building (BS EN 15978)

RELEVANCE

Construction Phase of one year caused same amount of emissions like the “operational energy use” phase of 60 years

Construction phase is underestimated and should not be neclected

Necessary to decode and assess the construction site

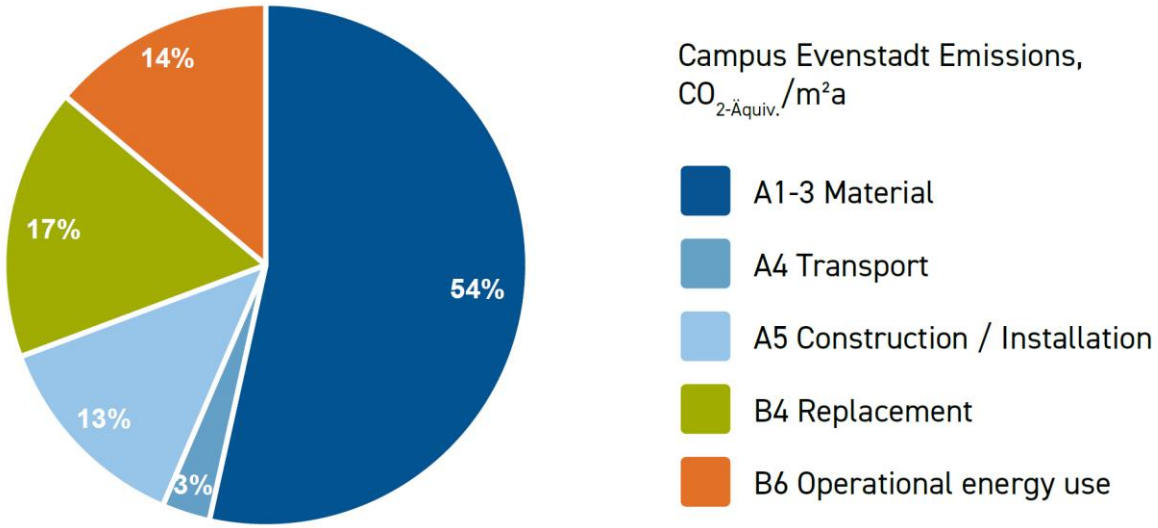


Figure 2. Campus Evenstad Emissions (Wiik et al. 2017)

THEORY

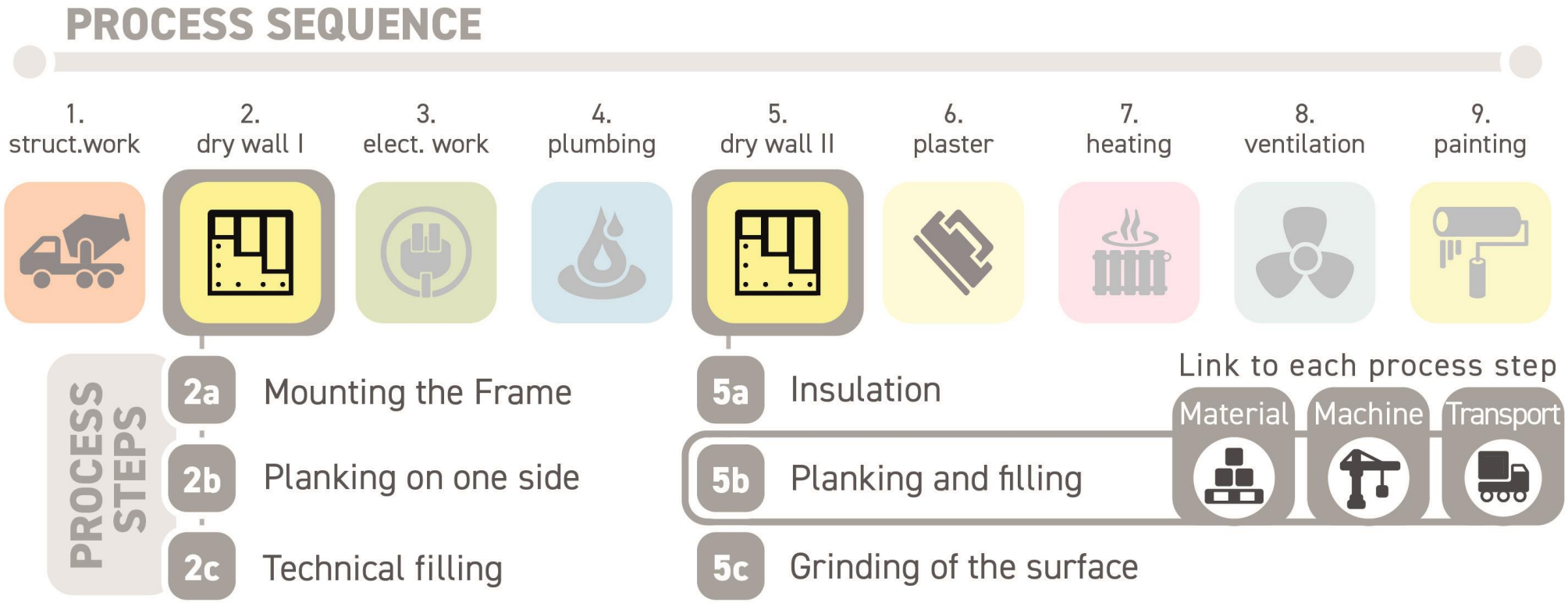


Figure 3. Example sequence with application of the resource categories to the work steps for dry wall construction

