

# « Construction Equipment in an Agile World »

Plenary Session, 16th October 2014, Crowne Plaza -Antwerp



“Future trends in construction processes : better, faster, cheaper,...”



*ir. Johan Vyncke*  
*Director Research & Innovation*  
*Belgian Building Research Institute*

CECE Congress 2014 - 15, 16, 17 October - Antwerp, Belgium





## INTRODUCTION

Construction is of all ages  
Progress over the last 50 years  
has been enormous

## KEY DRIVERS +



Expectations Owners  
Environmental Impact  
Productivity



## CONCLUSIONS

Collaboration and open  
innovation is more than ever  
key for the future



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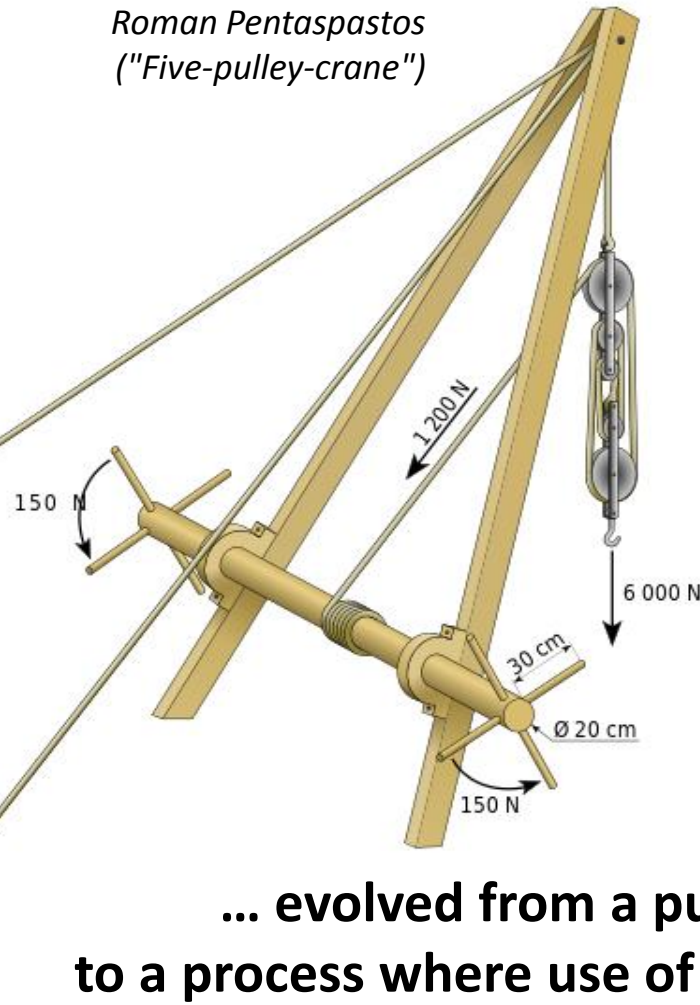
“Future trends in construction  
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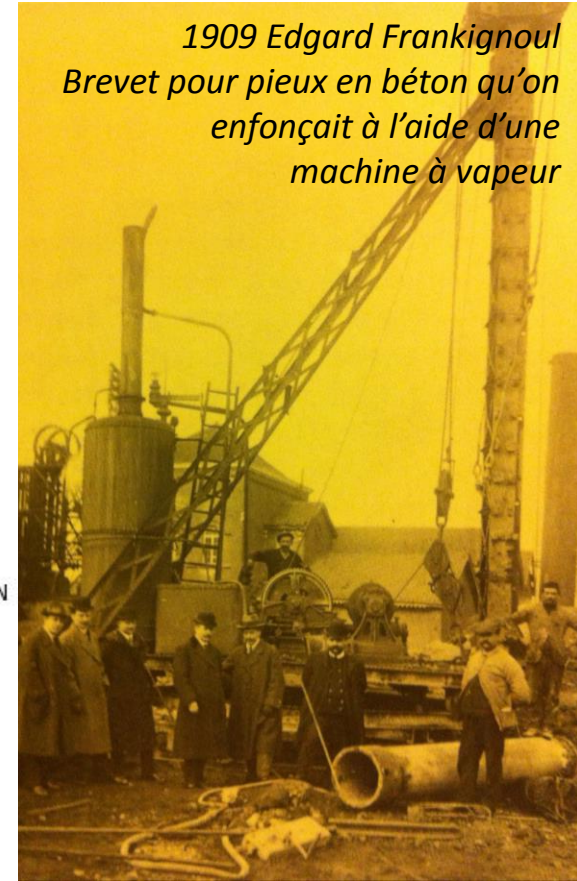


## INTRODUCTION ...

Roman Pentaspastos  
("Five-pulley-crane")



1909 Edgard Frankignoul  
Brevet pour pieux en béton qu'on  
enfonçait à l'aide d'une  
machine à vapeur



... evolved from a purely manual operation  
to a process where use of equipment is crucial ...



## INTRODUCTION ...



*Construction-site in Brussels  
World exhibition 1958*

Progress over the last 50 years  
has been enormous

## INTRODUCTION ...

Report on the seminar "Booming Cities -- Blooming Cities" -  
Brussels 2012  
<https://www.youtube.com/watch?v=0t0mVJPR7yo>

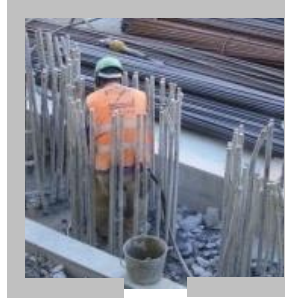
... nous devons construire différemment, à moindre coût et plus rapidement, ce qui signifie également que nous devons construire autrement, en permettant la créativité et l'innovation ...



