



# AMANAC WORKSHOP

BRUSSELS, BELGIUM | 03.07.2019

## WHAT KIND OF BUILT ENVIRONMENT FOR FUTURE GENERATIONS?

Bringing the solutions to the general public and the market

Christoph Müller  
*VDZ gGmbH*



The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760639 (EnDurCrete), 760824 (ReSHEALience) and 761072 (DACOMAT)

# From Laboratory into Practice – Approach for Accelerating the Transfer of innovative materials in Civil Engineering



Funded by the German Federal Ministry of Education and Research



The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°760639, 760824 and 761072

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# Motivation

Thematic calls from the *German Federal Ministry of Education and Research*



NanoTecture

„Nano Technology in the Construction Industry“

HighTechMatBau

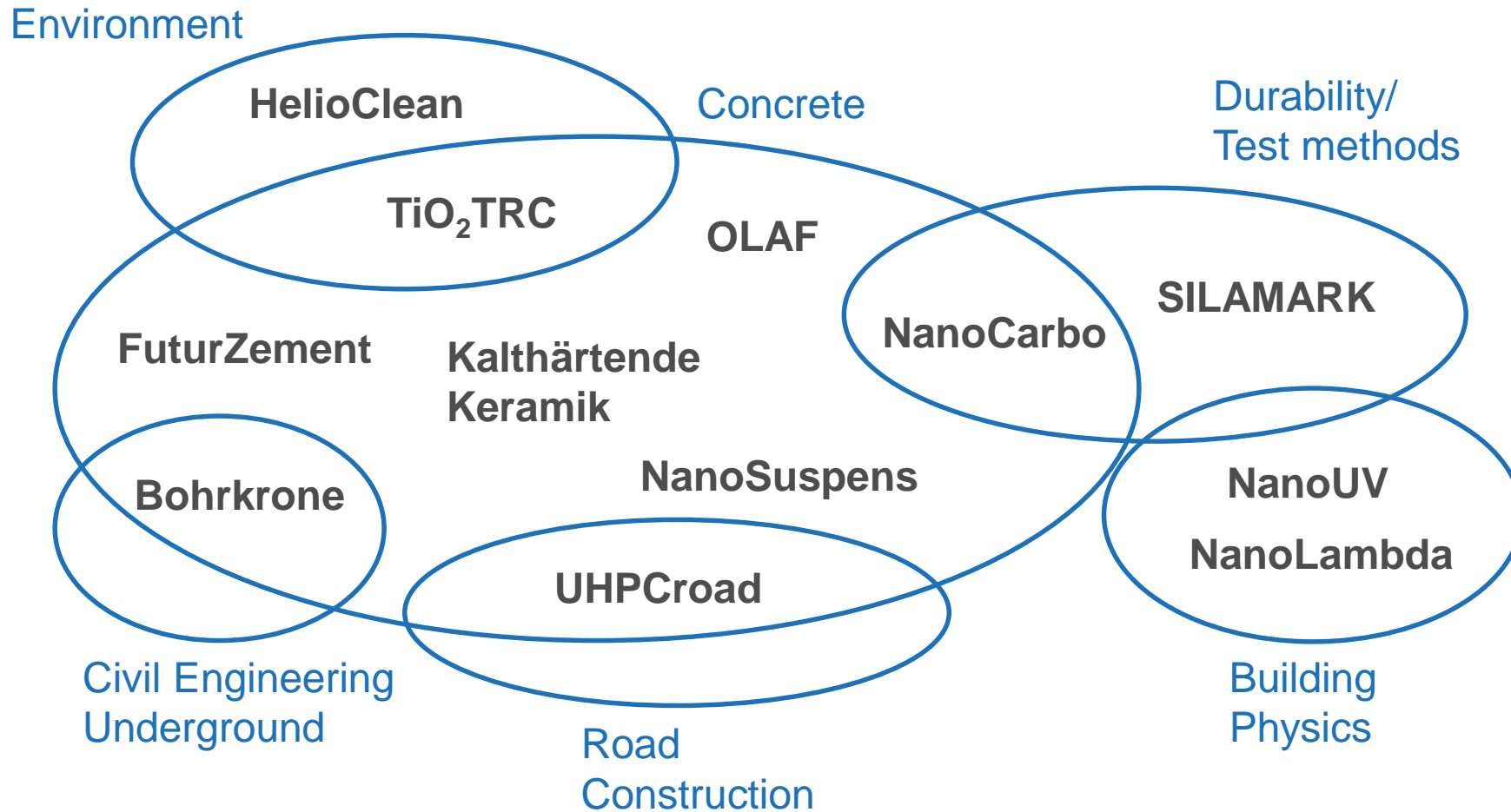
„New Materials for Urban Infrastructures“



