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Task 10.2 Data standards and licenses

D10.1 Data Management Plan

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EXECUTIVE SUMMARY

The HYDRALAB+ project is aimed at strengthening the coherence of experimental hydraulic and hydrodynamic research undertaken across its partner organisations. Accordingly, each research activity in HYDRALAB+ will require one or more Data Management Plans (DMPs). Indeed, Horizon 2020 guidelines emphasise that "Data Management Plans (DMPs) are a key element of good data management" and a DMP sets out the life cycle of the data to be collected, processed and stored by HYDRALAB+. HYDRALAB+ is also a voluntary member of the H2020 Open Data Pilot. This requires participants to make their publications open access and their research data *Findable*, *Accessible*, *Interoperable* and *Reusable* – FAIR for short. The aims of this report are to recommend mechanisms for capturing, storing and managing DMPs for the whole of HYDRALAB+ and describe a case study exemplar of how a data management plan should be created and maintained during the lifecycle of each experiment.

There is a sufficiently large number of research activities in HYDRALAB+ to make the management of these DMPs a complex issue in itself. It is therefore sensible to introduce a mechanism for marshalling them in a manageable form. The Digital Curation Centre has built and maintains a database and user interface to facilitate the storage , editing and retrieval of DMPs across a broad range of funding body requirements including Horizon 2020: DMP Online. HYDRALAB+ research activities can make use of the Horizon 2020 DMP template, available through the DMP Online website user interface, to manage and maintain their DMPs.

The following actions are recommended for the creation and management of DMPs across the HYDRALAB+ project:

- Use DMP Online to create and manage Data Management Plans;
- Use defined common identifiers to uniquely distinguish experiments and DMPs;
- Share DMPs with leaders of other interested HYDRALAB+ work packages;
- Include in each DMP a recommended MIME type (a mechanism for specifying the format of a data set so that any intelligent application can read and make best use of it) for each discrete dataset where possible.

A database of project activities will be maintained along with a record of the status of each activity's Data Management Plan.

Also included in this report is a case study exemplar (an experiment that is being led by HR Wallingford) illustrating use of DMP Online to create and maintain a Data Management Plan adhering to the Horizon 2020 template and EC Guidelines on FAIR Data Management.

This report is D10.1 of the HYDRALAB+ project, entitled "Data Management Plan". It is one of the outputs of Work Package 10 – JRA3: Facilitating the Re-use and Exchange of Experimental Data.



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1 Introduction

"A data management plan or DMP is a formal document that outlines how you will handle your data both during your research, and after the project is completed. The goal of a data management plan is to consider the many aspects of data management, metadata generation, data preservation, and analysis before the project begins; this ensures that data are well-managed in the present, and prepared for preservation in the future." ¹

<u>HYDRALAB</u> is a network of research institutes with world-leading hydraulic and hydrodynamic experimental facilities. The HYDRALAB+ project is funded by the European Commission through the Horizon2020 programme and is aimed at strengthening the coherence of experimental hydraulic and hydrodynamic research by improving infrastructure with a focus on adaptation to climate change issues. HYDRALAB+ has three key objectives:

- to widen the use of, and access to, unique hydraulic and hydrodynamic research infrastructures in the EU through the Transnational Access (TA) programme, which offers researchers the opportunity to undertake experiments in rare facilities to which they would not normally have access;
- (ii) to improve experimental methods to enhance hydraulic and hydrodynamic research and address the future challenges of climate change adaptation, through our programme of Joint Research Activities (JRAs). The JRAs are undertaking R&D to develop and disseminate tools and techniques that will keep European laboratories at the forefront of hydraulic experimentation; and
- (iii) to network with the experimental hydraulic and hydrodynamic research community throughout Europe and share knowledge, best practice and data with the wider scientific community and other stakeholders, including industry and government agencies. Some training will also be provided to the next generation of researchers.

HYDRALAB+ is also a voluntary member of the H2020 Open Data Pilot. This requires participants to make their publications open access and their research data *Findable*, *Accessible*, *Interoperable* and *Reusable* – FAIR for short (EC, 2016). General guidelines on FAIR data management can be found in EC (2016), the H2020 online manual section on <u>Open Access</u> and <u>Data Management</u> and the H2020 Annotated Model Grant Agreement.

EC (2016) emphasizes that "Data Management Plans (DMPs) are a key element of good data management" as a DMP sets out the life cycle (see section 1.1) of the data to be collected, processed and stored by HYDRALAB+. The requirement that data be FAIR means that information on the following should be made available in the DMP:

- "the handling of research data during and after the end of the project
- what data will be collected, processed and generated
- which methodology and standards will be applied
- whether data will be shared/made open access and
- how data will be curated and preserved (including after the end of the project)" (EC, 2016).

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¹ https://en.wikipedia.org/wiki/Data_management_plan



A Data Management Plan is a living document. This first version can only be an outline that will evolve as the project progresses and should be updated when there are significant changes, such as the collection of new data, the planning of new (or different) experiments, changes in consortium policies and in time for the periodic (and final) reviews of the project.

1.1 **AIMS**

This report is D10.1 of the Hydralab+ project, entitled "Data Management Plan". It is one of the outputs of Work Package 10 – JRA3: Facilitating the Re-use and Exchange of Experimental Data. Its aim is to recommend mechanisms for capturing, storing and managing Data Management Plans for the whole of HYDRALAB+.

It makes recommendations for data collected as part of the JRAs and TA. At this stage, DMPs for each of these experiments are not fully known (for example, the second round of applications for Transnational Access have not been assessed by the User Selection Panel, and the projects have not been chosen). This document therefore sets out in general terms what should happen and makes recommendations for HYDRALAB+ experiments for creating and managing Data Management Plans.

In addition, it describes a case study exemplar of how a data management plan should be created and maintained during the lifecycle of each experiment.

1.2 Management of Data Management Plans

There are many Data Management Plan (DMP) schemas available to researchers. In other words, there are many different ways of recording useful information about experimental data. Indeed, such schemas can be created by the researcher for a specific experiment – or sometimes not at all. This variety makes the task of communicating information about data sets across contextual boundaries potentially difficult, time-consuming and costly.

However, funding bodies and other stake-holding organizations increasingly require consistent, coherent and complete data management plans for research activities. This makes communication easier and more effective and fits into the requirements for HYDRALAB+ by providing an agreed platform for communication between the three main contexts of activity (field, laboratory and computer).

As such, each research activity in HYDRALAB+ will require one or more DMPs. There is a sufficiently large number of research activities in HYDRALAB+ to make the management of the DMPs a complex issue in itself. It is therefore sensible to introduce a mechanism for marshalling these DMPs in a manageable form.

The Digital Curation Centre (DCC) is "an internationally-recognized centre of expertise in digital curation with a focus on building capability and skills for research data management. The DCC provides expert advice and practical help to research organizations wanting to store, manage, protect and share digital research data" ².

² http://www.dcc.ac.uk/about-us



The DCC has built and maintains a database and user interface to facilitate the storage, editing and retrieval of Data Management Plans across a broad range of funding body requirements including Horizon 2020. This is DMP Online.³

1.3 Data Collection/Generation Activities

Data will be collected as part of the Joint Research Activities (JRAs) and Transnational Access (TA) parts of HYDRALAB+. The purposes of these activities are somewhat different, as outlined in the sections below.

1.3.1 Joint Research Activities

Joint Research Activities (JRAs) are aimed at improving the goods and services offered by European hydraulics laboratories, so that they remain at the technological forefront of hydraulic research. The three JRAs in HYDRALAB+ are:

- REpresenting Climate change In Physical Experiments (RECIPE work package 8).
 RECIPE is developing innovative experimental techniques, methods and protocols that will overcome barriers to research progress in modelling climate change in physical experiments.
 A range of laboratory experiments will be undertaken to assist with these tasks.
- 2. Cross-disciplinary Observations of Morphodynamics and Protective structures, Linked to Ecology and eXtreme events (COMPLEX work package 9).
 COMPLEX is developing tools and protocols to (i) improve observational equipment for measuring at complex boundaries, (ii) incorporate vegetation and biologically active sediment surfaces and (iii) allow evaluation of complex hard and soft engineering solutions. A range of laboratory experiments will also be undertaken to assist with these tasks.
 Synergies between JRAs 1 and 2 will be exploited, where possible, by combining experiments from both JRAs in the test schedule.
- Facilitating the Re-use and Exchange of Experimental Data (FREE Data work package 10).
 FREE Data is developing the techniques and tools for collecting and sharing data in a FAIR way. No physical experiments are being undertaken in FREE Data.