**Construction Confederation**  
Construction, Energy & Environment

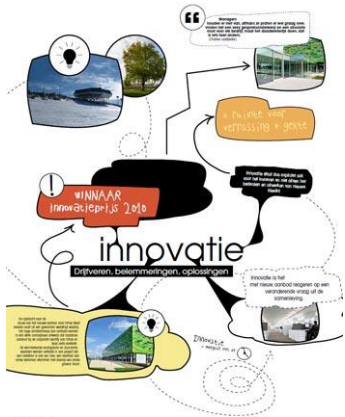


## INTRODUCTION ...

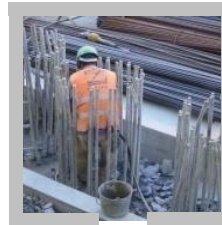
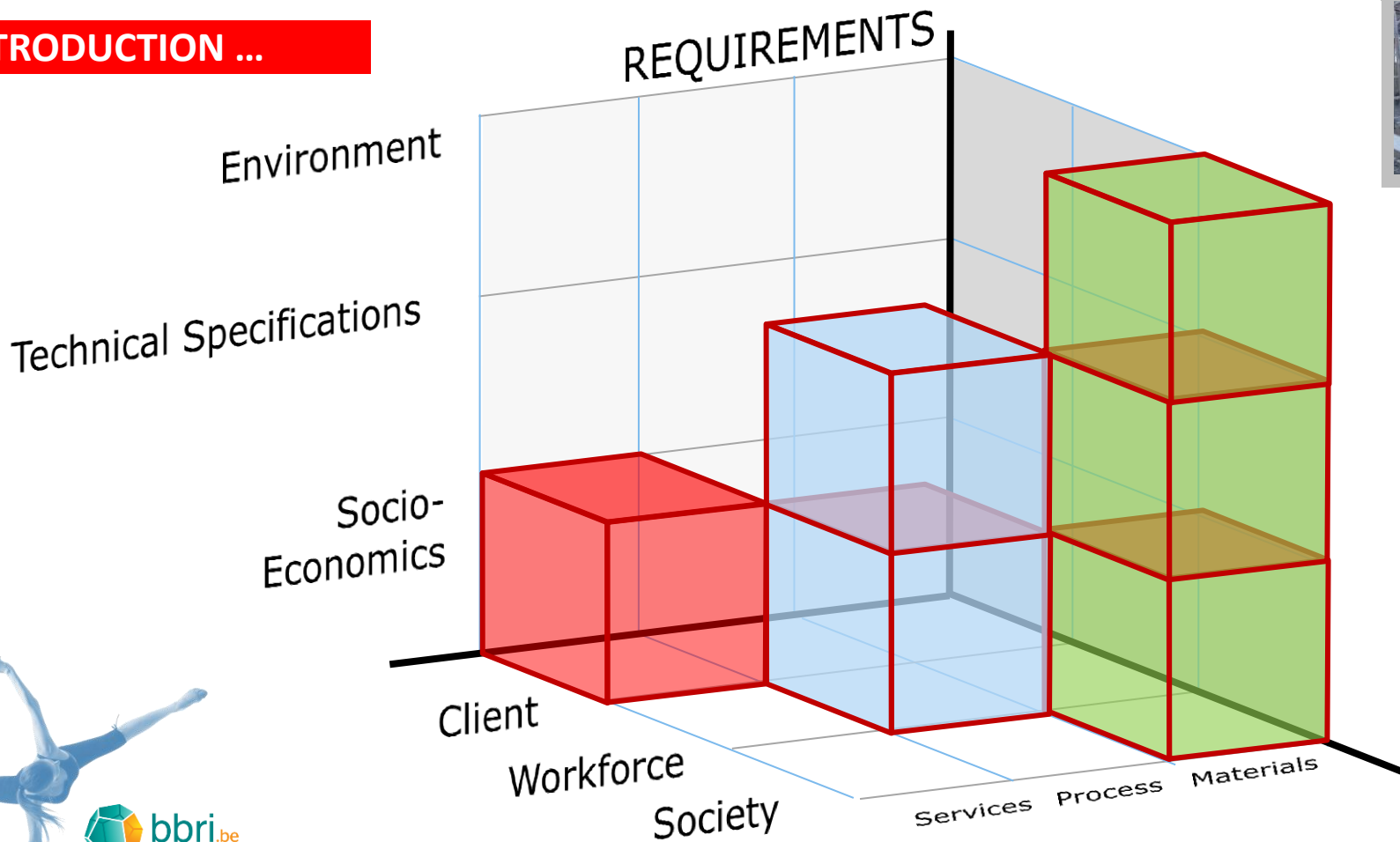


- **Climate Change**
- **Limits on Available Resources**
- **Demographic Changes**
- **Rational Use of Energy**
- **Affordability, Durability, Health,...**

... (innovation) drivers & demand



# INTRODUCTION ...

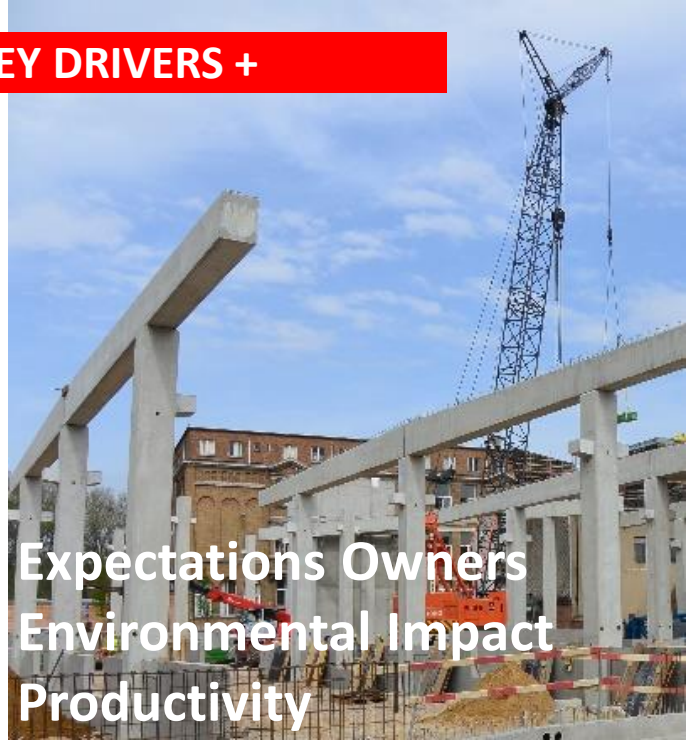




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## KEY DRIVERS +



### Expectations from Owners +

Major changes have been initiated by the new European Regulations



### Environmental Impact +

Assessment procedures are finding their way in the field



### Reflections on the Construction Process of the Future +

Productivity: From on-site manufacturing to on-site assembly and back...



