Where Quantum and Fluids entangle

Quantum Computational Fluid Dynamics
Dissemination, Exploitation and Communication Plan
Project number# 101080085

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Revision History

Version	Date	Who	Changes
0	04.12.2023	B. Atilla & Oscar Negrete	Created Document
1	18.04.2024	Belda Atilla	The document was rejected due to the amendment process. Revision changed and re-submitted.

Executive Summary

QCFD (Quantum Computational Fluid Dynamics) is an EU-funded project under the Horizon 2020 programme/HORIZON Research and Innovation Actions /HORIZON-CL4-2021-DIGITAL-EMERGING-02 call for proposals.

Scientific and technological progress is broadly underpinned by the ability to accurately predict and optimise complex fluid flows which arise acrossthe physical and life sciencesincluding climate research, as well asin the energy, chemical, automotive, aircraft, and ship building industries. The wide separation of length and time scales that need to be covered when designing and optimising flows and a large number of design parameters make numerical simulations highly demanding. Current capabilities are thus insufficient to meet future demands of users in academia and industry.

The overarching goal of this project is to rise to this challenge by developing a versatile quantum algorithmic framework for efficiently solving a wide range of CFD problems without compromising on accuracy. The proposed methodology will be demonstrated on hardware developed in European Quantum Technology Flagship Projects and will prove the feasibility and advantages of our approach using a core set of CFD problems arising in the thermal management of battery-electric-vehicles (BEV). The approach will subsequently be extended to a wider class of flow configurations. Extensive validation and benchmarking will provide detailed quantitative information on hardware requirements for achieving a quantum advantage.

Here we present the first version of the Dissemination, Communication and Exploitation Plan. This document is a deliverable of Work Package 10, Project and Data Management, Dissemination and Communication of the project. It is a comprehensive document defining target audiences, types of topics and results for sharing and further dissemination as well as types of actions, activities and tools for joint dissemination activities of the QCFD Project. These activities are based on the cooperation of all partners and are strongly linked not only to the QCFD project objectives but also to the activities of particular work packages.

This will be a dynamic document that will continuously be updated during the course of the project. Updated versions will be published in months 12, 24 and 36. The plan will be for use by all the partners involved in the QCFD project and form the basis of a common strategy for disseminating, communicating and exploiting project results.

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List of abbreviations

Acronym / Short Name	Meaning
EU	European Union
EC	European Commission
QCFD	Quantum Computational Fluid Dynamics
UHH	University of Hamburg
TUHH	Technical University of Hamburg
FZL	Jülich Research Centre
TUM	Technical University of Munich
ENG	ENGYS SRL
TUC	Technical University of Crete
PlanQc	PlanQc GMBH
CDE	Communication, Dissemination and Exploitation
KPI	Key Performance Indicator
WP	Work Package
PO	Project Officer
SME	Small and Medium Enterprise
WP	Work Package
WPL	Work Package Leader

1. Introduction

The communication activities should promote the entire action, both the project itself and its ongoing activities and results, to a wider range of audiences, including the public, traditional and social media.

This document outlines the key objectives, target audiences, and core messages of our communication and dissemination efforts. It delineates the diverse array of tools and channels we will employ to achieve widespread reach. These include the project website, dynamic social media channels, printed materials, newsletters, press releases and contributions to scientific journals. Additionally, the QCFD Team delves into active participation in conferences, workshops, and events, recognizing their pivotal role in amplifying our project's impact.

The dissemination of project results and information to the wider public is very important to the QCFD Consortium and for this purpose, project updates will be shared via website and social media channels (Twitter, LinkedIn).

2. Objectives

The key purpose of the QCFD communication strategy is to communicate the project scope, objectives, results and impacts properly and effectively to the interested audience and finally engage a variety of stakeholders in project activities.

The dissemination and exploitation measures aim to inform the target groups about the activities and the outputs of the project.

- to disseminate the project's results at dedicated events all around Europe as well as in scientific publications.
- valorize the results of the project during and after its lifetime.
- to ensure open access to results produced by the project.

3. Phases of the dissemination strategy

The planning and execution of the project dissemination activities require a schedule closely aligned with key project deliverables and milestones. At this scope, the project will be organized around 3 phases:

Initial awareness phase (Month 0-12) to ensure the project is known to relevant stakeholders and the public in general. In this phase, we will develop the project website and different communication and dissemination materials, including the project graphical identity (i.e. project logo, branding guidelines, templates for project documents and presentations). In this phase, we will also map stakeholders and constitute the project database to optimize targeted communication and dissemination.

