



PHUSICOS

According to nature

Deliverable D8.8

NBS Strategy Testament – Clustering activities to build NBS legacy

Work Package 8 – Dissemination and communication

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Summary

This report describes the main clustering activities that PHUSICOS has undertaken to create synergies with the other large scale demonstrator NBS sister projects, namely OPERANDUM and RECONNECT (funded under the same EU HORIZON 2020 call as PHUSICOS) as well as the NAIAD project (funded under an earlier H2020 call but which focused on exploring NBS related to the insurance value of ecosystems). The aim of the clustering activities has been to maximize the use of our collective project deliverables, to ensure lasting benefits of all project results. This includes producing excellent interdisciplinary science which is theoretically informed and policy relevant as well as building new networks through clustering activities and connecting people and disciplines.

OPERANDUM, PHUSICOS and RECONNECT started between June and September 2018. Since the start, and thanks to our EU officers, we were able to initiate the cooperation through regular updates and co-organization of events with the intention of working together to maximize project impacts. This clustering, referred to as the Task Force for NBS Hydro-meteorological risk reduction, began with participation at the consortium kick-off meetings of OPERANDUM and RECONNECT in July 2018 and September 2018, respectively. Unfortunately, due to the onset of the COVID-19 in early 2020 the cooperation was rather reduced with respect to the original plans, nevertheless several actions were undertaken which resulted in some common peer review publications, co-authorship of several Chapters of the Handbook for practitioners, as well as co-organization of common sessions at well-established conferences. In addition, thanks also to the favourable temporal alignment of the workflow between OPERANDUM and PHUSICOS a push forward of more synergy activities were established during a workshop that took place in April 2022 in Bologna. Common actions and activities targeting the sharing of information for some of our common Deliverables through peer review and discussion of results with respect to NBS cataloguing and clustering were successfully undertaken during the last 8 months of the OPERANDUM project and the last 12 months of the PHUSICOS project.

The strengthening of the collaboration between PHUSICOS and OPERANDUM culminated in the co-organization of three main activities: the co-organization of the first International Summer School on Nature-based Solutions that took place on August 29th – September 1st 2022 in Bologna, the organization of a session at COP27 EU Side Event which was held remotely on November 11th 2022, and the Final Conference of the two projects in Paris (December 13th – 16th 2022). The outcome of all these activities can be synthesized in having reached a common strategy for the evaluation of NBS performance as well as definition of common actions, significantly leveraging potential for mainstreaming NBS and facilitate further uptake of NBS. Two relevant outputs of the synergy activities has been the decision of sharing data on NBS implementation through the GeoIKP. The intention is to use this platform for continuous demonstration

of NBS co-design, co-development and implementation beyond the end of the two projects. Another relevant output is the NBS guidebook, showcasing good examples from both PHUSICOS and OPERANDUM in a river basin landscape perspective and through six ecosystems as narratives. The intention of the NBS guidebook is to inspire local authorities and decision makers to explore NBS interventions for their specific site challenges and typology within the river basin.

Further to these activities, the report reflects on the advantages and disadvantages of clustering activities. Although the clustering activities required additional time and resources, they were essential for the greater impact of the individual projects. This included creating a coordinator support network, creating synergies across projects, as well as creating greater critical mass for NBS policy impact. These benefits are not to be underestimated and the EU Horizon Europe research program has an important role to continue to support NBS clustering activities for mainstreaming NBS and facilitating their further uptake.

PHUSICOS is the second of the three NBS HydroMet projects to end. Therefore, this report is an update of the first report of common activities that was uploaded by OPERANDUM (their Deliverable D10.2). As agreed between project coordinators, this Deliverable will also be shared with RECONNECT prior to the conclusion of their project in August 2024 for further updates and further actions that the projects will carry out together after the end of OPERANDUM and PHUSICOS, continuing clustering activities to build NBS legacy.

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D 8.8 – Appendix A: List of all activities performed in the TF NBS HydroMet

1 Introduction and overview of the projects

The Innovation Action (IA) projects OPERANDUM, PHUSICOS and RECONNECT were the three successful projects of the call H2020-SC5-2017-TwoStage, "Large-scale demonstrators on nature-based solutions for hydro-meteorological risk reduction." Therefore, the three projects share much of their objectives that put the co-designing, co-development of nature-based solutions (NBS) for the reduction of hydro-meteorological risks at the centre of their actions by setting up activities to provide scientific evidence for the usability of NBS, best practices for their design, replication and scalability.

PHUSICOS, meaning 'According to nature' in Greek (φυσικός), aims to demonstrate that nature-based and nature-inspired solutions for reducing the risk of extreme weather events in particularly vulnerable areas are technically viable, cost-effective and implementable at regional scale. PHUSICOS specifically focuses on rural mountain landscapes and has had the following specific objectives: (i) Engaging a diverse range of stakeholders through a Living Labs approach; (ii) designing a comprehensive framework for comparative analysis and monitoring to evaluate the performance of various NBSs through technical innovation; (iii) exploring ways to enhance the inclusiveness, fairness and effectiveness of the co-design and implementation of NBSs in the context of governance innovation, the planning policy and implementation mechanisms for sustainable use and management of land, water, and natural resources in rural areas and their impacts at the local and wider watershed scale; (iv) creating a knowledge co-generation platform using learning arena innovation, including the use of social-ecological simulation approaches to encourage knowledge exchange through the identification of possible NBSs, their impacts as well as the training of local decision-makers and contractors to implement innovative NBS; (v) establishing a comprehensive state-of-the-art evidence-base and data platform concerning NBSs through product innovation suitable for replication, up-scaling and future implementation.

The focus of OPERANDUM has been on addressing several NBSs able to mitigate risks associated to several hazards. Furthermore, the NBS implemented in OPERANDUM within the space of their Open Air Laboratories (OALs) has covered a broader set of ecosystems throughout the watershed catchment system. OPERANDUM had the following specific objectives: (i) integration of knowledge about NBS efficacy against hydro-meteorological risks; (ii) strengthening of technology innovation in the area of NBS; (ii) improvement of acceptance of NBS based implementation; (iv) Enhancement of market demand and increase of competitiveness of NBS and (v) Strengthening the adoption of NBS in national policies.

RECONNECT, in addition to demonstrate, reference and upscale NBS for disaster risk reduction, is having among its ambitions and challenges the set-up of actions to stimulate a new culture of co-creation of 'land use planning' that links the reduction of hydro-meteorological risk with local and regional development objectives in a sustainable and financially viable way.