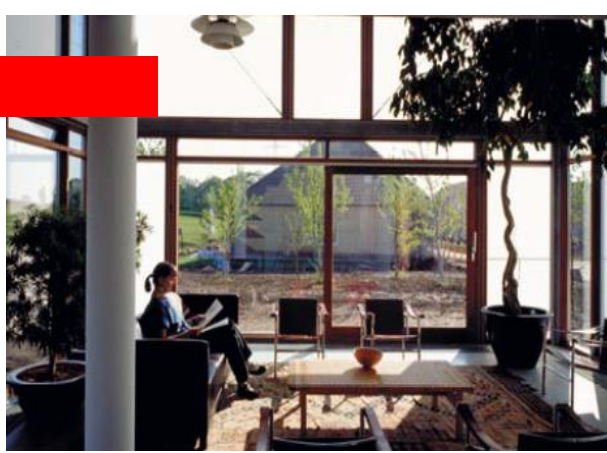
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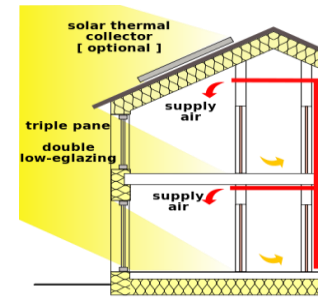


## KEY DRIVERS +



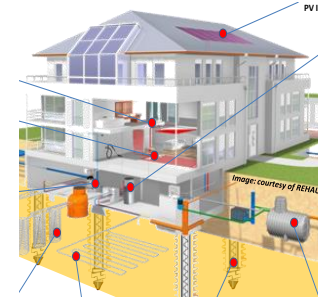
## Expectations from Owners + Major changes have been initiated by the new European Thermal Regulations

Directive 2010/31/EU on the energy  
performance of buildings - EPBD Recast



## NZEB

Moving on towards nearly  
zero-energy buildings



## Smart Homes

Earning money by using  
energy harvested locally



## Renovating our patrimony

Deep renovation of our  
building stock is possibly  
« the best strategy for  
CO<sub>2</sub> reduction »

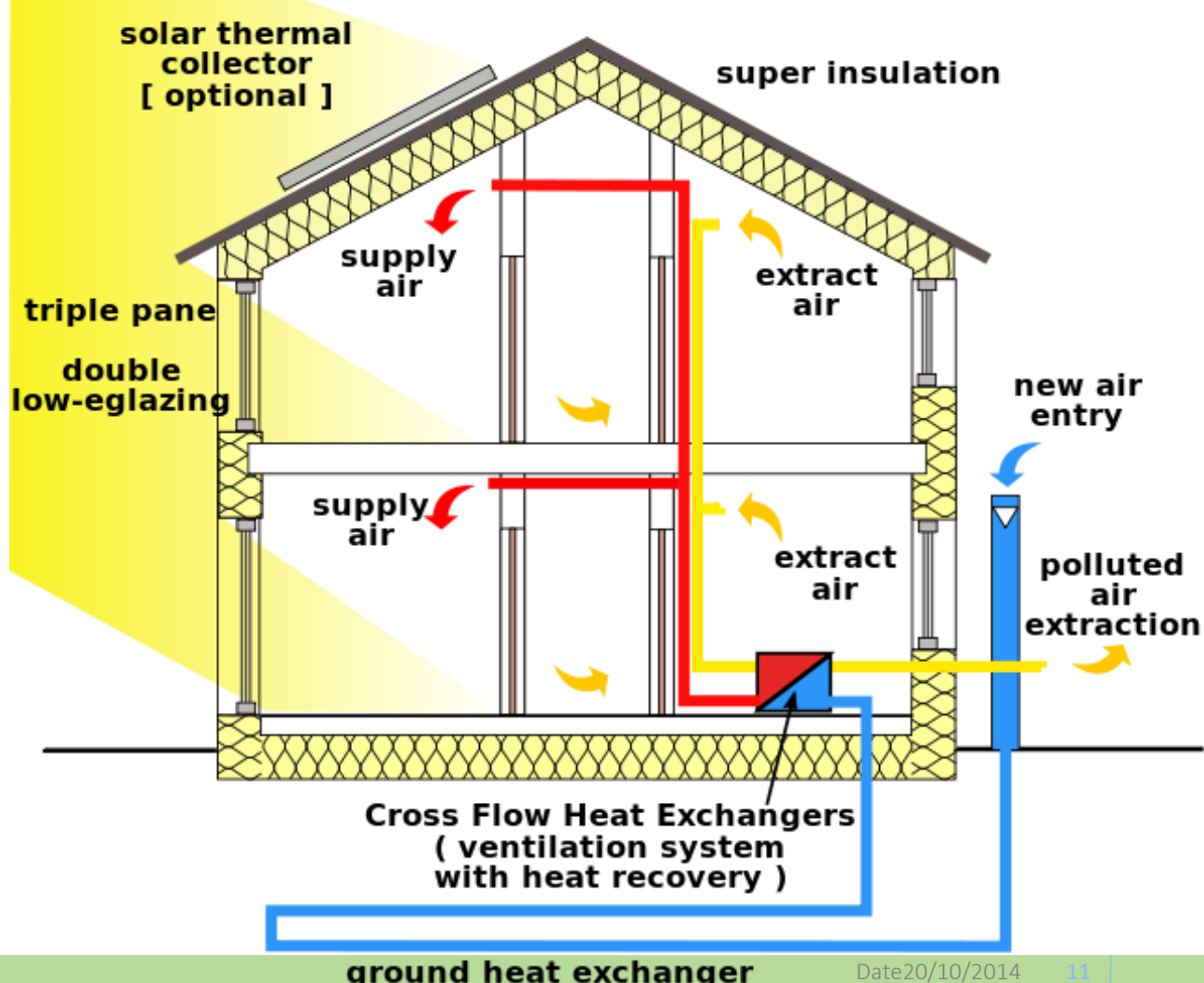


KEY DRIVERS +

Expectations from Owners ...

NZEB

Moving on towards nearly zero-energy buildings







KEY DRIVERS +

Expectations from Owners ...

## Smart Homes

Earning money by using energy harvested locally

Beton Kern Activering (BKA)

Lage Temperatuur Vloerverwarming (LTV)

Warmtepomp, Warmtewisselaar & Ventilatiesysteem D

Koude-WarmteOpslag (KWO grondwater)

Boorgat-EnergieOpslag (BEO veld)

Opervlakte Warmtewisselaar

Energiepalen

Image: courtesy of REHAU



[www.smartgeotherm.be](http://www.smartgeotherm.be)  
VIS-Traject met steun van IWT