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# NanoTecture



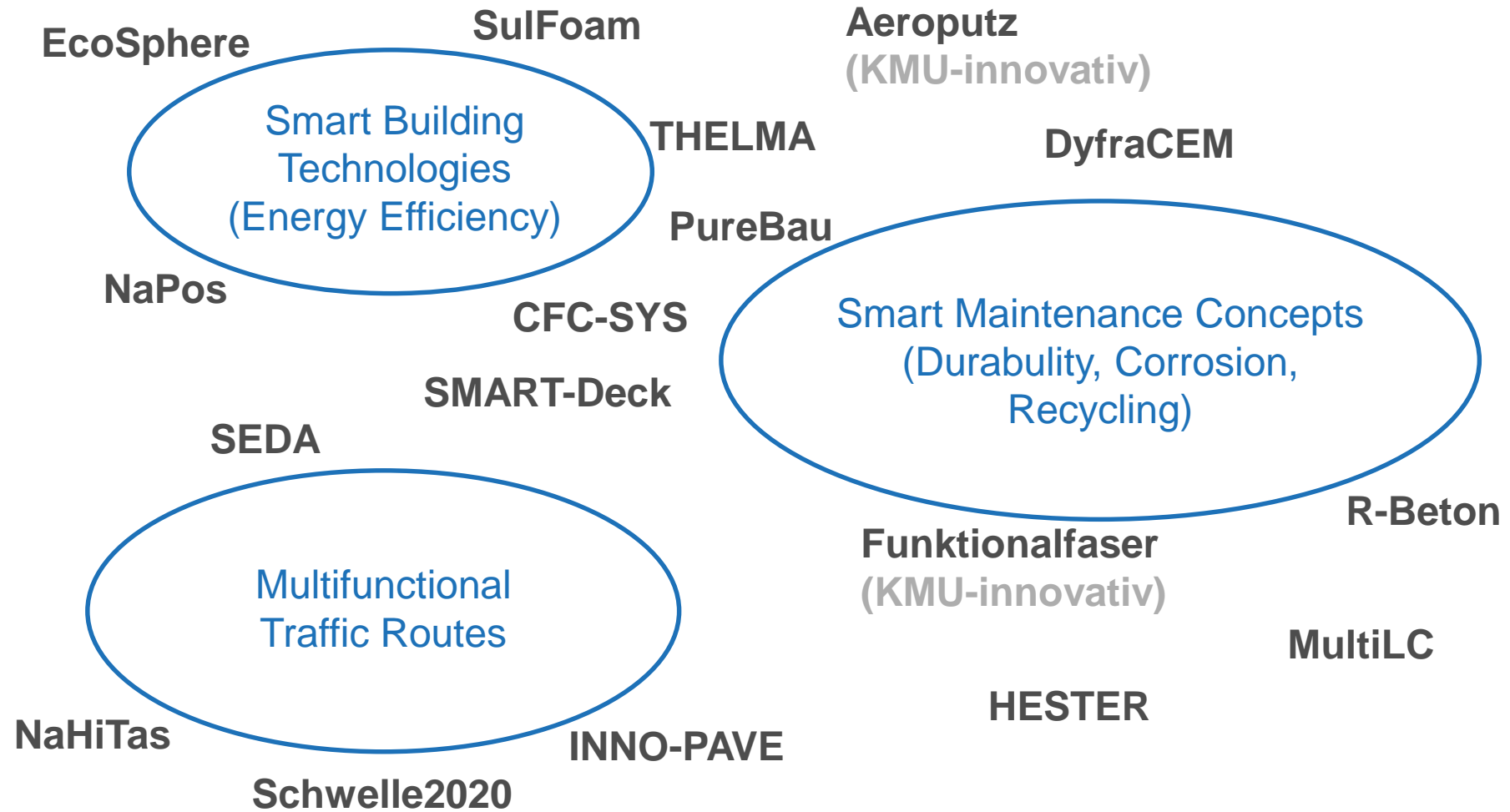
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# HighTechMatBau



