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Steinbeis-Transferzentrum
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MINnD UC8-GT : Geotechnical data standardization and management for BIM and Smart Cities

108th OGC Technical Committee, Joint IDBE / Smart Cities / LandInfra session

Stuttgart, Germany

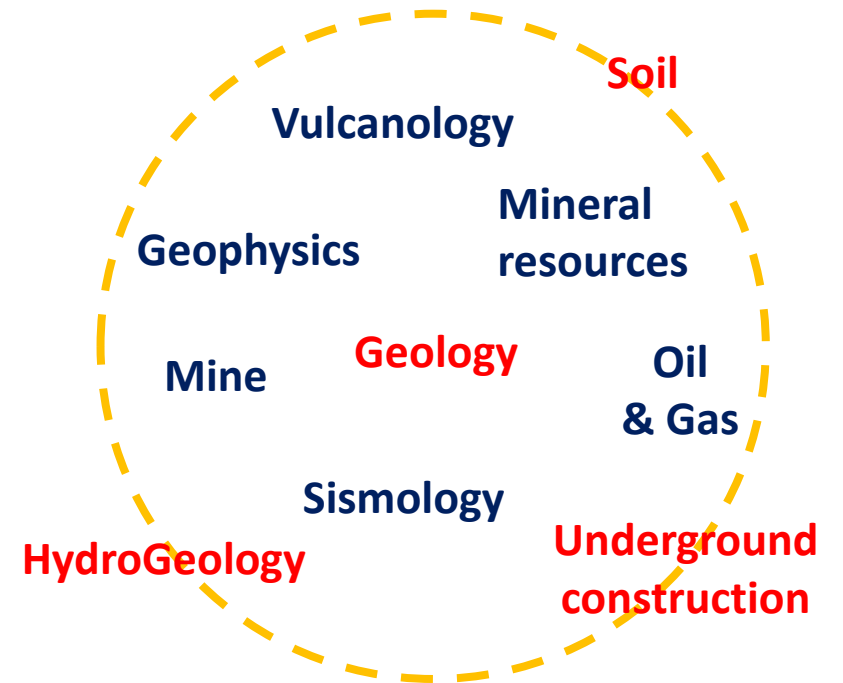
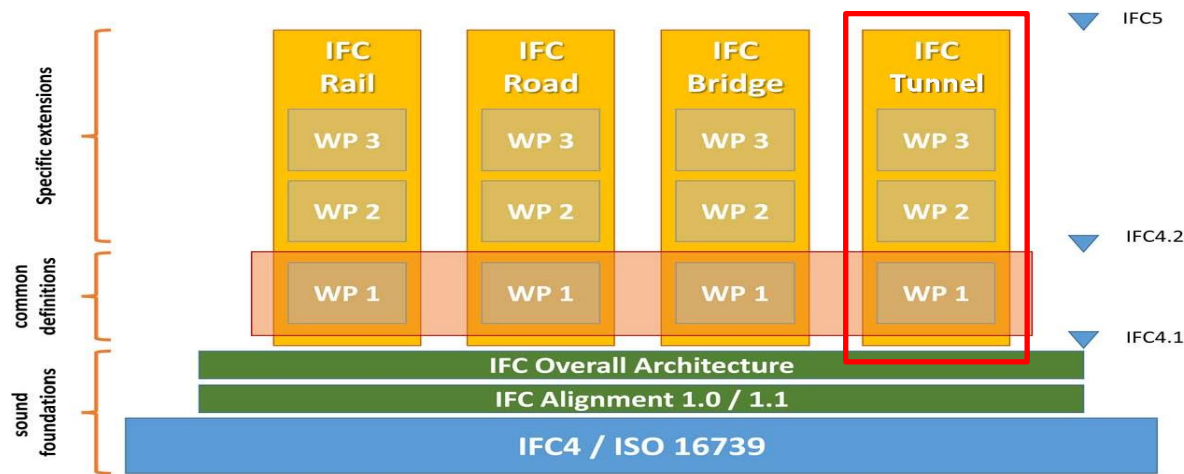
Mickaël Beaufils (BRGM), on behalf of the MINnD UC8-GT team

