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BL2F

Transforming Black Liquor to Biofuel

Research and Innovation Action
H2020-LC-SC3-2019-NZE-RES-CC

D8.3 – Data management Plan, version 3.0

WP8 - Task 8.4

31 October 2022 [M30]

Lead Beneficiary: TAU
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Disclaimer

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30th September 2020	N°1	Tero Joronen	Hanna Kivisaari	1st version to be updated
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31 October 2022	N°3			Scheduled update of the DMP

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Abbreviations and acronyms

Acronym	Description
BL	Black Liquor, side stream of pulping
BL2F	Black Liquor to Fuel EU project (#884111)
CA	Consortium Agreement
DX.Y	Deliverable X.Y
DM	Data Management
DMP	Data Management Plan
DoA	Description of Action
EC	European Commission
FAIR	Data management principle (Fair, Accessible, Interoperable and Re-usable)
GA	Grant Agreement
HDO	Hydro Deoxygenation
HTL	Hydrothermal Liquefaction
IHDO	Integrated Hydrodeoxygenation
MB	Megabyte
MS	Microsoft
NDA	Non-Disclosure Agreement
PC	Project Coordinator
POPD	Protection of Personal Data
TX.Y	Task X.Y
WP	Work Package

Executive Summary

The BL2F EU Project (#884111) aims to develop technology for converting Black Liquor to bio-oil by new HTL technology. The fuel will be especially applied for aviation and shipping. The project duration is from 1 April 2020 to 30 September 2023 (42 months).

In general, a DMP documents how data is managed throughout the entire research life cycle. Furthermore, the DMP is a living document and will be updated on regular basis as the implementation of the project progresses. Data is a catch-all term for all the information and research material (e.g. digital data, physical samples, codes, software and notes) that are needed to derive the results of the project.

This document is the BL2F Data Management Plan (DMP) version 3.0.

Keywords

BL2F, Black liquor, Fuel, Bio-oil, Data Management, Data Management Plan, FAIR

1 Introduction

The BL2F EU Project (#884111) aims to develop technology for converting Black Liquor to bio-oil by new HTL technology. The fuel will be especially applied for aviation and shipping.

The BL2F project duration is from 1 April 2020 to 30 September 2023 (42 Months). The Covid pandemic has delayed the project for 6 months, and in AMENDMENT Reference No AMD-884111-3 duration has been changed to 42 months. Reporting periods are M1-M24 and M25-M42.

The Data Management Plan (DMP) documents how the data is managed throughout the entire research life cycle. Furthermore, the DMP is updated as the implementation of the project progresses. Data is a catch-all term for all the information and research material that are needed to derive the results of the BL2F project. The DMP is supported by number of BL2F documents:

- Data Management Plan (1st version submitted on 30.9.2020)
- Grant Agreement (includes the research plan)
- Consortium Agreement
- Project Handbook (D8.1)
- Protection of Personal Data (POPD) document (D9.1)
- Non-EU Country (NEC) document (D9.2)
- Risk management plan (D8.2)
- Data spreadsheets

2 Data summary

The overall objective of the BL2F project is to develop a feasible, efficient and sustainable process converting black liquor (by-product of pulp production) to drop-in biofuels for aviation and shipping. For this, the aim is summarized in the research plan as

- to develop an innovative integrated hydrothermal liquefaction (IHTL) and salt separation process,
- to develop efficient upgrading process by hydrothermal Integrated HydroDeOxygenation (IHDO) to HTL process and to a pulp mill,
- to improve the sustainability of our concept by internally produced green hydrogen from aqueous phase,
- to develop HDO catalysts with improved performance and lifetime,

- to demonstrate cost-competitive further upgrading of fuel intermediate to drop-in fuels,
- to evaluate market potential, scale-up and demonstration at pulp mills, and
- to access environmental, economic and societal impact of the whole value chain.

Data collection and generation is a requirement to be able to achieve these objectives. In general, research data management will increase research efficiency and improve research integrity. DMP documents the data, the availability and accessibility of the data, the compliance with relevant policies, and in the long run increases the value of research and the possible reuse of the data.

BL2F will generate and collect for instance raw data of experiments and assessments, interviews with industry representatives and proceedings of workshops. The data is further refined to scientific knowledge, that is mainly published as journal articles. Some of the data is applied in public dissemination, and also exploited by developing further research initiatives and business activities.

In the following subsections we consider BL2F data partner-by partner. Data summaries will contain information about:

- **Data:** Name of the data.
- **Description:** Short description of the data.
- **Size and Format:** Expected size of the data. Format of the data. If any special or uncommon software is needed to view or use the data, details will be given.
- **Origin:** Origin of data and description of how the data is generated.
- **Exploitation:** How the data will be exploited within the BL2F collaboration, and beyond.
- **Status:** ● data exists, ● data in production, ● data expected in the future

2.1 BL2F data partner-by-partner

2.1.1 Tampereen korkeakoulusäätiö sr (TAU)

Main tasks in the project: TAU leads both WP1 (HTL-oil production) and WP8 (Management). In WP1, TAU run continuous tests in a pilot HTL reactor and develop pumping and thermal energy recovery. TAU will develop a novel laser based online quality measurement method for HTL-oil. TAU will work in WP2 on salt separation, and produce numerical models for HTL process, which is used for scaling up and optimization the HTL reactor from pilot size to industrial size. In WP4, TAU will lead the Integrated process analysis (Integrated HTL system modelling, analysis, concept design and optimization) and perform the HTL system scale-up and cost analysis. TAU will investigate the data for the LCA (WP5). All partners including TAU will work on the Exploitation plan & IPR management in WP6, communicate and disseminate the project and its results (WP7). In WP8 TAU is a coordinator responsible for coordinating and managing the project.