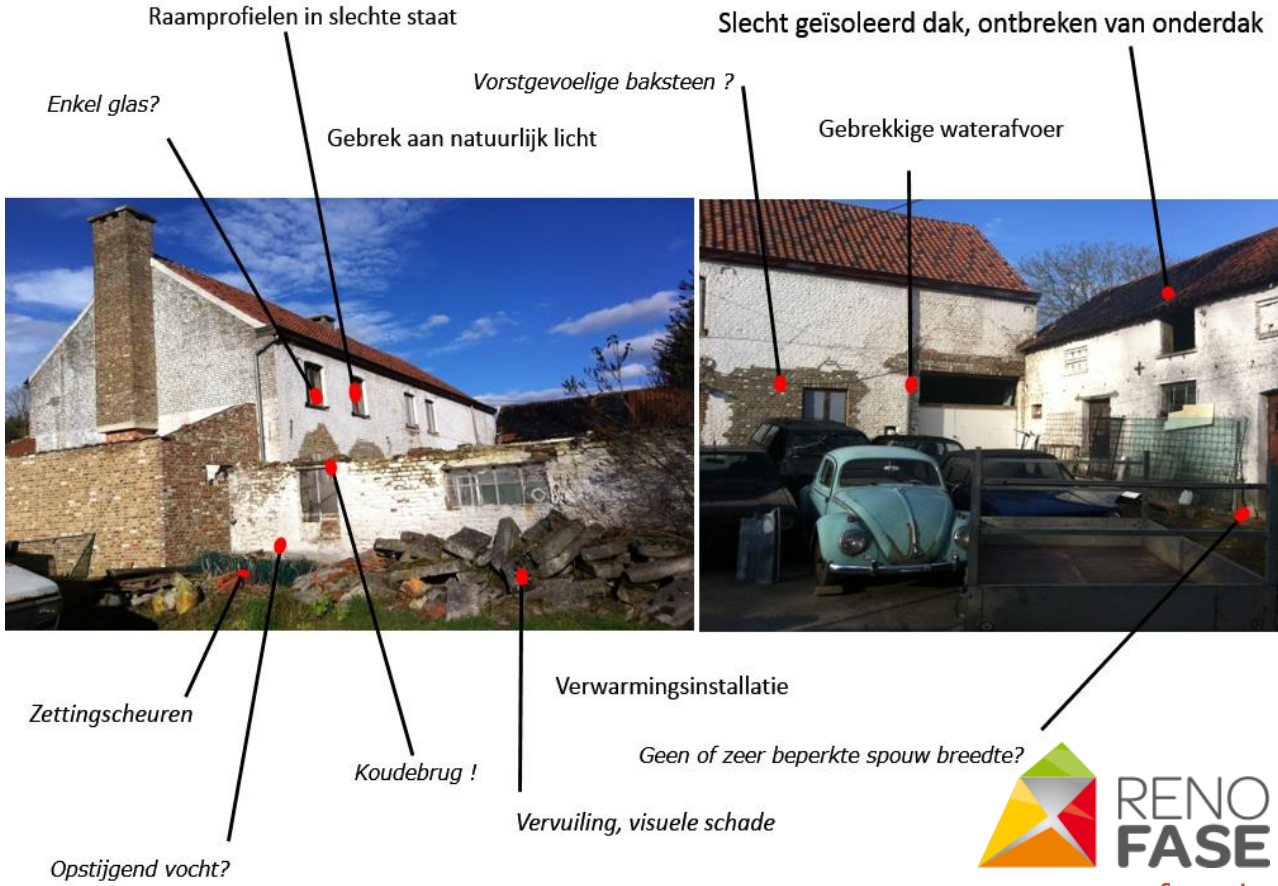




**KEY DRIVERS +**

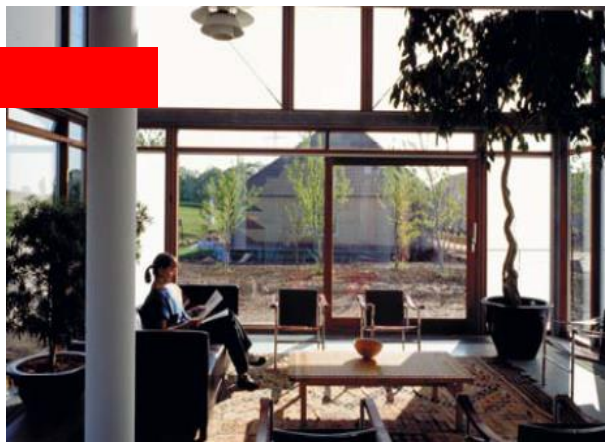
## Expectations from Owners ...

*Renovating our Patrimony*  
Deep renovation of our building stock is possibly « the best strategy for CO2 reduction »

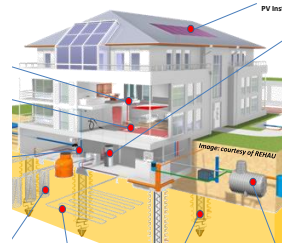
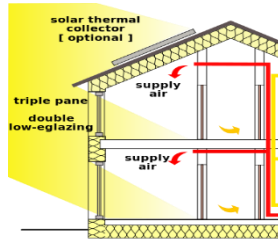


[www.renofase.be](http://www.renofase.be)