11 September 2018

Context: MINnD



- MINnD (2014-2018 > 2020)
 - A French collaborative program to extend BIM methods and standards from building to infrastructure modeling
 - In connection with buildingSmartFrance (MediaConstruct)
 - 70 partners



Context: MINnD UC8



- MINnD UC8: Underground Infrastructures (mid 2017-2018)
 - Focus on tunnels, underground spaces
 - Focus on the design part (not construction and exploitation of the infrastructure)
 - 14 partners involved



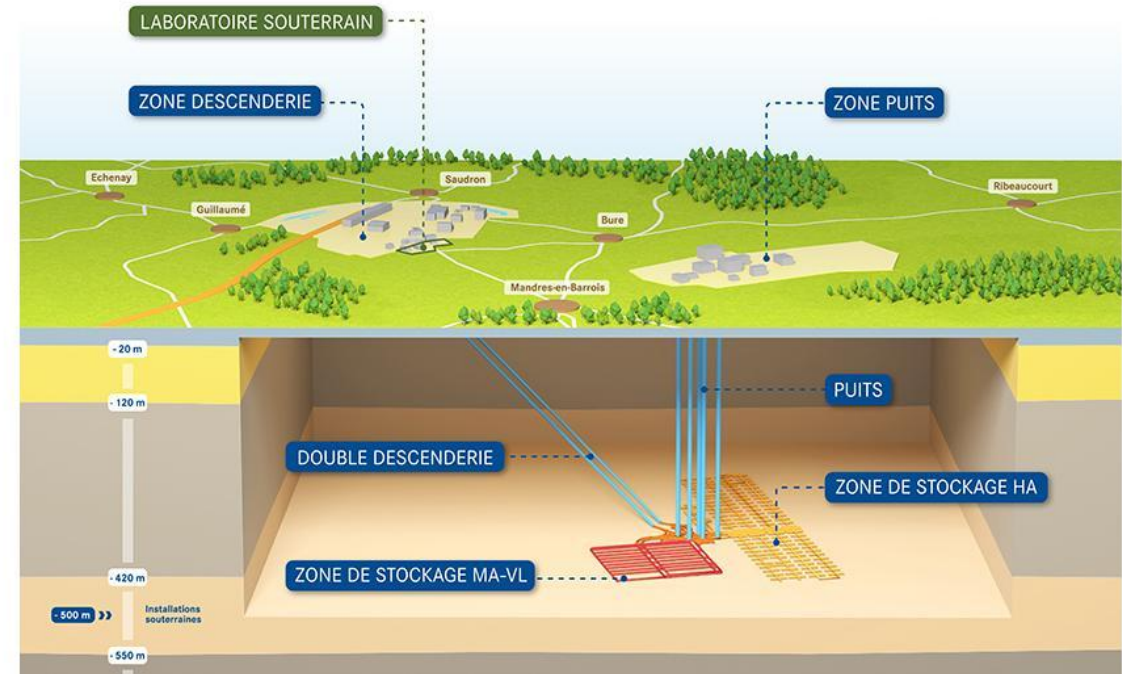
- Two teams:
 - GC: describe construction and equipments
 - GT: describe environment and interaction with construction

Context: MINnD UC8-GT



- Concrete applications / feedback

- Lyon-Turin (rail)
- Grand Paris Express (rail)
- CIGEO project (rail)
 - Long term and deep storage of radioactive waste
 - Several connected tunnels