The three projects together aim to create novel ways of demonstrating the effectiveness of NBS for DRR in a several regions located in different geographic, cultural and socio-economic contexts. Furthermore, since the start of the three projects (June 1st, 2018: PHUSICOS; July 1st, 2018: OPERANDUM; September 1st, 2018: RECONNECT), all projects have experienced the same challenges of setting-up innovation in various areas which have spanned socio-economic arenas to the establishment of tools to demonstrate, replicate and upscale NBS in rural landscapes. As such, it was decided to work together and devote some effort in common activities aimed to maximize the impact of the three projects. In the following sections main activities carried out together are reported. PHUSICOS is the second of the three NBS HydroMet projects to end. Therefore, this report is an update of the first report of common activities that was uploaded by OPERANDUM (their Deliverable D10.2). As agreed between project coordinators, this Deliverable will also be shared with RECONNECT prior to the conclusion of their project in August 2024 for further updates and further actions that the projects will carry out together after the end of OPERANDUM and PHUSICOS.

1.1 Establishing the HydroMet Task Force (TF)

OPERANDUM, PHUSICOS and RECONNECT have continuously collaborated to create synergies between and with other NBS projects and initiatives of interest that might provide significant leveraging potential for mainstreaming NBS. This clustering, referred to as the Task Force for NBS Hydro-meteorological risk reduction (TF NBS HydroMet), began with participation of the three project coordinators at the consortium kick-off meetings of OPERANDUM and RECONNECT in July and September 2018, respectively. After these kick-off meetings, the coordinators and selected partners were invited and participated at one another's consortium meetings when possible. The last physical meeting before the before the Covid-19 pandemic took place at the PHUSICOS consortium meeting in Lucca, Italy in October 2019. This was the first opportunity for the OPERANDUM coordinator to share their project to the PHUSICOS partners (Figure 1). A representative from RECONNECT's Italian case study site in Portofino was also able to participate.

The first formal clustering meeting was held January 22th –23th, 2019 in Ljubljana, Slovenia where the three project coordinators participated at the NAIAD's General Assembly. The aim of that meeting was to explore areas of collaboration and potential joint actions. A follow-up meeting took place in Brussels, on October 9th, 2019. Topics for discussion also included sharing approaches for NBS indicators and assessment frameworks between projects and experts. The Task Force for NBS Hydro-meteorological risk reduction still supports the ongoing Task Forces established for H2020 NBS projects operating in urban areas which later became facilitated by the NetworkNature project. PHUSICOS project Coordinator has been representing the TF NBS HydroMet projects in the NetworkNature Project Board.



Figure 1: The coordinator of the OPERANDUM project at the PHUSICOS consortium meeting, Lucca, Italy in October 2019.

1.2 Brief description of the clustering activities

The TF NBS HydroMet operates somewhat as its own satellite TF outside of the NetworkNature coordination umbrella, but with close follow-up by the EU Project Officers for the NBS projects from the call focusing on hydro-meteorological risk reduction (PHUSICOS, OPERANDUM, RECONNECT) with contributions from the now completed project, NAIAD. Since the start of these projects in 2018 there has been open and frequent communication between all of these projects, especially at the coordinator level. As shown in Figure 2, several joint submissions and co-hosting of sessions at events and conferences has been completed as well as co-authorship on scientific articles and EU report outputs. Appendix A report a detailed list of all activities performed in the TF NBS HydroMet. This has formed a strong basis for further collaboration and in the last reporting period this has focused on exploring how PHUSICOS, RECONNECT and OPERANDUM could make the most of one another's project outputs, especially learning materials and synergies with the data platforms.

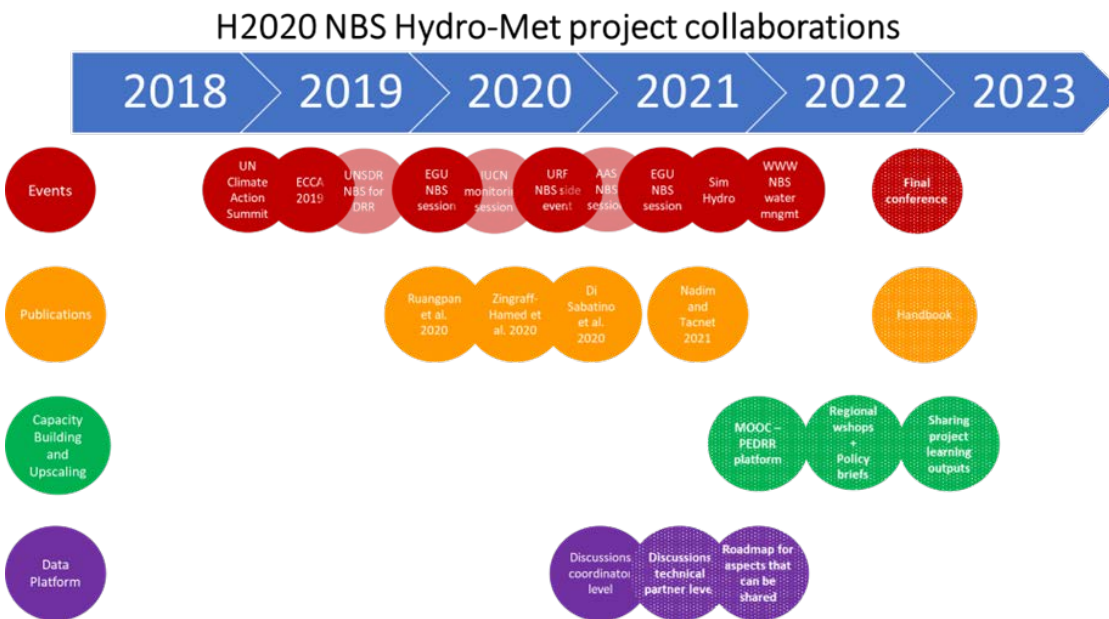


Figure 2: Illustration of the collaboration activities between the NBS Hydro-Met projects. Color coding: red = events, orange = publications, green = capacity building and upscaling, purple = data platform. Solid colors indicate completed activities, dot pattern indicated planned activities.

