

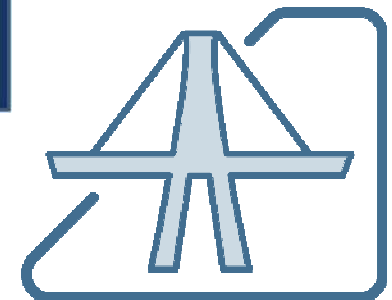


Tu 1301

(Sep 2013) Jan 2014 – Sep 2017

Chair Wouter Schroeyers

NuTeC, UHasselt, Belgium



Transport and Urban
Development (TUD)

NuTeC

Nuclear Technological Center (NuTeC, www.nutec.be)

Center of Environmental Studies (CMK, www.uhasselt.be/cmkn)



Industrial Sciences: “Nuclear and environmental Engineering”

- Environmental Technology-Radiochemistry
- Medical Nuclear Technology

Application and development of nuclear measurement methods



Environmental and energy related research



EMR dosimetry



A new COST initiative 'NORM4BUILDING'

1. What is COST?
2. Objectives and scientific content
3. Organization



What is COST?

- European RTD (Research and Technological Development) Framework Program
- COST supports the ‘construction’ of new European networks of researchers

COST sponsors:

- ORGANIZATION OF MEETINGS:
 - 12-13/02/2014 Israel Dead Sea Hotel
 - Linked to INS conference
 - 16-17/06/2014 Prague
 - Linked to EU-NORM symposium
 - 17-18/09/2014 Sheffield
 - Linked to CCS2014 - workshop on cementitious materials
- SHORT-TERM SCIENTIFIC MISSIONS
- TRAINING SCHOOLS
- PUBLICATIONS and DISSEMINATION



www.norm4building.org



 COST is supported
by the EU Framework Programme

 ESF provides the COST Office
through a European Commission contract

Preliminary work plan

Prefase: 'Preparation is everything'

- April 2013 NORM 7, Beijing
- Dec 2013 EAN workshop Madrid

www.norm4building.org

2014

- 3 [MC/WGs] meetings / workshop
 - Dead Sea
 - Prague , joint event (EU-NORM; MetroNORM)
 - (IRPA: training)
 - (Waste-eng,Brasil)
 - Sheffield - round table
- 3 CORE-group
- 5 STSM
- Dissemination

2015

- 2 [MC/WGs] meetings / workshop
 - Round table
- 2 CORE-group
- 10 STSM
- 1-2 training school
- Dissemination

2016

- 2 [MC/WGs] meetings / workshop
 - Round table
- 2 CORE-group
- 10 STSM
- 2 training schools
- Focus dissemination

(sept) 2017

- 2 [MC/WGs] meetings / **final workshop**
 - Round table
- 2 CORE-group
- 10 STSM
- 2 training schools
- Dominant budget dissemination:

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Main objective 'NORM4BUILDING'

- Exchange of multidisciplinary knowledge and experiences (radiological, technical, economical, legislative, ecological, ...)

Stimulate the
reuse of NORM residues in new tailor-made sustainable building materials
while
considering exposure to external gamma radiation and the resulting indoor air quality.

NORM residues

NORM residues (with interesting properties for reuse in building materials)	Codification EU-Waste Catalogue?	Estimated production (Milion Tons/year)
coal fly-ash	001 02 or 10 01 16	44 (2003, EU 15) ¹
slag and bottom ash from a coal-fired power plant	10 01 01 or 10 01 14	8 (2003, EU 15) ¹
phosphorous slag from thermal phosphorus production	06 09 02	-
phosphogypsum from phosphoric acid production,	-	180 (2003, World) ²
red-mud, (bauxite residue), from alumina production	01 03 07	120 (2003, World) ³
unprocessed slag from primary iron production	10 02 02	260-310 (2011, World) ⁴
steel or stainless steel, lead slags	10 04 01	130-210 (2011, World) ⁴
copper slags, from primary and secondary production.	10 06 01	24,6 (2009, World) ⁵
tin slags from primary and secondary production	-	-
specific residues originating from pyro- and hydro-metallurgies producing platinum group metals or rare earth elements	-	-

