Radiological evaluation of by-products used in construction and alternative applications; **Preparation of By-BM natural radioactivity database**

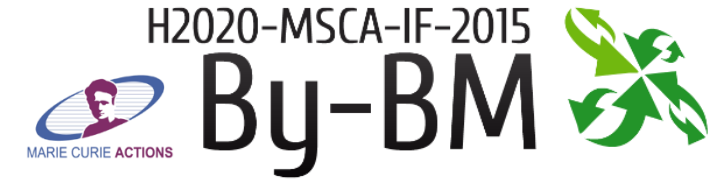Z. Sas[1], W. Schroeyers[2], R. Doherty[1], W. Sha[1], M. Soutsos[1]

[1]Queen's University Belfast
[2]University of Hasselt

EUNORM Symposia 2017

NPL (Teddington, UK)

2-5 October 2017

Why?
General reason

New eco-innovative construction materials

- The depletion of raw materials and development of low CO_2 construction materials

Important EU policy driver

- EU's Waste Framework Directive with its objective to reach 70% of preparation for reuse, recycling and other forms for material recovery

Reuse of industrial by-products

- Beneficial from economical point of view

Concerns from hazardous content

- Elevated natural radionuclide content can pose increased risk

2015   2016   2017   Present   2018   Queen's University Belfast

NORM4 BUILDING — Collaborative data collection → **Evaluation, revision** → **Draft database** → **Final COST database**

H2020-MSCA-IF-2015 By-BM → **Draft By-BM database** → **Visualised By-BM database** → **Final By-BM database** → **MERGING**
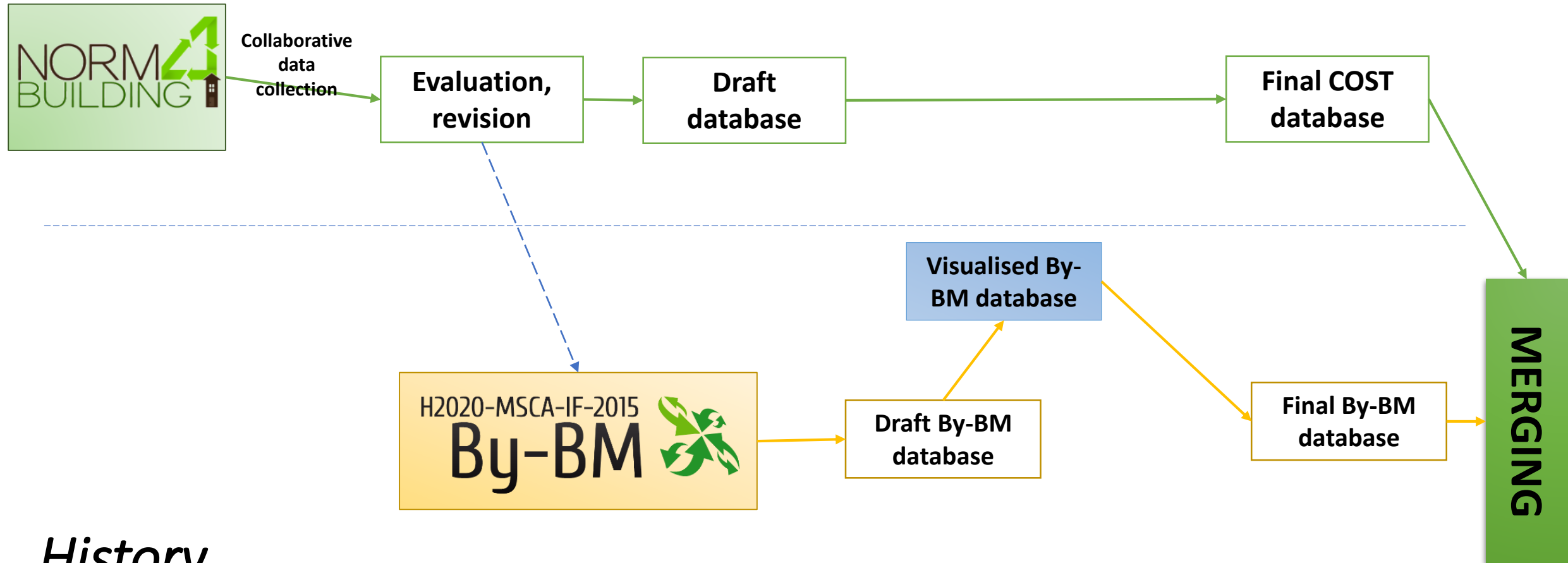
History
Database concepts

universiteit hasselt
KNOWLEDGE IN ACTION

H2020-MSCA-IF-2015 By-BM
MARIE CURIE ACTIONS

Why?