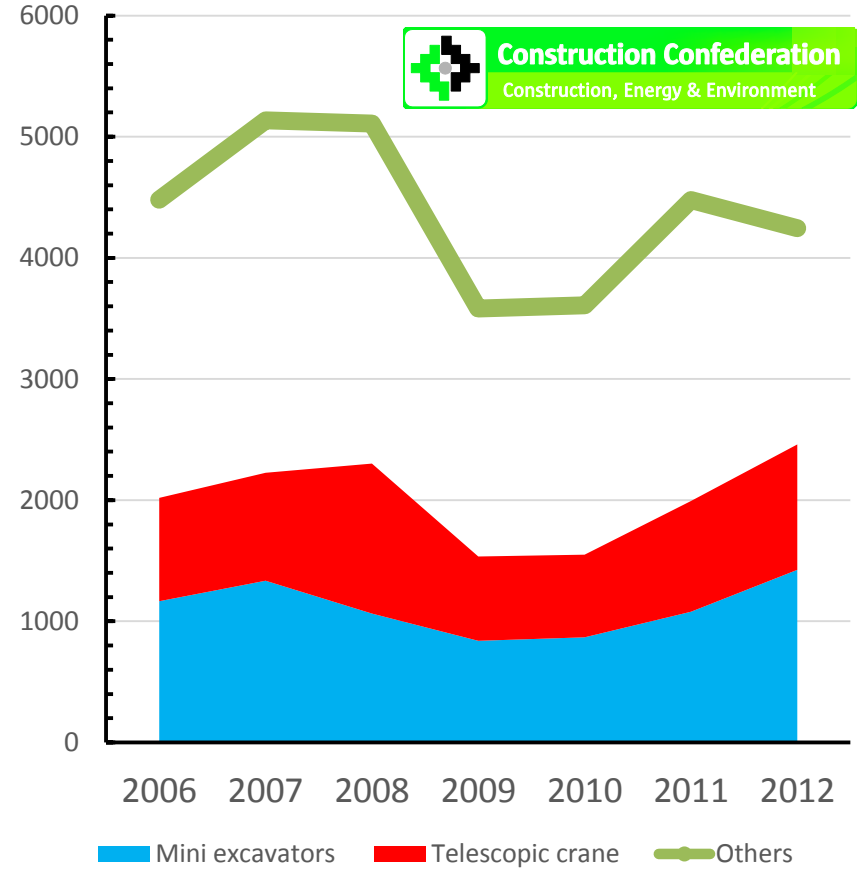
# KEY DRIVERS +



## Expectations from Owners :



# Belgian Sales Construction Equipment (# machines)



Source: Bouwbedrijf September 2013



## KEY DRIVERS +



**Environmental Impact + Assessment procedures are finding their way in the field**

- 40% energy
- 36% CO<sub>2</sub>
- 40% raw materials
- 50% waste



### Natural Raw Materials

As already put under the attention in 1972 by the “Club of Rome”: be aware there are “Limits to Growth”

### Demolition & Recycling

Construction & Demolition Waste can be a valuable source of secondary materials

### Soil-mixing

Construction of retaining and cut-off walls by mixing soil in-situ with cement

### Live Cycle Analysis

Case study ECOFFICE.  
Research project BPE 1000



## KEY DRIVERS +



## Environmental Impact ...

### *Natural Raw Materials*

As already put under the attention in 1972 by the “Club of Rome”: be aware there are “Limits to Growth”.

*Published in 1972 and presented for the first time at the International Students' Committee (ISC) annual Management Symposium in St. Gallen, Switzerland, the report of the Club of Rome predicted that economic growth could not continue indefinitely because of the limited availability of natural resources (particularly oil).*







**KEY DRIVERS +**

**Environmental Impact ...**

***Demolition & Recycling***  
**Construction & Demolition**  
**Waste can be a valuable**  
**source of secondary**  
**materials**

COM(2014) 445 final “**Resource efficiency opportunities in the building sector**” *A large majority of CDW is recyclable but with the exception of a few Member States recycling up to 90%, the average recovery for EU27 is just below 50%. Develop specific tools/guidelines for assessment of buildings prior to demolition and renovation with a view to optimal use of CDW.*





KEY DRIVERS +



## Environmental Impact ...

*Demolition & Recycling*  
**Construction & Demolition  
Waste can be a valuable  
source of secondary  
materials**



KEY DRIVERS +



Environmental Impact ...

*Soil-mixing*

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KEY DRIVERS +

Environmental Impact ...

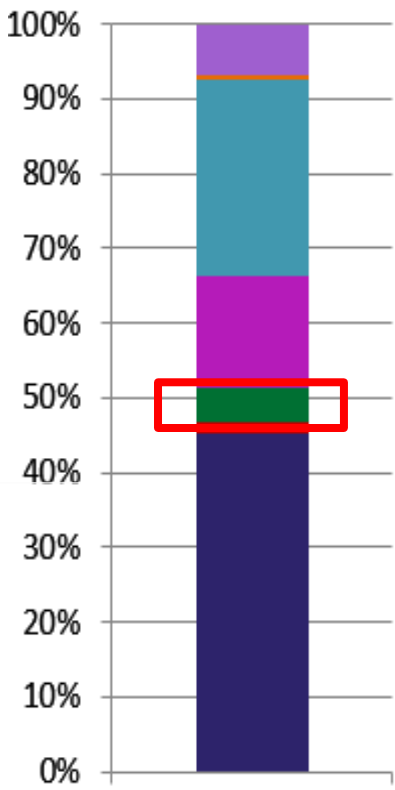
*Life Cycle Analysis*

**Case study ECOFFICE**

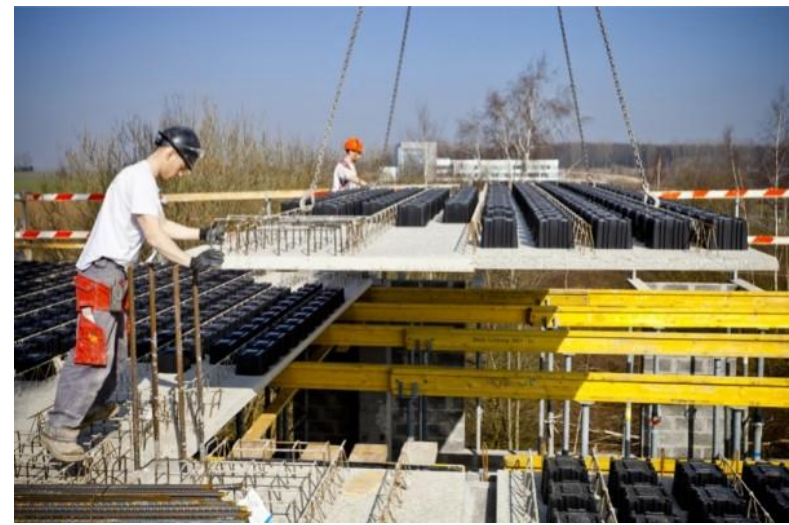
Research project BPE1000, RW



- Production (A1-A3)
- Transport (A4)
- Construction (A5)
- Replacements (B4)
- Energy (EPB items) (B6)
- Water consumption (B7)
- End of life (C)



Different phases of the life cycle for a period of 60 years







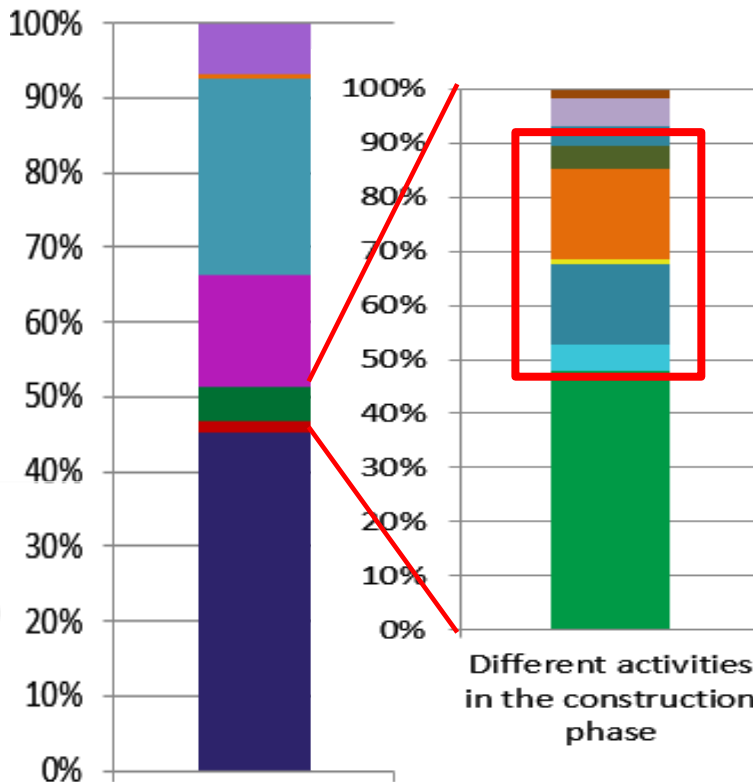
## Environmental Impact ...