Targeted dissemination phase (Month 12-36) to encourage a better understanding of the project results leading to greater engagement of external stakeholders and better future uptake of the project outcomes. In this phase, the consortium will enrich the website with new content, publish a project brochure and attend selected events. Preliminary project results will be presented to the target audiences through scientific publications and participation in conferences and workshops.

Presentation of results (Month 36-48): this represents the period just prior to the end of the project when the project reaches its most significant output. This will be the more active period matching with the finalization of the project and the publications of the final project results.

Table 1 below presents more in detail the main tasks planned over the next 4 years within the dissemination and exploitation strategy.

4. Target audience

The consortium has identified several groups that have an interest in or are going to be affected by the QCFD project.

Different groups of stakeholders have diverse interests, and we will thus tailor communication and dissemination activities for different target groups. Specifically, we will distinguish between industrial stakeholders who could directly benefit from the project results and potentially invest in follow-on research projects, academic and industrial researchers with expertise in CFD and/or quantum technologies to build a broad research community working on QCFD problems, and lay audiences where the target is to raise general awareness of the potential of quantum computing in industrial applications.

We list major communication channels and aims for each target group in Table 1. The major communication channels and dissemination activities that will be set up are described in Table 2.

TABLE 1: Communication channels and aims

industry CFD experts	Channels: project website, social media channels, data repository, scientific publications, scientific talks and posters, dedicated workshop sessions.
	Aims: project involvement, commercial exploitation of quantum technologies.
OpenFOAM users and developers	Channels: OpenFOAM – QCFD software interface and documentation, dedicated workshop sessions, project website, social media channels.
	Aims: project involvement, extending the OpenFOAM open-source developer community to QCFD applications.
academic quantum computing and CFD community	Channels: scientific publications, scientific workshops, scientific talks and posters, data repository, QCFD software framework and documentation, project website, social media channels.
	Aims: Project involvement e.g. leading to new QCFD algorithms and/or proposals for optimized hardware architectures.
quantum hardware developers in industry and academia	Channels: scientific publications, scientific workshops, scientific talks and posters, data repository, project website, social media channels.
	Aims: Project involvement leading to a detailed understanding of QCFD hardware requirements and e.g. to QCFD optimized quantum hardware architectures in the longer term.
students	Channels: project website, social media channels, tutorial examples, online videos, semi-popular publications, student internships and undergraduate research projects.
	Aims: attract PhD students into the project's interdisciplinary field of science.

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mass media	Channels: project website, social media channels, press releases.
	Aims: disseminate most important results widely, raise project awareness.
interested lay audiences	Channels: project website, social media, public talks, open house events.
	Aims: General awareness of the project.

TABLE 2: Description of communication channels and dissemination activities

scientific publications	These will be the main tool to communicate scientific advances and results. We will produce publications targeted at individual specialized target audiences in CFD research, quantum algorithms and optimization, and quantum hardware development as well as more general publications that target a wider interdisciplinary group of researchers. Publications will follow EU guidelines on open access publishing and properly acknowledge the QCFD project. We will publish in international peer-reviewed journals including Physical Review Letters/Research/A/B/E/X, Nature Family, Quantum, Quantum Science and Technology, New Journal of Physics, Computers & Fluids, AIAA J., J. Comput. Physics, Flow Turb. and Combustion, J. Structural and Multidisc. Optimisation, J. Num. Methods in Fluid Flow, ZAMM
scientific talks and posters	Talks and posters will attract stakeholder interest and be used to disseminate project results and the QCFD framework widely. We will adapt scientific talks to the target audiences in quantum technologies and CFD. Talks will provide unique opportunities to communicate the necessity of an interdisciplinary approach in developing quantum solutions for industrially relevant problems. Events that we aim to present our results at include EU Quantum Flagship events (e.g. EQTC), Quantum, QIM, ECCOMAS Congress, WCCM Congress, EUROGEN, AIAA Conf., MARINE, Int. Conf. CFD, GAMM.
project website	The website will provide project information, scientific results. It will contain sections dedicated to communicating with the major stakeholders listed above. The website design will be tested for different types of devices including phones, tablets and desktop computers.
social media channels	We will have a Twitter account for immediate communication of general project news and communicating directly with target audiences. We will also create a LinkedIn community group to bring together interested stakeholders.
online videos	We will create a project video accessible from the website and youtube that presents the project and general concept. Where appropriate and possible we will produce video abstracts for scientific publications (e.g. New Journal of Physics).
logo and templates	We will create a project logo and presentation templates (e.g. word, power point, keynote) accessible to all project partners.
data repository	Project data containing CFD and QCFD benchmark results will be published in institutional repositories including appropriate metadata in line with the