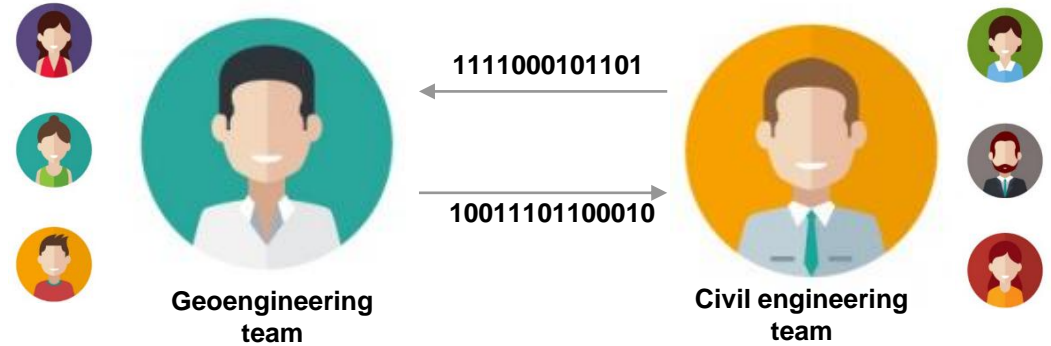
- Objective

- Sustainable organization of data to ensure smooth transition between design, construction and maintenance
- Being able to retrieve data in 100 years

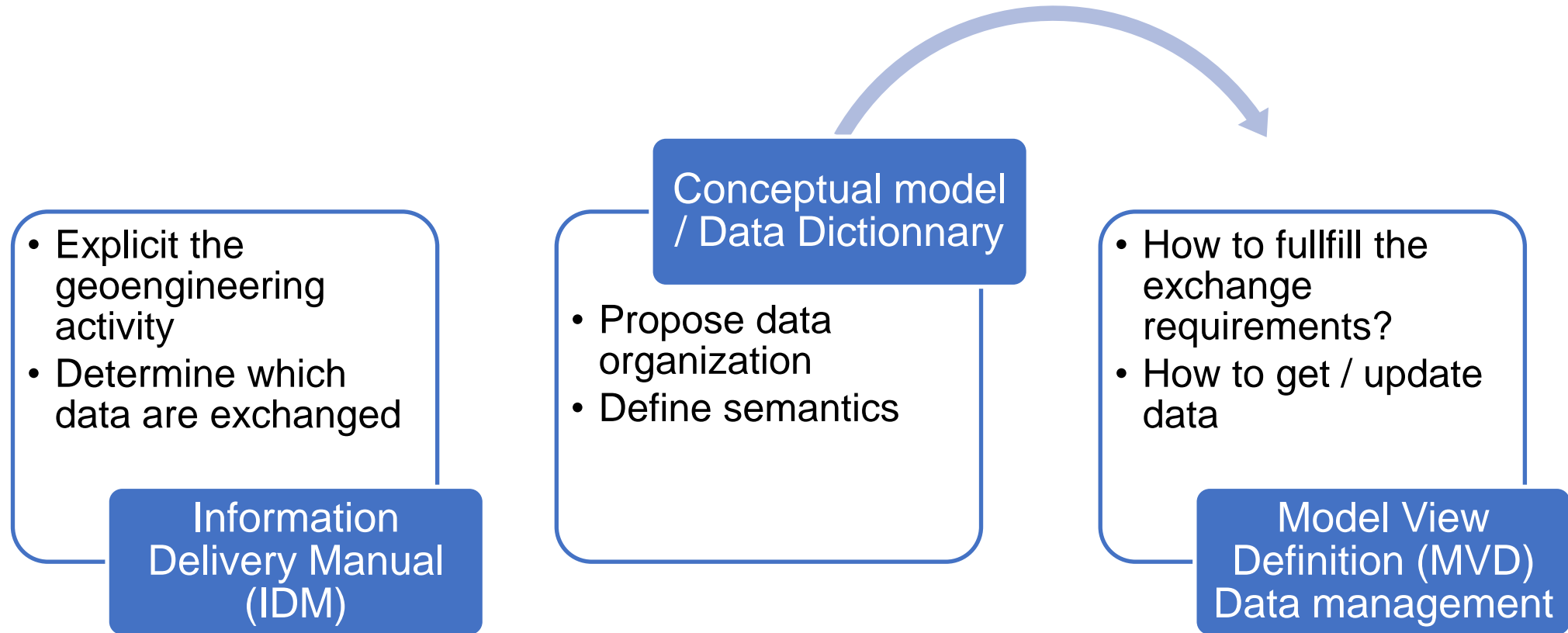
Challenges



- A very cross-frontier topic
 - Geoscience / Civil Engineering
 - GIS / BIM (+ geomodelling tools!)
 - OGC / bSI
- « Which kind of interoperability do we want? »
 - Extending IFC with geo* concept (An, 2017), (China BIM alliance, 2015)?
 - Integrating BIM data into earth models? city models including subsurface, natural + anthropic?
 - Something else?
- Think outside the (project) box
 - Data maintenance, reuse > the last «Ds» of BIM
 - From smartbuilding and infrastructures to smart cities