FRAMEWORK

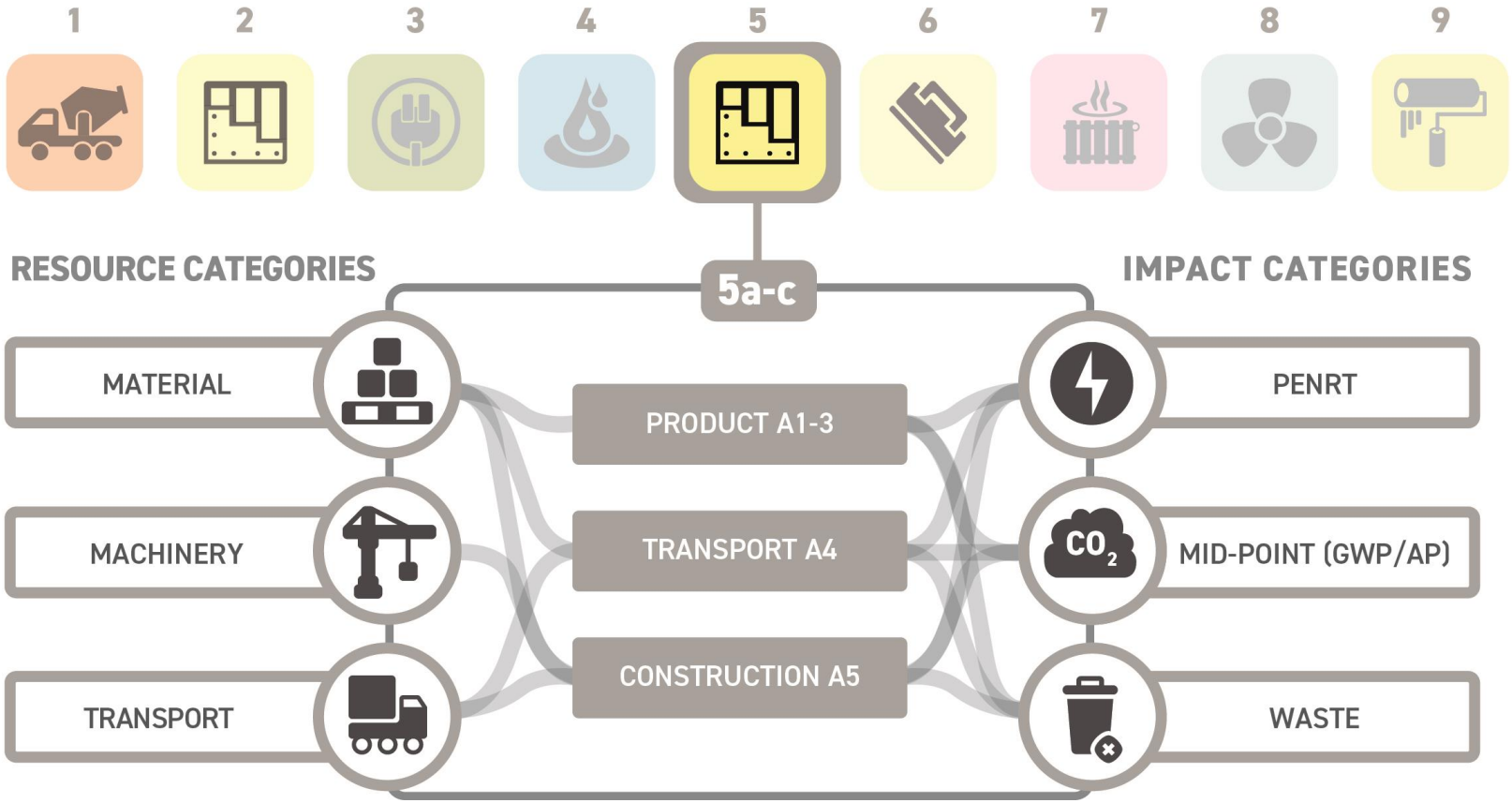


Figure 4. Framework for the environmental assessment of construction processes with in- and outputs