	project's data management plan and FAIR (Findability, Accessibility, Interoperability and Reusability) principles. The repository will be promoted on the project website.
OpenFOAM – QCFD software interface and documentation	Open-source software developed in this project will be published in a public access git format repository. It will be documented along the guidelines of the data management plan and be publicly accessible.
QCFD software framework and documentation	Open-source software developed in this project will be published in a public access git format repository. It will be documented along the guidelines of the data management plan and be publicly accessible.
tutorial examples	The website will contain a dedicated section containing tutorial QCFD and OpenFOAM – QCFD software interface examples. These will be explained in detail to aid interested researchers setting up their own QCFD calculations.
workshops	We will hold project workshops approximately after 18, 30 and 42 months of the project. These workshops will focus on communicating results to the CFD, quantum technologies and quantum computing communities. They will contain dedicated sessions for these target audiences and also plenary sessions for all. Round table and breakout discussions, poster and industry focussed sessions will be designed to maximise participant involvement in the workshops. Workshops in months 30 and 42 will also contain tutorial sessions on the structure and usage of the QCFD library. The OpenFOAM interface will be presented in detail in the workshop in month 42.
interactions with EU Flagship projects	Regular meetings, user forum, long-term visits, knowledge and technology exchange. We have established close contacts with the applicants for successor projects of Aqtion, OpenSuperQ and PASQuanS and agreed on closely collaborating with them during the implementation of the projects.
student internships and undergraduate research projects	We will advertise student research opportunities at the participating host institutions. We will attract undergraduate students with broad scientific interests and a background in physics, engineering, computer science, mathematics or a cognate subject to get involved in the project.
press releases	We will collaborate with the institutional public-relations offices to write press releases on highlight project research results and disseminate them widely.
semi-popular articles	We will describe the QCFD project and its general scientific approach, important results and possible impacts in semi-popular articles e.g. on theconversation.com
public talks & open house events	These will be used to communicate project results and its possible impacts to the general audience to raise general awareness.

5. Communication and dissemination rules

5.1. Communication within the QCFD consortium

Communication among partners is crucial to exchange up-to-date knowledge and data on what is going on in the different WPs and to enhance and optimize external communication and dissemination.

The overall responsibility of this WP#10, Project and Data Management, Dissemination and Communication are UHH's belongs to UHH. But the assigned lead beneficiary of the work package will organize related CDE activities & materials and will submit for consortium approval. When approved, the actual plan is then ready to be applied. When the CDE activity has been completed, a related activity report shall be prepared for the annual updates of this CDE Plan. All these phases must be carefully managed and monitored inside the project, assuring the proper mechanisms to avoid deviations or eventual failures, while disseminating and/or exploiting results.

All partners are requested to regularly participate in communication and dissemination activities, namely:

- Communicating their activities and disseminating their results to their respective networks, on social media and through news on the project website,
- Contributing to the content of the newsletter (articles, interviews),
- Informing the other partners of interesting, related initiatives and events they could participate in,
- Keeping track of their communication and dissemination activities by filling in a dedicated reporting table available in the MS-Team of the project,
- Disseminating results and publications in open access.

Internal communication will be ensured through regular exchange of information via e-mail and during regular meetings when all partners gather to discuss achievements, upcoming activities, deadlines, and issues arising within the different work packages. WP leaders also present main research advances during meetings or other WP leader meetings that are organized whenever needed.

5.2. Dissemination of own (including jointly owned) Results (Consortium Agreement, Article 8.4)

During the Project and for a period of 1 year after the end of the Project, the dissemination of own Results by one or several Parties including but not restricted to publications and presentations, shall be governed by the procedure of Article 17.4 of the Grant Agreement and its Annex 5, Section Dissemination, subject to the following provisions.

Prior notice of any planned publication shall be given to the other Parties at least 14 calendar days before the publication. Any objection to the planned publication shall be made in accordance with the Grant Agreement by written notice to the coordinator and to the Party or Parties proposing the dissemination within 30 calendar days after receipt of the notice. If no objection is made within the time limit stated above, the publication is permitted.