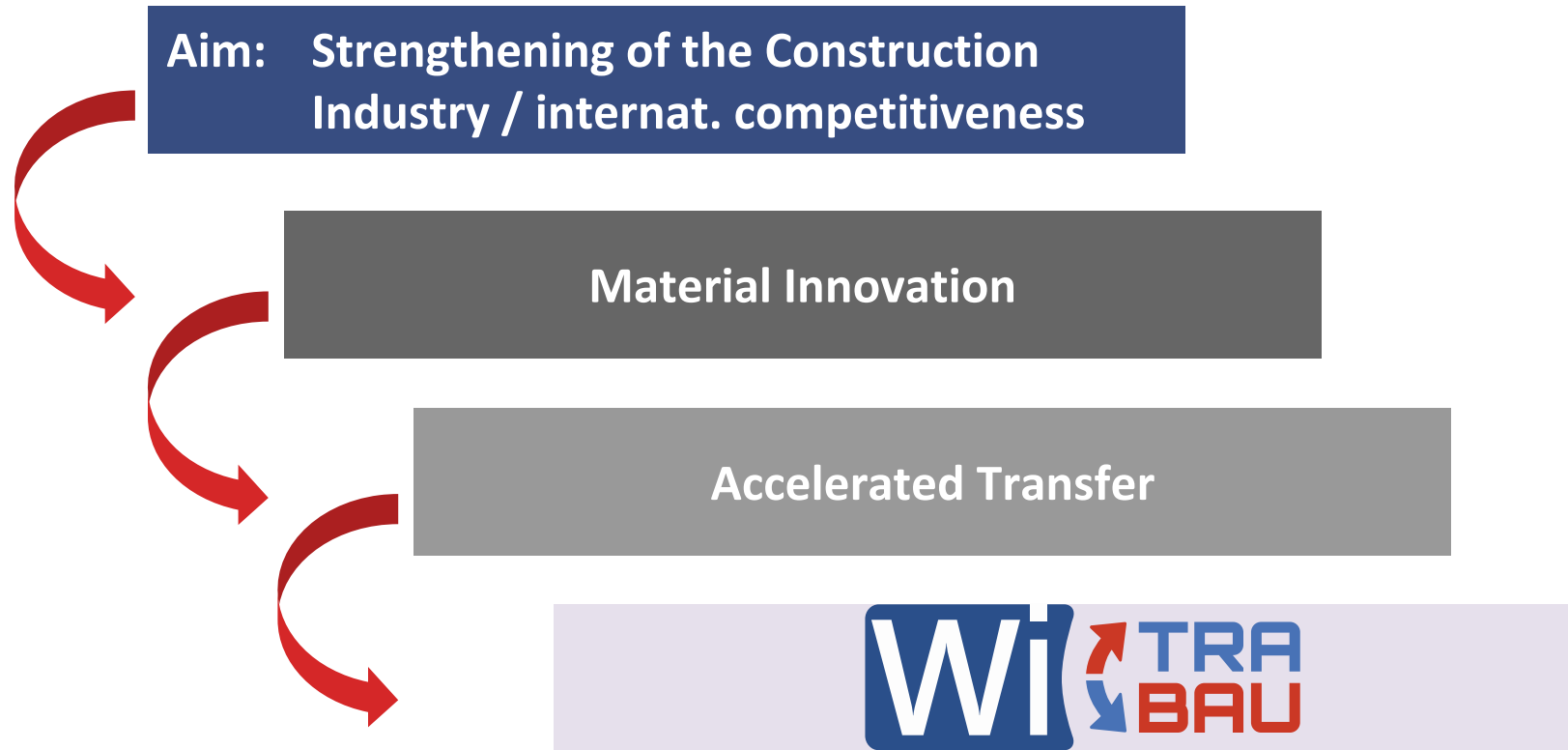
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