[1] Ecoba - SPECIAL PRINT CPI 04/06

[2] A.B. Parreira, A.R.K. Kobayashi Jr., O.B. Silvestre, J. Environ. Eng. 129 (2003) 956–960

[3] www.redmud.org/Disposal.html

[4] U.S. Geological Survey, Mineral Commodity Summaries, January 2012

[5] S.H. Chew, S.K. Bharati, Proc. Of Int. Symp. On Geoenvironmental Eng., ISGE2009, 705, 2009

Using NORM for building materials?



Fly ash



Phosphogypsum



Metal slag



Red mud



Ceramics

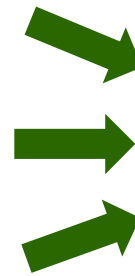


Concrete



Cement

- Suitable chemical and physical properties?
 - (Pre)treatment of residues?
- Gamma exposure towards occupants?
- Indoor air quality?
 - Radiological and chemical noxes?
- End-of-life considerations?
 - Leachability?



A need to check under what conditions materials can be used and where!



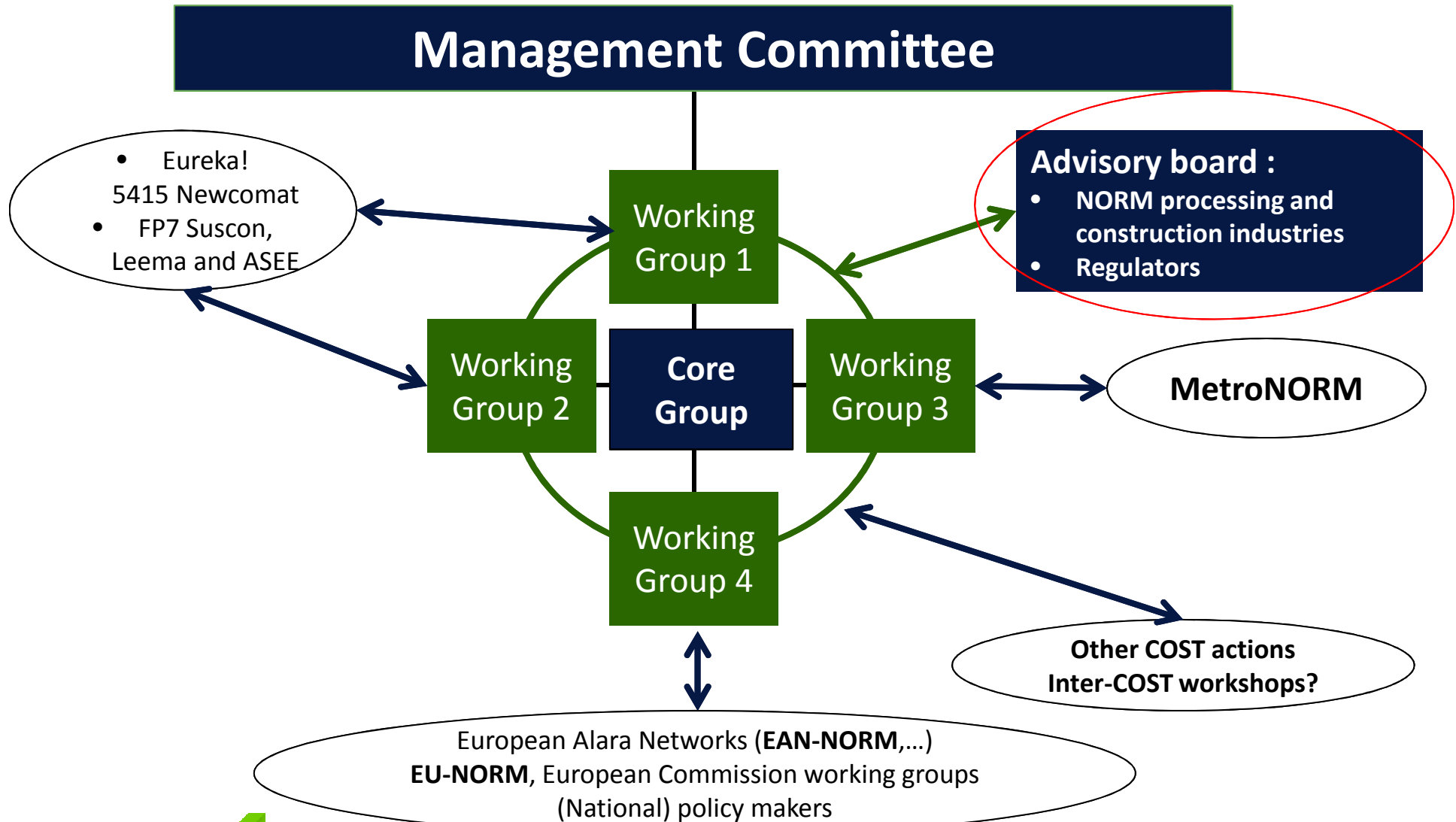
Focus on reuse of residues in
 Ceramic
 Cement Geopolymers
 Concrete