Data	Description	Size and Format	Origin	Exploitation	Status
Report on continuous HTL process	Report on the experience gained by conducting the continuous experiments of HTL process in the reactor and experimental system, designed and fabricated at the TAU. a) Result on the brainstorming of the different reactor design b) Result on the effect of different process and operating parameters on the biocrude yield and salt separation efficiency c) Result on the optimized process and operating condition to achieve the max biocrude yield and salt separation efficiency.	<1 GB 1) .pdf file 2) Word file - .docx 3) Excel sheet - .xlsx 4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx	WP1/T1.3: * Will conduct continuous experiments of HTL process using Black Liquor * Will carry out physical and chemical analysis of the bio-crude and Hydrochar. * Following result/ analysis would be reported a) Effect of different process parameters on Bio-crude yield and quality. b) Understanding the Chemical kinetics of HTL process using BL as feedstock. c) effect of operating conditions on the salt separation. d) Reactor design changes to increase the salt separation and bio-crude yield	In BL2F: WP1-6 After BL2F: Use in publications	●
Report on continuous HTL process without salt separation	Report on the continuous HTL experiments conducting on the experimental system, designed and fabricated at the TAU without salt separation a) Result on the effect of different process and operating parameters on	<1 GB 1) .pdf file 2) Word file - .docx 3) Excel sheet - .xlsx	WP1/T1.3.1: Similar methodology and analysis, as above, will be conducted for these set of experiments. Since, in these experiments, we will not focus on salt separation, no result related to salt separation will be reported.	In BL2F: WP1-6 After BL2F: Use in publications	●

	the biocrude yield without salt separation. b) Result on the optimized process and operating condition to achieve the max biocrude yield	4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx			
Report on continuous HTL process with salt separation	Report on the continuous iHTL experiments conducting on the experimental system, designed and fabricated at the TAU with salt separation a) Result on the effect of different process and operating parameters on the biocrude yield and salt separation efficiency in the iHTL reactor. b) Result on the optimized process and operating condition to achieve the max biocrude yield and max salt separation efficiency in the iHTL reactor	<1 GB 1) .pdf file 2) Word file - .docx 3) Excel sheet - .xlsx 4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx	WP1/T1.3.2: Similar methodology and analysis, as above, will be conducted for these set of experiments with result related to salt separation will also be reported	In BL2F: WP1-6 After BL2F: Use in publications	
Report on continuous HTL process at the Pulp Mill site	Report on the continuous iHTL experiments conducted on the experimental system, designed and fabricated at TAU but at the Pulp mill site and using fresh industrial Black Liquor a) Result on the effect of different process and operating parameters on the biocrude yield and salt separation efficiency in the iHTL reactor using fresh industrial Black Liquor. b) Result on the optimized process and operating condition to achieve the max biocrude yield and max salt separation efficiency in the iHTL reactor using fresh industrial Black Liquor. c) Comparison of the result obtained from Task 1.3.2, conducted using procured Black Liquor and Task 1.3.3 using fresh Black Liquor. Procured BL could have aged and may have undergone some chemical reactions. d) Result/ Report on the Heat and energy recovery	<1 GB 1) .pdf file 2) Word file - .docx 3) Excel sheet - .xlsx 4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx	WP1/Task1.3.3: * Similar methodology and analysis, as above, will be conducted in these set of experiments also. However, these experiments will be conducted at the pulp mill site of "The Navigator Company" in Portugal. * An additional analysis will also be conducted in this task, wherein the integration of new HTL process into the existing pulp mill infrastructure will be studied.	In BL2F: WP1-6 After BL2F: Use in publications	

	after integrating iHTL experimental system with the existing Pulp Mill infrastructure.				
Report on CFD model of the reactor	Report on the CFD simulations of iHTL reactor system, designed and fabricated at TAU. a) CFD model to study the hydrodynamics of the of the novel iHTL reactor without any salt separation. b) CFD simulation with the complete HTL reaction kinetics and heat transfer. c) Multiphase CFD model to study the salt separation efficiency in the novel iHTL reactor with HTL reactions.	2-5 TB 1) .pdf file 2) Word file - .docx 3) Excel sheet - .xlsx 4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx 6) CFD model build in the Ansys FLUENT software 7) Postprocessing data from the CFD simulation in the Excel sheet, Graph and Image format.	WP1/T1.6: * CFD simulation of the iHTL reactor will be conducted to study the hydrodynamics, heat transfer and chemical kinetics inside the reactor. * Following analysis/ understanding will be reported/ developed a) How the water/ liquid flow inside the reactor b) how heat is transferred between different salt, bio-crude and hydrochar phases and reactor walls. c) How does the chemical reaction occurs inside the reactor and the concentration distribution of reactant and products.	In BL2F: WP1,2,4,5 After BL2F: Use in publications	
Report on Process model and process scale-up	Report on the process simulations of iHTL reactor system, designed and fabricated at TAU. a) Process model to design the HTL process with Heater and cooler for the optimum heat and mass duty.	2-5 TB 1) .pdf file 2) Word file - .docx 3) Excel sheet - .xlsx 4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx 6) Process model build in the AspenPlus software 7) Postprocessing data from the process simulation in the Excel sheet, Graph and Image format.	WP1/T1.6: Process simulation will be conducted to understand and develop the HTL process with optimum heat and mass transfer at minimum economics and maximum waste heat and side stream recovery.	In BL2F: WP1,2,4,5 After BL2F: Use in publications	
Report on thermodynamic model	Report on the thermodynamic modelling, conducted using FactStage software and validated	2-5 TB 1) .pdf file	WP1: Thermodynamics simulation will be conducted to understand the complex phase	In BL2F: WP1,2,4,5	

	using our batch experimental system. a) Thermodynamic model to design the efficient iHTL reactor with salt separation, b) Understanding on how different salts will behave at different temperature.	2) Word file - .docx 3) Excel sheet - .xlsx 4) Images and graphs - .jpeg 5) PowerPoint presentation - .pptx 6) Thermodynamic model build in the FactSage software 7) Postprocessing data from the Thermodynamic simulation in the Excel sheet, Graph and Image format.	equilibria using FactSage software. The result from FactSage will be compared with our results from batch experiments.	After BL2F: Use in publications	

Table 1: BL2F data at TAU

BL2F data at TAU will be stored in the Eduuni, OneDrive (service provided by the IT administration of TAU) and TAU group drive.

2.1.2 Brunel University London (BUL)

Main tasks in the project: BUL leads WP5 on the sustainability assessment of the novel integrated process for advanced biofuel production from black liquor by capitalizing the tools and methodology developed in the SMART-Plant and HYDROUSA Horizon 2020 projects. BUL will be the main responsible for the task related with the digitalization, the LCA and LCC and the Circular Economy Assessment. BUL will participate in communication, dissemination and exploitation activities (WP6&7). BUL will carry out the required administration tasks (WP8).