### Life Cycle Analysis

### Case study ECOFFICE

Research project BPE1000, RW

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- Reinforced concrete crane sole
- Construction wood
- Fuel concrete mixers on site
- Fuel heat canon/forklift
- Use of compact excavator
- Fuel concrete pumping
- On site electricity prod. (generator)
- Electricity consumption network
- Demolition existing concrete slab
- Mixed constructionwaste
- Water consumption on site



## KEY DRIVERS +



Reflections on the Construction  
Process of the Future +

**Productivity: From on-site  
manufacturing to on-site  
Assembly and back...**



### Site Logistics

Getting people and materials  
quickly and safely on the  
jobsite ...



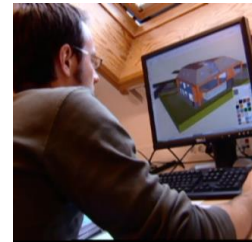
### Safety & Security

Stay at a safe distance of  
dangerous operations



### The « Stealth Site »

Manage disturbance for the  
Surroundings, noise, dust,  
Vibrations, any hindrance  
whatsoever...



### BIM, GPS, iCM,...

“Spellcheck errors”,  
simulate, monitor, ....

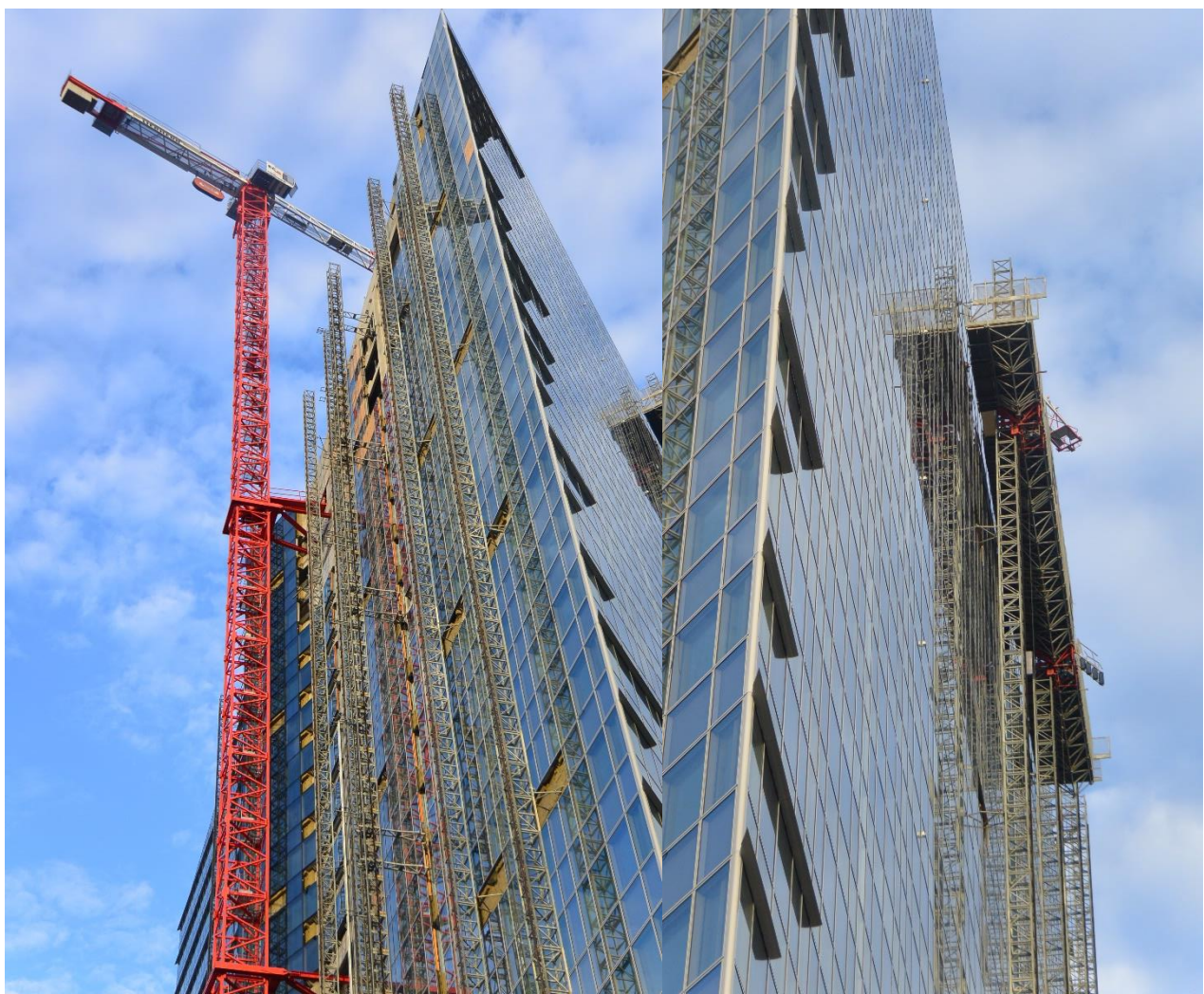
KEY DRIVERS +



Construction Process ...

### *Site Logistics*

Getting people and materials quickly and safely on the jobsite ...