2 Clustering activities according to the three phases of the TF NBS HydroMet

2.1 First phase – basis for collaboration

2.1.1 Common publications

During the first phase of the activities of the TF NBS HydroMet (January 2019- April 2020) the basis for collaboration was set. It was decided that the focus would be on establishing links between coordinators and project partners in order to develop publications on common topics and organize joint events. As the first clustering activity was concerned the publishing, and RECONNECT had already started an NBS for hydro-meteorological risk reduction review article, the first common publication was led by RECONNECT with contributing authors from OPERANDUM and PHUSICOS. Ruangpan, L.; Vojinovic, Z.; Di Sabatino, S.; Leo, L.S.; Capobianco, V.; Oen, A.M.P.; McClain, M.E.; Lopez-Gunn, E. (2020): Nature-based solutions for hydro-meteorological risk reduction: a state-of-the-art review of the research area. *Nat. Hazards Earth Syst. Sci.* 20, 243–270. According to Google Scholar, this article is cited 198 times (on 27/04/2023). This publication is rather relevant since it sets a common ground for the interpretation of main results of the three projects.

During this initial phase of the TF, though on a minor tone, the three projects led a common news article on the first issue of the *Bulletin of Atmospheric Science and Technology* (a new journal edited by Springer-Nature) where the TF NBS HydroMet was presented together with its main aim. The journal has recently received indexing in SCOPUS and more attention to the news is expected. Currently, our news has received more than 1000 views.

Another publishing activity that began during this establishing phase was coordinating and contributing to the NBS Special Issue in the *Sustainability* open access journal. This activity was led by the PHUSICOS partners at the Technical University in Munich and had an aim at providing a forum for presenting current original research covering the different aspects of NBS from technical reflections on human–nature interactions and policies to innovations resulting from co-design and co-creation processes. A total of 11 contributions are published, most from the PHUSICOS project with co-authorship and a contribution from partners in the RECONNECT project.

The TF NBS HydroMet was heavily involved in Task Force 2 activities, contributing to the development of an assessment framework for NBS performance and efficacy which resulted in the publication of the EC Handbook “Evaluating the impact of Nature-based Solutions: a handbook for practitioners”. In particular, Chapter 6 of this handbook focuses on NBS against natural hazard and builds upon the results of NAIAD, PHUSICOS, OPERANDUM and RECONNECT projects to provide guidelines as well as specific indicators and methodologies to monitor and evaluate both direct impacts and co-benefits delivered by NBS in the context of DRR. In addition to that, OPERANDUM also led Chapter 7 of the same handbook, which deals with data requirements in relation to ensuring both the efficacy and cost-effectiveness of the NBS evaluation process, and in order to establish the monitoring plans and schemes described in the Handbook.

Additional activities that support the exploitation of OPERANDUM, PHUSICOS and RECONNECT results and mainstreaming NBSs in general, have also included contributions to the HORIZON EUROPE research missions as well as to the United Nations NBS platform where our EU H2020 Task Force for NBS hydro-meteorological risk reduction, submitted a joint contribution to the global call for NBS for the UN Climate Action Summit held in New York, September 2019. The Task Force for NBS hydro-meteorological risk reduction was in good company along with the other 150 contributions that have been received and made available on the UN's Environment Program (UNEP) platform (<https://www.unenvironment.org/nbs-contributions-platform>). The comprehensive list demonstrates the value and feasibility of NBSs as well as illustrates their broad worldwide implementation.

2.1.2 Events and conferences

The TF NBS HydroMet began to be promoted during this period with the start of collaborating on suggesting sessions together at relevant conferences. The first TF NBS HydroMet submission was a proposal for a joint session entitled "The role of nature-based solutions and EcoDRR in the management of large scale hydrometeorological

risks in Europe" to the European Climate Change Adaptation (ECCA) conference to be held in Lisbon in May 2019. Although the session was not approved, the collaboration to develop the session was fruitful and provided a basis on which to continue the collaborations. Furthermore, we were invited to give a TF NBS HydroMet pitch during a time slot at the EASME stand to specifically promote the NBS projects and the NBS taskforces. A short presentation highlighting PHUSICOS, OPERANDUM, RECONNECT and NAIAD ran on autoplay during a 30-minute period where we were also available to interact with visitors and respond to any questions.

A large effort was also made in this phase to design and propose a new session at EGU 2020 (Vienna 4-8/05/2020) which due to the pandemic was held remotely. Details are given below: Name of Session: NH1.5 "Nature-Based Solutions for Hydro-Meteorological Risk Reduction"; convener: Silvana Di Sabatino; co-conveners: Amy Oen (PHUSICOS), Zoran Vojinovic (RECONNECT), Elena Lopez Gunn (NAIAD). The session received 36 abstracts of which 14 were accepted for oral presentations. Some peer-review papers originated as the outcome of this session. At the same time, the session demonstrated the novel approach of the TF NBS HydroMet in one of the most prominent scientific conferences devoted to geoscience.

2.2 Second phase – aligning common activities

2.2.1 Events and conferences

The momentum of submitting TF NBS HydroMet session proposals to key events and conferences continued during the second phase of clustering activities. NBS were really starting to come into focus both at the European and Global policy scale. For example, proposals were submitted for sessions at:

- EU Green Week 2020, "Nature-based solutions spark transformative climate action and biodiversity initiative"
- IUCN World Congress 2020, "Monitoring and evaluation of nature-based solutions for the management of large-scale hydrometeorological risks"
- Understanding Risk Forum 2020, "Nature-based solutions: balancing risk and reward"
- American Association of Advancement of Science 2021, "Advances in modelling nature-based solutions to balance dynamic ecosystems"
- EGU 2021, "Nature-based solutions for hydro-meteorological risk reduction"
- World Water Week 2021, "Reconnecting water management with nature: Upscaling NbS for climate resilience"

Although not all of the sessions were selected, a good number of them were and these are described in more detail below. These solidified the TF NBS HydroMet collaboration during the second phase of our activities (May 2020 – March 2022) and facilitated frequent meetings between the three sister projects coordinators to align some

common activities. In close collaboration with the POs of the three projects, several areas of integration of specific outcome have been identified.

During this period the second edition of the EGU session for EGU 2021 (19-30 April 2021) was planned. Details of the sessions are given below. Session details: NH1.4; session title: NBS for disaster risk reduction. Chairmen: Amy Oen (PHUSICOS), Silvana Di Sabatino (OPERANDUM), Zoran Voijnovic (RECONNECT). This session received more than 30 abstract of which 29 were actually delivered. As in the past edition the session was rather successful, and several abstracts were transformed into peer review papers.