Data	Description	Size and Format	Origin	Exploitation	Status
BL2F mass balance	A mass balance of the BL2F system was created in excel. The description of the entire process is described in the word file.	2 MB Excel and Word	WP5/T5.1 and partly from WP4	In BL2F: WP5 (T5.1, T5.2) After BL2F: Archival	●
LCA model	A LCA model was created in Umberto LCA software.	3 MB Umberto	WP5/T5.1 and partly from WP5	In BL2F: WP5 (T5.1, T5.2) After BL2F: Archival	●
Data for LCA	Excel file containing the source of the data for the LCA model. A report in word that describes the assumptions of the model and the results of the study.	Excel	WP5/T5.1	In BL2F: WP5 (T5.1,) After BL2F: Archival	●
LCC model	A LCC model was created in Umberto LCA software.	3 MB Umberto	WP5/T5.2 and partly from WP5	In BL2F: WP5 (T5.1, T5.2) After BL2F: Archival	●
Data for LCC	Excel file containing the source of the data for the LCC model.	Excel	WP5/T5.2	In BL2F: WP5 (T5.2) After BL2F: Archival	●
Report Sustainability assessment	Report with the results of the LCA and LCC analysis.	Word	WP5/T5.1 & T5.2	In BL2F: WP5 (T5.1, T5.2) After BL2F: Archival	●
Selection of indicators	Sef indicators to assess the circularity of the BL2F system.	Excel	WP5/T5.3	In BL2F: WP5 (T5.3) After BL2F: Reuse	●
Report Circularity assessment	Report with the results of the Selection of Indicators.	Word	WP5/T5.3	In BL2F: WP5 (T5.3) After BL2F: Reuse	●

Table 2: BL2F data at BUL.

To open the data in Umberto format it is necessary to have access to Umberto LCA software, although the results will be visible also in an excel file.

BL2F data at BUL will be stored in the Shared OneDrive Brunel University.

2.1.3 Karlsruher Institut für Technologie (KIT)

Main tasks in the project: WP1 analytic of the feedstock, i.e. black liquor, task leader of batch tests in order to analyse key products and to evaluate concentration profiles of different reaction conditions for the formal kinetic evaluation. WP2 analytics on effect of salt and other additions on HTL of black liquor. KIT will provide in WP4 the formal kinetics evaluation for ASPEN calculations and process simulation overall contributing to the cost analysis. KIT will participate in communication, dissemination, and exploitation activities (WP6&7). KIT will work in the administration tasks (WP8).

Data	Description	Size and Format	Origin	Exploitation	Status
Report on feedstock characterization	Report on the selection of feedstocks and characterization of their chemical and physical properties (Task 1.1)	972 kB .pdf	WP1/T1.1: Chemical analysis	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Feedstock – EA, ICP-OES	Results of elemental analysis (EA) and inductively coupled plasma optical emission spectrometry (ICP-OES)	10 kB .xlsx	WP1/T1.1: Elemental analysis (EA) inductively coupled plasma optical emission spectrometry	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Feedstock – XRF/EDX	Results of X-ray fluorescence spectroscopy (XRF) and energy dispersive X-ray spectroscopy (EDX)	23 kB .xlsx 12.5 MB .docx, .png	WP1/T1.1: X-ray fluorescence spectroscopy (XRF) energy dispersive X-ray spectroscopy (EDX)	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Feedstock – TC/TIC/TOC	Results of total carbon, total inorganic/organic carbon analysis (TC, TIC/TOC)		WP1/T1.1: Total carbon, total inorganic/organic carbon analysis (TC, TIC/TOC)	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons	●

				with products etc. After BL2F: Use in publications	
Feedstock - Ash	Result of ash content analysis (TGA)	101 kB .pdf	WP1/T1.1: Thermogravimetric analysis(TGA)	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Feedstock – TX/AOX	Results of Total Halides and Adsorbable organic halides analysis	19 kB .xlsx	WP1/T1.1: Total Halides and Adsorbable organic halides analysis	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Feedstock – Density/Viscosity	Results of density and viscosity measurement	106 kB .pdf	WP1/T1.1: Rheometer	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Feedstock - GPC	Results of GPC analysis	11 kB .pdf 116kB .pdf	WP1/T1.1: Gel permeation chromatography (GPC)	In BL2F: WP1, WP2, (WP4 & 5) will be used as basis for calculations, comparisons with products etc. After BL2F: Use in publications	●
Concentration profiles aromatic compounds – GC-FID	Concentration profiles of detectable aromatic compounds in organic product phase	.opju (Origin)	WP1/T1.2: GC-FID	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●

Carbon mass balance HTL products	Carbon mass balance of all product phases (C in solid, org/inorg C in liquid, C in detectable compounds in gas phase)	.opju (Origin)	WP1/T1.2: GC-FID, TOC/TC, EA, ICP, GC-TCD	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Sulfur concentration profiles	Total, organic and inorganic Sulfur concentration profiles in liquid product phase	.opju (Origin)	WP2/T2.2: GC-FID, ICP, EA	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Concentration profiles aq Phase - HPLC	Concentration of small acids and alcohols in aq. Phase after extraction with HPLC	.opju (Origin)	WP1/T1.2: HPLC - organic acids	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Biocrude molecular weight - GPC	Biocrude average molecular weight & chromatograms	.opju (Origin)	WP1/T1.2: GPC	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Dimethyl sulfide concentration gas phase – GC-FID	Dimethyl sulfide (DMS) as main organo-sulfur compound in gas phase; S-content in product in DMS	.opju (Origin)	WP2/T2.2: GC-FID	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Organo-sulfur compounds concentration profils – GC-SCD	Different organo-sulfur compound concentration profiles	.opju (Origin)	WP2/T2.2: GC-SCD	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Sodium & potassium balance	Sodium and potassium balances for different HTL of BL products (Temp, time variation)	.opju (Origin)	WP2/T2.2: ICP	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Concentration profiles under influence of diff. salts	Concentration profiles of typical compounds (aromatics & non-aromatics) under the influence of different salts	.opju (Origin)	WP2/T2.2: GC-FID, HPLC	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
NMR analysis biocrude	NMR analysis of extracted biocrude (continuous experiments) compared with lignin; P-NMR due to small amounts of biocrude (batch experiments)		WP1/T1.2: NMR	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●
Kinetic model approach	Kinetic model of HTL of BL with focus on depolymerisation of lignin		WP1/	In BL2F: WP1, WP2, (WP4 & 5) After BL2F: Use in publications	●

Table 3: BL2F data at KIT.

