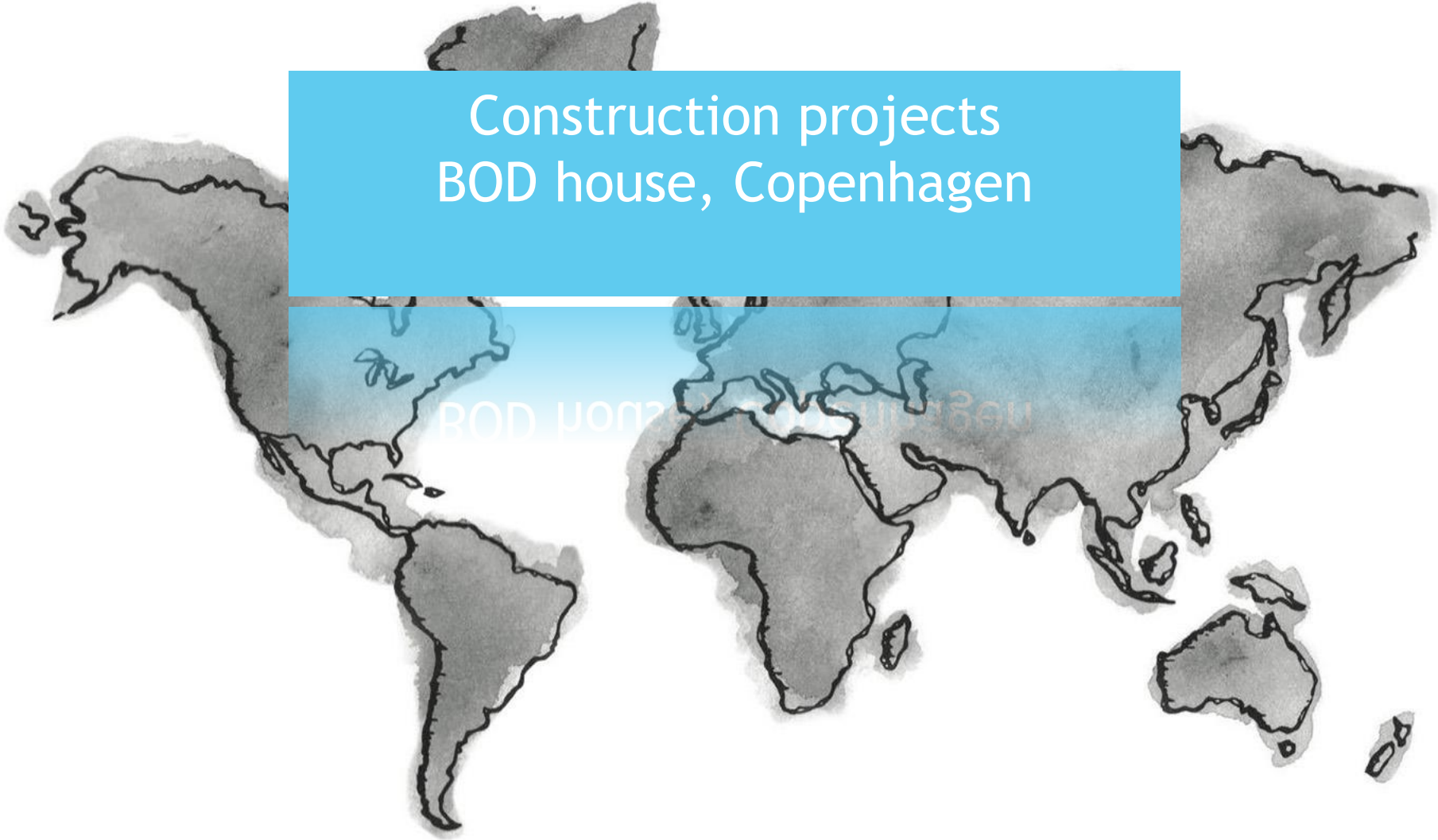
Commercial 3D printing in Construction

Jakob Jørgensen, Head of Technology

COBOD International A/S

COBOD

Construction projects
BOD house, Copenhagen




The BOD