Tasks of the MINnD UC8-GT group



...in connection with the other group (GC)
...and in connection with the current dynamics

A definition of geoengineering activity



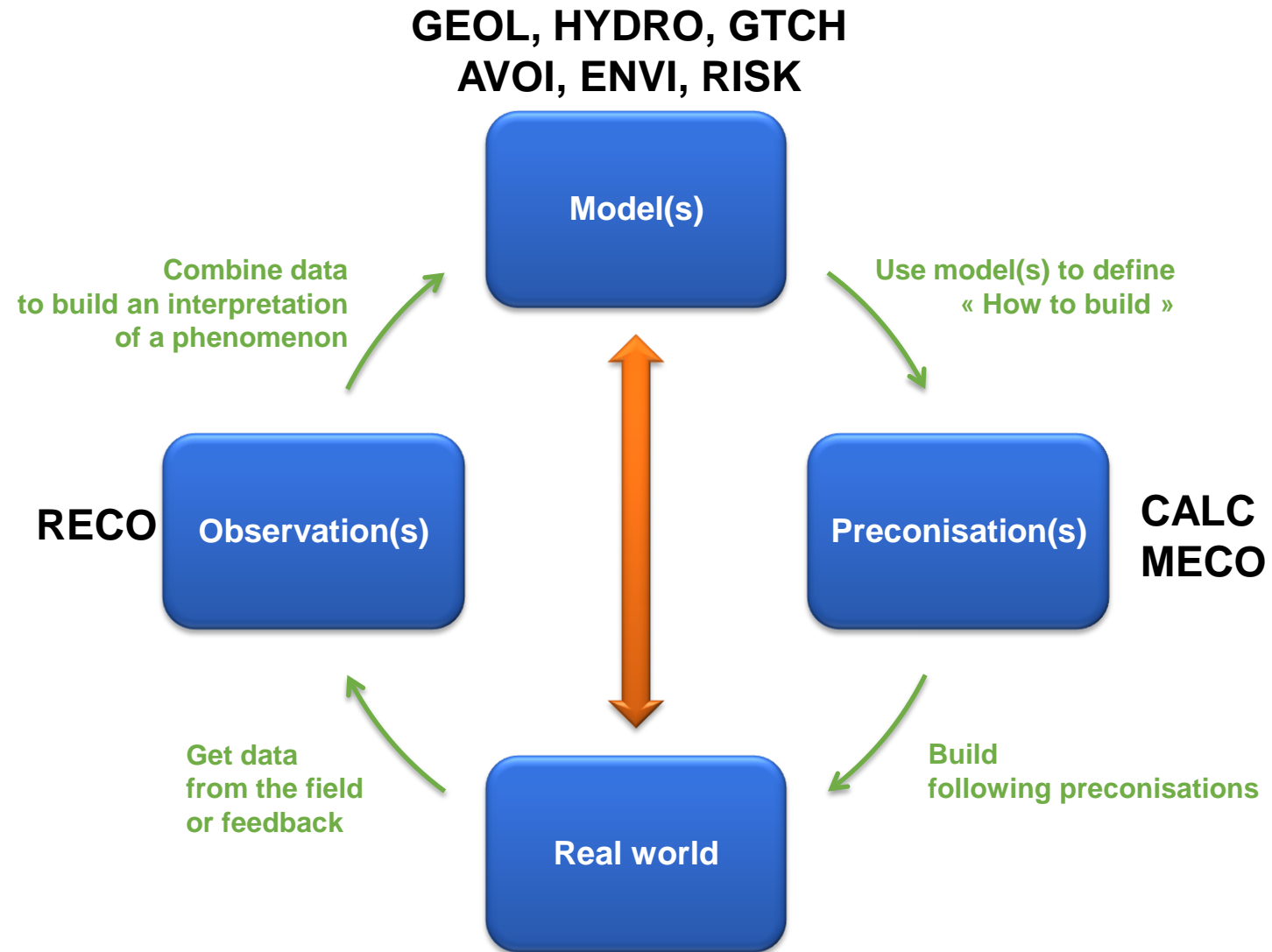
- A very mis-used term. A lot of confusion with geology, hydrogeology.
- Geoengineers aim at characterizing subsurface to help civil engineers to define how to build (if it is possible)
- Thus:
 - They propose infrastructure sizing
 - They propose construction methods
 - They assess risks of the project and impacts on:
 - Surrounding constructions and existing utility networks,
 - Environment (pollution, excavated materials to evacuate)