BL2F data at KIT will be stored in the KIT-IKFT Server.

2.1.4 SINTEF As (SINTEF)

Main tasks in the project: SINTEF contributes mainly to WP1 in selection of alloys, manufacturing of the test rig speciments, evaluation of the corrosion results. In WP6, SINTEF contributes to the analysis and identification of policies and stakeholders; participates in the exploitation plan and IPR management. SINTEF will actively communicate and disseminate the project and its results (WP7). In WP8, SINTEF will perform local administration and provide feedback to the coordinator.

Data	Description	Size and Format	Origin	Exploitation	Status
HTL oil production, material selection and corrosion	Industrially viable corrosion resistant materials will be selected and tested. Lab-scale methods (C-rings, stress-jigs etc.) will be used. Testing the selected materials will further proceed at SINTEF ENERGY HTL reactor. Long term duration tests	C-rings of about 45mm OD, 3mm thickness	WP1/T1.5: C-ring manufacturing in the SINTEF Industry workshop, mixing of simulated water based black liquor at SINTEF Industry corrosion laboratory and autoclave ranking testing at SINTEF Industry corrosion lab. Final testing of the 3 winning material candidates at SINTEF ENERGY HTL reactor.	Publication after review by the project partners.	

Table 4: BL2F data at SINTEF.

BL2F data at SINTEF will be stored in the SINTEF SharePoint.

2.1.5 SINTEF Energi As (SINTEF-ER)

Main tasks in the project: SINTEF-ER leads WP4 on Techno-economic assessment. WP1: Short- and long-term continuous HTL – corrosion experiments with black liquor as feedstock. WP4: Development of the concept design and process analysis of the HTL system; scale-up of equipment design and calculations of CAPEX and OPEX for the complete integrated process including technical risk mitigation; definition and modelling of relevant business cases and evaluation of their economic viability. WP6: Contribution to the analysis and identification of policies and stakeholders; participation in the exploitation plan and IPR management. WP7: Participation to the communication and dissemination activities. WP8: Local administration and management tasks.

Data	Description	Size and Format	Origin	Exploitation	Status
Process flow Diagrams		.xlsx	WP4/T4.1:		
Operating conditions		.xlsx	WP4/T4.1:		
CFD model IHTL+salt separation		Fluent	WP4/T4.1: Created by TAU		
Thermodynamc model IHTL		FactSage	WP4/T4.1: Created by TAU		
IHTL process performance results		.docx	WP4/T4.1: Created by TAU		
HTL plant performance results		.docx	WP4/T4.1:		
HTL plant + pulp mill performance results		.docx	WP4/T4.1:		
Parametric model HTL plant		C++	WP4/T4.1 and T4.2:		
Parametric model integration HTL plant and pulp mill		C++	WP4/T4.1 and T4.2:		
HTL plant scale-up analysis results		.docx	WP4/T4.2:		
HTL plant cost analysis results		.docx	WP4/T4.2:		
Business case description		.docx	WP4/T4.2:		
Business case analysis results		.docx	WP4/T4.2:		

Table 5: BL2F data at SINTEF-ER.

BL2F data at SINTEF will be stored in SINTEF-ER server, and in Eduuni.

2.1.6 Paul Scherrer Institut (PSI)

Main tasks in the project: PSI leads WP2 on Salt recovery and side stream valorization. Study in WP 2, Task 2.1 the separation of typical salts mixture contained in Black Liquor, e.g. sodium carbonate, sulfate, sulfide or hydroxide, using PSI's existing equipment (HP-DSC and salt separation test rig). Optimization of salt separation from hydrothermally liquefied black liquor and integration of HTL to the salt separator in Task 2.2. Process optimization along with the investigation of catalysts to optimize HTL, and additives, to optimize salt separation, will be performed jointly with KIT, TUT and VTT. Development of an integrated hydrothermal HDO (IHDO): support on the selection, formulation and characterization of catalysts, along with their testing under continuous flow in WP 3, Task 3.1 & 3.2. PSI will contribute to the analytical characterization of the HTL oils (before and after HDO) and of the HTL process waters by high-resolution mass spectrometry in WP 1, Task 1.6 and WP 2 & 3. PSI will participate to the dissemination, communication and exploitation activities (WP 6&7) and the local project Management (WP 8).

Data	Description	Size and Format	Origin	Exploitation	Status
HP-DSC data and salt extraction of model salt solutions	Raw HP-DSC data, salt extraction data of on-line and off-line analyses	< 1GB .xlsx, .txt	WP2/T2.1: Data obtained by a SETERAM Sensys HP-DSC Data to be obtained on Salsan II, and off-line analyses	In BL2F: Data to be used in WP2, Task 2.1 and 2.2. After BL2F: Data to be published either during BL2F project or after.	
Salt extraction from black liquor	Salt extraction data of black liquor on-line and off-line analysis.	< 1GB .xlsx, .txt	WP2/T2.1: Data to be obtained on Salsan II, and off-line analyses	In BL2F: Data to be used in WP2, Task 2.1 and 2.2. After BL2F: Data to be published either during BL2F project or after.	

Table 6: BL2F data at PSI.

Data stored on PSI server as well as personal work laptop, data backed-up on servers. All computers are password protected. Darius Yeadon responsible for data.

2.1.7 Teknologian tutkimuskeskus VTT Oy (VTT)

Main tasks in the project: VTT is leader of WP3 Upgrading and application testing. Development of aqueous phase reforming of HTL aqueous phase (WP2) including laboratory scale testing of catalysts development in another project and concept development. Investigate and select the best gas treatment concept (WP2). Participation in salt separation development of HTL product especially related to modelling (WP1 & 2). Hydrotreament development (WP3) including laboratory and bench scale catalyst testing and catalyst development. Calculation of the effect on pulp mill chemical recovery when the IHTL plant is integrated (WP4). Participation in communication and dissemination of the BL2F project and its results (WP7). Local project management as part of WP8.