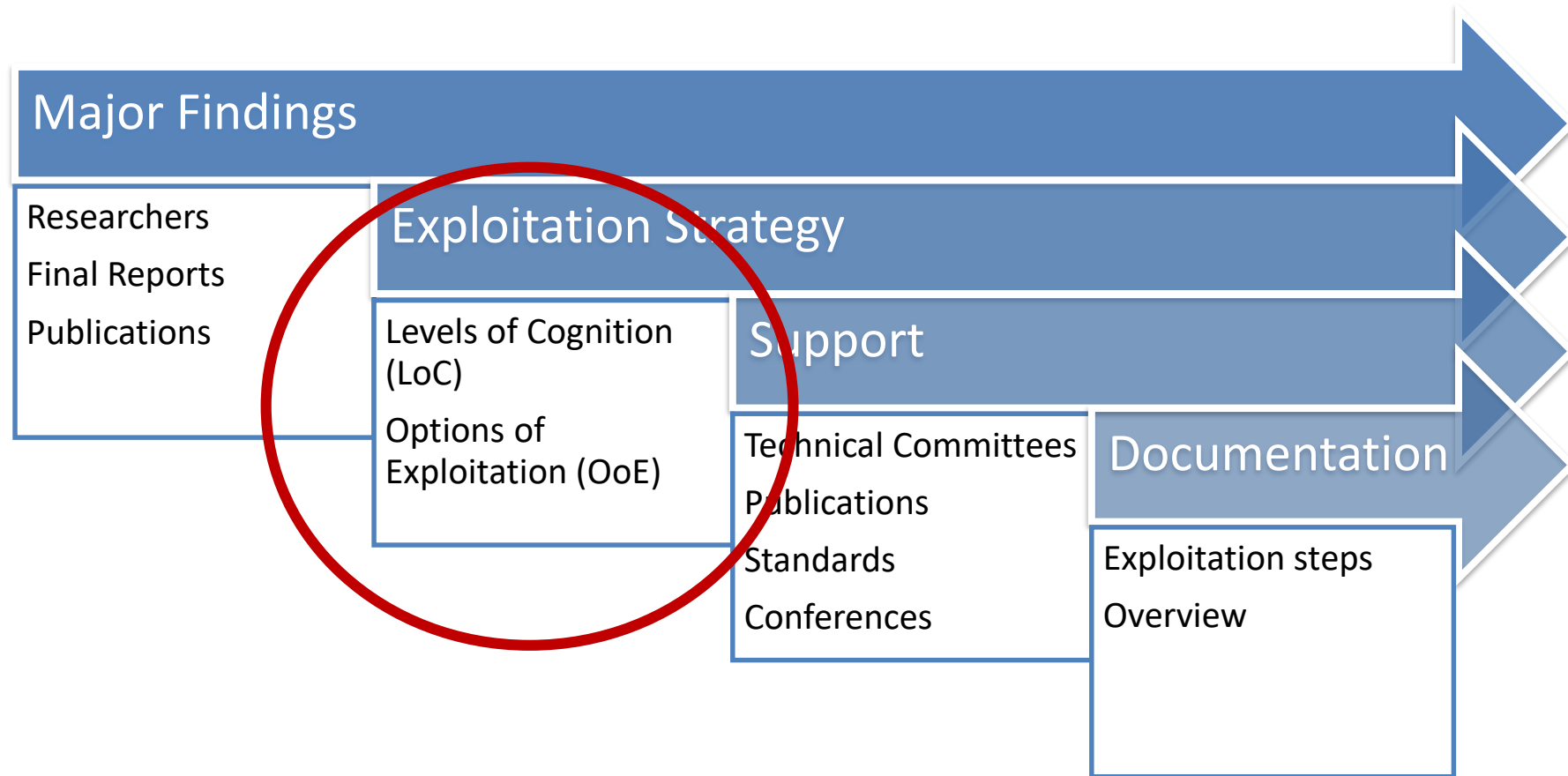
# Motivation