JRA experiments are conducted by HYDRALAB+ participants in the experimental facilities of HYDRALAB+, with an emphasis on joint experiments with multiple participants, often trying different tools and techniques as part of a coordinated experimental plan. The details of the current experimental programme are given in *Table 2 JRA experiments in HYDRALAB+*, but are being developed as HYDRALAB+ develops.

1.3.2 Transnational access

Transnational Access (TA) provides opportunities for researchers to form multi-national teams and bid for access to advanced hydraulic experimental facilities to which they would not normally have access. The HYDRALAB+ TA facilities are based at the institutes: Deltares, Aalto University, CNRS-Grenoble, DHI, HR Wallingford Ltd., HSVA, Leibniz Universität Hannover, NTNU, University of Hull and Universitat Politèchnica de Catalunya.

³ https://dmponline.dcc.ac.uk/about_us



The experimental facilities being made available are designed for research across a range of disciplines, including hydraulics, geophysical hydrodynamics, morphodynamics, ecohydraulics, ice engineering and hydraulic structures.

Potential TA users form multi-national teams, choose an experimental topic, identify a suitable facility and write a proposal to undertake a set of experiments.

Each proposal is checked for technical suitability then reviewed by an independent User Selection Panel. Therefore, the purpose of the data generation is not known until the successful proposals have been selected. There will be at least two calls for new TA proposals during HYDRALAB+. The selected projects from the first call are listed in *Table 3 Transnational experiments granted by HYDRALAB+ first call for proposals*.

1.4 DMP ONLINE

HYDRALAB+ research activities can make use of the Horizon 2020 DMP template (available through the DCC DMP Online website user interface) to manage and maintain their data management plans. With such a facility already available it would appear superfluous to invest in the design and development of a functionally similar (if not identical) application specifically for HYDRALAB+.

For such a system to be useful to HYDRALAB+, it is essential that common access across research domains (field, lab, and computer), research activities (JRA, TA) and management levels is maintained.

The facility to share common information about data management is also important and benefits from a consistent data format allowing searching and aggregating across domain boundaries. In practice the exporting of DMPs to a standard consistent schema and format is a basic requirement. To that end the existing XML schema used by DMP Online for exporting DMPs will be the de facto standard for exchanging information about DMPs.

1.4.1 DMP Access

The DMP Online user interface allows for multiple users to have access to a given DMP. There are three permission levels:

- Read-only users can only read the plan.
- Editor users can contribute to the plan.
- Co-owner users can also contribute to the plan, but additionally can edit the plan details and control access to the plan.

1.4.2 DMP Development Cycle

DMP Online leads the data management plan through three main stages of development:

• Initial – this stage represents the first version of your DMP and should be submitted within the first six months of the project.

It is not required to provide detailed answers to all the questions in the *Initial* version of the DMP. The DMP is intended to be a living document in which information can be made available on a finer level of granularity through updates as the implementation of the project



progresses and when significant changes occur. DMPs should have a clear version number and include a timetable for updates

- Detailed this stage represents the main working stage of the plan throughout its lifetime
- Final review this stage represents the DMP as a completed document for review.

1.4.3 DMP Online Export Formats

The DMP Online user interface allows the user at any point in the DMP life cycle to export the DMP to one of the following formats:

- CSV
- html
- json
- pdf
- text
- xml
- docx

A number of these formats (particularly XML) will be useful for the later searching or collating of information about HYDRALAB+ data management plans and research activities generally.

1.4.4 DMP Licenses

The DMP Online user interface also allows the user to specify how the data will be licensed or released and the site provides useful guidance for this.⁴

2 FAIR DATA

One of the requirements for HYDRALAB+ experimental data is for it to be "FAIR" (findable, accessible, interoperable and re-usable). From the sources outlined in the introduction to this document we can add guidelines from DMP Online. However, a brief outline of considerations for completing a DMP section on this includes (but are not limited to):

2.1 Making data findable, including provisions for metadata

- Outline the discoverability of data (metadata provision);
- Outline the identifiability of data and refer to standard identification mechanism (e.g. do you make use of persistent and unique identifiers such as Digital Object Identifiers (DOIs)?);
- Outline naming conventions used throughout;
- Outline the approach towards search keyword selection;
- Outline the approach for clear versioning;
- Specify standards for metadata creation (if any). If there are no standards in your discipline then describe what metadata will be created and how.

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 $^{4\} http://www.dcc.ac.uk/sites/default/files/documents/publications/reports/guides/How_To_License_Research_Data.pdf$



2.2 Making data openly accessible

- Specify which data will be made openly available. If some data is kept closed then provide the rationale for doing so;
- Specify how the data will be made available;
- Specify what methods or software tools are needed to access the data. Is documentation about the software needed in order to access the data included? Is it possible to include the relevant software (e.g. in open source code)?
- Specify where the data and associated metadata, documentation and code are deposited;
- Specify how access will be provided in case there are any restrictions.

2.3 MAKING DATA INTEROPERABLE

- Assess the degree of interoperability of your data. Can it easily be used and incorporated by
 other practitioners in your discipline and other disciplines? Specify what data and metadata
 vocabularies, standards or methodologies you will follow to facilitate interoperability.
- Specify whether you will be using standard vocabulary for all data types present in your data set, to allow inter-disciplinary interoperability. If not, will you provide mapping to more commonly used ontologies which structure data and its inter-relationships?

2.4 Increase data re-use (through clarifying licenses)

The data collected in HYDRALAB+ will be licensed, so that it can be re-used. We will not specify a single license, but require that all data becomes open data (http://opendefinition.org/guide/data/) and recommend the use of licenses that conform to the open definition that is suitable for data. A list of suitable licenses can be found at http://opendefinition.org/licenses/.

Each HYDRALAB+ Data Management Plan will incorporate the specification of an embargo period. While no specific minimum or maximum time scale is prescribed, two years after the experiment is complete is suggested.

We intend that all data collected or generated will be made available under an open license. Therefore it will be usable by third parties after the embargo period, which is intended to allow those who collect and process the data to have first use of it. We do not intend to restrict the re-use of any of the data. In practice, some of the original data, such as 3-D PIV data, will consist of large files that are in a proprietorial format. In most cases, sharing of this data will come after it is processed into 2-D array time series of velocities and other quantities. The original data should be kept in case it needs to be re-analyzed.

Clear documentation of processes showing the sequence of transformations of the data from its original form to subsequent forms for storage will be produced by the experimenter; such documentation will be incorporated into the relevant Data Management Plan.

HYDRALAB+ does not have its own data quality assurance process, but relies on the quality assurance processes of individual laboratories.

⁵ http://opendefinition.org/od/2.1/en/



The length of time any specific data will remain re-usable isn't possible to determine. This will depend on the data repositories used, the quality of the meta-data that is provided and, potentially, the file format used to collect or store the data.

3 QUALITY CONTROL

It is important for the successful future sharing of data between the three domains examined in HYDRALAB+ (field, laboratory, and computer) that the Data Management Plans are themselves searchable and that queries can be performed across the broad range of experimental DMPs.

Although HYDRALAB+ does not have its own data quality assurance process, steps will be taken to ensure the Data Management Plans are quality controlled.

3.1 DMP DATABASE

A database of the JRA and TA activities will be maintained along with a record of the status of each activity's Data Management Plan. The final form of this database is yet to be determined but may be represented as a serialised XML document searchable by XPath queries or a relational database comprising the CSV or JSON exported values from DMP Online.

Each plan will be uniquely identified by the DMP Online Plan Id available in each XML export for a given plan ("<plan id='123456'>") and an identifier unique to HYDRALAB+ identifying the experiment.

Such an identifier already exists for TA experiments (see *Table 3 Transnational experiments granted by HYDRALAB+ first call for proposals*) and is specified in the column labelled "Acronym".