An objection is justified if

a) the protection of the objecting Party's Results or Background would be adversely affected, or

b) the objecting Party's legitimate interests in relation to its Results or Background would be significantly harmed, or

c) the proposed publication includes Confidential Information of the objecting Party.

The objection must include a precise request for necessary modifications.

If an objection has been raised the involved Parties shall discuss how to overcome the justified grounds for the objection on a timely basis (for example by amendment to the planned publication and/or by protecting information before publication) and the objecting Party shall not unreasonably continue the opposition if appropriate measures are taken following the discussion.

The objecting Party can request a publication delay of not more than 30 calendar days from the time it raises such an objection. After 7 calendar days the publication is permitted, provided that the objections of the objecting Party have been addressed.

5.3. Information on EU funding (as defined in Article 17.2 of the GA)

Unless otherwise agreed with the granting authority, communication activities of the beneficiaries related to the action (including media relations, conferences, seminars, information material, such as brochures, leaflets, posters, presentations, etc., in electronic form, via traditional or social media, etc.), dissemination activities and any infrastructure, equipment, vehicles, supplies or major result funded by the grant must acknowledge EU support and display the European flag (emblem) and funding statement (translated into local languages, where appropriate)

Quality of information — Disclaimer

Any communication or dissemination activity related to the action must use factually accurate information. Moreover, it must indicate the following disclaimer (translated into local languages where appropriate):

“Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.”

Applications For IPR Protection of Results

Include the following standard sentence in each application filed by or on behalf of a beneficiary:

"The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No:101080085".

Standards Incorporating Results

If results are incorporated in a standard, the beneficiary shall ask the standardization body to include the following statement in (information related to) the standard:

"Results incorporated in this standard received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No:101080085".

CDE Activities

The following must be included in all CDE activities:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No:101080085.

Infrastructure, Equipment, Major Results

The following must be displayed on all infrastructure, equipment and major results funded by the grant:

This [infrastructure][equipment][insert type of result] is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No:101080085.

When displayed together with another logo, the EU emblem must have appropriate prominence.

6. Tools and channels

Different tools and channels will be used to disseminate and communicate the activities carried out by QCFD and their results. Each tool and channel will be used appropriately to address different target groups at different stages of the proposal implementation, thereby increasing the efficiency of the Dissemination Plan. The relationship between the tools and channels, the target groups and the expected results are presented in Table 1.

The tools and channels used include the project website, articles targeted at both a lay and a technical audience, press releases, e-newsletters, scientific papers and leaflets, social media presence, and participation in workshops/conferences.