A new COST initiative 'NORM4BUILDING'

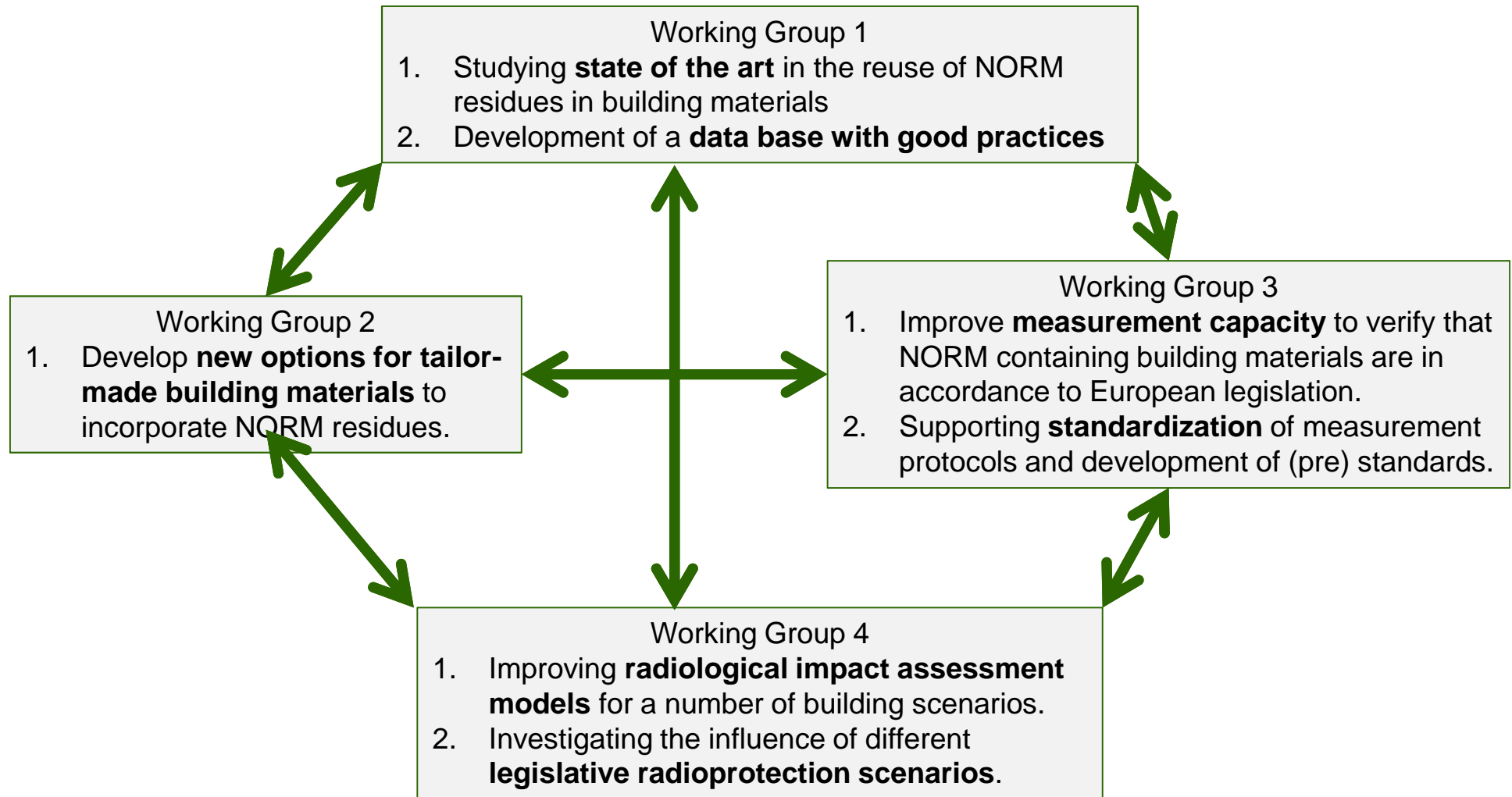
1. What is COST?
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Organization – collaboration