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# Evaluation



# Levels of Cognition (LoC)

**Basic findings**, e. g. as basis for subsequent application-oriented research activities

Large-scaled application-oriented findings, e. g. appropriate for **codes and standards**

Exemplary applications, e. g. as basis for **technical assessments and approvals**

Application-oriented findings as basis for further **product developments**

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# Options of Exploitation (OoE)

Consideration in subsequent **research projects**

Expert **publications**, presentations and journals

**Lectures** at universities, etc.

Guidelines and **education** materials for industry

**Status reports** as preliminary step of standardisation

**Data sheets** for industry

Set of **rules**

- Codes of the WiTraBau-Partners; inclusion in existing or new codes
- Technical Approvals
- Standards

Application-oriented **development**

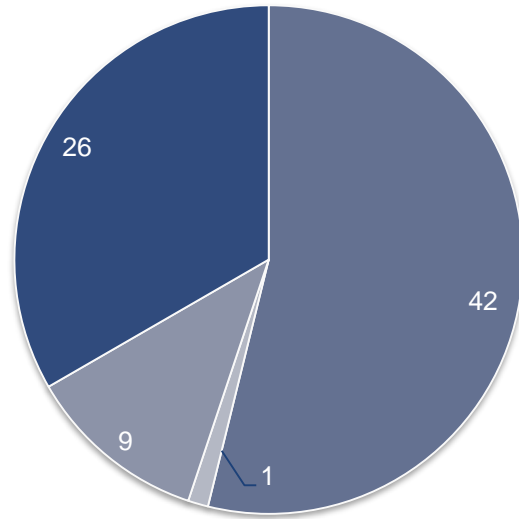
Exploitation proposals by the Grants



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# Outcome – Example NanoTecture