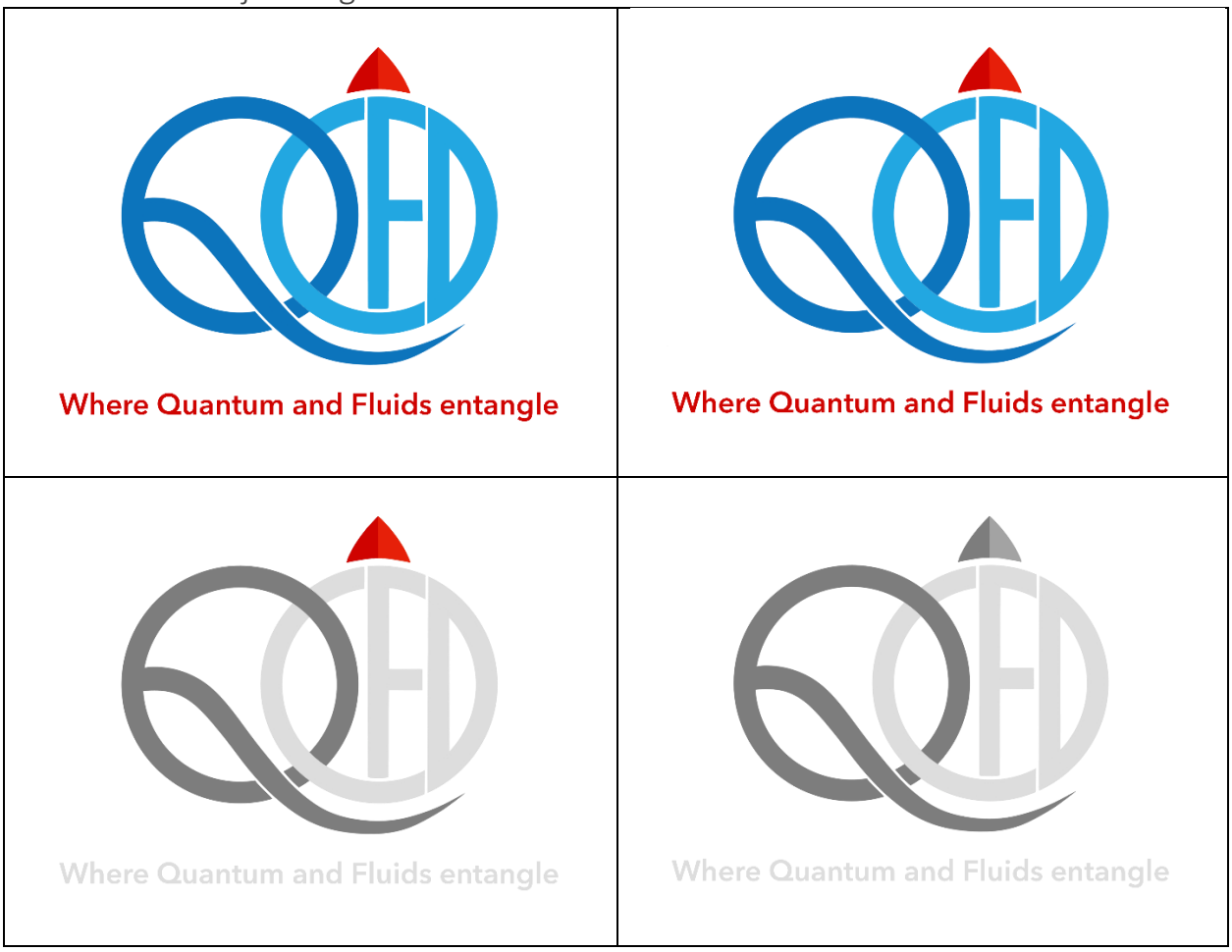
The journal articles are primarily intended to communicate the recent findings to the scientific and academic communities. However, the project will also be published in journals and magazines important to the industry to disseminate new relevant solutions to other possible end users. Project presentations at technical conferences are intended to reach the same audience.

Any dissemination activities and publications in the project, including the project website, will specify that the project has received funding from the European Union’s Horizon 2020 programme, as well as display the European emblem. When displayed in association with a logo, the European emblem will be given appropriate prominence. All publications will reference the grant agreement number.]

6.1. Use of graphic identity and EU visibility

A common graphic identity has been defined to allow for better visibility and recognition as well as branding of the QCFD project. Therefore, all dissemination tools and activities must refer to or include Project Name, Project Logo, Project Website and Information on EU funding. These will be consistently used for the project website and all other communication templates, such as PowerPoint, Word, posters and EC Report. Templates can be downloaded from the project website: qcfd-h2020.eu.

6.2. Project Logos



6.3. MS-Teams

The QCFD team will utilize Microsoft Teams to enhance internal communication seamlessly and its centralized space feature for storing project-related documentation, ensuring accessibility for all team members. The key features contributing to this accessibility include:

- Creating and managing teams and channels
- Chat and file sharing
- Scheduling meetings and calls
- Project-wide announcements

6.4. Open Access to Scientific Data Tool

The project will collect, managed and benchmark research data. Data management is described separately in 10.01 Data Management Plan.

The data collection strategy is designated to support the scope of scientific and development goals of QCFD. Central to this scheme is the utilization of data derived from numerical simulations to provide theoretical and practical validation, a benchmark database, and a clear roadmap for computational tools design. The results developed

throughout the duration of the project will take the form of scientific publications, whose pre-refereed versions will be available, and outreach material to disseminate the key research advances to the community.

The portal www.qcfd-h2020.de will serve as the primary access point for the data generated by QCFD. This portal will ensure accessibility for project partners, while adhering to protocols that respect intellectual property protection regulations for the public. For more technical data, a distributed version control system will be utilized, hosted on the PHYSnet servers at the University of Hamburg (www.git.physnet.uni-hamburg.de).