As a result, during this phase a plan was made for the set-up of a common session on the specific topic of the upscaling of NBS at the World Water Week in August 2021. The session was coordinated by RECONNECT and sponsored by the three projects equally. The virtual session highlighted methods to scaling NBS focusing on the potential barriers to uptake as well as the possible enablers and solutions to apply NBS to reduce hydro-meteorological risk and mitigate climate change. On the live chat, the audience joined the discussions, raising important challenges to upscaling NbS, such as financing, skepticism, monitoring and governance. The project's experts addressed the questions from the participants during the session.

Another common activity was the participation to UR2020 session "Understanding Risk Forum 2020" on the December 2nd, 2020. On behalf of NGI, University of Bologna, IHE Delft and iCATALIST, Farrokh Nadim (NGI) led the virtual session Nature-based solutions: Balancing risk and societal benefits. The focus of the session was

- i. explore how balancing perspectives can improve the implementation of nature-based solutions (NBS) to reduce hydro-meteorological risks; and
- ii. promote and share experience currently being developed in Europe and Asia with the best available science and knowledge to establish a coherent approach towards risk management.

Again, this has been a further initiative to communicate TF NBS HydroMet results in a homogenized manner contributing to increase the impacts of each project. That session gave the possibility to show case how the implementation of nature-based solutions has the potential to reduce the risk of extreme hydro-meteorological events and simultaneously provide environmental, social and economic benefits and help building resilience. This session allowed also to further reflect on how NBS not only mitigate the impact of hydro-meteorological events but also can contribute to disaster risk reduction and achieve the broader goals of the Sendai Framework, as well as the Sustainable Development Goals of the United Nations.

2.2.2 Data platform

During this second phase a discussion between the three projects was initiated around the idea of sharing information and tools between the platforms that each project has been developing. It was recognized that since the GeoIKP was in a more advanced and

complete state than the other platforms it would be an ideal candidate to act as the hub for integration of project results especially with respect to upscaling and NBS efficacy. The details of such an integration were finalized during the third phase, described below. In addition, the three projects have agreed to work together on methods for upscaling of NBS.

In that respect, OPERANDUM and PHUSICOS were also involved in Task Force 1 (Data and Knowledge Sharing), acting as a bridge between the activities of Task Force 2 and the development of a Shared Data Management Plan envisioned in Task Force 1 to support collaboration between research and innovation projects funded under the Horizon 2020 and Horizon Europe programmes supported by the European Commission. The plan includes principles of promoting open data; sharing case studies of NBS implementation; sharing metadata; defining levels of access; documenting the provenance of data; using free and open-source software. The plan supports the principles that data should be findable, accessible, interoperable and reusable (FAIR) as a framework to follow when designing a Data Management Plan. A further evolution of the work done in the handbook was discussed during a meeting held in the last phase of the clustering and reported here for simplicity. A very recent cluster meeting of Network Nature Taskforces was held on 28/09/2022 in Bruxelles. The event gathered NetworkNature partners, the European Commission, and Taskforce members, providing opportunities for knowledge-sharing, networking, and collaboration, for the first time in person. GeoIKP was presented in the Panel “Tools of tools from the H2020 and HE NBS projects.

2.3 Third phase – selected common project outputs

2.3.1 Common deliverables

During the third phase of the TF NBS HydroMet a technical meeting was organized by OPERANDUM in Bologna at the end of April 2022. During this technical meeting to which participated the three projects it was decided to continue the discussion about the integration of the platform and an agreement was reached between PHUSICOS and OPERANDUM. Several funds have been secured in the meanwhile which will allow the maintenance of the GeoIKP after the end of the OPERANDUM project. As such, the GeoIKP is available to PHUSICOS as a common tool also after the end of PHUSICOS project. During the meeting, it was also decided to push the exploitation of projects results by identifying 4 areas of integration as illustrated in the diagram below. This diagram illustrates the common Deliverables of OPERANDUM and PHUSICOS which were identified as having benefit from the cooperation.

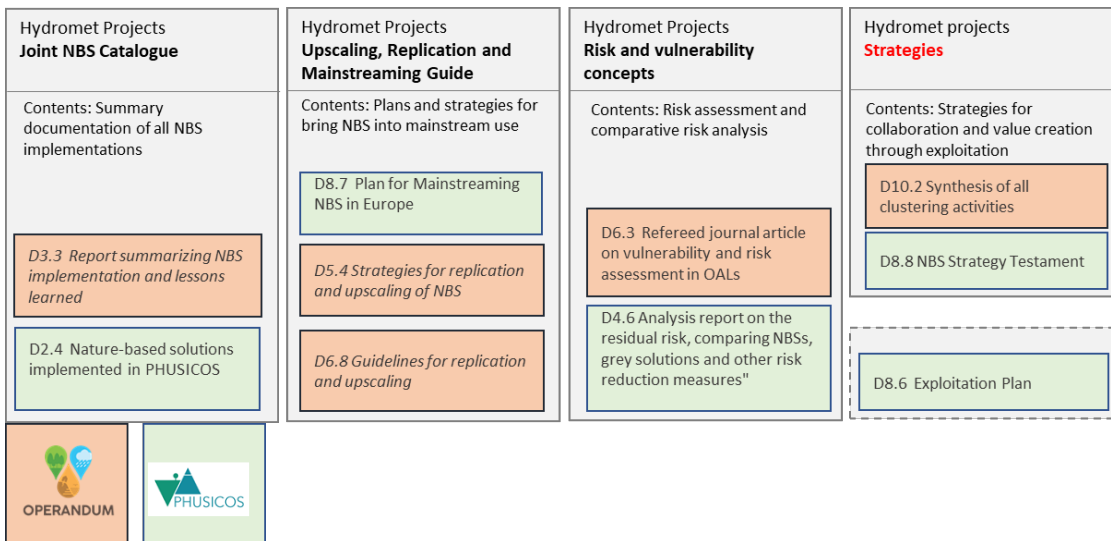


Figure 3: Overview of the joint activities between OPERANDUM and PHUSICOS together with the indication of specific Deliverables in each project documenting the common findings.

The method of implementing the cooperation has been to share the content of the Deliverables by having reviewers from each other project. For example, from OPERANDUM's side, the Deliverables indicated in orange in Figure 3 were reviewed by the PHUSICOS Coordination team. This procedure has allowed to openly share the information, comment on findings and harmonize final messages whenever possible. For example, PHUSICOS partners working with risk and vulnerability concepts were invited to contribute to the OPERANDUM D6.3, a refereed journal article. PHUSICOS's Exploitation Plan Deliverable (D8.6) built on the methodology of the OPERANDUM exploitation and therefore relevant OPERANDUM partners have reviewed this PHUSICOS deliverable.

