FWO DMP Template

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

1. General Information	
Name applicant	Özlem Cizer (KU Leuven), Phung Quoc Tri (SCK CEN)
FWO Project Number & Title	G086422N - Multiscale analysis and modeling of carbonation-induced changes in microstructure and transport properties of blended cements
Affiliation	☒ KU Leuven ☐ Universiteit Antwerpen ☐ Universiteit Gent ☐ Universiteit Hasselt ☐ Vrije Universiteit Brussel ☒ Other: SCK CEN
2. Data description	
Will you generate/collect new data and/or make use of existing data?	☒ Generate new data ☒ Reuse existing data

Describe the origin, type and format of the data (per dataset) and its (estimated) volume

*If you **reuse** existing data, specify the **source** of these data.*
*Distinguish data **types** (the kind of content) from data **formats** (the technical format).*

New experimental and numerical data will be generated, collected and stored in 4 work packages (WP). Following tables provide a detailed overview of the data for each WP.
Cemdata 18 database will be used for thermodynamic simulations.

WP 1: Characterization of hydrated systems [PhD-KUL]
Cements and their hydrated forms in pastes will be characterized by means of a number of techniques that will generate various data sets.

Type of data	**Format of data**	**Volume of data**	**How created**
Literature survey	Word file (.docx) Adobe file (.pdf)	2 MB 100 MB	Summary of literature survey (.docx) with citations to relevant articles (.pdf)
White Portland cement, blast furnace slag, metakaolin, limestone	Physical item	-	Commercial materials to be purchased from each producer
Cement paste samples for experiments	Physical item	-	Mixing white Portland cement with blast furnace slag, metakaolin, limestone and water, and curing under controlled environments
XRF raw data	Excel files (.xlsx)	1 MB	Measurements performed on the XRF apparatus
PSD raw data	Excel files (.xlsx)	1 MBA	Measurements performed on the laser diffraction apparatus
QXRD raw data	.raw, .rd, .xy, .inp. .out	200 MB	Measurements performed on the XRD apparatus
NMR spectroscopy raw data	.dps	1GB	Measurements performed on the NMR spectrometer
SEM raw data	.tif, xlsx, .docx	1GB	Measurements performed on the SEM apparatus
MIP raw data	.smp, .xls	10 MB	Measurements performed on the MIP apparatus

Nitrogen adsorption raw data	.xls, .pdf	2MB	Measurements performed on the Nitrogen adsorption apparatus
Thermoporometry raw data	.xls	1MB	Measurements performed on the thermoporometry apparatus
NMR relaxometry raw data	Various (.dps, .app, .out, .txt, .int, . bdiscrete)	200 MB	Measurements performed on the Bruker minispec NMR analyzer
Processed data of QXRD, MIP, nitrogen adsorption, thermoporometry and NMR	Excel files (.xlsx)	10 MB	Processing and analysis of raw data

WP 2: Phase dependent carbonation and microstructural development

Synthetic C-S-H phase will be prepared from hydrated C_3S pastes. Synthetic aluminate hydrate phases of monosulphate and ettringite will be prepared using C_3A and $CaSO_4$.

Type of data	**Format of data**	**Volume of data**	**How created**
Pure C_3S, pure C_3A, CaSO**4**	Physical item	-	Commercial materials to be purchased from each producer
Paste samples for experiments	Physical item	-	Mixing C_3S, pure C_3A, CaSO**4** with water, and curing under controlled environments
TGA raw data	.dsv, .csv	100 MB	Measurements performed on the TGA apparatus
QXRD raw data	.raw, .rd, .xy, .inp. .out	200 MB	Measurements performed on the XRD apparatus
NMR spectroscopy raw data	.dps	1GB	Measurements performed on the NMR apparatus
SEM raw data	.tif, xlsx, .docx	1GB	Images from SEM saved on an external hard drive

MIP raw data	.smp, .xls	10 MB	Measurements performed on the MIP apparatus
Nitrogen adsorption raw data	.xls, .pdf	5 MB	Measurements performed on the Nitrogen adsorption apparatus
NMR relaxometry raw data	Various (.dps, .app, .out, .txt, .int, .bdiscrete)	200 MB	Measurements performed on the NMR apparatus
Processed data of TGA, QXRD, MIP, nitrogen adsorption and NMR	Excel files (.xlsx)	10 MB	Processing and analysis of raw data
Thermodynamic modelling		5 GB	Simulated data from GEMS software

WP 3: Impact of carbonation on macroscopic and transport properties

Mortar specimens at 40x40x160 mm3 will be produced and tested.