Data	Description	Size and Format	Origin	Exploitation	Status
Physisorption results	Surface area measurements of HDO catalysts		WP3/T3.1: 3Flex	In BL2F: WP3, excluding Neste. Confidential until decided otherwise.	
XRF results	Elemental composition of HDO catalysts	.xlsx	WP3/T3.1: XRF	In BL2F: WP3, excluding Neste. Confidential until decided otherwise.	
GC results of model compound tests	GC data from model compound HDO experiments	Software specific files converted to .xlsx, pdf	WP3/T3.2: GC and GC-MS measurements with nonpolar and polar columns	In BL2F: WP3 Confidential until decided otherwise.	
Analysis of products of HTL-oil HDO	Analysis of products of HDO of HTL-oils by different methods		WP3/T3.2: Several methods	In BL2F: WP3	
Catalyst characterization data	Characterisation of APR catalysts, several methods		WP2/T2.3: Several methods	In BL2F: WP2	
GC results from APR experiments	GC results from APR studies	Software specific files converted to .xlsx, pdf	WP2/T2.3: GC and GC-MS measurements with nonpolar and polar columns	In BL2F: WP2	
Hydrogen evolution data	Hydrogen evolution from APR studies	.xlsx	WP2/T2.3: Gas flow meter	In BL2F: WP2	
Kinetic modelling results	Kinetic parameters, kinetic models, concentration data from kinetic parameter estimation	.xlsx, Matlab m-files	WP3/T3.4: Computational parameter estimation based on numeric methods	In BL2F: WP3, WP4	

Table 7: BL2F data at VTT.

BL2F data at VTT will be stored in VTT OneDrive and Teams.

2.1.8 The Navigator Company SA (NVG)

Main tasks in the project: NVG will carry out the supply of black liquor from its pulp mills to project partners both for batch and continuous tests (WP1) and will grant access to its pulp mills for the installation of a portable equipment to run pilot-scale continuous test in industrially relevant environment (WP1). Black liquor supplied to project partners for work to be done in WP1 will be used by the relevant partners also for salt separation tests in WP2. The company will contribute to the techno-economic (WP4) and sustainability assessments (WP5). NVG will have a significant role in results exploitation (WP6) and will disseminate the project results (WP7) and perform the relevant management activities (WP8).

BL2F data at NVG: Samples of black liquor accompanied by a sample transfer sheet, which in some cases contained characterization data. Registry of samples sent to partners is stored at the NVG servers, in a folder specifically created for the project. This is valid for WPs 1 and 2. The data shared (either by email or through cloud sharing) with partners is also kept in our servers. This is valid for WPs 4, 5 and 6.

2.1.9 Valmet technologies Oy (VALMET)

Main tasks in the project: WP1 Valmet coordinates delivery of sufficient quantities of black liquor from NVG's pulp mill(s) to project partners. WP1 Continuous test runs; participation in corrosion study and material selection. WP4 Task 4.1 Conceptual Design; participate as industrial partner to comment it, in order to ensure feasible and optimal design. WP4 Feasibility, Business Models, and TEA; participate in task to give industrial point of view, and to study the plant delivery business. Valmet will support LGI in WP6 to develop the Market replication study and exploit the project results. WP7 Dissemination and communication; Prepare industrial presentations in conferences and participate relevant workshops. WP 8 Jukka Mäkinen as Innovation Manager will be in charge of the Innovation Management.

BL2F data at VALMET:

WP1: Documentation of BL sample transport is stored in the VALMET SharePoint. Results (.xlsx) from KIT and PSI are stored in the VALMET SharePoint.

IPR: Public patents are listed in Eduuni and unpublished in VALMET IPR system.

2.1.10 Neste Oyj (NESTE)

Main tasks in the project: Neste's R&D efforts in the BL2F project will focus on WP3 and the HTL biocrude upgrading and refining. By extensive analysis, laboratory and pilot experiments, the suitability of black liquor based HTL biocrude for upgrading and refining to marine and aviation fuels will be validated. In addition to the upgrading test experiments, Neste participates to the project by giving industrial expert support to other the project partners. Neste will also evaluate the business potential of black liquor to fuel conversion and thus create important input to process optimisation at early stage of development (WP6). Neste will actively use its own channels to broadly communicate the BL2F project. The company will perform the local project management tasks as required in WP8.

BL2F data at NESTE:

Analysis data of the samples will be stored at the management system for samples. Reports and analysis results are stored in the project directory.

2.1.11 RANIDO, s.r.o. (RANIDO)

Main tasks in the project: WP3 Ranido will be involved in development of hydrotreating catalysts, it will prepare catalyst samples for screening and upscale catalyst preparation from bench to pilot scale. Ranido will actively disseminate (WP7) and exploit the results (WP6). The local project management will be performed under WP8.

Data	Description	Size and Format	Origin	Exploitation	Status
Analysis - XRF, XRD, BET etc.	Analysis results	1 GB .pdf, .docx, .txt., .xlsx	WP3/T3.1: Machine output	In BL2F: WP3/T3.1 After BL2F: Archived at Ranido	

Table 8: BL2F data at RANIDO.

BL2F data at RANIDO will be stored at RANIDO server.

2.1.12 LGI Consulting (LGI)

Main tasks in the project: LGI plays a key role within the project, as it is leading WP6 Market Potential and Exploitation, as well as WP7 Dissemination and Communication. LGI will coordinate related actions and rely upon the discussions with the consortium and the Innovation Manager at Valmet. LGI is also participating in Task 4.3.1 on Business models. LGI will perform local administration tasks in WP8.

Data	Description	Size and Format	Origin	Exploitation	Status
Policy mapping & stakeholder assessment	Deliverable	.pdf, .docx	WP6	website, linkedin, twitter	●
Database of policies			WP6	In BL2F: D6.1.	●
Interviews regarding the delieverable D6.2		word document & video	WP6	In BL2F D6.2. Video will be deleted when the deliverable is accepted.	●
D6.2 Demand scenarios for biofuels in 2040	Deliverable	.pdf, .docx	WP6		●
IP Repository		Excel sharepoint		In BL2F allows to see the key exploitable results.	●
Project Website	Website	Wordpress	WP7	Key tool for project communication and dissemination. Online for at least 6 months after the end of the project.	●
SendinBlue email list	Mailing list for BL2F newsletter	SendinBlue	WP7: Subscriptions to the newsletter from different online sources	During BL2F list will be used to send newsletters.	●

Table 9: BL2F data at LGI.