In line with the FAIR (Findability, Accessibility, Interoperability and Reusability) principles, the project is committed to maintaining transparency throughout its data management processes. To this end, all disseminated information will be accompanied by detailed metadata and comprehensive documentation. This is aimed at not only facilitating a deeper understanding of the results but also enabling and simplifying the scientific reproduction of these outcomes.

6.5. Project Website

QCFD will develop and keep updated a user-friendly project website under qcfd-h2020.eu.

The website will be the primary source of information for external parties, providing updates on project activities and achievements to all target audiences. The aim is to inform stakeholders and associated industries about project developments, but also to present the project's achievements and the QCFD developments to the public.

All partners will contribute to the website by providing relevant project information. All communication efforts by project partners and social media will always be redirected to the QCFD website. Traffic to the website will be increased by creating mutual links between the partners' websites and other relevant websites.

The project website will contain:

ABOUT

- Project documents
- Objectives

PARTNERS
WORK PACKAGES

PROJECT DELIVERABLES

- Deliverables
- Publications
- Data & Benchmark Reports

NEWS

- General News
- Events
- Meetings

JOBS

CONTACT

- Social Media Links

DATA SECURITY

6.6. Social Media

The project will have a social media presence on Twitter and LinkedIn to ensure wider dissemination to different age groups and target audiences. Social media will be used as a tool to announce project developments, but most importantly drive traffic to the project website.

Once the project has video material, it will be embedded on the website using YouTube. For the first phase of the project, the social media accounts will share posts related to the project scope and post on events where QCFD is to be presented to build a community of interest, creating an audience for when there are project results to share.

Online media platforms will be monitored to provide information on the analytics, sources, types of content and individuals/organisations that promote or disseminate project messages, allowing optimisation and targeting of communication to ensure maximum outreach of news or results. These results will also be included in interim reports and the final dissemination report. The social media accounts will be managed by UHH with support from the partners.

Consortium partners will follow the project social media channels and engage with them as much as possible. Whenever possible, the partners will share posts on their own corporate websites and social media networks. If they need assistance, UHH can guide them on the best ways to do so.

6.7. Printed Material

A poster, a roll-up and a brochure will be developed for distribution to partner networks and at conferences, exhibitions, and other events. The project poster and brochure version will contain general information about the research activities, participants, and expected results. In addition, a general PowerPoint presentation will be created, presenting the project's objectives, methodology, partners, etc.

6.8. Scientific Journals

Scientific papers will be published in specialized international peer-reviewed journals like Computer Physics Communications, Computers & Fluids, Journal of Physics Communications, AIAAJ, Physical Review Fluids, Physical Review A, Quantum, Quantum Science and Technology, SciPost, etc. In addition, project partners will publish their most important and widely applicable results that are of broad interest in more interdisciplinary journals including Physical Review Letters and the nature/science family of journals.

6.9. Participation at Conferences, Workshops and Events

Project partners will attend sector related events, conferences, workshops, to meet target groups, other stakeholders, public authorities, and scientific community and to raise awareness about the project objectives and results. These events provide access to target audiences at local, national, European and international levels. Activities attended will be listed here in annual revisions.

7. Monitoring and Reporting

The reach and impact of QCFD dissemination activities will be assessed qualitatively and quantitatively and closely monitored and reported using participation statistics, search metrics and other established indicators of media use.

As WP leader, UHH will regularly evaluate impacts and results achieved through the communication activities, in order to ensure an accurate monitoring and reporting of communication activities.

Monitoring activities will rely on the responsible involvement of all the partners, which regularly (every six months) will fill in the templates in Annexes with information on the communication and dissemination activities. Each partner will be in charge of monitoring its communication activities and reporting progress.

The EC will be informed about the results via the periodic reporting of the project.

8. Annexes

8.1. Sample Post Template

#		PHOTO
Date		
Title		
Scope		
#		
@		
Notes		

8.2. QCFD Partners' Communication and Dissemination Actions Follow Up

	QCFD PARTNERS' PUBLICATIONS FOLLOW UP									
	Beneficiary	Authors	Title	DOI	Year	Published on	Publisher/Journal	URL	ISSN	Notes
1										
2										
3										
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8.3. QCFD Partners' Publications Follow Up

	QCFD PARTNERS' PUBLICATIONS FOLLOW UP														
	Beneficiary	Authors	Title	DOI	Year	Internal Submission Date	Approval Date	Official Submission Date	Received Comments on	Final Submission Date	Published on	Publisher/Journal	URL	ISSN	Notes
1															
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