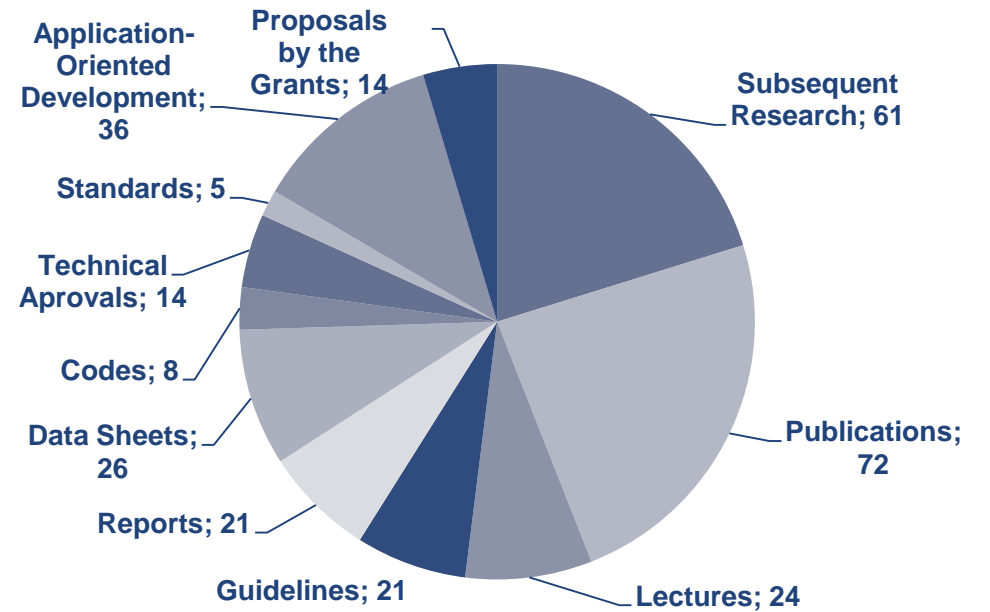


- Basic Findings
- Large-scaled applic.-orient. Findings
- Exemplary Applications
- Findings as basis for product develop.

← Levels of Cognition

Options of Exploitation →

- ➔ 12 Projects
- ➔ 78 Findings
- ➔ 302 OoE



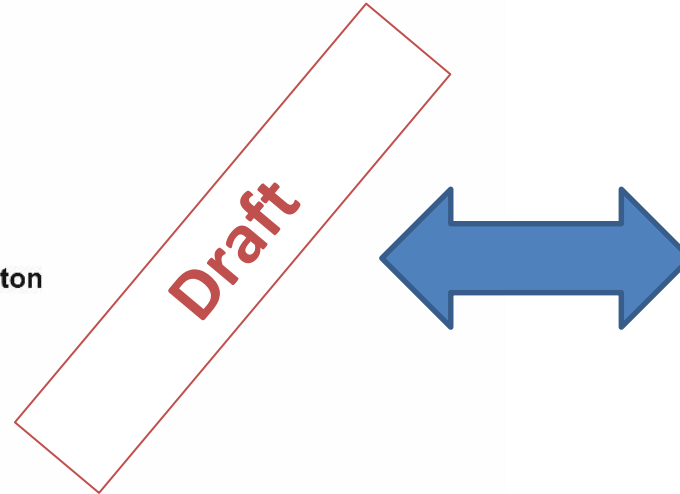
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# Transfer of Results into standardisation – Example CO<sub>2</sub> efficient cements for UHPC

## DEUTSCHER AUSSCHUSS FÜR STAHLBETON

**DAfStb-Richtlinie**  
**Ultrahochfester Beton**  
(UHFB-Richtlinie)  
Ausgabe November 2018



What are suitable and field-tested cement types for production of concrete elements from UHPC?

Die Verpflichtungen aus der Richtlinie 89/34/EG des Europäischen Parlaments und des Rates vom 22. Juni 1998 über ein Informationsverfahren auf dem Gebiet der Normen und technischen Vorschriften (Abl. EG Nr. L204 S.378), zuletzt geändert durch die Richtlinie 98/48/EG des Europäischen Parlaments und des Rates vom 20. Juli 1998 (Abl. EG Nr. L217 S. 18) sind beachtet worden.

Bezüglich der in dieser Richtlinie genannten Normen, anderen Unterlagen und technischen Anforderungen, die sich auf Produkte oder Prüfverfahren beziehen, gilt, dass auch Produkte bzw. Prüfverfahren angewandt werden dürfen, die Normen oder sonstigen Bestimmungen und/oder technischen Vorschriften anderer Vertragsstaaten des Abkommens über den Europäischen Wirtschaftsraum entsprechen, sofern das geforderte Schutzniveau in Bezug auf Sicherheit, Gesundheit und Gebrauchstauglichkeit gleichermaßen dauerhaft erreicht wird.