Scientific focus working groups



Expected outcomes (WG 1): 'data base with best practices'

deliverables

1) Set **criteria** for evaluation of practices

2) Build **new database with good practices**

a) Add information of **representative national surveys** to database.

b) **Cost-benefit analysis and a SWOT analysis** on database practices

3) Updating 'activity concentration index' database

4) Update information for the **European Waste Catalogue**

Impact:

-**NORM aspects are taken into account for reuse**

-**'Good practices database' as guideline for reuse for industry**

Expected outcomes (WG 2):

'Options for new tailor-made building materials'

deliverables

- 1) Study **new develop options** for NORM containing building materials:
 - a) Include in database
 - b) Analytical model per type of building materials with **relation** between **% of virgin raw materials substituted** and **radiological content**
 - c) Recommendations on **secondary raw materials to be used** in the **synthesis of geopolymers/inorganic polymers considering the radiological content.**

- 1) Reports on the effects on the radiological content of building materials linked to:
 - i. the **pretreatment** of the raw materials,
 - ii. the **development and application** of the building material
 - iii. the effect of **inherent and engineered properties**

Impact:

-New 'upgraded' reuse options for NORM residues

Expected outcomes (WG 3): 'Improve measurement capacity and standardisation'

deliverables

- 1) Publications regarding **optimized (*in-situ*) measurement protocols and the validation of protocols** for the determination of
 - a) Activity Concentration Index
 - b) Radon (possibly thoron) emanation and exhalation rate
- 2) Proposal for a **calibration procedure** and steps in the development of **standard materials**
- 3) Organization of **intercomparisons** between institutes using several measurements protocols and instruments
- 4) Factsheet for **unified certification procedure of construction materials**.



Impact:

-Standardized measurement procedure for more uniform assessment of NORM containing building materials in Europe.

Expected outcomes (WG 4) : 'Improving radiological impact assessment models'

deliverables

- 1) **Improved radiological impact models** specifically for the (i) cement, (ii) concrete and (iii) ceramics industries and (iv) the use of geopolymers.
- 2) Report on **end-of-Life considerations (leachability)**
- 3) **Round table discussions** with all stakeholders and reports on the **evaluation of the practical implementation of the new materials on the market.**
- 4) Comparison and evaluation of **alternative legislative scenarios** that can potentially stimulate the use of NORM residues while limiting the radiological impact.