Currently, OPERANDUM Coordination team contributed to PHUSICOS Deliverable D8.7 (NBS Guidebook) to complete the mapping of NBS over Europe (Figure 4). The NBS Guidebook showcases good examples in a river basin landscape perspective. In the guidebook, every ecosystem is developed as a landscape narrative, where the qualities, spatial relations and transformations, ecosystem services, possible NBS and their specific implementation are highlighted. This approach allows for a coherent vision between different NBS within one determined landscape or territory. By laying out a spatial strategy for the entire area, the socio-ecological benefits of the NBS will also be able to be reinforced and allow for a more resilient (urban) landscape.



Figure 4: Front page and illustration of the six ecosystems as narratives in the NBS Guidebook "According to nature – towards Nature-based Solutions as a design attitude" (PHUSICOS D8.7 with contributions from OPERANDUM and UrbanGreenUP).

In this work, the OPERANDUM team has also been working on analysing NBS cases already included in the GeoIKP platform. This extra effort made by the OPERANDUM and PHUSICOS is allowing to further harmonize the results of each project and identify clarify the methodology for the clustering of NBS as well as facilitate the uptake.

2.3.2 Summer school

During this phase, OPERANDUM and PHUSICOS joined forces to organize the first edition of the summer school on "Nature-Based Solutions for Hydro-Meteorological Hazards and Climate Change Adaptation". The school was held at the Department of Physics and Astronomy (DIFA) of the University of Bologna in August 2022 and counted on the involvement of several partners, including UNESCO, the FMI, KAJO, the Norwegian Geotechnical Institute, Rina-C, TU Delft and University of Glasgow. The overarching objective of the summer school was to provide PhD students and early career scientists with a knowledge basis for the application of NBS to mitigate hydro-meteorological risks and to adapt to climatic change.

The school consisted in a 4-day training with frontal lectures and hands-on sessions where students were grouped and worked to produce a final presentation. After a selection process handled by UNIBO and UNESCO, 28 were admitted among 63 applicants and 23 students attended the summer school.

Students came from Europe (Italy, Netherlands, Switzerland, Norway, Germany, Malta, France), Middle East (Lebanon), and Asia (Pakistan) and were mostly postgraduate students and post-doctoral researchers. The school included a field trip to a site of the Open-Air Laboratory Italy (the Volano beach) where students were guided through the details of the NBS design and implementation and met a cluster of stakeholders of the OPERANDUM project. Snapshots from the school are shown in Figures 5 and 6.

2.3.3 COP27 Side event

Another major clustering event has been the joint participation COP27 EU Side Event. On November 11th, 2022 Bjørn Kalsnes, PHUSICOS project manager, moderated one of the EU side events at the ongoing COP27 summit in Sharm el-Sheikh, Egypt, which focused on nature-based solutions. It was obvious that as the OPERANDUM and PHUSICOS projects were getting close to completion outputs to include NBS implementations, long-term monitoring, stakeholder involvement, and governance strategies are mature for dissemination and exploitation. The opportunity to moderate this event has been therefore a great opportunity to share project results with contributions from expert communities all over Europe.

The published news used to publicize the event reads as follows:

“On Friday, November the 11th (11:30-12:30 CET), you can watch the side event; "Combatting extreme weather: are nature-based solutions ready to tackle the challenge?". During this session, you will get examples of research and implementation of nature-based solutions from Europe and across the globe. Here is a short presentation of what you can expect:

- Professor Silvana Di Sabatino, from the University of Bologna, Department of Physics and Astronomy is the H2020 OPERANDUM project coordinator. She will talk about nature-based solutions for climate adaptation and mitigation with examples from the EU-funded projects, OPERANDUM and PHUSICOS.
- Dr. Burton Suedel, Research Biologist leading the Risk Integration Team at the U.S. Army Engineer Research and Development Center, will showcase practical experience implementing large-scale nature-based solutions to reduce climate risk from the United States and its territories.
- Verónica Garcia Ruiz, Project Manager for Climate and Disasters Resilience at the International Union for Conservation of Nature (IUCN) will focus on how interdisciplinary collaboration in different disciplines is essential to achieve good nature-based solutions”

The third phase of the clustering concludes, from OPERANDUM perspective and the content of this report, with the co-organization of the final conference of OPERANDUM and PHUSICOS. This is described in detail in the next section.

3 Co-organization of the Final Conference

In the final stage of the OPERANDUM project a final conference was held at UNESCO Headquarters in Paris. UNESCO led the organisation of the Final Conference while content preparation for conference sessions was co-led by UNESCO, UNIBO (OPERANDUM coordinator) and NGI (Norwegian Geotechnical Institute, PHUSICOS coordinator). Several brainstorming calls were held from July 2022 onwards between UNESCO, UNIBO and several partners to come up with the most suitable formats to address the aims of each session (see Table 1).



Figure 7: Photo of OPERANDUM partners during the final conference at UNESCO HQ.

The event aimed to present the project achievements with an explicit scientific approach considering policy aspects and the value of private/public partnership to a wide audience including all relevant stakeholders, Member States as well as representatives from EU institutions and major projects. The final conference took place over four days, from December 13th – 16th, 2022 comprising sessions of various formats, including a general assembly, an international conference on Nature-based Solutions for DRR with leading European researchers and practitioners and a roundtable discussion for Member States (see Figures from 7 to 13).

3.1 Day 1 – December 13th, 2022 (OPERANDUM)

The first day of the final conference was devoted to the OPERANDUM Executive Board meeting, the board welcomed many project members as listeners. The final results of the project were presented at specific objectives level.

Table 1: Overview of the joint Final Conference sessions.