Herausgeber:  
Deutscher Ausschuss für Stahlbeton - DAfStb

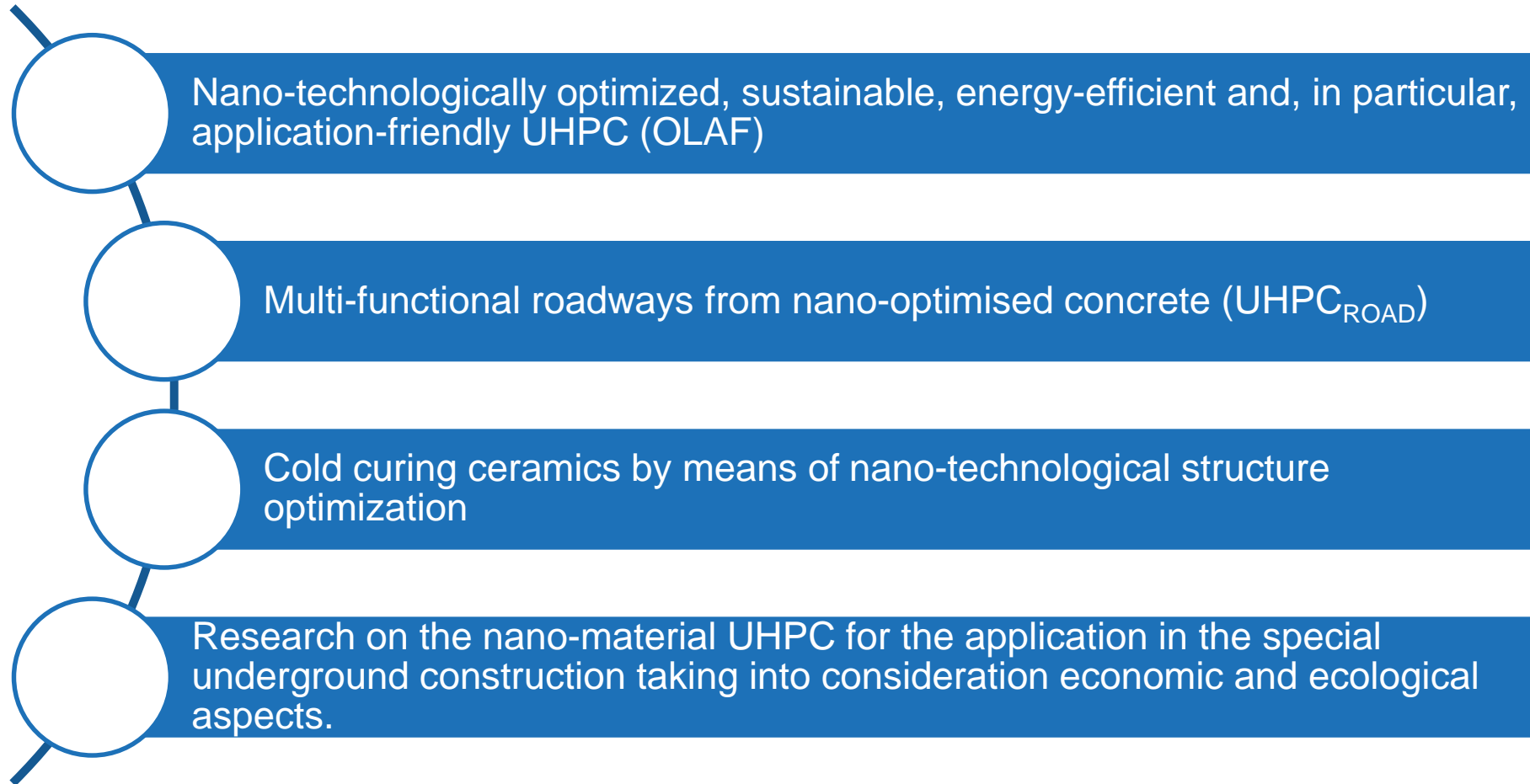
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# Transfer of Results into standardisation – Examples UHPC



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# Construction elements and demonstrators with UHPC