Inhomogenity of reported infromtaion

An overall insight view into the radiological features

Reported scientific data

Problems

- **The review of the reported scientific data and a proper dose assessment method are necessary before reuse**

- Generally the activity concentrations are presented as a range with a mean value

- Several magnitude range

- Does not allow:
  - Statistical analysis
  - Classification
  - Mixing calcualtion
  - Dose prediction

Approach
Manual Data mining (By-BM Database)

Manual data mining
- Data collection for By-BM Project
- Scientic reported data (articles)

Selection criteria
- K-40, Th-232, Ra-226 (gamma spect.)
- Only individual sample data
- Average value only e.g. from the same type, querry, deposit

Classification
- I-index, Ra_{eq} index, etc.

Distribution analysis
- Main statistical parameters

Visualisation
- Dinamic suface with active filtering

Results & Conclusions

By-BM Database

Record info

- No of materials: 28 (21 BM; 7 BP)
- Total records: 1526 (1095 BM; 436 BP)
  - 48 countries

Distribution analysis

- Mean value of Ra-226, Th-232 and K-40 content were 2.52, 2.35 and 0.39 times higher in case of the BPs

Visualisation

- Demo version is ready
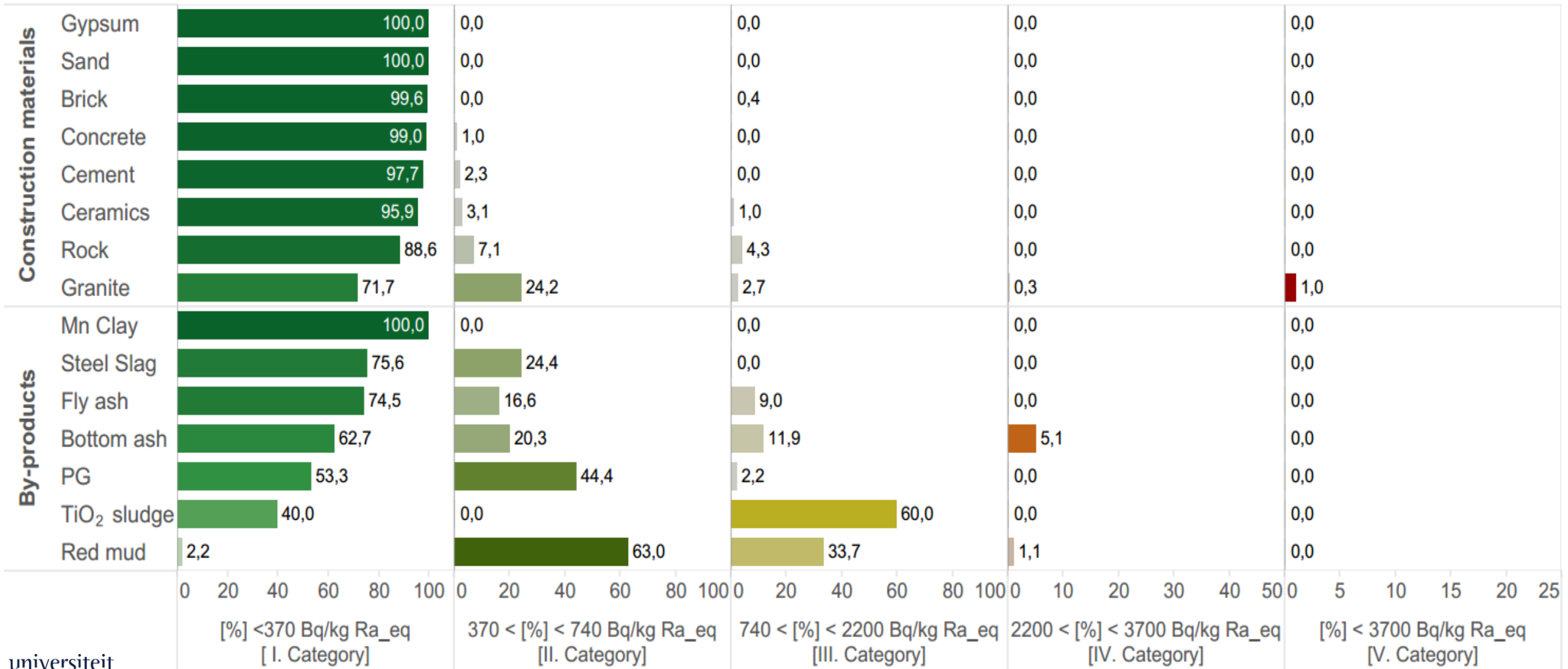
Natural radioactivity database

