Coupled Corrosion-Mechanical Assessment of Cracked Critical Zones of Reinforced Concrete Members

A Data Management Plan created using DMPonline.be

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Funder: Fonds voor Wetenschappelijk Onderzoek - Research Foundation Flanders (FWO)

Template: FWO DMP (Flemish Standard DMP)

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Grant number / URL: G0A3H24N

ID: 206042

Start date: 01-02-2024

End date: 01-02-2028

Project abstract:

Much of the critical infrastructure in the western world, and elsewhere, was built in the 1970s and 80s. As a result, in the coming decade a large number of bridges, tunnels, and other important structures will enter a critical age of 50 years, typically linked to significant levels of corrosion and deterioration. Therefore, it becomes increasingly important to be able to accurately assess the safety and remaining lifetime of existing structures, taking account of the current state of corrosion and predicting its evolution over time. The corrosion of reinforced concrete structures occurs mainly due to the penetration of water, oxygen, carbonation and chlorides in the concrete, which leads to depassivation and corrosion of the steel reinforcement. These processes are accelerated by cracks in the structure. As the corrosion advances, the cracks open wider and as the cracks open wider, the corrosion advances even faster, thus quickly reducing the safety of the structure. This project aims at investigating the coupling between the corrosion and the mechanical behavior in critical regions of reinforced concrete structures. The problem will be tackled by testing at small scale, designing and implementing an innovative setup for coupled testing at large scale, and extending the capacities of a crack- and kinematics-based mechanical modeling framework to incorporate interaction with enhanced corrosion models and predict the mechanical degradation with inclusion of corrosion effects.

Last modified: 07-05-2024

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Coupled Corrosion-Mechanical Assessment of Cracked Critical Zones of Reinforced Concrete Members Application DMP

Questionnaire

Describe the datatypes (surveys, sequences, manuscripts, objects …) the research will collect and/or generate and /or (re)use. (use up to 700 characters)

A series of small- and large-scale experiments will be conducted. For the large-scale experiments, a test setup needs to be designed. This will mainly be done with drawing software such as Sketchup and Autocad. These final plans will be kept in their original software format and in PDF files.

Calculations carried out will also be saved in PDF version; if they have been made with handwriting on paper, they will be scanned and saved as PDF.

Probable software that will be used is:

- Word
- Excel
- Sketchup
- Autocad
- Diana FEA
- SCIA Engineer
- Matlab
- VecTor2
- VallenAE
- LabView

These software are always kept in their original format. Calculations and measurements will be transferred into an Excel / Matlab or scanned and saved as a PDF.

Specify in which way the following provisions are in place in order to preserve the data during and at least 5 years after the end of the research? Motivate your answer. (use up to 700 characters)

This research will be carried out by:

- Luke van Ratingen, PhD student at Hasselt University, under the supervision of Prof. Dr. Degee.
- Nadia Amin, PhD student at Liege University under the supervision of Prof. Dr. Mihaylov.
- Andras Vanquaille, PhD student at KU Leuven University under the supervision of Prof. Dr. Verstrynge.

During the project, raw and processed data will be stored on the researchers' personal computers, with save backup systems provided at each of the partner institutions.

Joint data and experimental results will be shared on a Google Drive platform that is made accessible to all project partners.

1. Designation of responsible person (If already designated, please fill in his/her name).

At UHasselt, the data will be kept on Google Drive for at least five years, and it is managed by the university. Professor Herve Degee will be responsible for maintaining these results. Research data will be saved during the research on the institutional storage solution, the Google Cloud Platform of Hasselt University. The institutional storage solution provides sufficient and secure storage, including automatic back-up and role-based access control.

2. Storage capacity/repository

Digital research data will be preserved on the institutional storage solution, the Google Cloud Platform of Hasselt University. Additionally, digital datasets supporting publications will be shared upon publication of the manuscripts in a trusted discipline-specific data repository or another recommended repository at the time of publication. A data availability statement will be added to the manuscript to describe all necessary information required to access the data and the conditions under which it must be accessed. An embargo period will be set to publish datasets with valorization potential if the Tech Transfer office of Hasselt University deems this necessary.

What's the reason why you wish to deviate from the principle of preservation of data and of the minimum preservation term of 5 years? (max. 700 characters)

not applicable

Are there issues concerning research data indicated in the ethics questionnaire of this application form? Which specific security measures do those data require? (use up to 700 characters)

No personal data will be used during this study.

Which other issues related to the data management are relevant to mention? (use up to 700 characters)

Data will be collected across three different universities. Collecting and maintaining all the necessary data will be potentially challenging. But with today's digital capabilities, this should be easily solved by using a shared drive where all obtained information can be collected en stored. For This we will use the unlimited protected Drive from UHasselt.

1. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
		Please choose from the following options: - Generate new data - Reuse existing data	*Please choose from the following options:* - Digital - Physical	*Please choose from the following options:* - Observational - Experimental - Compiled/aggregated data - Simulation data - Software - Other - NA	*Please choose from the following options:* .por, .xml, .tab, .csv,.pdf, .txt, .rtf, .dwg, .gml, … - NA	*Please choose from the following options:* <100MB <1GB <100GB <1TB <5TB <10TB <50TB >50TB - NA	
Test specimens short term - failure	The results of the tested dapped end beams up till failure	Generate new data	Digital and Physical	Experimental and observational	.xlsx .docx .pptx	1 TB	few papers with measurements
Test specimens long term with water exposure - failure	The results of the long term deformations of the dapped end beams exposed to water and the final test result up till failure	Generate new data	Digital and Physical	Experimental and observational	.xlsx .docx .pptx	1 TB	few papers with measurements
Test specimens long term saline exposure - failure	The results of the long term deformations of the dapped end beams exposed to saline and the final test result up till failure	Generate new data	Digital and Physical	Experimental and observational	.xlsx .docx .pptx	1 TB	few papers with measurements

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

Data from an online open access database established at KU Leuven are available and can be used for this project: KUL-edCCRC: Experimental Datasets for Concrete Cracking due to Reinforcement Corrosion (doi.org/10.48804/WO62A4)

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.

- No

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

2. Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).

All necessary information to understand the data files will always be listed in the data file itself. The PDF versions always allow users to view files without having to be familiar with the layout or operation of specific software systems.
Collected data from specific test setups will be processed and made available in understandable text and graphs.
Reports of simulations will be drawn up with a description of what exactly was tested and how the results should be interpreted.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type)

which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.

- No

When using a suitable name for the file and the person responsible for compiling the file, data will be easy to find. A folder system will be created in Google Drive so that files can be stored well-organized

3. Data storage & back-up during the research project

Where will the data be stored?

Research data will be saved during the research on the respective institutional storage solutions, and on the Google Cloud Platform of Hasselt University. The institutional storage solution provides sufficient and secure storage including automatic back-up and role-based access control.

How will the data be backed up?

Research data will be backed up on the respective institutional backup solutions, and on the Google Cloud Platform of Hasselt University. The institutional storage solution provides sufficient and secure storage including automatic back-up and role-based access control.

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 UHasselt drive is well-maintained and the university's data management team ensures that sufficient storage is always available.
Both at KU Leuven and ULiège, sufficient storage is available and project funding will be used for payment of backup space on the university servers.

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

The institutional storage solutions provide sufficient and secure storage including automatic back-up and role-based access control.

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

No additional costs are expected for data storage at UHasselt.
Both at KU Leuven and ULiège, sufficient storage is available and project funding will be used for payment of backup space on the university servers. Expected costs are few hundred euros.

4. Data preservation after the end of the research project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

For now, all information collected during this study will remain available for at least 5 years after the study is completed.

Where will these data be archived (stored and curated for the long-term)?

Files will be kept in the Google drive of the CERG research group for more than 5 years. Paper data will be stored in a folder in the ACB².
At KU Leuven and ULiège, institutional data storage archives are available where data can be stored longer than 5 years, under the supervision of the respective PIs.

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

No additional costs are expected for data storage at UHasselt,
at KU Leuven, a few hundred euros are expected which can be covered on other funding.

5. Data sharing and reuse

Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.

- Yes, in an Open Access repository
- Yes, in a restricted access repository (after approval, institutional access only, …)

All raw and processed data remains available for future research upon request by the project partners (institutional access only).
A selection of processed data related to the experimental work will be published in an Open Access repository.

If access is restricted, please specify who will be able to access the data and under what conditions.

N.A.

Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.

- No

Where will the data be made available? If already known, please provide a repository per dataset or data type.

Research data will be available after the research on the institutional storage platform, the Google Cloud Platform of Hasselt University. The institutional storage solution provides sufficient and secure storage and role-based access control.
The Open Access repository to be used is not yet decided upon.

When will the data be made available?

To project partners: immediately upon acquisition of the data
Open access: after publication of the related research that covers the datasets

Which data usage licenses are you going to provide? If none, please explain why.

Tentatively, open access data will be published under a CC-BY-NC-SA license.

Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.

- Yes

Not yet available

What are the expected costs for data sharing? How will these costs be covered?

No additional costs are expected for data storage.

6. Responsibilities

Who will manage data documentation and metadata during the research project?

PhD students and Promotors

Who will manage data storage and backup during the research project?

The PhD students and UHasselt ICT team

Who will manage data preservation and sharing?

PhD students and Promotors

Who will update and implement this DMP?

PhD student - Luke van Ratingen

GDPR

Have you registered personal data processing activities for this project?

- Not applicable

Coupled Corrosion-Mechanical Assessment of Cracked Critical Zones of Reinforced Concrete Members DPIA

DPIA

Have you performed a DPIA for the personal data processing activities for this project?

- Not applicable

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