BL2F data at LGI will be stored at LGI server, Eduuni, BL2F website and LGI Teams.

2.2 BL2F data storages

2.2.1 Eduuni

Materials related to day-to-day project management are in Eduuni-wiki[1], which is an e-work and collaboration service hosted at CSC – IT Center for Science Ltd. in Finland and implemented with Atlassian Confluence 7.13 product.

Each wiki site, called Space, has a unique URL and permissions. In BL2F access to the Eduuni-wiki is granted and controlled by the project coordinator and the project manager. Everyone must use two-factor authentication to sign into Eduuni account, and to use strong password.

In BL2F Eduuni is used to share information about project administration, meetings, official documents, work package and deliverable information, dissemination, exploitation and project templates.

Suggestion: Create a new page (or pages to WPs) to Eduuni-wiki with list(s) of project results. The log of results could contain information such as: date, name, short description, contact person(s), location/link to details/data, and intended dissemination level.

Eduuni is not used to store personal data or large files. The terms of use state *that if the content you store in the Services contains personal information or other confidential information, you are responsible for ensuring that the data is processed with sufficient security*. Also storing large amounts of data to Eduuni could become expensive.

User or the owner of the Eduuni-wiki Space can restore material from the page history or for from bin. Eduuni is backed up each working day by the service provider. The backups are stored for 89 days and can be used to retrieve the Eduuni-wiki Space or parts of it (a billable service). Request must be made by the admin or a named contact person.

2.2.2 TUNI Groups (TG-BL2F-DM)

TUNI Groups is a group work service provided and recommended by the Tampere University. The service is also suitable for processing basic personal data[2], and some confidential personal data (such as personal identity number or data relating to a minor) when the data is separately encrypted. TUNI Groups is a collection of Office 365 applications, of which SharePoint forms the basis of common data storage for BL2F.

- Group owner, the project coordinator, manages the Group settings and members.

[1] https://info.eduuni.fi/en/services/wiki/
[2] https://content.tuni.fi/sites/default/files/proxy/public/2020-11/henkilotietokategoriat-11.6.2018_0-1-eng.pdf

- The materials and contents of a private group are only available to Group members added or accepted by the Group owner.
- Access to data is ensured with multifactor authentication and monitored with a user log (see multifactor authentication).
- Members can create, edit and delete the contents of the Group but cannot control the Group settings or members.
- The service and data are in EEA.
- Can be used with computer software, browser and mobile applications
- Does not incur any costs (included in the TUNI user rights)
- The life cycle of the Group is one year, which can be extended 1 year at a time.

TG-BL2F-DM is used to store BL2F data, to share data securely between partners, WPs and Tasks, and to record descriptive metadata.

Data in the common data storage is organised by partners. A schematic folder structure is presented in Figure 1. Alongside to data folders, each partner should have a README.txt file describing the folder structure and what files are contained within the folders. Each partner has also data spreadsheet (datalog) to record the metadata.

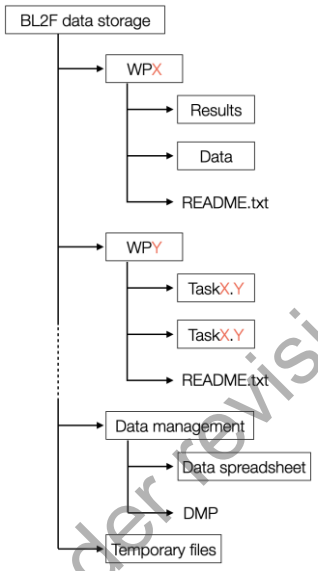

Figure 1: BL2F common data storage file structure.

2.3 BL2F data guidelines

All the BL2F data must comply with following requirements:

- The data is saved in the most relevant format.
- The data is saved in the highest possible quality.
- The data must not change without revisioning.

- Any changes in the data must be clarified, e.g. by keeping a log where the changes for each respective file is documented, version by version.
- Data documentation explains how data were created or digitized, how the data should be interpreted, its structure, and how the data has been modified. This information can also be called data-level documentation or even metadata as it is information about data.
- In all conversions, maintaining the original information content of the data should be ensured.
- The data must be accompanied with metadata.
- The data must follow the common naming convention: BL2F_partner_WPX_classification _description_date_revY.xxxx
    - partner = the acronym of the partner (i.e. creator of the data)
    - X = the WP number
    - classification = the classification of data: process, business or environment
    - description =a descriptive name
    - date = the date in the format YYYYMMDD
    - Y = the revision number
    - xxxx = the file format
- Data must be in English and in SI units
- Every data must contain a valid contact person, who is responsible for the data in question.

3 FAIR Data

3.1 Internally in the BL2F collaboration

Findable: BL2F members are committed to good data management in their daily work. Data relevant for other partners, WPs or Tasks is made available in the common data storage (TG-BL2F-DM). The data is in line with the data requirements discussed in section 2.3.

Suggestion: A log of results is kept in Eduuni to enhance the findability of results and data.

Accessible: The data is made available in the common data storage for the BL2F collaboration. The log of results is kept in Eduuni, and data is described in the data spreadsheet in the common data storage to enhance the accessibility of data.

Interoperable: The data must be accompanied with rich metadata.

Re-usable: Data exchange between partners, WPs and Tasks is requirement to achieve the scientific goals of the project. The partners are committed to share relevant data and metadata to project partners at the highest possible quality to allow the data re-use.

Data ownership is identified in the GA and CA and will follow the sector's guidelines. Owners of the data will be able to decide on the openness and usage policies for their own data.

3.2 Externally

In principle all the data collected in BL2F is confidential due to the nature of the project. However, BL2F is committed to follow the H2020 Program Guidelines on FAIR Data: data should be *as open as possible, as closed as necessary*. It is advised to publish the descriptive metadata, if the data itself cannot be opened.