<i>Construction element and demonstrators</i>	<i>Compressive strength</i>	<i>Cement</i>	<i>Publication</i>
Passenger car ramp (d (d = 6 cm)	165 MPa	CEM X (S-V-LL) 52,5 R (OLAF- Compound)	OLAF
	190 MPa	CEM II/B-S 52,5 R (Nanodur® Compound 5941)	
Facade elements Parabolic reflector Element for fish breeding pools	150 MPa	CEM X (S-V-LL) 52,5 R (Nanodur® Compound 5941)	
Machine base		CEM II/B-S 52,5 R (Nanodur® Compound 5941)	
Multifunctional road made of UHPC	130 MPa	CEM III/A 42,5 N	UHPC <sub>ROAD</sub>
UHPC drill bits	200 MPa	CEM I 42,5 N	Drill bits made of UHPC

Source:  
HighTechMatBau Kick-Off-  
Tagung : Tagungsband mit  
Beiträgen aus NanoTecture  
und HighTechMatBau ; Neue  
Werkstoffe für urbane  
Infrastrukturen (Düsseldorf  
28.09.2015). Düsseldorf, 2015

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# What are suitable and field-tested cement types for production of concrete elements from UHPC?

Current state of discussion in Draft of the UHPC-Guideline:

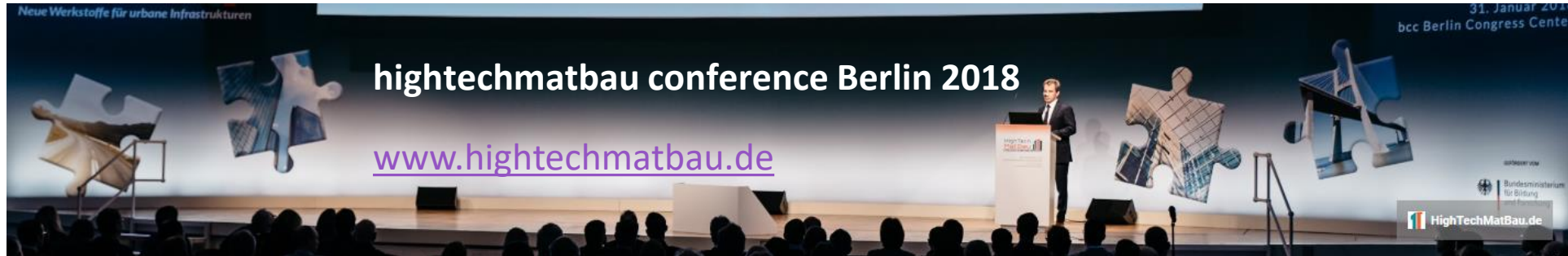
- „...to be suitable for the production of UHPC are CEM I, CEM II/A (D, S, V, LL), CEM II/B (S, V, LL), CEM II/B-M (S-D), CEM III/A and CEM III/B acc. to EN 197-1.“



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# Bringing the solutions to the general public and the market



## YouTube-Kanal

Die Filme des Förderschwerpunktes HighTechMatBau finden Sie auch im Videoportal YouTube.



 zum YouTube-Kanal



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# Summary

- Define the **Levels of Cognition (LoC)** you expect to reach e. g.
  - basic findings,
  - basis for further **product developments**,
  - as basis for **technical assessments and approvals**,
  - appropriate for **codes and standards**,
  - in European research projects **Technology Readiness Level (TRL)**
- Define the **Options of Exploitation (OoE)** e. g.:
  - Consideration in **subsequent research projects**
  - Expert **publications, presentations** and journals
  - **Guidelines** and education materials, data sheets **for the industry**
  - Inclusion in existing or new **standards**, basis for **technical approvals**



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# Acknowledgement

## Thank You!

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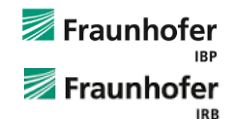


GEFÖRDERT VOM

Bundesministerium  
für Bildung  
und Forschung

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