Comprehension of the geoengineering activity



- 9 main topics

Designation	Id
Structure sizing and definition of the geotechnical influence zone	CALC
Construction methods	MECO
Risk and uncertainty assessment	RISK
Anthropic environment impact	AVOI
Environmental impact	ENVI
Geological modeling	GEOL
Hydrogeological modeling	HYDR
Geotechnical modeling	GTCH
Observations and Measurements	RECO



Expliciting the geotechnical activity proceses



- Information Delivery Manual (IDM)

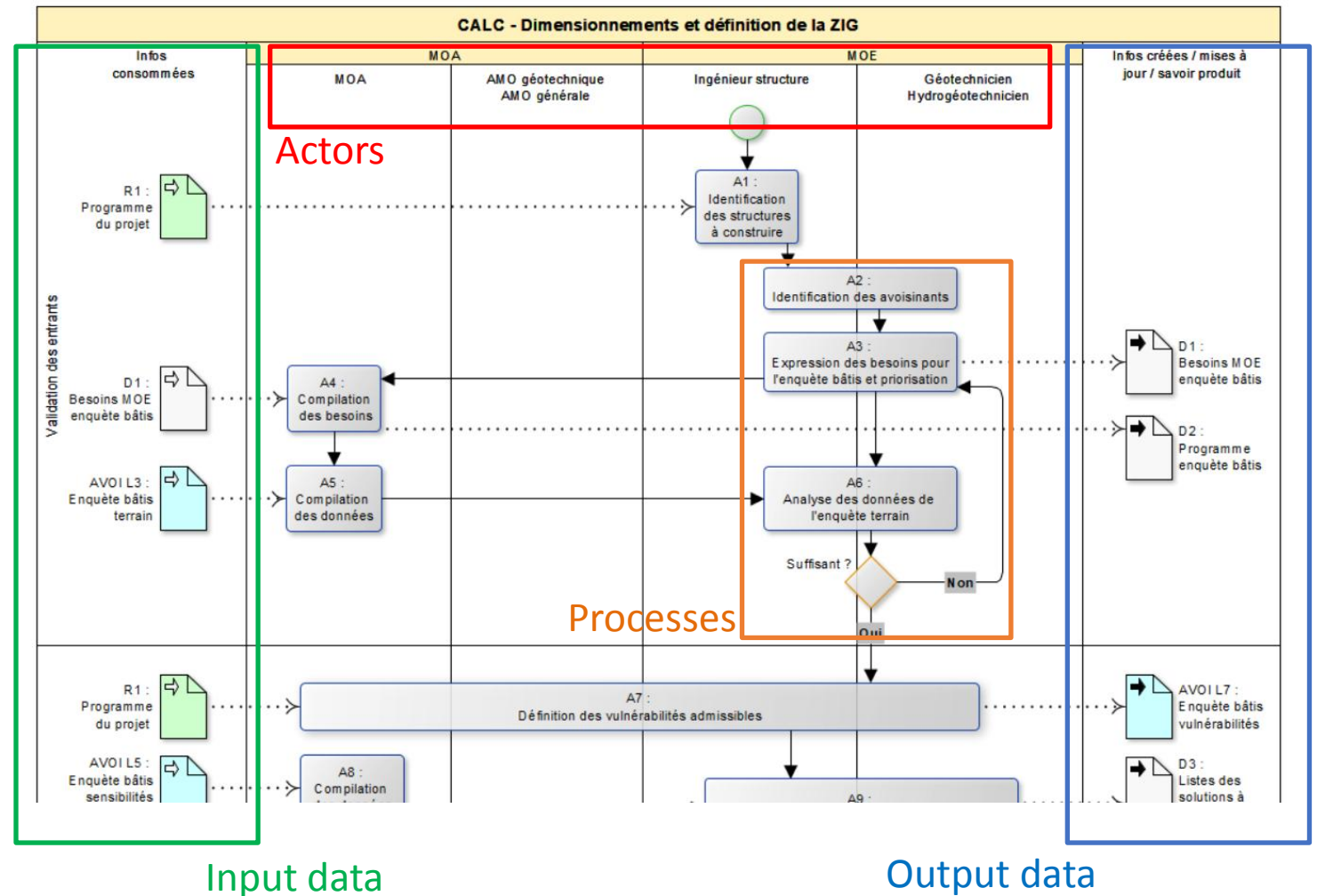
- Workflow description
- ISO 29481-1:2016
- 1 per subject