Type of data	**Format of data**	**Volume of data**	**How created**
Mortar specimens	Physical item	-	Mixing solid components with water, and curing under controlled environments
TGA raw data	.dsv, .csv	100 MB	Measurements performed on the TGA apparatus
XRD raw data	.raw, .rd, .xy, .inp. .out	200 MB	Measurements performed on the XRD apparatus
MIP raw data	.smp, .xls	10 MB	Measurements performed on the MIP apparatus
Nitrogen adsorption raw data	.xls, .pdf	5 MB	Measurements performed on the Nitrogen adsorption apparatus
NMR relaxometry raw data	Various (.dps, .app, .out, .txt, .int, .bdiscrete)	100 MB	Measurements performed on the NMR apparatus

	Processed data of TGA, XRD and NMR	Excel files (.xlsx)	10 MB	Processing and analysis of raw data
	Mechanical strength results	Excel files (.xlsx)	10 MB	Mechanical testing in compression and 3-point bending
	Diffusivity test results	Excel files (.xlsx)	10 MB	Diffusivity setup
	Permeability test results	Excel files (.xlsx)	10 MB	Permeability setup
	Corrosion rate	Excel files (.xlsx)	10 MB	Corrosion setup

WP4: Carbonation modelling

Functions, scripts, …

Type of data	**Format of data**	**Volume of data**	**How created**
HP Geochemistry codes + outputs	Executive file (.exe), outputs (.dat)	1 GB	HP Geochemistry software
COMSOL codes	Comsol file (.mph)	5 GB	COMSOL software

3. Ethical and legal issues

Will you use personal data? If so, shortly describe the kind of personal data you will use AND add the reference to your file in your host institution's privacy register. *In case your host institution does not (yet) have a privacy register, a reference is not yet required of course; please add the reference once the privacy register is in place in your host institution.*	☐ Yes ☒ No If yes: - Privacy Registry Reference: - Short description of the kind of personal data that will be used:

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, add the reference to the formal approval by the relevant ethical review committee(s).	☐ Yes ☒ No If yes: - Reference to ethical committee approval:
Does your work possibly result in research data with potential for tech transfer and valorisation? Will IP restrictions be claimed for the data you created? If so, for what data and which restrictions will be asserted?	☐ Yes ☒ No If yes, please comment:
Do existing 3rd party agreements restrict dissemination or exploitation of the data you (re)use? If so, to what data do they relate and what restrictions are in place?	☐ Yes ☒ No If yes, please comment:

4. Documentation and metadata

What documentation will be provided to enable understanding and reuse of the data collected/generated in this project?	Physical data: • Only a limited amount of test samples will be stored for over 2 years in a CO2-free desiccator in the lab since the test samples may change over time. • All samples are numbered and a central excel file lists the experiments performed and where the results of the experiments can be found, … • The successfully developed test set-ups are kept in the lab to allow future work to be done using these set-ups. This allows reproducing the results. Experimental data: • A ReadMe file (.txt) will be created in the folder of the experimental data to describe how the data was retrieved, the file format, the measurement date,… This ReadMe file contains references to other documents which can be consulted to obtain more information about experimental methodology and data processing procedures. • All experimental parameters, data processing methods, results, … are kept in .docx and .xlsx files within the different folders. The ReadMe file will guide users to the correct file where all relevant information can be found. • The structure of Excel files is explained within the separate excel files since the variable nature of the research does not allow all excel files to be constructed similarly. This can be done either on the first sheet for all following excel sheets or information can be given on every sheet individually. Numerical data: • Code scripts is provided… • COMSOL, HP Geochemistry files will be added to an already existing in-house toolbox with documentation explaining how functions can be used. • A ReadMe file describing the organization and the content of the scripts will be created. Every file is clearly documented in the code by means of in-line comments. The results of the processing are described in a separate report and in publications. • …
Will a metadata standard be used? If so, describe in detail which standard will be used. If not, state in detail which metadata will be created to make the data easy/easier to find and reuse.	☐ Yes ☒ No If yes, please specify:

5. Data storage & backup during the FWO project	
Where will the data be stored?	Raw experimental data, data analyses, scripts and functions, pictures, algorithms and reports will be stored on a personal network folder on NAS storage with a default storage quota of 100GB at KU Leuven. Alexandria - a internal secured versioning network will be used to stored data (modelling + experimental) generated at SCK CEN. The storage capacity for this project is foreseen to be 100 GB.
How will the data be backed up?	The personal network folder is automatically backed up using 'snapshot' technology and mirrored every 4 hours to a second ICTS data center.
Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	☒ Yes The KU Leuven drive provide 100 GB of storage which will be sufficient for a large part of the project. Additionally, for Business Cloud Storage provides 2 TB of storage with the option of increasing this to 5 TB of storage if necessary. SCK CEN: Alexandria network = 100 GB plus internal network drive = 1 TG. ☐ No If no, please specify:
What are the expected costs for data storage and backup during the project? How will these costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of* ***the allocated project budget*** *to be used to cover the cost incurred.*	Both the costs for KU Leuven drives and OneDrive storage are financed by the KU Leuven. The use of Alexandria network + internal network drive will be covered by SCK CEN's budget.
Data security: how will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?	Both the personal drive of the KU Leuven as well as OneDrive can only be accessed with a password defined by the researcher. The rights to access the Alexandria network + internal network drive is defined the researcher in consultant with the supervisor at SCK CEN.

6. Data preservation after the end of the FWO project FWO expects that data generated during the project are retained for a period of minimally 5 years after the end of the project, in as far as legal and contractual agreements allow.	
Which data will be retained for the expected 5 year period after the end of the project? In case only a selection of the data can/will be preserved, clearly state the reasons for this (legal or contractual restrictions, physical preservation issues, ...).	All data (except for the physical test samples) will be retained for a period of 10 years, conform the KU Leuven RDM policy. The same principle applies for SCK CEN. Samples will be stored at least 3 years after ending the project.
Where will these data be archived (= stored for the long term)?	The data will be archived on the 'Large Volume Archive Storage' of KU Leuven network drive (K-drive) which is ideal for space requirements from 100 GB to 5 TB. For SCK CEN, data is permanently stored on the network, unless a clear up action is executed with the agreement of the data owner and hierarchy?
What are the expected costs for data preservation during these 5 years? How will the costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of* ***the allocated project budget*** *to be used to cover the cost incurred.*	The cost of 'Large Volume Archive Storage' network drive (K-drive) of KU Leuven is 100,86 €/TB/year, corresponding to an expected total cost of 504.30 € for a period of 5 years. The cost for data preservation is covered by the MAT research division that allocates annual budgets to cover these costs. The cost for data storage will be covered by SCK CEN's budget?

7. Data sharing and reuse	
Are there any factors restricting or preventing the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?	☐ Yes ☒ No If yes, please specify:

Which data will be made available after the end of the project?	All data are made available to the other researchers after the end of the project.
Where/how will the data be made available for reuse?	☐ In an Open Access repository ☒ In a restricted access repository ☐ Upon request by mail ☐ Other (specify):
When will the data be made available?	After publication of the research results
Who will be able to access the data and under what conditions?	The data are made available to the other researchers of the research groups at KU Leuven and SCK CEN after the end of the project. Third parties can have access upon request. The full dataset will be made available, provided that they give appropriate credit, i.e. reference to the related publications and/or doi of the data set.
What are the expected costs for data sharing? How will these costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of* ***the allocated project budget*** *to be used to cover the cost incurred.*	There are no extra costs associated with the data sharing.

8. Responsibilities	
Who will be responsible for the data documentation & metadata?	The PIs of KU Leuven and SCK CEN, and 2 researchers to be hired on this project
Who will be responsible for data storage & back up during the project?	Both researchers will be responsible for putting the data they generated within this project. ICT Groups of KU Leuven and SCK CEN are responsible for the daily backups.
Who will be responsible for ensuring data preservation and sharing?	WP1 and WP2: Prof. Özlem Cizer WP3 and WP4: Dr. Quoc Tri PHUNG

Who bears the end responsibility for updating & implementing this DMP? *Default response: The PI bears the overall responsibility for updating & implementing this DMP*	The end responsibility for updating and implementing the DMP is with the PI (supervisor), Prof. Özlem Cizer