Conference session		Aim	Partners in charge
Day 1 <i>internal</i>	OPERANDUM Executive board	Presentation of OPERANDUM results organized by strategic objectives	UNIBO
Day 2 <i>internal</i>	Internal meeting with OPERANDUM, PHUSICOS and RECONNECT	Reporting on common activities and deliverables followed by breakout sessions	UNIBO, NGI, KAJO, UNESCO
	Urban NbS Excursion	Presentation of an urban NbS case study site in Paris area	Agenceter, UNESCO
Day 3 <i>public</i>	Panel discussion on Nature-based solutions in the EU environmental agenda	Relations between Global and EU agenda: Addressing science and policy gaps and challenges of NbS implementation in Europe	UNESCO & UNIBO
	Roundtable on Nature-based solutions in EU: Challenges and lessons learnt	Showcasing NBS projects and their lessons learnt. Common sharing of best practices among case studies owners and external stakeholders.	NGI, UNIBO & UNESCO
	Information meeting to UNESCO Member States on Advancing the disaster risk reduction and climate change adaptation agenda: Application of ecosystem services and NbS	Presentation of results of evidence building for NbS and the role of NBS in addressing societal challenges and accelerating the environmental agenda to UNESCO Member States and EU/UN representatives	UNESCO
	Networking cocktail	Networking between OPERANDUM community and UNESCO Permanent Delegations	UNESCO
Day 4 <i>internal</i>	Legacy meeting roundtable	Outlook on future H2020 calls, funding opportunities and topics	UNIBO

3.2 Day 2 – December 14th, 2022 (OPERANDUM, PHUSICOS and RECONNECT)

Day 2 of the agenda was devoted to Internal meeting with OPERANDUM, PHUSICOS and RECONNECT. Day 2 included the OPERANDUM community as well as partners

from PHUSICOS and RECONNECT and started with a greeting by UNESCO's chief of Disaster Risk Reduction Unit followed by snapshot presentations of each of the sister projects by respective coordinators.

Subsequently, common activities and deliverables between PHUSICOS and OPERANDUM were introduced as a starting point for further discussion during breakout sessions on the following topics:

- Clustering activities (moderated by UNIBO, OPERANDUM)
- NBS Exploitation (moderated by NGI, PHUSICOS)
- NBS data and ideas for integration in the GeoIKP (moderated by UNIBO, KAJO)

During the clustering activities discussion group, partners addressed the development and implementation of NBS, vulnerability and risk assessment specific to NBS and capacity building at EU and global level. Partners discussed the diversity of socioeconomic contexts in different regions and the importance of tailoring approaches to local needs, interests, and capacities. NBS exploitation addressed the application of the OPERANDUM exploitation framework to the PHUSICOS innovation actions and how this supports NBS replication and upscaling. Partners highlighted the fact that the upscaling and replication methodology must include multi-disciplinary aspects of monitoring, modelling, social acceptance, economic estimation/value, and sustainability framework. Missing a point means missing a part of the information for a successful practical application.

The discussion group on NBS data and ideas for integration in the GeoIKP focused on the identification of NBS interventions to be showcased in the guide-plan catalogue as well as NBS best-practice examples and related datasets to be showcased in GeoIKP. Partners assessed further options of integration in GeoIKP, explored writing task assignments to the co-authors and finalized timelines to complete the guide-plan catalogue and for integration in GeoIKP (by March 30, 2023). It was agreed to extend the GeoIKP's story map collection with PHUSICOS best practices and case studies. Furthermore, the option to add subtitles to the platform's introduction video was discussed which could be translated into different languages making it more accessible to non-native English speakers. A dissemination campaign to local authorities and planners was considered beneficial. Follow up meetings will take place to further discuss the ideas and integration of PHUSICOS data on the GeoIKP. The process has started at the time of handling this report and will continue in the following months.

3.3 Day 3 – December 15th, 2022 (International NBS Conference)

The day of December 15th comprised a series of public sessions as part of an international conference on NBS for hydro-meteorological risk reduction dedicated to the EU context. The conference brought together several major EU and international organizations and projects active in the field of NBS and attracted a broad audience who

were both physically present and via streaming. Details are provided in the following chapters and videos from this second day are available via YouTube ([OPERANDUM - YouTube](#)).



Figure 8: Panel discussion on the science and policy gaps and challenges of NBS implementation in Europe at UNESCO, Paris (photo: OPERANDUM).



Figure 9: Welcome speech at international conference on NBS by UNESCO's chief of DRR unit.

3.3.1 Panel discussion on Nature-based solutions in the EU environmental agenda

The first session on “Nature-based solutions in the EU environmental agenda - Science & policy gaps and challenges of NBS implementation in Europe” was moderated by OPERANDUM and addressed relations between the Global and EU agenda and research gaps for NBS. The panel included representatives from the European Commission’s Directorate-General for Research & Innovation, the IUCN, the United Nations Office for Disaster Risk Reduction, Aqua Publica Europea and the UNESCO Regional Bureau for Science and Culture in Europe.



Figure 10: Panel speakers of roundtable on Nature-based solutions in the EU environmental agenda.

3.3.2 Roundtable on Nature-based solutions in EU: Challenges and lessons learnt

The second session on “Nature-based solutions in Europe – Challenges and Lessons Learnt” was moderated by PHUSICOS and the Norwegian Geotechnical Institute, to showcase a variety of EU-funded NBS projects and underline the challenges they face (implementation, stakeholders’ involvement, etc.). The panel included representatives from GoGreenRoutes, UPSURGE, I-CHANGE, REGREEN, FutureMARES, PHUSICOS, RECONNECT, and OPERANDUM.



Figure 11: Panel speakers of Roundtable on Nature-based solutions in EU: Challenges and lessons learnt.

3.3.3 Information meeting to UNESCO Member States

The information session on “Advancing the disaster risk reduction and climate change adaptation agenda: application of ecosystem services and nature-based solutions” was moderated by UNESCO’s Disaster Risk Reduction Unit, to build evidence of the role of NBS in societal challenges and accelerate the environmental agenda. The panel included representatives from UNESCO’s Division of Ecological and Earth Sciences and Division of Water Sciences, the Universities of Glasgow and of Bologna, the United Nations Office for Disaster Risk Reduction, and the European Research Executive Agency.



Figure 12: Panel members at Information meeting to UNESCO Member States.

3.3.4 Key take-aways of the Conference:

As a synthesis of achievements of the round table some important statements were made as given below. These statements help identify a roadmap for future developments of the findings of the three projects.