- A 3D printed house
in Copenhagen
3D Printhuset

Design architect: Ana Goidea, MAA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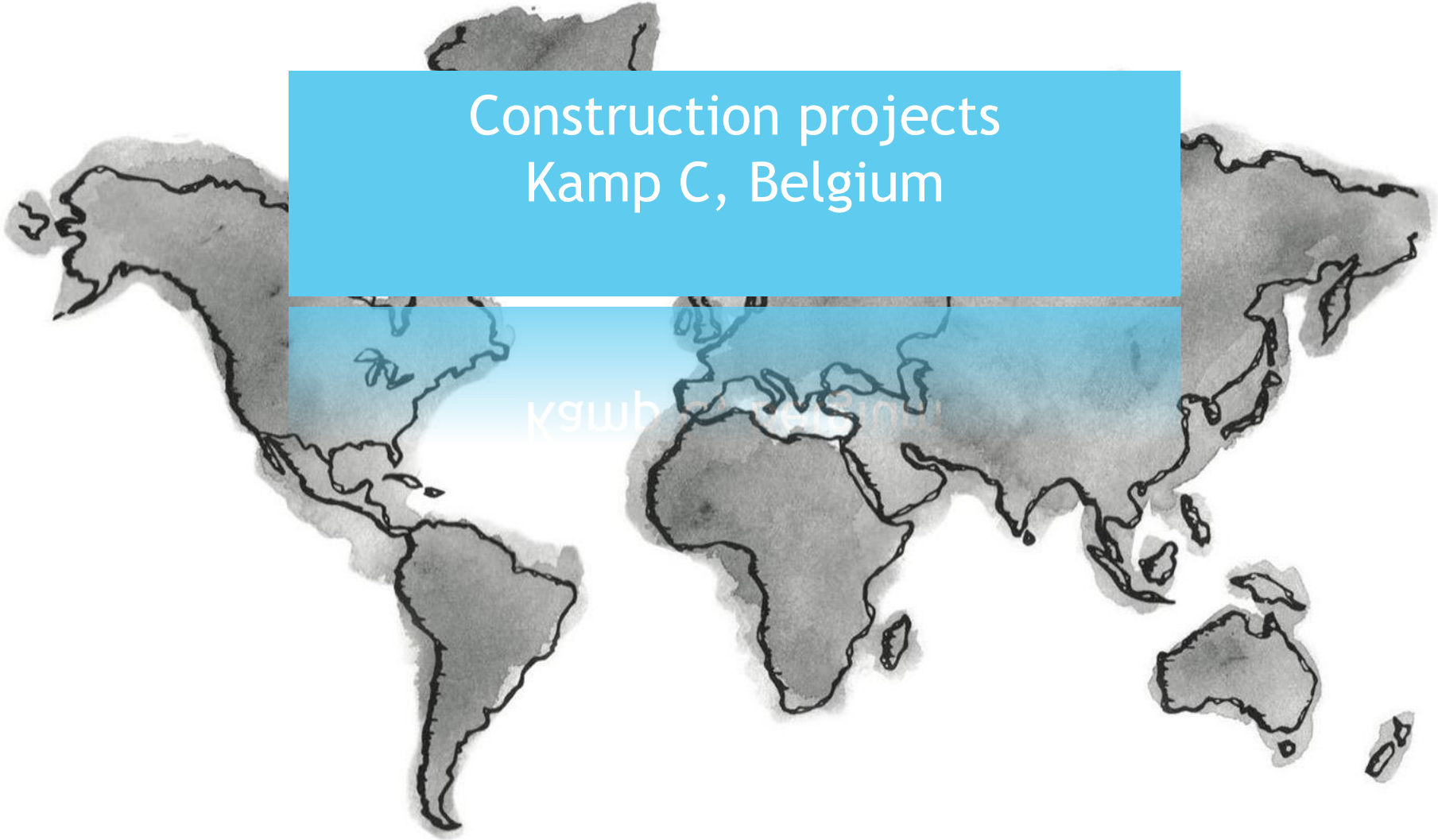
Construction projects
Kamp C, Belgium