3.2 JRA IDENTIFIER

For JRA experiments the identifier will be arranged as follows

HYDRALAB+ H+

PARTNERCODE e.g.: HRW, DELTARES, CNRS, AALTO, etc.

WORKPACKAGE e.g.: JRA[n], TA[n] 3 digit seq # e.g.: 001, 002, 003

allocating the sequential number assignment will be the

responsibility of the WP leader

For example:

H+_HRW_JRA1_002 (second sequential experiment in Joint Research Activity 1 - RECIPE)

3.3 RESPONSIBLE INDIVIDUAL

In addition, for each experiment producing one or more DMPs a responsible individual from the relevant organisation will be appointed to ensure the DMP is created and maintained in accordance with these recommendations.



This person should have a broad overview of both the science and the data management involved in the experiment.

3.4 Maintenance

Regular querying of the DMP Online database will allow the database to be kept as up to date as possible using the Initial, Detailed and Final review status to determine the state of a given activity's DMP.

The database itself will be maintained by HRW as part of its brief as Lead Beneficiary of Work Package WP10.

4 Data formats and standards

It is important to distinguish between data "format" and data "standard".

Data "format" is a description of the organisation of a given stream of data (including files).

Data "standard" is an agreed protocol for sharing data – the "format" may or may not constitute part of the "standard". It is a fine and sometimes unclear distinction.

Data standards tend to have tightly controlled specifications (e.g. GML, WaterML2, both of which are subtypes of the XML standard).

Data formats range from third party proprietary formats (.ZIP, .PDF, XLSX) through open formats like .CSV and bespoke custom formats developed for specific purposes (output files from many bespoke numerical models for example).

There is a universe of formats and standards which may or may not be used – or required – within the HYDRALAB community and to be prescriptive about a specific format is likely to impose unnecessary restrictions and cut across well-established processes and procedures within partner organisations. We will therefore adopt a non-prescriptive approach to data standards within HYDRALAB+ unless and until other tasks (e.g. 10.2 Data standards and licenses, 10.3 Repository, 10.4 and 10.5 Data flux) make recommendations accordingly. Regarding data formats, given that the data we may be dealing with could be proprietary, bespoke, open, closed, binary, ASCII text, images, video, sound and so on, we consider looking to existing practices in this area.

The Multipurpose Internet Mail Extension (MIME) provides an extensible mechanism for specifying data formats and currently has many common data formats pre-specified (for application specific data like XLSX, to video, images and so on). The following section introduces MIME and use of this standard for specifying data formats in HYDRALAB+ is recommended for future accessibility to data via automatic means.



4.1 MIME TYPES

MIME was designed mainly for email systems:

"the content types defined by MIME standards are also of importance for the World Wide Web. Servers insert the MIME header at the beginning of any Web transmission. Clients use this content type or media type header to select an appropriate viewer application for the type of data the header indicates. Some of these viewers are built into the Web client or browser (for example, almost all browsers come with GIF and JPEG image viewers as well as the ability to handle HTML files)." ⁶

Basically, the MIME type is a mechanism for specifying the format of a data set so that any intelligent application can read and make best use of the data thereby improving the I of FAIR (interoperability). A current list of MIME types is maintained by IANA.⁷ A good description of MIME types, what they are and why they are useful in data management is given by Wikipedia⁸.

The University of Hull (UHULL) data repository also makes use of MIME types. For example, the url

https://hydra.hull.ac.uk/resources/hull:13268

provides a dataset with the MIME type

vnd.openxmlformats-officedocument.spreadsheetml.sheet

By assigning an appropriate MIME type to a data set (even if it's a custom type) the degree of interoperability is increased by providing a standard description of the data. Furthermore, it increases the possibility of identifying third party software which may be able to manipulate the data.

The relevant MIME type for HYDRALAB+ datasets will be recorded in DMP Online in the Data Summary of the DMP at the Final Review stage, section 1 in answer to the question: "Specify the types and formats of data generated/collected".

This specification will be the MIME type recommended by the experimenter for the specific dataset.

5 SUMMARY OF RECOMMENDATIONS

In summary, the following actions are recommended for the creation and management of DMPs across the HYDRALAB+ project:

- Remind HYDRALAB+ partners about the requirement to create and manage data management plans as part of any HYDRALAB+ experiment (JRA or TA). (HRW)
- Learn and use DMP Online to create and manage Data Management Plans. (All partners producing DMPs)
- Use the defined common identifiers to uniquely distinguish experiments and data management plans in HYDRALAB+. (All partners producing DMPs)

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⁶ https://en.wikipedia.org/wiki/MIME

⁷ http://www.iana.org/assignments/media-types/media-types.xhtml

⁸ https://en.wikipedia.org/wiki/Media_type



- Share DMP Online DMPs with leaders of other interested work packages (in all cases with the relevant person responsible for this deliverable). (All Experimenters)
- DMPs to include a recommended MIME type for each discrete dataset where possible. (All partners producing DMPs)
- Create and maintain a database using DMP Online identifiers to monitor the status of each DMP for each experiment. (HRW)

6 CASE STUDY

This section introduces a case study exemplar illustrating use of a DMP Online Data Management Plan by a HYDRALAB+ participant to create and maintain a data management plan adhering to the Horizon 2020 template and EC (2016) Guidelines on FAIR Data Management.

The case study title and description are given in the sections below. Following this is a summary of the Data Management Plan for this experiment.

This takes the form of a document exported from DMP Online for the relevant DMP.

6.1 EXPERIMENT TITLE

JRA 8.2 Use of Joint Probability Analysis and storm sequencing / abbreviation for wave overtopping.

This is the JRA experiment that is being led by HRW at HR Wallingford.

Its unique identifier is H+_HRW_JRA1_002 and this used to identify the relevant Data Management Plan in DMP Online.

6.2 DESCRIPTION

There follows a brief description of the nature of the experiment.

6.2.1 Introduction

The design of seawalls / breakwaters is often required to achieve very low target overtopping discharges when these structures protect vulnerable infrastructure or activities. The balance between economically viable protection and performance requirements is often difficult to achieve without good knowledge on low overtopping. The paucity of data in this space and the higher uncertainty associated with existing methods, increase the challenge. The occurrence of low number of overtopping waves has the consequence that any test results are substantially more affected by the inherent variation of random waves, therefore more uncertain.

Within the multi-institute project RECIPE under the HYDRALAB+ project, experimental studies for RECIPE Task 8.2 have generated new data on the response of seawalls, breakwaters and related coastal structures with the aim of improving future model testing. Tests by LNEC, UPC, UPORTO, and assisted by Deltares, have explored armour damage progression. Tests by HRW have explored wave overtopping with contributions of data from UPORTO and LNEC.



The physical model test results described hereafter were intended to explore these issues and provide example data on the problem. The tests were successful in obtaining low to very low overtopping discharge test data. For low / very low overtopping discharges, these test data present considerable scatter relative to the latest empirical prediction. A number of repetitions were performed for wave conditions resulting in very low overtopping discharges, which illustrated the inherent uncertainty associated with low overtopping.

The general form and procedures of hydraulic model tests of this type have been presented in previous HYDRALAB guidelines ((HYDRALAB III, 2007), and are consistent with industry guidelines i.e. the Rock Manual (CIRIA, 2007) and EurOtop (EurOtop, 2016).

6.2.2 Physical model tests

The overtopping tests measured overtopping volumes, wave-by-wave, and mean discharge for a simple impermeable smooth 1:2 slope and for a simple vertical wall. The test conditions were carefully designed to cover a wide range of overtopping, but particularly under low-discharge conditions. The 2D model tests measured wave overtopping on two different structures: a simple (smooth) 1:2 slope with two different crest levels (1m structure A1 – refer to Figure 1 and 1.2m structure A2 – refer to Figure 2) and a simple vertical wall also with two crest levels (0.9m structure B1 – refer to Figure 3 and 1.1m structure B2 – refer to Figure 4). All levels were relative to the flume floor.

No approach slope or bathymetry was used, so the depth at the structure toe was the same as at the wave paddle (refer to Figure 5). Most tests were run at water levels of 0.7m and 0.75m, and some using a water level of 0.8m, all above sea bed level. The tests measured wave-by-wave overtopping volumes, and mean discharges. The collection chutes from the test section to the measurement tanks were varied between 0.04m to 0.335m width to accommodate a wide range of discharges with three tank sizes.