- Policies need to be based on sound scientific knowledge to transform policy objectives into research opportunities
- European R&I projects should be strongly geared towards policy objectives as outlined in the European biodiversity strategy and climate adaptation strategy
- Continuous identification of NBS-related knowledge gaps and policy needs are necessary to accelerate NBS uptake
- Feedback from the research community to policy is considered essential
- NBS should be considered as complementary approach – working in synchrony with existing engineered infrastructure
- NBS are linked to the systemic nature of risk and there is a need to address these links in a coherent manner – consideration for the systemic nature of disaster risk is still limited
- Structural gaps exist in terms of risk governance – in many countries, fragmentation of roles and responsibility for tackling issues of DRR prevents effective collaboration
- There is a need for strengthening collaborative, intersectoral, transboundary and inclusive governance systems
- A major gap is related to risk financing – based on a lack of engagement from both public and private partnership for seeing CCA and DRR as an investment and not a cost
- Lack of technical skills, metrics on NBS efficacy and benefits, governance, and finance
- A new approach to risk reduction is needed, moving from quick fixes to long-term solutions (ensuring long-term, optimized benefits)
- It is crucial to learn to speak the language of specific target audiences (particularly in case of financial institutions and investors)
- The knowledge of indigenous and local communities is key to fully recognize the value of and potential of sustainable NBS
- International collaboration and partnerships across projects, organisations and governments is required to accelerate the uptake of NBS for sustainable development.

3.3.5 Networking cocktail

The day ended with a cocktail reception where the Chief of UNESCO's Disaster Risk Reduction Unit welcomed OPERANDUM Final Conference participants followed by a brief address by coordinators of PHUSICOS and OPERANDUM. A photo exhibition featuring photos from all Open-Air Laboratories were displayed. This exhibition was organized and printed by UNESCO.



Figure 13: Welcome address by OPERANDUM and PHUSICOS coordinators (left), discussion between European Commission representative and EU project coordinators (right).



Figure 14: Welcome by UNESCO DRR project officer (left) and snapshot of final conference participants (right).

3.4 Day 4 – December 16th, 2022 (Legacy roundtable)

On the final day of the conference, a legacy meeting roundtable took place which brought together representatives of the European Commission’s Directorate-General for Research & Innovation (DG RTD) and the European Research Executive Agency (REA) with EU project leads to discuss ongoing EU policies & initiatives dealing with Disaster Risk Reduction, Adaptation and Environment aspects and role of biodiversity in Disaster Risk Reduction. In addition, future funding opportunities, calls and relevant topics within Horizon Europe were discussed among participants. The session was moderated by UNIBO.

The conference marked the end of OPERANDUM project as well as one of the main last event of PHUSICOS. We recall that both projects were funded under the European Union's Horizon 2020 framework aiming to reduce hydro-meteorological risks through innovative Nature-based Solutions based on explicit scientific evidence, an enabling policy context and participatory approaches. The term 'nature-based solutions' is still a fairly new concept. The United Nations Environment Assembly only recently ratified the definition of this term in September 2022. That is why the December conference offered a timely opportunity to establish a common understanding of how to leverage nature-based solutions around the world and overcome the regulatory and policy barriers to their implementation.

The December conference attracted a wide range of participants to include international policymakers from UNESCO and representatives of the European Commission, United Nations Office for Disaster Risk Reduction and the International Union for Conservation of Nature. Project leaders from OPERANDUM attended but also senior researchers and project leaders from other EU-funded projects: PHUSICOS, RECONNECT, I-Change, GoGreenRoutes, UPSURGE, FutureMares and REGREEN. The International Conference demonstrated the need to strengthen collaborative intersectoral, transboundary and inclusive knowledge sharing when shifting from quick fixes to long-term solutions that ensure long-term, optimized benefits for people and planet. Conference attendees across various projects, sectors and organizations were committed to continue international and EU partnerships to share knowledge widely and build momentum for community led Nature-based Solutions co-creation across Europe and beyond.

4 Reflections on clustering activities

The requirement for clustering activities and collaboration across the NBS HydroMet projects came during the negotiation phase, after the proposals were accepted and before the contracts were finalised with the European Commission. As such, activities were added in the revision of the project proposals. For PHUSICOS, we communicated this requirement to the partners with emphasis on additional responsibilities for the Work Package leaders.

Although the clustering activities required additional time and resources, they were essential for the greater impact of the individual projects. This included creating a coordinator support network, creating synergies across projects, as well as creating greater critical mass for NBS policy impact. Each of these three key areas are described in more detail below.

4.1 Creating a coordinator support network

Clustering activities between the NBS HydroMet projects began at the project coordinator level as described in Chapter 1. This was an important phase of this activity in order for the project coordinators to establish trust and confidence in one another. After this basis for collaboration was established, the clustering activity developed into

our own coordinator support network which was a great source of knowledge and information on both the practical aspects of coordinating a large research project as well as the scientific aspects of achieving innovation and exploitation of project results.

Not only has this coordinator support network been a space for knowledge exchange, it has also functioned as a more informal space for sharing our trials and tribulations. European research projects are complex by nature and coordinating such large projects can be a very lonely endeavour. The challenges met by project coordinators are best understood by other project coordinators and the informal discussions among the NBS HydroMet project coordinators has provided valuable insights and encouragement that would not have otherwise been available.

Several European NBS research project coordinators participated in the panel discussions for the International NBS Conference at UNESCO in December 2022 (Chapter 3.3). During the informal exchanges between project partners, we jested about everything we wish we would have known before taking on the role as project coordinator. One idea that was generated during this discussion was creating a Research Project Coordinator Handbook to include practical advice and tips from previous project coordinators and made available to funded European research project coordinators.

4.2 Creating synergies across projects

At the consortium level, the clustering activities helped create synergies across projects. While the transdisciplinary nature of European research projects is essential for implementing NBS and require many areas of expertise, there is often only room for one or two partners with a specific area of expertise within a single project consortium. Clustering activities established linkages between partners with similar areas of expertise across projects addressing the same challenging and producing similar projects outputs towards the same outcomes. These exchanges were advantageous as partners were able to become familiar with the state-of-the-art from such partners. In some cases, this also resulted in projects building on one another's project results (e.g. common deliverables, Chapter 2.3.1).

Although beneficial, establishing clustering across all project partners required more effort than at the coordinator level. More time was needed to convince the project partners that these activities are important and not all partners perceived the clustering activities as within their scope of work. They also referenced a lack of funds to support this work as the reason. This feedback emphasises the importance of highlighting this expectation in the research call text and including these activities in the partner tasks with Person Months (PMs) specified.

4.3 Creating critical mass for NBS policy events

The NBS clustering activities also generated critical mass for the TF NBS HydroMet in order for the TF to have more impact at high level NBS policy events. More doors were open for the TF NBS HydroMet as a group of projects working together than would have

been available for a single project. This included invitations to high level meetings, events and conferences as well as receiving information about the current status of NBS within the European policy landscape. Reflecting on activities over the last five years, there are three that specifically stand out as being achieved as a result of the establishment of the TF NBS HydroMet: i) the pitch during a time slot at the EASME stand during ECCA in 2019, ii) the contribution to UNEP's platform of NBS prior to the 2019 UN Climate Action Summit, and iii) organising and moderating the session on NBS during the COP27 EU Side Event in 2022.