RESULTS EXAMPLE

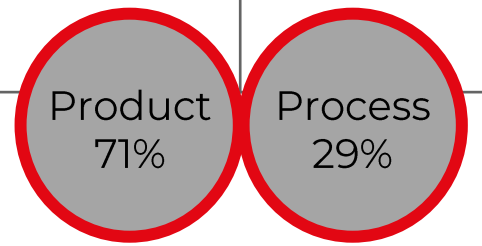
Description	Resource Category	Life cycle Phase	Impact Category GWP [kg-CO2e]	Product / Process View
Plasterboard and insulation	Material	A1-3	7.37	Product
Trasportation Gate to Site (Plasterboard and Insulation)	Transport	A4	0.43	Process
Filler (Auxillary material)	Material	A5	0.21	Process
Materiallosses due to cuts (Plasterboard and Insulation)	Material	A5	1.47	Process
Usage of table saw and cordless screwdriver	Machinery	A5	0.84	Process

Table 1. Exemplary results of the framework application to the work package 5a-c

RESULTS EXAMPLE

Description	Resource Category	Life cycle Phase	Impact Category GWP [kg-CO2e]	Product / Process View
Plasterboard and insulation	Material	A1-3	7.37	Product
Trasportation Gate to Site (Plasterboard and Insulation)	Transport	A4	0.43	Process
Filler (Auxillary material)	Material	A5	0.21	Process
Materiallosses due to cuts (Plasterboard and Insulation)	Material	A5	1.47	Process
Usage of table saw and cordless screwdriver	Machinery	A5	0.84	Process

Table 1. Exemplary results of the framework application to the work package 5



POTENTIAL OF THE FRAMEWORK

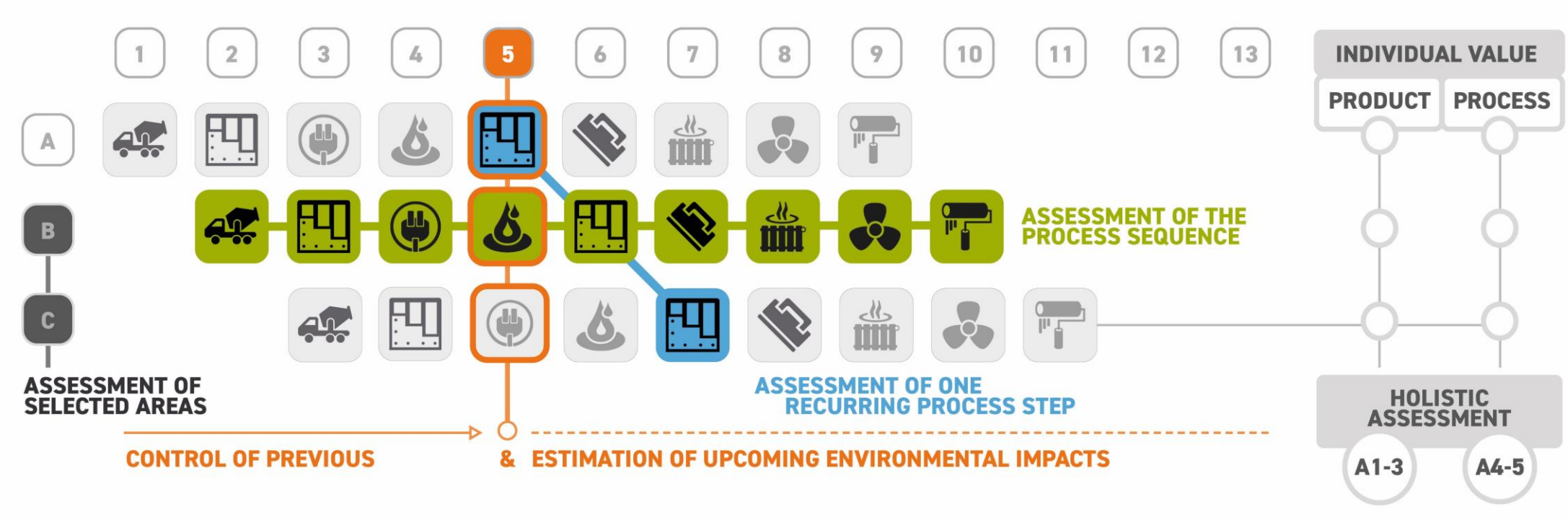


Figure 5. Analysis options when applying the framework to Takt Planning

DISCUSSION

- Framework enables to map material and energy flows, transport expenditures, and emissions or resource depletion from a processual point of view
- Subcategories of the resource categories should be defined
- Results of the framework so far are limited to resource categories that can be linked to a single work package directly
- Limited to construction projects with TPTC
- Limitations need to be overcome for full scalability

CONCLUSIONS

The construction sector has a responsibility to find sustainable solutions. The environmental waste during construction is neither surveyed nor evaluated.

The framework enables analysis and visualization of emissions and environmentally relevant waste of construction processes combining TPTC and LCA.

Assessing environ. quality through the framework with TP shows scalable and data-driven capabilities. especially when used with digital tools

THANK YOU!

Slosharek Benjamin

slosharek.benjamin@gmail.com

benjamin.slosharek@kvlgroup.com

www.linkedin.com/in/benslosharek