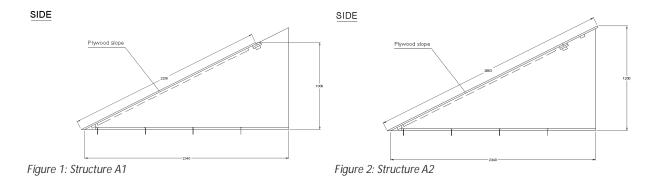






Figure 3:: Structure B1 Figure 4: Structure B2



Figure 5: Flume layout with 1:2 slope (after calibration) showing wave paddle, five wave gauges, test section and absorbing beach

The target wave conditions were Hs ≈ 0.04 - 0.185m, and also allowing for extreme testing to Hs ≈ 0.24 m. The wave periods (Tm) ranged from 1.2s to 3s. The suggested conditions gave wave steepnesses of s0m ~0.06 (storm sea), 0.035 (ocean waves), and 0.01 (swell). Tests were run for 500 waves or 1000 waves, although one test used multiple simulations with changed seed to give 10 x 1000 waves. All tests run are listed in Table 1.

Test conditions were calibrated in the flume before construction of the test section, to minimise corruption of incident waves by reflections. Calibration was an iterative process. The amplitude of the signal driving the wave generator was adjusted until the spectral significant wave height measured at the calibration point was within $\pm 5\%$ of the target significant wave height. During testing all wave conditions were recorded by wave gauges. Another wave gauge was installed in the overtopping tank and an event detector on the crest of the structure. Overtopping discharges were quantified by collecting the overtopping water by a chute into a calibrated tank and measuring the volume collected in a known time. Mean overtopping discharges were calculated by measuring the depth of water in the tank.

Mean overtopping discharges measured during testing were then compared with predictions given by the empirical formulae. Finally the number of overtopping waves, N_{ow} , and the individual overtopping volumes, V_{ow} , were determined by analysing the wave gauge inside the overtopping tank with the event detector.



Table 1 List of tests run at HR Wallingford

	Number			Test co	nditions		Structur	·e			
Lab	20161+	No	wc	T _p (s)	H _{m0} (m)	Spectral shape	A,B	1,2	Chute	Tank	File Name
HR	00101	500	20	1.76	0.14	J3.3	Α	1	1	С	HR00101-WC20No500_Sp-J3.3_StA1_Ch1_TC
HR	00102	500	20	1.76	0.14	J3.3	Α	1	1	С	HR00102-WC20No500_Sp-J3.3_St-A1_Ch1_TC
HR	00103	500	20	1.76	0.14	J3.3	Α	1	1	С	HR00103-W C20No500_Sp-J3.3_St-A1_Ch1_TC
HR	01304	500	24	3.3	0.14	J3.3	Α	1	1	С	HR01304-W C24No500_Sp-J3.3_St-A1_Ch1_TC
HR	01305	500	15	1.32	0.14	J3.3	Α	1	1	С	HR01305-W C15No500_Sp-J3.3_St-A1_Ch1_TC
HR	01406	500	05	1.32	0.14	J3.3	Α	1	1	С	HR01406-W C05No500_Sp-J3.3_St-A1_Ch1_TC
HR	01407	500	05	1.32	0.14	J3.3	Α	1	1	D	HR01407-W C05No500_Sp-J3.3_St-A1_Ch1_TD
HR	01408	500	08	1.54	0.11	J3.3	Α	1	1	С	HR01408-W C08No500_Sp-J3.3_St-A1_Ch1_TC
HR	01409	1000	06	1.32	0.08	J3.3	Α	1	1	В	HR01409-W C06No1000_Sp-J3.3_St-A1_Ch1_TB
HR	01410	1000	06	1.32	0.08	J3.3	Α	1	2	С	HR01410-W C06No1000_Sp-J3.3_St-A1_Ch2_TC
HR	01711	1000	23	2.31	0.07	J3.3	Α	1	2	С	HR01711-W C23No1000_Sp-J3.3_St-A1_Ch2_TC
HR	01712	1000	18	1.54	0.11	J3.3	Α	1	2	С	HR01712-W C18No1000_Sp-J3.3_St-A1_Ch2_TC
HR	01413	1000	16	1.32	0.08	J3.3	Α	1	2	В	HR01413-WC16No1000_Sp-J3.3_St-A1_Ch2_TB
HR	01414	1000	16	1.32	0.08	J3.3	Α	1	2	В	HR01414-W C16No1000_Sp-J3.3_St-A1_Ch2_TB
HR	01415	500	10	1.76	0.14	J3.3	Α	1	3	D	HR01415-W C10No500_Sp-J3.3_St-A1_Ch3_TD
HR	01716	500	10	1.76	0.14	J12	Α	1	3	D	HR01716-WC10No500_Sp-J12_St-A1_Ch3_TD
HR	01717	500	10	1.76	0.14	J01	Α	1	3	D	HR01717-W C10No500_Sp-J01_St-A1_Ch3_TD
HR	01818	500	10	1.76	0.14	J06	Α	1	3	D	HR01818-W C10No500_Sp-J06_St-A1_Ch3_TD
HR	01819	500	05	1.32	0.14	J3.3	Α	1	3	D	HR01819-W C05No500_Sp-J3.3_St-A1_Ch3_TD
HR	01820	500	05	1.32	0.14	J12	Α	1	3	С	HR01820-W C05No500_Sp-J12_St-A1_Ch3_TC
HR	01821	500	05	1.32	0.14	J01	Α	1	3	С	HR01821-W C05No500_Sp-J01_St-A1_Ch3_TC
HR	01822	500	05	1.32	0.14	J06	Α	1	3	С	HR01822-W C05No500_Sp-J06_St-A1_Ch3_TC
HR	01823	500	05	1.32	0.14	J06	Α	1	3	С	HR01823-W C05No500_Sp-J06_St-A1_Ch3_TC
HR	01824	500	05	1.32	0.14	J02	А	1	3	С	HR01824-W C05No500_Sp-J02_St-A1_Ch3_TC
HR	01825	500	14	3.30	0.14	J3.3	Α	1	3	С	HR01825-WC14No500_Sp-J3.3_St-A1_Ch3_TC
HR	01826	1000	13	2.31	0.07	J3.3	Α	1	2	С	HR01826-W C13No1000_Sp-J3.3_St-A1_Ch2_TC
HR	01827	1000	13	2.31	0.07	J3.3	Α	1	2	С	HR01827-WC13No1000_Sp-J3.3_St-A1_Ch2_TC