Results & Conclusions

Ra eq conentration of datamined materials

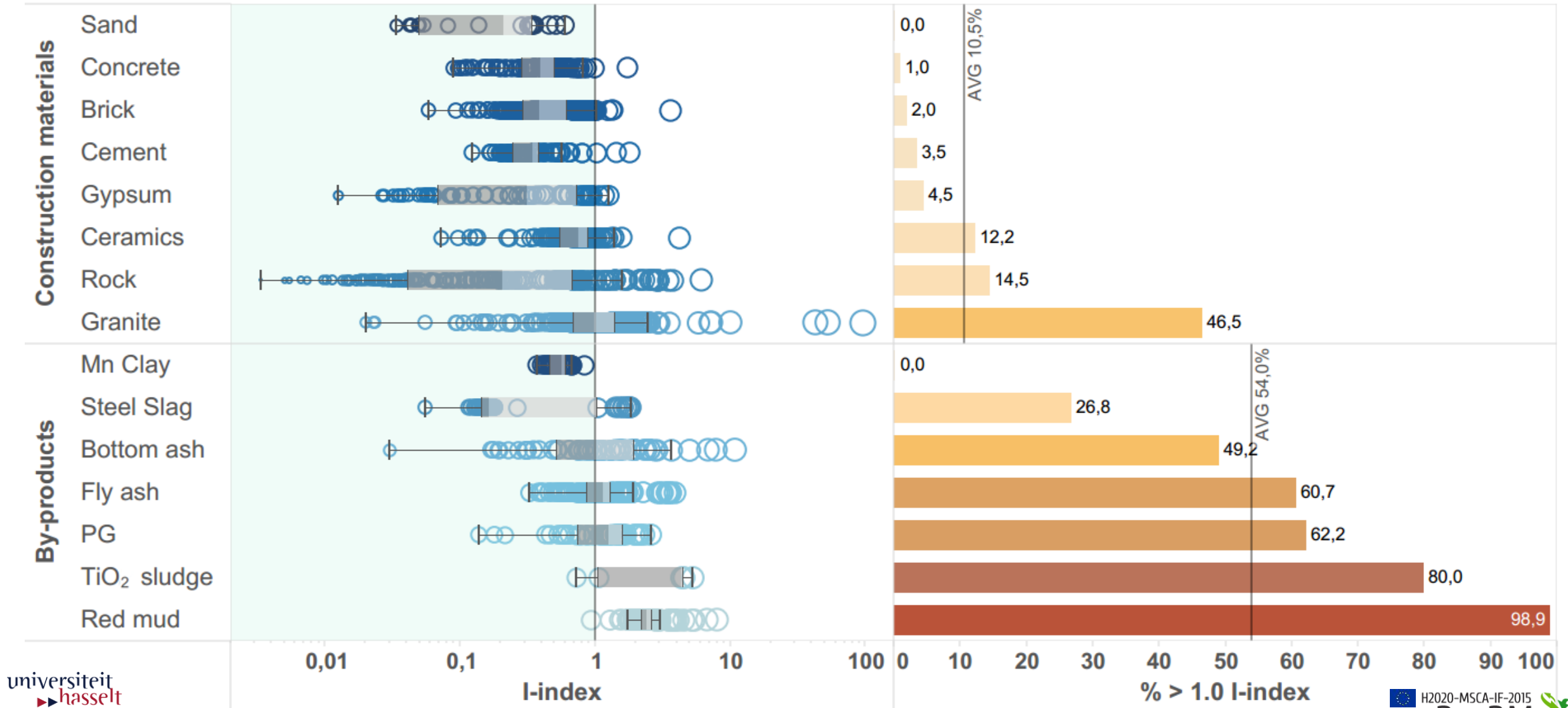# Results & Conclusions

I-index of datamined materials

Results & Conclusions

Published paper • Construction and building materials (27 May 2017)

Title • Radiological evaluation of by-products used in construction and alternative applications; **Part I. – preparation of natural radioactivity database**

Target group
• Cross-disciplinary
• Construction material experts

Main achievement
• Statistical analysis
• Visualized database

Practical tool • Mixing ratio prediction

Online channels

Dissemination

Official website	bybmproject.com/
Facebook	www.facebook.com/ByBMproject/
LinkedIn	www.linkedin.com/groups/8536276
Twitter	twitter.com/ByBM_Project
Instagram	www.instagram.com/bybmproject/
ResearchGate	www.researchgate.net/project/By-BM-H2020-IF-2015