- Highlight basics

- Who does what?
- Which data?
- Which results?

- Focus on knowledge construction

- Not methods and tools



Some feedback from the geoengineering activity study



- Several kind of geoscientists involved in a project
 - Geologist, hydrogeologist, geoengineer, driller, geodata manager, ...
 - Sometimes two roles can be addressed by only one person
- Tools heterogeneity
 - Each actor may have its own kind of tool
 - Several software / editors for the same kind of tool
- Semantic heterogeneity
 - Importance of common vocabs (eg. IUGS-CGI)
- 3D geomodelling is only 5% of the projects

Proposition of mapping with OGC + INSPIRE data models



Concepts to address

Observations on the field

Measurements

Results of calculus / estimations

Lab analysis

Geology logs

Boreholes

GeologicUnit / GeologicStructure and specializations

Aquifer, fluid bodies, void, flows

Existing buildings

Existing networks

Risk zones

Survey / Campaign

Geomodel

Lyon-Turin tunnel hydrogeological modeling



- Cross-section view along the project axis
- Geological model as the base for the hydrogeological model
- Adding refinements (layer merge) to represent homogeneous area regarding hydrogeological parameters
- Additionnal data according to hydrogeological « issues » that can be faced along the axis of the project
 - Ex : aggressive water presence, hot water presence

Other propositions from the group



- Attaching geotechnical information to the alignment
 - Being able to know what « geo » issue can be faced at each step on the tunnel axis
 - Risk concerning hydrogeology: hot water, aggressive water,
 - Risk concerning geologic formation property change
 - Risk concerning geologic structure: fault presence
 - Risk concerning surrounding construction
 - Risk concerning pollution on environment
 - API to get those information from geomodels on demand?
- Define which IFC properties of an element can be impacted by each « geo » particularity
 - Eg. Expected speed of the train have an impact on the alignment geometry
 - Some geotechnical property may have direct impact on choice of some equipments

Summary



- Geoengineering is not (only) provision of « map » of the subsurface
 - It goes further with the proposition of structure sizing, construction methods and risk assessment
 - At least, a lot of O&M to deal with
- Several (if not all) needed concepts are already in a OGC / INSPIRE data model
 - Relying on them would facilitate compatibility between geoscience data for constructions and other geoscience data
 - It would also help aggregation of geodata
 - Activities of geoscience data harmonization are already on the run (BoreholeIE)
- A very cross-frontier topic
 - To be addressed by bSI and OGC together, targetting common conceptual models
 - Thursday 13th Expert panel on geotechnics for BIM organised by bSI

Thanks for your attention!



- Questions ?
- Contact:
 - m.beaufils@brgm.fr
- Useful links:
 - MINⁿD website : <http://www.minnd.fr/en/>
 - GeoScienceDWG home page : http://external.opengis.org/twiki_public/GeoScienceDWG/WebHome