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	Number			Test co	nditions		Structur	е			
Lab	20161+	No	wc	T _p (s)	H _{m0} (m)	Spectral shape	A,B	1,2	Chute	Tank	File Name
HR	01928	1000	04	2.31	0.06	J3.3	Α	1	2	С	HR01928-W C04No1000_Sp-J3.3_St-A1_Ch2_TC
HR	01929	500	01	1.32	0.08	J3.3	Α	1	2	С	HR01929-W C01No500_Sp-J3.3_St-A1_Ch2_TC
HR	01930	500	02	1.54	0.11	J3.3	Α	1	1	D	HR01930-W C02No500_Sp-J3.3_St-A1_Ch1_TD
HR	01931	1000	03	1.76	0.04	J3.3	Α	1	2	В	HR01931-W C03No1000_Sp-J3.3_St-A1_Ch2_TB
HR	02532	500	21	1.76	0.24	J3.3	Α	2	3	С	HR02532-W C21No500_Sp-J3.3_St-A2_Ch3_TC
HR	02533	1000	17	1.54	0.19	J3.3	Α	2	1	С	HR02533-W C17No1000_Sp-J3.3_St-A2_Ch1_TC
HR	02534	1000	20	1.76	0.14	J3.3	Α	2	1	С	HR02534-W C20No1000_Sp-J3.3_St-A2_Ch1_TC
HR	02535	1000	24	3.3	0.14	J3.3	Α	2	1	С	HR02535-W C24No1000_Sp-J3.3_St-A2_Ch1_TC
HR	02536	500	22	2.31	0.20	J3.3	Α	2	1	С	HR02536-W C22No500_Sp-J3.3_St-A2_Ch1_TC
HR	02537	1000	15	1.32	0.14	J3.3	Α	2	1	С	HR02537-WC15No1000_Sp-J3.3_St-A2_Ch1_TC
HR	02538	500	07	1.54	0.19	J3.3	Α	2	1	С	HR02538-W C07No500_Sp-J3.3_St-A2_Ch1_TC
HR	02639	500	12	2.31	0.15	J3.3	Α	2	3	С	HR02639-W C12No500_Sp-J3.3_St-A2_Ch3_TC
HR	02640	500	09	1.76	0.20	J3.3	Α	2	1	С	HR02640-W C09No500_Sp-J3.3_St-A2_Ch1_TC
HR	02641	1000	05	1.32	0.14	J3.3	Α	2	1	С	HR02641-W C05No1000_Sp-J3.3_St-A2_Ch1_TC
HR	02642	1000	05	1.32	0.14	J06	Α	2	1	С	HR02642-W C05No1000_Sp-J06_St-A2_Ch1_TC
HR	02643	1000	05	1.32	0.14	J12	Α	2	1	С	HR02643-W C05No1000_Sp-J12_St-A2_Ch1_TC
HR	02644	1000	05	1.32	0.14	J01	Α	2	1	С	HR02644-W C05No1000_Sp-J01_St-A2_Ch1_TC
HR	02645	1000	05	1.32	0.14	J02	Α	2	1	С	HR02645-W C05No1000_Sp-J02_St-A2_Ch1_TC
HR	02746	1000	10	1.54	0.11	J3.3	Α	2	1	С	HR02746-W C10No1000_Sp-J3.3_St-A2_Ch1_TC
HR	02747	1000	10	1.54	0.11	J12	Α	2	1	С	HR02747-W C10No1000_Sp-J12_St-A2_Ch1_TC
HR	02748	1000	10	1.54	0.11	J06	Α	2	1	С	HR02748-W C10No1000_Sp-J06_St-A2_Ch1_TC
HR	02749	1000	10	1.54	0.11	J01	Α	2	1	С	HR02749-W C10No1000_Sp-J01_St-A2_Ch1_TC
HR	02750	1000	10	1.54	0.11	J01	Α	2	1	С	HR02750-W C10No1000_Sp-J01_St-A2_Ch1_TC
HR	02751	500	14	3.30	0.14	J3.3	Α	2	1	С	HR02751-W C14No500_Sp-J3.3_St-A2_Ch1_TC
HR	02752	500	12	2.31	0.15	J3.3	Α	2	3	С	HR02752-W C12No500_Sp-J3.3_St-A2_Ch3_TC
HR	02753	1000	08	0.11	J3.3	J3.3	Α	2	2	В	HR02753-W C08No1000_Sp-J3.3_St-A2_Ch2_TB
HR	02754	1000	18	2.12	0.11	J3.3	Α	2	2	В	HR02754-W C18No1000_Sp-J3.3_St-A2_Ch2_TB
HR	10255	1000	06	1.32	0.08	J3.3	Α	2	2	В	HR10255-W C06No1000_Sp-J3.3_St-A2_Ch2_TB
HR	10256	1000	02	1.54	0.11	J3.3	Α	2	2	В	HR10256-W C02No1000_Sp-J3.3_St-A2_Ch2_TB
HR	10257	1000	01	1.32	0.08	J3.3	А	2	2	В	HR10257-WC01No1000_Sp-J3.3_St-A2_Ch2_TB



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	Number			Test co	nditions		Structur	е			
Lab	20161+	No	wc	T _p (s)	H _{m0} (m)	Spectral shape	A,B	1,2	Chute	Tank	File Name
HR	10358	1000	25	2.12	0.08	J3.3	Α	2	2	В	HR10358-W C25No1000_Sp-J3.3_St-A2_Ch2_TB
HR	10358	1000	25v	2.12	0.11	J3.3	Α	2	2	В	HR10358-W C25vNo1000_Sp-J3.3_St-A2_Ch2_TB
HR	10359	1000	18	2.12	0.11	J3.3	Α	2	2	В	HR10359-W C18No1000_Sp-J3.3_St-A2_Ch2_TB
HR	11160	1000	14	2.12	0.11	J3.3	Α	2	1	С	HR11160-W C14No1000_Sp-J3.3_St-A2_Ch1_TC
HR	11161	1000	14	2.12	0.11	J3.3	Α	2	2	В	HR11161-W C14_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11162	1000	14	2.12	0.11	J3.3	Α	2	2	В	HR11162-W C14_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11163	1000	14	2.12	0.11	J3.3	Α	2	2	В	HR11163-W C14_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11164	1000	18	2.12	0.11	J3.3	Α	2	2	В	HR11164-W C18_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11465	1000	06	1.32	0.08	J3.3	Α	2	2	В	HR11465-W C06_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11466	1000	01	1.32	0.08	J3.3	Α	2	2	В	HR11466-W C01_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11467	1000	25	2.12	0.08	J3.3	Α	2	2	В	HR11467-W C25_No1000-Se2_Sp-J3.3_St-A2_Ch2_TB
HR	11568	1000	23	2.31	0.07	J3.3	Α	1	2	В	HR11568-W C23_No1000-Se1_Sp-J3.3_St-A1_Ch2_TB
HR	11569	1000	23	2.31	0.07	J3.3	Α	1	2	В	HR11569-W C23_No1000-Se2_Sp-J3.3_St-A1_Ch2_TB
HR	11570	1000	13	2.31	0.07	J3.3	Α	1	2	В	HR11570-W C13_No1000-Se2_Sp-J3.3_St-A1_Ch2_TB
HR	11571	1000	13	2.31	0.07	J3.4	Α	1	2	В	HR11571-WC13_No1000-Se2_Sp-J3.4_St-A1_Ch2_TB
HR	11572	1000	03	2.31	0.07	J3.5	Α	1	2	В	HR11572-W C03_No1000-Se1_Sp-J3.5_St-A1_Ch2_TB
HR	11573	1000	03	2.31	0.07	J3.6	Α	1	2	В	HR11573-W C03_No1000-Se2_Sp-J3.6_St-A1_Ch2_TB
HR	11774	10000	23	2.31	0.07	J3.3	Α	1	2	В	HR11774-W C23_No10000-Se2_Sp-J3.3_St-A1_Ch2_TB
HR	12375	500	15	1.32	0.14	J3.3	В	1	1	С	HR12375-W C15No500_Sp-J3.3_St-B1_Ch1_TC
HR	12376	500	20	2.12	0.11	J3.3	В	1	1	С	HR12376-W C20No500_Sp-J3.3_St-B1_Ch1_TC
HR	12377	500	24	3.3	0.14	J3.3	В	1	1	С	HR12377-W C24No500_Sp-J3.3_St-B1_Ch1_TC
HR	12377	500	18	2.12	0.11	J3.3	В	1	1	С	HR12377-W C18No500_Sp-J3.3_St-B1_Ch1_TC
HR	12378	500	20	1.76	0.14	J3.3	В	1	1	С	HR12378-W C20No500_Sp-J3.3_St-B1_Ch1_TC
HR	12379	1000	18	2.12	0.11	J3.3	В	1	1	С	HR12379-W C18No1000_Sp-J3.3_St-B1_Ch1_TC
HR	12380	1000	18	2.12	0.11	J3.3	В	1	1	С	HR12380-W C18No1000_Sp-J3.3_St-B1_Ch1_TC
HR	12381	1000	16	1.32	0.08	J3.3	В	1	2	В	HR12381-WC16No1000_Sp-J3.3_St-B1_Ch2_TB
HR	12382	1000	19	1.76	0.04	J3.3	В	1	2	В	HR12382-WC19No1000_Sp-J3.3_St-B1_Ch2_TB
HR	12383	1000	23	2.31	0.07	J3.3	В	1	2	В	HR12383-W C23No1000_Sp-J3.3_St-B1_Ch2_TB
HR	12484	1000	11	1.76	0.04	J3.3	В	1	2	В	HR12484-WC11No1000_Sp-J3.3_St-B1_Ch2_TB
HR	12485	1000	13	2.31	0.07	J3.3	В	1	2	В	HR12485-W C13No1000_Sp-J3.3_St-B1_Ch2_TB