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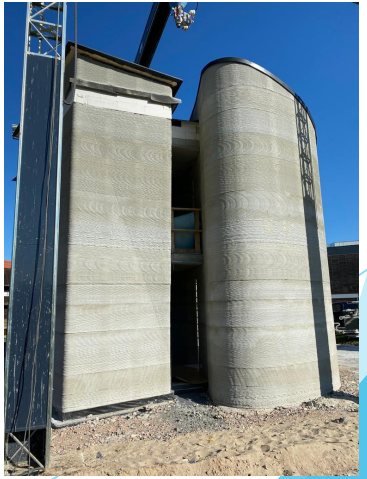


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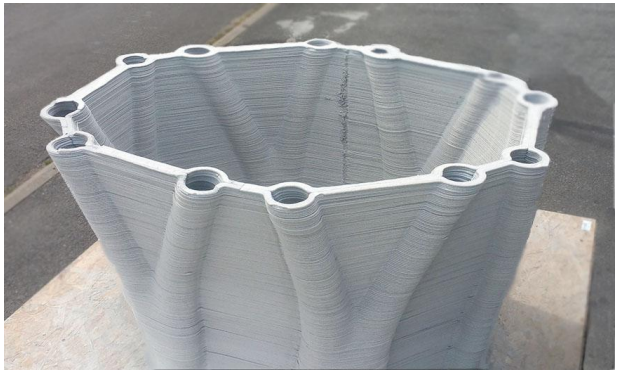
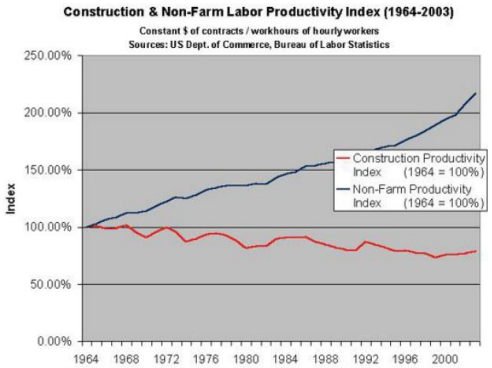
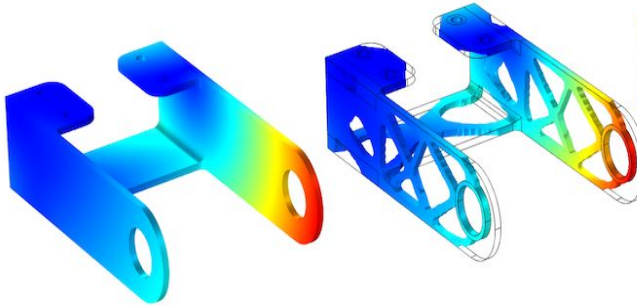
Why is 3D Printing interesting for construction?
- The future “promises”







Design freedom – Complexity for free
- No added cost for complex projects
- High level of customization
- Spectacular houses at the cost of regular houses.

Automation / Digital production
- Huge potential productivity gains
- Industry transitions to digital = completely new business models
- Reduction of human errors
- Digital standards, pre-approved methods, less training required
- Complexity no longer an issue of highly skilled labours

Reduced use of building materials
- Enabling selective material placement
- Reduction in non essential materials
- No formworks = Less waste

Global Overview – 3D construction printing

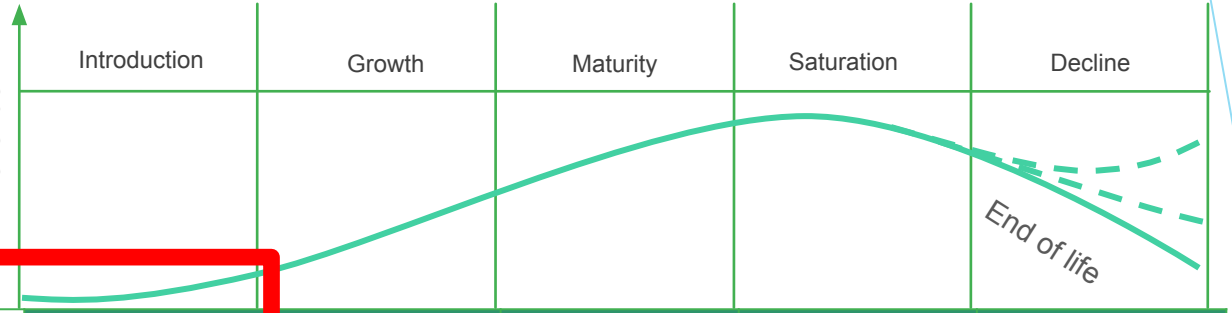
Global scoreboard as of October 1, 2020

	Buildings	Structures	Total ongoing projects
Europe	9	3 (various)	44
Asia (incl. Middle East)	15	6 (various)	20
US	10		17
South America	10		1
Africa	1		
Total	31	9	82