Findable: The data that has long-term scientific value will be made available through trusted repositories such as Zenodo[3] or IDA[4] to support the findability of the data. Data repositories provide persistent identifiers to promote data citation and make data findable through search engines. Keywords and descriptions are added into repository metadata to improve the findability and reusability of the data.

IDA is a service for safe research data storage organized by the Ministry of Education and Culture of Finland. The service is offered free of charge to Finnish universities such as TAU. IDA is part of the Fairdata services[5]. IDA enables saving, organizing and sharing data within the project group and storing the data in an immutable state. Before the data stored in IDA can be made openly accessible, descriptive information (metadata) is added to the data with the research dataset description tool Qvain[6]. The research dataset published with Qvain gets a unique and persistent identifier (DOI) and a landing page in Etsin.[7] This makes the dataset findable for others and enables re-use of the data and creating a scientific reference. The files linked to the published dataset can be set openly available. It's also possible to publish only the metadata of the dataset, if the data itself cannot be opened.

Zenodo is a service built and operated by CERN and OpenAIRE. Every upload is assigned a unique and persisted identifier (DOI), to make them citable and trackable. The published data are described with rich metadata. Zenodo allows to update

[3] https://zenodo.org/
[4] https://www.fairdata.fi/en/ida/
[5] https://www.fairdata.fi/en/
[6] https://qvain.fairdata.fi/
[7] https://etsin.fairdata.fi/

dataset easily with versioning feature. Zenodo allows to publish data also in restricted access mode.

Accessible: The published data in BL2F will be carefully selected to protect confidentiality, privacy, trade secrets, commercial exploitation and intellectual property rights.

To enhance accessibility, data and metadata that are opened will be deposited to trusted repository that provide persistent identifiers and will be assigned open licenses such as CC-BY or CC0. Data and metadata will be understandable to both humans and machines.

Data will be stored in a (folder) structure that is as self-explanatory as possible. The file names will also be adapted in such a way that those interested can navigate the archived data package as well as possible. The data is accompanied with rich metadata that also describes what the data is about and what it should be used for.

Suggestion: List the data you are planning to make available in Table 10 and data with restricted access in Table 11. If the data needs, for example, special software to open the files, please give details. Specify how access will be provided in case there are any restrictions. Briefly describe where data will be made available, and for how long.

If the project does not collect or produce any data fully or partially suitable for reuse, justify why the data cannot be made available even partially.

Data	Repository	Format	Licence	Embargo

Table 10: Data to be made available to external parties.

Data	Why restricted	Format

Table 11: Data that will need to have restricted access

The project deliverables – except D3.1, D3.4, D6.3, D6.5, D8.2, D9.1, D9.2 and D9.3, which contain especially business sensitive material – will be openly available in a PDF format both on the project website[8] and the EU portal[9].

Interoperable: Data is produced according to the data requirements discussed in section 2.3 in a non-proprietary common file types. Data must be accompanied with rich metadata. Metadata is recorded according to the metadata standard of the chosen repository.

Suggestion: describe metadata standards, README files or other documentation will you use to help others understand and use your data, when information available.

Re-usable: The data that has long-term scientific value will be made available through repositories such as Zenodo[10] or IDA[11] to support the re-usability of the data. Data have clear usage licences and are accompanied with descriptive metadata and documentation about file naming conventions, folder structure, definitions of variables and units of measurement, and explanation about the methodology and provenance.

Suggestion: Assign CC-BY or CC0 licence or similar to your data and metadata to enable data re-use. Define how long the data is available.

For data management and protection, the project's research material and data will be stored following the partner organisations' guidelines to facilitate reuse of research data in line with the Open Science Policy and Grant Agreement rules. Owners of the data will be able to decide on the openness and usage policies for their own data. Data ownership will be identified in the Grant Agreement and will follow the sector's guidelines.

The released project deliverables are openly available from the BL2F website and the EU portal. BL2F is committed to provide deliverables for at least 3 years after the project on the website. The deliverables can be used freely by any interested party.

Suggestion: Assign CC-BY or CC0 licence or like to enable re-use.

4 Allocation of resources

Due to the nature of the BL2F project, both WPs and partners are responsible in implementing the data management in BL2F. The project coordinator leads the work by establishing the data management principles.

[8] https://www.bl2f.eu
[9] https://cordis.europa.eu/project/id/884111
[10] https://zenodo.org/
[11] https://www.fairdata.fi/en/ida/

4.1 Management responsibilities

WP leaders: WP leaders are responsible for data collection and processing in the work package. WP leaders are also responsible for data management within the WP and sharing the data to other WPs and/or Tasks. Time allocation 1h/month.

Representatives from partner institutes: Management of BL2F data is shared amongst the project partners, each partner is responsible for managing their own data responsibly and according to BL2F and FAIR principles.

After the BL2F project has ended, the project partners are responsible for their BL2F data. Depending on the data it will be either destroyed or archived, and if the data permits opened to external users.

Time allocation 1h/month.

The Project Coordinator: The project coordinator leads the work in the data management during the research project life cycle and ensures that the DMP is updated as the project progresses. The Project Coordinator manages members and settings both in the Eduuni-wiki and in the TUNI Group. Time allocation 1h/month.

The DMP is updated whenever significant changes arise, such as

- New data
- Changes in the consortium policies
- Changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving).
- At least in time with the periodic evaluation and for the final review of the project.
- Next update of the DMP is scheduled to 30/04/2023.

The Project Manager: Manage members in the Eduuni-wiki.

Project members: Every project member is responsible for managing their data. This includes for example data capture, metadata production, documentation, data quality, storage and backup, data archiving, data sharing and data destruction. Time allocation 1h/month.

4.2 Cost of making data FAIR

The data management is part of the WP8 (Task 8.4), and lead by TAU. The project budget includes 8 PMs in total for data management, 2.5 PMs are reserved for TAU and for all other partners 0.5 PMs each. If there are needs to change the budget, they are handled based on the principles of the GA.

The long-term (3 years) preservation of the Eduuni workspace is included in the TAU budget of WP8, while the cost of operating the BL2F website for 3 years after the project has ended is part of LGI budget.

The services within the BL2F collaboration used for managing, preservation, sharing, and publishing of the data are free of charge for the project members.