5 Summary

This report documented some of the main activities of clustering between OPERANDUM, PHUSICOS and RECONNECT. For simplicity, the clustering activities have been grouped by different phases/periods of the project. The report identifies a first phase where the common strategy for cooperation was set, a second phase where more actions, especially joint events were prepared and a third phase where major activities were designed to maximize impact and harmonize final messages. The joint activities culminated in the joint final conference in Paris in December which gave an opportunity to discuss major achievements with a large audience. At the same time the Conference gave the opportunity of sharing findings with new projects and identifying priorities in the policy uptake of NBS for DRR.

Further to these activities, the report reflects on the advantages and disadvantages of clustering activities. Although time and resources are required and that activities can be perceived by some partners as outside the scope of their tasks, the advantages of clustering activities across NBS projects outweighs these challenges. The benefits of creating a supportive coordinator network, leveraging synergies across projects as well as having increased impact at the European and International level is not to be underestimated. The EU Horizon Europe research program has an important role in this work to indicate this requirement in the research program call text as well as facilitating introductions between projects. With these efforts, clustering activities will continue to support mainstreaming NBS and facilitate further uptake of NBS.

Appendix A

Clustering activities

Contents

A1 List of OPERANDUM, PHUSICOS and RECONNECT clustering activities

Clustering Activity	Place	Date	OPERANDUM	PHUSICOS	RECONNECT	Link
OPERANDUM kick-off meeting	Bologna (IT)	03/07/2018	Organizer	Participant	-	https://site.unibo.it/operandum/en/agenda/kick-off-meeting https://www.operandum-project.eu/events/post-3/
UN Climate Action Summit	New York City (USA)	20-21/09/2018	Contributor	Participant & Contributor	Contributor	NBS contributions platform UNEP - UN Environment Programme (Contribution #196)
RECONNECT kick-off meeting	Portofino (IT)	26/09/2018	Participant	Participant	Organizer	https://phusicos.eu/news/reconnect-kick-off-meeting/ http://www.reconnect.eu/2018/09/28/h2020-reconnect-kick-off-meeting/
RECONNECT thematic meeting	Apeldoorn (NL)	27/11/2018	Participant	-	Organizer	No public link available
NAIAD workshop	Ljubljana (SI)	22/01/2019	Participant	Participant	Participant	http://www.reconnect.eu/2019/03/25/reconnect-at-the-naiad-project-meeting/ https://www.operandum-project.eu/events/naiad-nbs-clustering-meeting/
OPERANDUM workshop	Paris (FR)	27/02/2019	Organizer	Participant	Participant	https://www.operandum-project.eu/events/operandum-workshop-on-stakeholder-engagement/
EEA internal meeting	Copenhagen (DK)	14/03/2019	Participant	Participant	Organizer	No public link available

Clustering Activity	Place	Date	OPERAND UM	PHUSICOS	RECONEC T	Link
ECCA 2019 EASME stand for NBS HydroMet	Lisbon (PT)	28/05/2019	Contributor	Participant	Contributor	http://www.reconnect.eu/2019/05/21/reconnect-at-ecca-2019/
H2020 NBS TF2 and NBS Taskforce Hydromet	Brussels (BE)	07/10/2019	Participant	Participant	Participant	https://wedocs.unep.org/bitstream/handle/20.500.11822/28803/EUH2020.pdf?sequence=1&isAllowed=y
PHUSICOS Consortium meeting	Lucca (IT)	16/10/2019	Participant	Organizer	Participant	http://www.reconnect.eu/2019/10/18/reconnect-phusicos-project-meeting/
EGU 2020	Remote	05/05/2020	Co-Organizer	Co-Organizer	Co-Organizer	https://meetingorganizer.copernicus.org/EGU2020/displays/34902 http://www.reconnect.eu/2020/05/05/reconnect-at-egu-2020/
UR2020 NBS side-event	Remote	02/12/2020	Co-Organizer	Co-Organizer	Co-Organizer	https://understandrisk.org/nature-based-solutions-balancing-risk-and-reward/
EGU 2021	Remote	28/04/2020	Co-organizer	Co-organizer	Co-organizer	https://meetingorganizer.copernicus.org/EGU21/session/38970 http://www.reconnect.eu/2020/12/28/call-for-abstract-egu-2021/
World Water Week	Remote	05/03/2021	Co-Organizer	Co-Organizer	Co-Organizer	https://www.worldwaterweek.org/event/9799-reconnecting-water-management-with-nature-upscaling-nature-based-solutions

Clustering Activity	Place	Date	OPERANDUM	PHUSICOS	RECONECT	Link
Internal clustering meeting	Remote	29/03/2021				No public link available
Internal clustering meeting	Remote	19/05/2021				No public link available
Internal clustering meeting	Remote	04/06/2021				No public link available
Internal clustering meeting	Remote	14/06/2021				No public link available
OPERANDUM technical meeting	Bologna (IT)	27/04/2022	Organizer	Participant	Participant	No public link available
RECONNECT annual meeting	Remote	25/05/2022	Participant	Participant	Organizer	http://www.reconnect.eu/category/events/
RECONNECT national meeting	Torino (IT)	15/06/2022	Participant	-	Organizer	http://www.reconnect.eu/national-workshops/portofino-natural-park/
OPERANDUM summer school	Bologna (IT)	29/08/2022	Organizer	Participant	-	https://www.operandum-project.eu/events/operandum-international-summer-school/

Clustering Activity	Place	Date	OPERANDUM	PHUSICOS	RECONECT	Link
COP27 EU side event NBS for extreme weather	Remote	11/11/2022	Participant	Moderator	Participant	https://rea.ec.europa.eu/events/cop27-un-climate-change-conference-eu-side-events-2022-11-07_en https://www.operandum-project.eu/events/cop27-un-climate-change-conference-eu-side-events/ https://www.ngi.no/eng/News/NGI-News/Combating-extreme-weather-with-nature-based-solutions
OPERANDUM/PHUSICOS final conference	Paris (FR)	13/12/2022	Organizer	Co-Organizer	Participant	https://www.unesco.org/en/articles/international-conference-nature-based-solutions-manage-hydro-meteorological-risks