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	Number			Test co	nditions		Structur	е			
Lab	20161+	No	wc	T _p (s)	H _{m0} (m)	Spectral shape	A,B	1,2	Chute	Tank	File Name
HR	12486	1000	06	1.32	0.08	J3.3	В	1	1	В	HR12486-WC06No1000_Sp-J3.3_St-B1_Ch1_TB
HR	12487	1000	06	1.32	0.08	J3.3	В	1	1	В	HR12487-W C06No1000_Sp-J3.3_St-B1_Ch1_TB
HR	12488	1000	05	1.32	0.14	J3.3	В	1	3	С	HR12488-W C05No1000_Sp-J3.3_St-B1_Ch3_TC
HR	12488	500	05	1.32	0.14	J01	В	1	3	С	HR12488-W C05No500_Sp-J01_St-B1_Ch3_TC
HR	12590	500	05	1.32	0.14	J12	В	1	3	С	HR12590-W C05No500_Sp-J12_St-B1_Ch3_TC
HR	12591	500	10	1.54	0.11	J3.3	В	1	3	С	HR12591-WC10No500_Sp-J3.3_St-B1_Ch3_TC
HR	12592	500	10	1.54	0.11	J01	В	1	3	С	HR12592-WC10No500_Sp-J01_St-B1_Ch3_TC
HR	12593	500	10	1.54	0.11	J12	В	1	3	С	HR12593-W C10No500_Sp-J12_St-B1_Ch3_TC
HR	12594	500	14	3.3	0.14	J3.3	В	1	3	С	HR12594-W C14No500_Sp-J3.3_St-B1_Ch3_TC
HR	12595	500	08	1.54	0.11	J3.3	В	1	1	С	HR12595-W C08No500_Sp-J3.3_St-B1_Ch1_TC
HR	12996	1000	15	1.32	0.14	J3.3	В	2	2	В	HR12996-W C15No1000_Sp-J3.3_St-B2_Ch2_TB
HR	12997	1000	18	2.12	0.11	J3.3	В	2	2	В	HR12997-W C18No1000_Sp-J3.3_St-B2_Ch2_TB
HR	12998	1000	18	2.12	0.11	J3.3	В	2	2	В	HR12998-W C18No1000_Sp-J3.3_St-B2_Ch2_TB
HR	12999	1000	20	1.76	0.14	J3.3	В	2	2	В	HR12998-W C20No1000_Sp-J3.3_St-B2_Ch2_TB
HR	12900	1000	24	3.30	0.14	J3.3	В	2	2	В	HR12999-W C24No1000_Sp-J3.3_St-B2_Ch2_TB
HR	12901	1000	17	1.54	0.19	J3.3	В	2	2	В	HR12901-W C17No1000_Sp-J3.3_St-B2_Ch2_TB
HR	12902	1000	22	2.31	0.20	J3.3	В	2	1	С	HR12902-W C22No1000_Sp-J3.3_St-B2_Ch1_TC
HR	12903	500	21	1.76	0.24	J3.3	В	2	1	С	HR12903-W C21No500_Sp-J3.3_St-B2_Ch1_TC
HR	13004	500	12	2.31	0.15	J3.3	В	2	1	С	HR13004-WC12No500_Sp-J3.3_St-B2_Ch1_TC
HR	13005	1000	09	1.76	0.2	J3.3	В	2	1	С	HR13005-W C09No1000_Sp-J3.3_St-B2_Ch1_TC
HR	13006	1000	12	2.31	0.15	J3.3	В	2	1	С	HR13006-WC12No1000_Sp-J3.3_St-B2_Ch1_TC
HR	13007	1000	05	1.32	0.14	J3.3	В	2	2	В	HR13007-WC05No1000_Sp-J3.3_St-B2_Ch2_TB
HR	13008	1000	05	1.32	0.14	J01	В	2	2	В	HR13008-W C05No1000_Sp-J01_St-B2_Ch2_TB
HR	13009	1000	05	1.32	0.14	J12	В	2	2	В	HR13009-W C05No1000_Sp-J12_St-B2_Ch2_TB
HR	13110	1000	08	1.54	0.11	J3.3	В	2	2	В	HR13110-W C08No1000_Sp-J3.3_St-B2_Ch2_TB
HR	13211	1000	10	1.54	0.11	J3.3	В	2	2	В	HR13211-WC10No1000_Sp-J3.3_St-B2_Ch2_TB
HR	13312	1000	10	1.54	0.11	J01	В	2	2	В	HR13312-WC10No1000_Sp-J01_St-B2_Ch2_TB
HR	20113	1000	10	1.54	0.11	J12	В	2	2	В	HR20113-W C10No1000_Sp-J12_St-B2_Ch2_TB
HR	20114	1000	14	3.3	0.14	J3.3	В	2	2	В	HR20114-W C14No1000_Sp-J3.3_St-B2_Ch2_TB
HR	20115	1000	07	1.54	0.185	J3.3	В	2	1	В	HR20115-WC07No1000_Sp-J3.3_St-B2_Ch1_TB



6.2.3 Test data output

The discharged water is collected by a chute leading to the collection tank. The event detector installed on the crest of the structure will identify that an overtopping volume will be collected in the tank at a given point in time. The mean overtopping discharge can be calculated by measuring the change of depth of water in the tank over the duration of the test. Measuring the elevation of the water level in the tank after each event has been detected will allow the calculation of individual overtopping volume. The output of the wave gauge inside the overtopping tank and the event detector on the crest of the structure are a time series of the levels measured as shown in Figure 6.

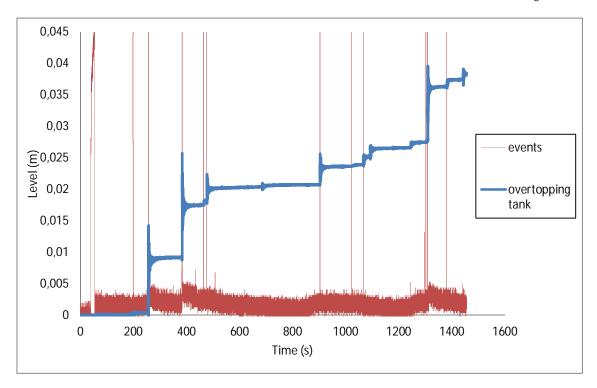


Figure 6 Example of measurement instruments output

6.3 DATA MANAGEMENT PLAN

The case study created a data management plan online using the identifier H+_HRW_JRA1_002.

The location of the data management plan on the DMP Online server is

https://dmponline.dcc.ac.uk/projects/jra-8-2-use-of-joint-probability-analysis-and-storm-sequencing-abbreviation-for-wave-overtopping

(if required please request read access to this document from HR Wallingford).



A. THE EXPORTED XML VERSION OF THE DATA MANAGEMENT PLAN IS INCLUDED IN APPENDIX A



Data Management Plan Export XML.

This format allows queries (for example, in the form of XPath) to be performed on the data.

/plan/details/detail[@title="Project Name"]

Will return the value "JRA 8.2 Use of Joint Probability Analysis and storm sequencing / abbreviation for wave overtopping - DMP title"

Building a database from the XML exports allows querying and aggregating across all data management plans for all HYDRALAB+ experiments – for example, to identify the degree of reliance on video format, or the occurrence of GML standard data sets and so on.

7 EXPERIMENTS PRODUCING DATA MANAGEMENT PLANS

This section enumerates all the experiments which currently form part of HYDRLAB+ and which are expected to produce and maintain a data management plan.

Each of these experiments, both JRA (Joint Research Activity) and TA (Transnational Activity) will be expected to create and maintain a Data Management Plan using DMP Online for the duration of the HYDRALAB+ project.

The TA experiments are already assigned an identifier. We will retrospectively assign identifiers using the schema above to the JRA experiments.