Impact:

-More realistic dosimetric assessment taking into account the specific technical properties of the used building materials

Steps towards scientific progress

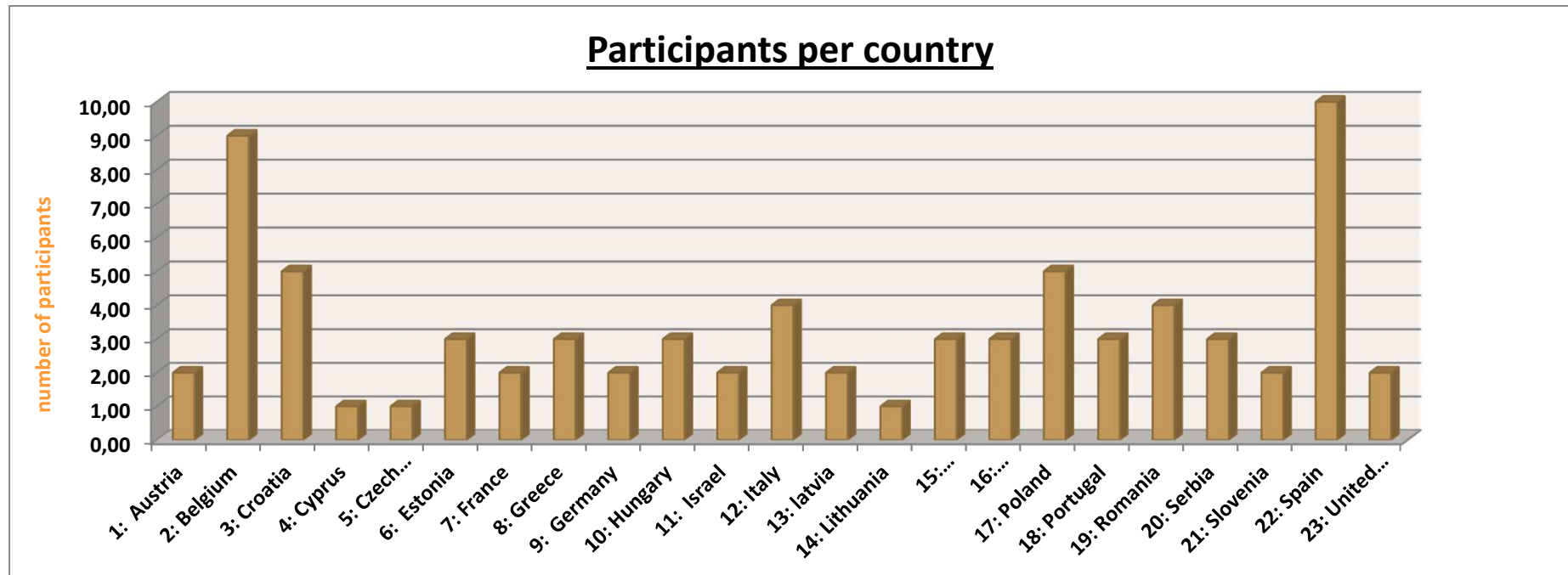
- Started the construction of the database of best practices
 - Defined the criteria for the evaluation of practices
 - Designed the database architecture
- Initial proposals for realistic dosimetric models
- Joined forces with **MetroNORM** to prepare (pre-)standards and EAN-NORM network to ensure radiation protection
- **Building European and national research projects together with companies to find new options for reuse**
 - Several (inter)national projects in preparation

Food for thought

- Is there no risk that the ACI (gamma radiation dose) will become the only parameter for optimization?
 - Eg. Fly ash containing building materials can lower surface porosity
 - **ACI** can become (slightly) **higher**
 - **Reduction in the radon dose** (taking into consideration realistic ventilation rates)
 - **Overall** this can give a **dose reduction**
 - ➔ taking into account radiation protection we should encourage this practice?

A new COST network NORM4Building (01/2014-09/2017)

- 23 COST countries + European Commission
- A strong variety of (so far) about 76 experts



Interested?

www.norm4building.org

Contact:

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