## KEY DRIVERS +



## Construction Process ...

### *Safety & Security*

Stay at a safe distance of dangerous operations

« Drones on Site »

*Teleoperated machines are perfect for drilling and blasting contractors, but suitable also for quarries and the municipal sector. Typical applications consist of road construction, demolition works, secondary breaking, foundation drilling and trenching.*



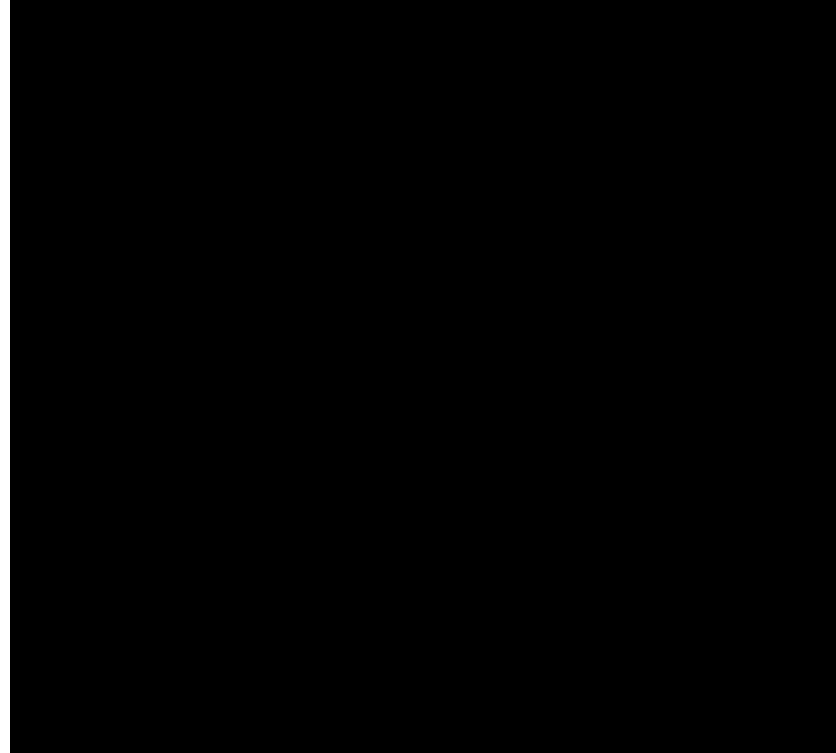
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*The « Stealth Site »*

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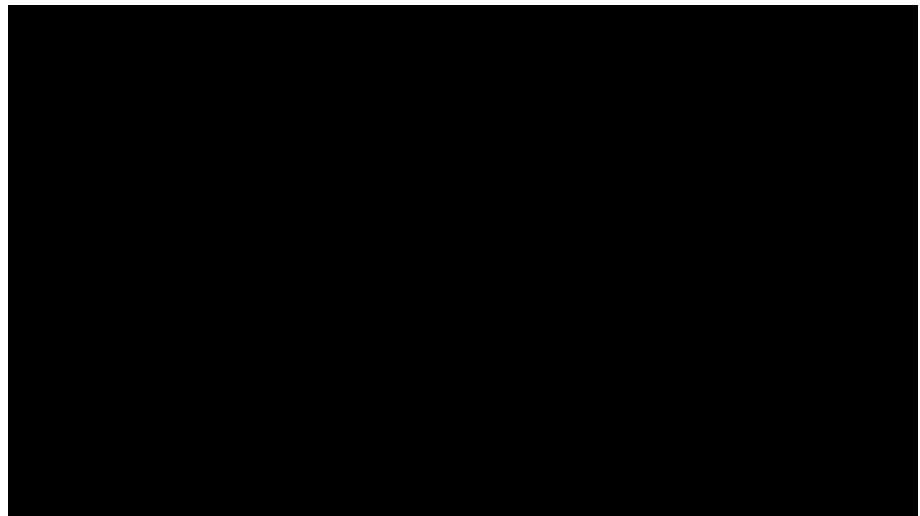
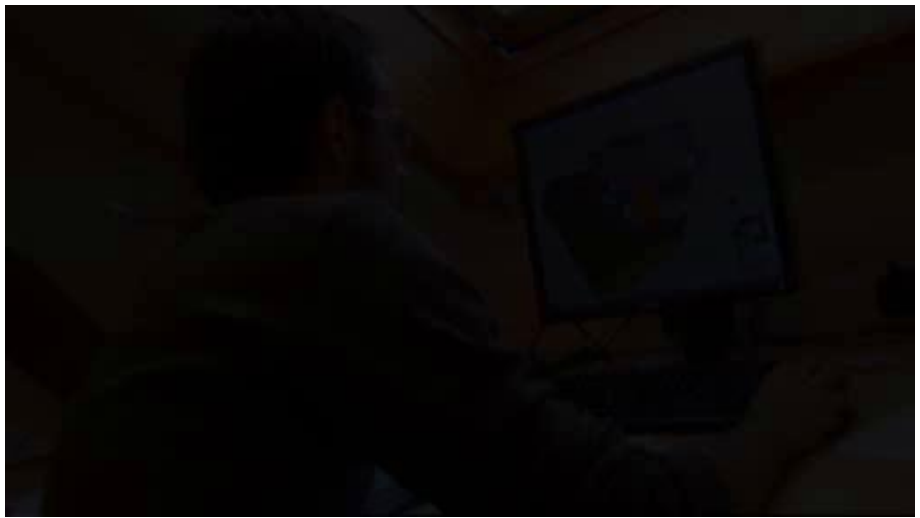
KEY DRIVERS +



Construction Process ...

**BIM, GPS, iCM, ...**

**Track, “Spellcheck errors”,  
simulate, monitor, controlle....**

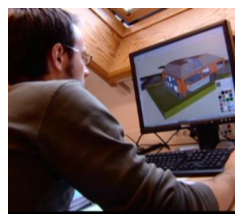




## KEY DRIVERS +



## Reflections on the Construction Process of the Future :



*Track, Trace and Time registration: The Triple-T project has as goal to inform contractors about opportunities of using the newest technology in daily practise. Info sessions, site visits and individual coaching are being implemented.*

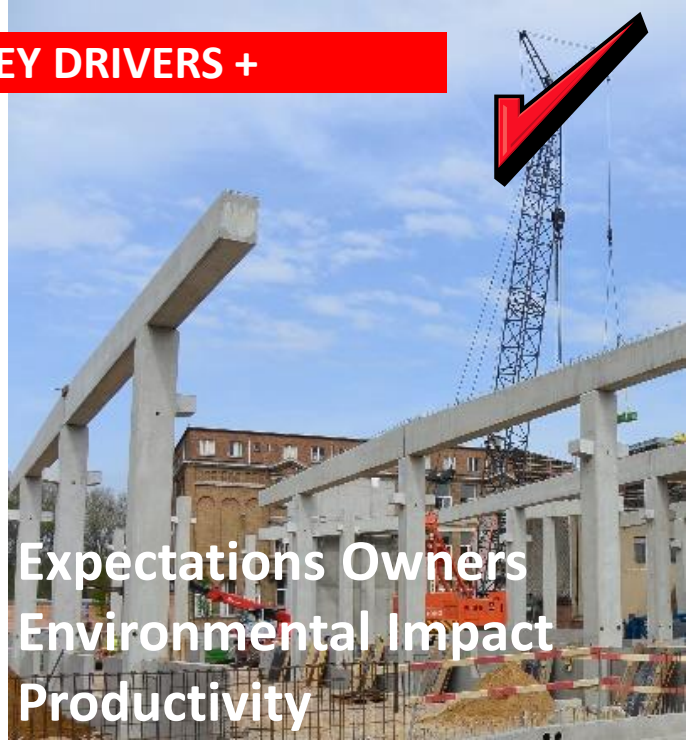




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## \_ CONCLUSIONS

Mainstream of the breakout session is addressing new expectations from customers, and society in terms of attention to the environment, demography and economic concerns