Table 2 JRA experiments in HYDRALAB+

Experiment	Туре	Location	Task	Year
Overtopping and Joint Probability Analysis for theoretical storms, mean sea level, storm surge conditions.	Small wave flume, with two armour layer of concrete cubes	UPC	8.2	1 & 2
Overtopping and damage experiments. Use of joint probability analysis and design point probabilistic method.	wave flume 50 m x1.6 m, 1:30 Froude model,1:2 rock slope, two rock layers	LNEC	8.2	1 & 2 tbc
Use of Joint Probability Analysis and storm sequencing / abbreviation for wave overtopping.	small wave flume with vertical wall and smooth 1:2 slope, without armour	HRW	8.2	1 & 2 tbc
Damage experiments in a	wide wave flume 28 m x 12	UPORTO	8.2	?



wide (3D) configuration.	m, 1:2 rock slope			
PIV measurements	Toulouse-flume channel	CNRS-T	8.2 & 9.1	1 & 2
Lightweight sediments	Flume channel	NTNU	8.3 & 8.2	1 & 2 tbc
Cohesive sediment experiments to study cliff erosion	Small wave flume	CNRS-T	8.3	2
Behaviour of light weight material when studying the morphological evolution. The use of different density fluids will be considered and tested if feasible	Small wave flume	UPC	8.3	2
Distorted scale beach model	wave flume 50 m x 1.6 m, 1:30 Froude model, 1:2 structure slope	LNEC	8.3	2 tbc
Mesocosm	Bucket	LBORO	8.4	2 tbc
Stressed Organisms	Flume Channel	LBORO/H ULL	8.4	2 & 3

Table 3 Transnational experiments granted by HYDRALAB+ first call for proposals

Acronym	Facility	Project title	Team leader
H+-Aalto-02- Wave	Aalto Ice Tank	Waves-in-ice: Wave attenuation and ice breakup	Jaak Monbaliu
H+-CNRS-##	Coriolis-II	The dynamics of bi-directional exchange flows: implication for morphodynamic change within estuaries and sea straits	Claudia Adduce
H+-CNRS-##	Coriolis-II	Topographic barriers and warm ocean currents controlling Antarctic ice shelf melting	Elin Darelius
H+-Deltares-12- DB-Heller	Delta Flume	Tsunamis due to ice masses: Different calving mechanisms and linkage to landslide-tsunamis	Valentin Heller
H+-Deltares-03-	Schelde	Large scale experiments of overtopped wave	Andreas



DF-Kortenhaus	Flume	loads on storm walls	Kortenhaus
H+-DHI-01- WaveCurrentInt	Shallow water basin	Waves plus currents INteracting at a right anGleover rough bedS (WINGS)	Carla Faraci
H+_LUH_08_GW K_DynaRev	Large Wave Flume	Dynamic Coastal Protection: Resilience of Dynamic Revetments Under SLR	Christopher Blenkinsopp
H+_LUH_17_GW K_ICODEP	Large Wave Flume	ICODEP – Impact of Changes in the fOreshore on coastal Defence Performance	Riccardo Briganti
H+_LUH_12_GW K_Hydromast	Large Wave Flume	Calibration of Bioinspired Hydromasts Under Wave Action	Jeffrey Tuhtan
H+-HSVA-01- Kvaerner	HSVA LIMB	Experimental study on wave propagation in ice and the combined action of waves and ice on structures	Hilde Benedikte Østlund
H+-HSVA-02-UCL	HSVA AETB	Sea Ice Dynamics: Role of Broken Ice in Multi - scale Deformation	Peter Robert Sammonds
H+-HULL-01-TES	TES	Testing a novel explanatory factor for the non- linearity between rainfall event magnitude - frequency and catchment erosion with HYDRALAB+	Jantiene Baartman
H+-HULL-07-TES	TES	Flow through emergent and submerged patches in wide shallow flow	Olivier Eiff
H+-NTNU-01- StratWeb	Sletvik Field Station	Stratification and food web dynamics in marine pelagic environments. Acronym: STRATWEB	Philippe Pondaven
H+-UPC-01-CIEM	CIEM	Hydrodynamics and turbulence under breaking waves	Ming Li
H+-UPC-02-CIEM	CIEM	Influence of storm sequencing and beach recovery on sediment transport and beach resilience (resist)	José Alsina
H+-HRW-02- Kleinhans	Fast Flow Facility	Splitting nature at its seams: morphodynamic stability of river and tidal bifurcations	Maarten Kleinhans



8 Data Flow Diagram

This section portrays the proposed flow of data between the various processes producing and consuming experimental data and data management plans. These include the experiment itself, the DMP Online store, HR Wallingford's local store, University of Hull data repository (as an example of a data repository) and the Samui hosted HYDRALAB+ website.