3D Construction Printing - Status

Market matureness

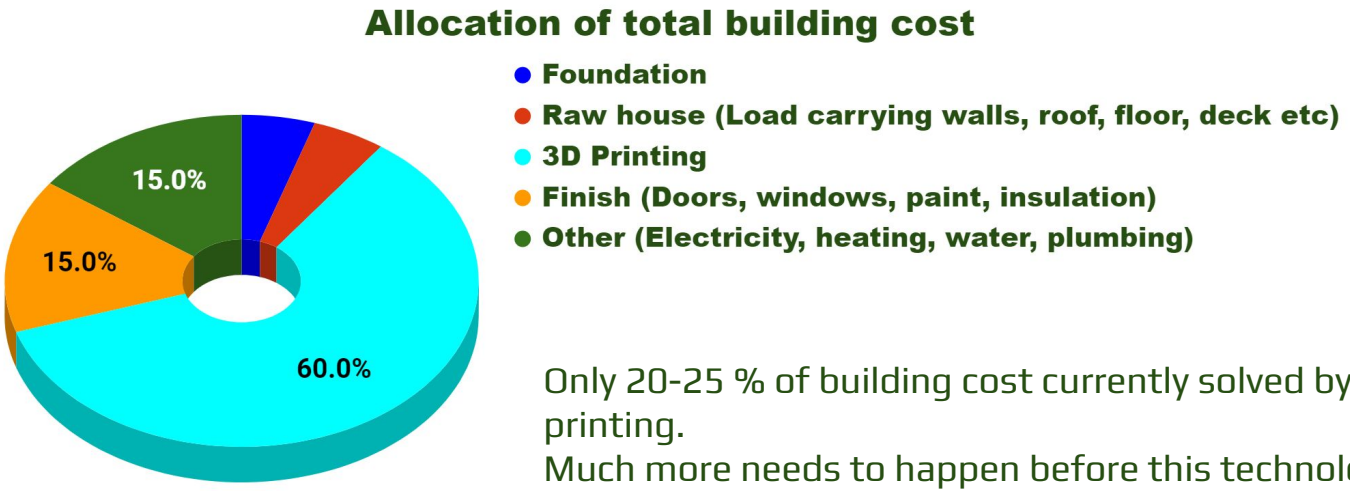
Now Exploration



Audience	Innovators	Early Adopter	Every Majority	Late Majority	Laggard
Market	Small	Expanding	High	Peaked	Contracting
Price	Very High	High	High	Medium	Low
Sales	Low	Expanding	High	Flattening	Moderate
Competition	Low	Increasing	Moderate	High	Moderate
Business Focus	Awareness / Experience	Growth / Scale	Market share	Customer Retention	Transition

3D Construction printing – the hype & the "truth"

Until now, 3D printing has only addressed a small part of construction both in terms of cost and time consumption.



Only 20-25 % of building cost currently solved by 3D printing.
Much more needs to happen before this technology can hae a real impact on construction cost.

Cost/productivity

1) Key figures for competing concrete casting methods

Volume of casted concrete – productivity for the alternative methods (based on industry's own numbers)	M3 of concrete per day per person
Precast plants	1,7
In situ casting with form works equipment	1,3
Tilt up method (data only based on one case)	1,1

1) 3DCP (COBOD)

Casting of concrete – productivity for COBOD, based on 7 hours of printing	Print speed (cm per second)	Width of print layer (cm)	M3 concrete per worker per day
BOD1 speed, 2017	10	5	1,3
BOD2 speed, 2019	30	10	3,9
BOD2 speed, 2020	60	550	5,8
BOD2 speed, expected 2021-22	100	550	10-13