Moderator: **Sandy Guthrie**,  
*Editor of Construction Europe magazine*

- **Philippe Samyn**, Architect, Engineer and Urbanist, Architecture and technological progresses
- **Jean Polet**, General Manager Europe, Efficiency of the jobsite
- **Martin Ockier**, Area Director Benelux, Provision of construction elements
- **Claude Dumoulin**, Representative at the Technical Division, Transport infrastructures of tomorrow

CONSTRUCTION  
**europa** khl

SAMYN and PARTNERS  
architects & engineers

 **BESIX**

 **DEME**  
Building Environment

 **BOUYGUES  
CONSTRUCTION**

**Breakout Session 3:**

**“Innovation in meeting customer requirements”**





## New headquarters of the Council of the European Union

- **Philippe Samyn**, Architect, Engineer and Urbanist, Architecture and technological progresses

SAMYN and PARTNERS  
architects & engineers

# Burj Khalifa the tallest building in the world, a magnificent centerpiece of Downtown Dubai, United Arab Emirates



- **Jean Polet**, General Manager Europe,  
Efficiency of the jobsite



\_ CONCLUSIONS

# Thornton Bank Offshore Wind Farm Ostend ,Belgium

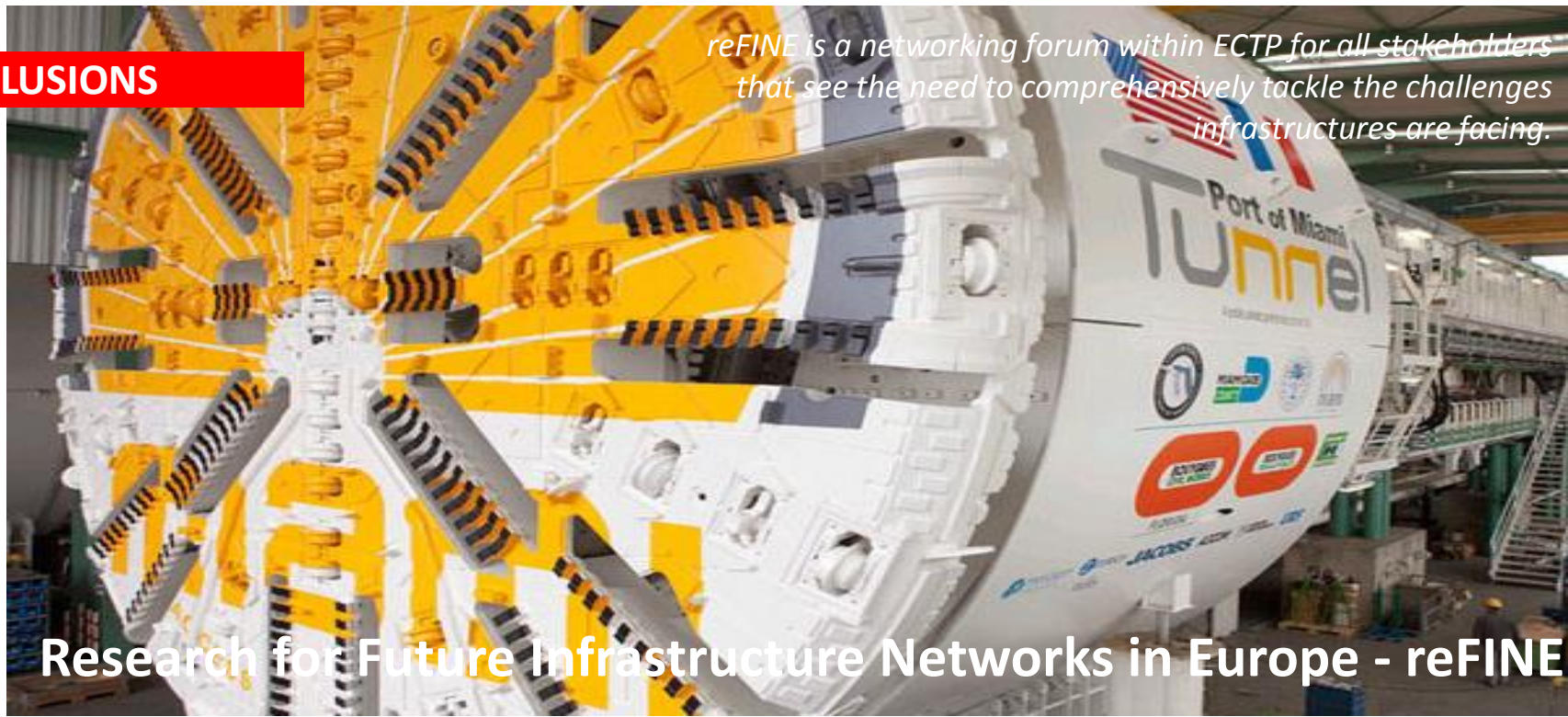


- **Martin Ockier**, Area Director Benelux,  
Provision of construction elements



## \_ CONCLUSIONS

*reFINE is a networking forum within ECTP for all stakeholders that see the need to comprehensively tackle the challenges infrastructures are facing.*



## Research for Future Infrastructure Networks in Europe - reFINE



EUROPEAN CONSTRUCTION TECHNOLOGY PLATFORM



Research for Future Infrastructures in Europe

reFINE



- **Claude Dumoulin**, Representative at the Technical Division, Transport infrastructures of tomorrow



# \_ CONCLUSIONS



Speaking with a single voice to our contacts...



***ECCREDI European Council for Construction Research Development & Innovation***

# \_ CONCLUSIONS





## CONCLUSIONS :

- **Network with members of ECCREDI**
- **Set up open innovation & Tech-Transfer with the construction sector**
- **Interact with specialist on « measure, monitor and control... »**





## Concrete Buffer Gone Wild

Spencer Laboda. My dad's description: We're glad that nobody was injured in this potentially hazardous situation. If my memory is correct we bought lunch for some of the participants. This was a great construction crew and they built a magnificent building.