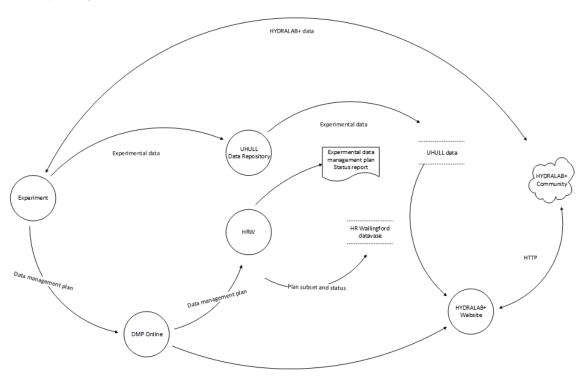


Figure 7 Data management plan data flow diagram



B. Data Management Plan Export XML

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<?xml version="1.0" encoding="UTF-8"?>
<pl><plan i d="26385">
for wave overtopping</project>
<phase id="983922637">Initial DMP </phase>
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<detail title="Project Name">JRA 8.2 Use of Joint Probability Analysis and storm sequencing /
abbreviation for wave overtopping - DMP title</detail>
<detail title="Project Identifier">H+_HRW_JRA1_002</detail>
<detail title="Grant Title">654110</detail>
<detail title="Principal Investigator / Researcher">James Sutherland</detail>
<detail title="Project Data Contact">Paul Cleverley</detail>
<detail title="Description">The design of seawalls / breakwaters is often required to achieve very
low target overtopping discharges when these structures protect vulnerable infrastructure or
activities. The balance between economically viable protection and performance requirements is often
difficult to achieve without good knowledge on low overtopping. The paucity of data in this space and
the higher uncertainty associated with existing methods, increase the challenge. The occurrence of
low number of overtopping waves has the consequence that any test results are substantially more
affected by the inherent variation of random waves, therefore more uncertain.
Within the multi-institute project RECIPE under the HYDRALAB+ project, experimental studies for
RECIPE Task 8.2 have generated new data on the response of seawalls, breakwaters and related coastal
structures with the aim of improving future model testing. Tests by LNEC, UPC, UPORTO, and assisted
by Del tares, have explored armour damage progression. Tests by HRW have explored wave overtopping
with contributions of data from UPORTO and LNEC.
The physical model test results described hereafter were intended to explore these issues and provide
example data on the problem. The tests were successful in obtaining low to very low overtopping
discharge test data. For low / very low overtopping discharges, these test data present considerable
scatter relative to the latest empirical prediction. A number of repetitions were performed for wave
conditions resulting in very low overtopping discharges, which illustrated the inherent uncertainty
associated with low overtopping. </detail>
<detail title="Funder">European Commission (Horizon 2020)</detail>
</details>
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< ul class="bullet"&gt;
< li &qt; State the purpose of the data collection/generation&lt; /li &qt;
< li&qt; Explain the relation to the objectives of the project&lt; /li&qt;
&It; Ii> Specify the types and formats of data generated/collected&It; /Ii>
< li&gt; Specify if existing data is being re-used (if any)&lt; /li&gt;
< li&gt; Specify the origin of the data&lt; /li&gt;
< li&gt; State the expected size of the data (if known)&lt; /li&gt;
< li&qt; Outline the data utility: to whom will it be useful&lt; /li&qt; &lt; /ul&qt; &lt; /p&qt;
</question_text>
<answer id="86971">
<answer_text>&lt;p&gt;Within the multi-institute cooperation project HYDRALAB+ (EC Contract No.
654110), the Joint Research Action RECIPE is intended to provide new innovative and societal-engaging
experiments, measurement techniques, methods and protocols to ensure that physical hydraulic
modelling plays its full role in solving problems of climate change mitigation and
adaptation. & It; /p>
< p&gt; To address the issues of climate change adaptation, experiments in environmental hydraulics
may therefore need to address interactions of hydraulics, sediment, biota, ice, and people for
unsteady conditions over long time periods. & amp; nbsp; This will enable a broader use of physical
modelling to identify adaptation strategies that predict, with increased confidence, the impacts of
```



code& rdquo; , where:

&It; Ii> Laboratory is & amp; Idquo; HR& rdquo; &It; /Ii>

&I t; ul &at;

climate change on coastal, estuarine and river environments. </p> <p> The main objective of Task 8.2 is to develop protocols for experiments in physical models representative of extreme events (storms, floods, etc.) or sequence of such events, since these events and their frequency are strongly impacted by climate change. & amp; nbsp; As one of the partners participating in Task 8.2 HR Wallingford developed wave flume experiments to test the use of Joint Probability Analysis and storm sequencing / abbreviation for wave overtopping.</p> <p&qt;The overtopping tests at HR Wallingford intended to measure overtopping volumes, wave-bywave, and mean discharge for a simple impermeable smooth 1:2 slope and for a simple vertical wall.& nbsp; The tests were carried out in one of HR Wallingford& rsquo; s wave flumes, which is 50m long, 1m deep and 1m wide. & amp; nbsp; & lt; /p&qt; < p> The tests were intended to generate test data leading to the development of guidance (eventually) to simplify and accelerate model testing for analysis of wave overtopping-critical coastal structures. < /p> </answer_text> </question> </answers> </section> <section id="1050937478" number="2" title="2. FAIR data"> <answers> <question id="1049147882" number="1" question_format="Text area"> <question_text>< p> 2.1 Making data findable, including provisions for metadata: < ul class="bullet"> < li> Outline the discoverability of data (metadata provision) < /li> < li> Outline the identifiability of data and refer to standard identification mechanism. Do you make use of persistent and unique identifiers such as Digital Object Identifiers? &It; li> Outline naming conventions used&It; /li> &It; Ii> Outline the approach towards search keyword&It; /Ii> &It; Ii> Outline the approach for clear versioning&It; /Ii> < li> Specify standards for metadata creation (if any). If there are no standards in your discipline describe what metadata will be created and how &It; /p> </question_text> <answer id="86972"> $< answer_text>\< p\> The \ data \ files \ were \ organized \ according \ to \ the \ standard \ procedures \ of \ HR$ Wallingford & amp; nbsp; The directory structure of the project is the HR Wallingford standard one, subdivided into: < /p> &I t: ul &at: &It; Ii> correspondence&It; /Ii> &It; Ii > data_recei ved&It; /Ii > < li> drawings< /li> &I t; Ii > mai I _archi ve&I t; /Ii > &| t; | i > mode| &| t; /| i > < li> project_management< /li> &It; li> proj ect_support&It; /li> < li> report_production< /li> < li> risk< /li> &I t; /ul > < p> All data from physical modelling tests is stored in the model sub-folder. & nbsp; This is then subdivided into different sub-sub-folders if different experiments are carried out.</p> < p> The test- and file-naming convention adopted for the experiments carried out under Task 8.2 of RECIPE & amp; ndash; Hydralab+ at HR Wallingford was: < /p> &It; Ii & gt; & amp; I dquo; Laboratory& amp; rdquo; + & amp; rdquo; Number & amp; rdquo; + & amp; rdquo; Wave Condition code& rdquo; +& rdquo; Number of waves& rdquo; + & Idquo; Spectral shape code& rdquo; + &Idquo; Structure code" + &Idquo; Chute code" + &Idquo; Tank



```
&It; Ii> Number is & amp; Idquo; Month, day, test number in day& amp; rdquo; &It; /Ii>
< li&gt; Wave condition code is WCO1 to WC25&lt; /li&gt;
< li&qt; Number of waves is No500 or No1000 or No10000&lt; /li&qt;
< li&gt; Spectral shape code is Sp-J01 to Sp-J12&lt; /li&gt;
< li&gt; Structure code is St-A1, A2, B1 or St-B2&lt; /li&gt;
&It; Ii> Chute code is Ch1 to Ch3&It; /Ii>
&It; Ii> Tank code is TA to TC&It; /Ii>
&I t; /ul >
&| t; /| i >
&It; /ul > </answer_text>
</answer>
</auestion>
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&It; ul class="bullet">
< li&gt; Specify which data will be made openly available? If some data is kept closed provide
rationale for doing so</li&gt;
&It; Ii> Specify how the data will be made available&It; /Ii>
< li&qt; Specify what methods or software tools are needed to access the data? Is documentation
about the software needed to access the data included? Is it possible to include the relevant
software (e.g. in open source code)?&It;/Ii>
< li&qt; Specify where the data and associated metadata, documentation and code are
deposited</li&gt;
&It; li & gt; Specify how access will be provided in case there are any restrictions & It; / li & gt;
&I t; /ul >
&It; /p> </question_text>
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publicly available in a secure data repository (to be identified). & amp; nbsp; Some data will have been
processed to obviate the need for propriety software used to record and process (initially) raw data
in the laboratory. & amp; nbsp; The data files publicly available should be accessible with Microsoft
Office Excel. < /p&gt; </answer_text>
</answer>
</question>
<question id="1049147886" number="3" question_format="Text area">
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< ul class="bullet"&gt;
< li&gt; Assess the interoperability of your data. Specify what data and metadata vocabularies,
standards or methodologies you will follow to facilitate interoperability. </li&gt;
< li&qt; Specify whether you will be using standard vocabulary for all data types present in your
data set, to allow inter-disciplinary interoperability? If not, will you provide mapping to more
commonly used ontologies?&It; /Ii>
&I t; /ul &at;
&It; /p> </question_text>
<answer id="86974">
<answer_text>&lt; p&gt; These data are essentially very simple responses a few of which are presented
as time series, in all instances the vocabulary and terminology are consistent with: EurOtop2, CIRIA
Rock Manual (2007), and HYDRALAB III, 2007& nbsp; Guidelines for physical model testing of
breakwaters: rubble mound breakwaters.&It;/p></answer_text>
</answer>
</question>
<question id="1049147884" number="4" question_format="Text area">
<question_text>&lt; p&qt; 2. 4 Increase data re-use (through clarifying licenses):
< ul class="bullet"&gt;
<li&gt; Specify how the data will be licenced to permit the widest reuse possible&lt; /li&gt;
&lt:li&qt; Specify when the data will be made available for re-use. If applicable, specify why and for
what period a data embargo is needed &It; /Ii>
```



```
< li&gt; Specify whether the data produced and/or used in the project is useable by third parties,
in particular after the end of the project? If the re-use of some data is restricted, explain
why&It; /Ii >
< li&gt; Describe data quality assurance processes&lt; /li&gt;
<li&gt; Specify the length of time for which the data will remain re-usable&lt;/li&gt;
&I t; /ul >
&It; /p> </question_text>
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< li&gt; Estimate the costs for making your data FAIR. Describe how you intend to cover these costs
&| t; /| i >
<li&gt;Clearly identify responsibilities for data management in your project&lt;/li&gt;
&It; li> Describe costs and potential value of long term preservation&It; /li>
&I t; /ul >
&It; /p> </question_text>
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backup copies will be maintained at HR Wallingford under the job prefix
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that you are using (if any)</question_text>
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<answer_text>&lt;p&gt;None.&lt;/p&gt;</answer_text>
</answer>
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</answers>
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</plan>
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B. References

CIRIA, CUR, CETMEF (2007). The Rock Manual. The use of rock in hydraulic engineering (2nd edition). C683, CIRIA, London.

EC (2016). Guidelines on FAIR Data Management in Horizon 2020. Version 3.0, July 2016.

EurOtop, (2016). Manual on wave overtopping of sea defences and related structures. An overtopping manual largely based on European research, but for worldwide application. Van der Meer, J.W. Allsop, N.W.H., Bruce, T., De Rouck, J., Kortenhaus, A., Pullen, T., Schüttrumpf, H., Troch, P. and Zanuttigh, B., www.overtopping-manual.com

HYDRALAB III, 2007 Guidelines for physical model testing of breakwaters: rubble mound breakwaters, HYDRALAB III Deliverable NA3.1, Version 1.3.