5 Data security

The BL2F project is technically very demanding. Potential risks are followed in a risk register throughout the project to be able to react fast and to guarantee proper implementation of the project.

The BL2F project is governed by two decision-making bodies:

- **General Assembly** has one representative from each participating organization and is chaired by the Project Coordinator. The General Assembly acts as the ultimate decision-making body. The General Assembly ensures that each partner has a voice and vote in the project management.
- **Management Board** consists of the Project Coordinator, the work package leaders and the Innovation Manager (IM, Mikko Uusitalo Valmet), Ursel Hornung (KIT), Judit Sandquist (SINTEF), Frederic Vogel (PSI) and its function will be to monitor the day-to-day running of the project. The Management Board will make proposals and report to the General Assembly. The Management Board is chaired by the Project Coordinator and the Management Board is responsible for efficient implementation of the decisions of the General Assembly. The WPLs report to the Management Board.

All the roles are defined, and rules of operation are agreed in the GA and CA. The detailed decision-making procedures aim to minimise the risk of problems arising during the implementation of the project and provide mechanisms for the amicable resolution of any emerging conflict.

In BL2F the data is collected, generated, processed, stored and managed non-centrally at various partner institutes. The summary of BL2F data has been presented in section 2. Due to this nature of the BL2F project, both WPs and partners are responsible for the data security. The storage and backup of the research data and the encryption of the sensitive data will rely on established procedures at each partner institution.

Potential identified risks with data security and possible risk mitigation actions are listed in Table 12.

Identified risk	Mitigation actions
Findability	Data is published in a trusted repository. Data has persistent identifier, search keywords and rich metadata.

Accessibility	Data relevant for other partners, WPs or Tasks will be stored to the BL2F common data storage. The data storage owner manages the group members and access rights. To access the common data storage multifactor authentication must be enabled. Data is published in a such a way that they can be accessed by humans and machines.
Interoperability	All data and metadata will be stored in open file formats and documented using standards and vocabularies.
Re-usability	Open licences (CC-BY or equivalent) will be used for data and metadata.
Bad quality of data	The creator of the data is responsible to deliver highest possible quality. The WP leader together with the Quality Manager will validate the quality of the data.
Data ownership	Data ownership is defined in the GA and CA
Data transfer	Data transfers are done via common BL2F data storage. Attention is paid to version control and naming convention of the data files. Rich metadata and documentation accompany the data files. Secure file transfer over the network with a VPN solution will be used.
Loss of data	Regular backups (local, cloud), and the BL2F common data storage is used.
Personal data	Personal data is collected, stored and processed according to GDPR regulation. Sensitive data will be encrypted and anonymised.
Trade secrets and IPR	Results are published and exploited according to GA and CA. Disclosure of business-sensitive data is avoided by non-disclosure and aggregation of numeric data. Results will only be published with IPR protection clearance. The project partner carrying out the work leading to the resulting IP will own the IPRs for the project's results. If at least two partners jointly create any results, and it is not possible to distinguish between the contributions of each of the project partners, such work will be jointly owned by the contributing partners.

Version control	The data must not change without versioning.

Table 12: Potential identified risks with data security and actions to mitigate the identified risks.

6 Ethical

BL2F deliverables D9.1 (POPD), D9.2. (NEC) and D9.3 (EPQ) discuss ethical aspects in the BL2F project.

6.1 Personal data

The collection, processing, and safekeeping of personal data compiled during the research project will be subject to the provisions of the General Data Protection Regulation. The BL2F project involves the collection of personal data for the purposes of scientific research. According to GDPR regulation the collected personal data is minimized to be adequate, relevant and necessary for the purpose of the processing. Data is pseydonymised, or if possible anonymised, after collection. Pseudonymised data is still personal data, and its processing is subject to data protection regulations.

In BL2F following personal data is recorded:

- Interviews: video, voice, name, workplace
- Email list: name, email.
    - SendinBlue mailing list is GDPR compliant. Subscriptions to newsletter from different online sources.

A separate deliverable for personal data management (D9.1 POPD) has been prepared and submitted.

6.2 Non-EU countries

Deliverable 9.2 on non-EU countries (NEC) describes the results of ethical self-assessment

6.3 IPR and Ownership of results

Ownership of research data will be allocated according to the GA and the CA.

BL2F is committed to promote reproducibility of research by opening data, codes and other research outputs given that ethical principles, data protection and privacy, and proprietary rights are not compromised in anyway, and data sharing is done responsibly. Therefore, BL2F will consider any ethical, privacy and legal issues that can have an impact on data sharing. In cases that a new technology or device will be

developed to obtain the data, licensing will be required prior to sharing the data publicly.

The legal issues that have impact on the data sharing are mainly related to the business information of companies participating the project. BL2F will avoid disclosure of business-sensitive data by non-disclosure and aggregation of numeric data. Results will only be published with IPR protection clearance.

Owners of the data have right to select the published data and the protection is made based on the principles defined in the GA and CA.

7 Other

Other national/funder/sectorial/departmental procedures for data management that you are using.

- **Open science and research in the Tampere higher education community**[12] state in a brief summary that:
    - The higher education community promotes open access to digital research data, scientific publications and research methods, and the use of open source codes, standards and interfaces in research.
    - The higher education community uses the means of open publishing to increase the impact of its research, development and innovation (RDI) activities.
        - In the Tampere higher education community, scientific publications are opened up either in parallel versions (Green Open Access) or in high-quality Gold Open Access channels, if the latter exist in the field.
    - The research data produced at Tampere University and Tampere University of Applied Sciences, scientific publications and theses, and the research methods used are in principle shared and open.
        - For justified reasons, the degree of openness of research data may vary. The commercial utilisation of research data and the protection of rights are considered in the implementation of the principles of openness.
        - The essential metadata describing the research data is always open. The metadata include information on the structure of the

[12] https://www.tuni.fi/sites/default/files/2019-02/tuni-open-science-guidelines.pdf

data and details concerning its production, producers, owners, and terms of use, as well as the unique persistent identifier of the data.

- The researcher ensures that the research data to be produced is findable, accessible, interoperable and re-usable (the FAIR principles).

- Machine-readable licences that permit re-use are utilised in the opening and open publishing of research data.