Rural Environmental Monitoring via ultra wide-ARea networKs And distriButed federated Learning

Dissemination Exploitation and Communication Plan

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Abstract

One of the main objectives of REMARKABLE's WP6 is to develop awareness about the existence of the project, its potential impacts (both internal and external) and implement strategies for individual and joint (commercial and academic) exploitation of the project outcomes.

This document presents the Communication and Dissemination plan and all related activities foreseen to grasp a broad range of stakeholders (such as farmers, veterinarians, tourists, and policy makers) by offering different levels of information and employing diverse communication means, tailored based on the stakeholder's role and interest.

The actions reported in the current document contribute not only to the external, but also to the internal dissemination, among all project partners. Therefore, it is a strategic document for the beneficiaries serving to aid them in establishing the foundations for their intellectual property strategy and foreseen exploitation. Furthermore, this deliverable gives details on how these activities are intended to be performed, as well as how to monitor their impact.

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1. Introduction

This document presents the REMARKABLE's Dissemination and Communication plan established in order to appropriately promote the project and its outcomes. The contractual agreements for dissemination are provided in the Grant Agreement, Section 3, Articles 28 and 29 and Section 4, Article 38.1 [1].

The document presents the objectives, the global strategy, and the essential activities in order to:

- Apprise and promote the project and its findings/successes (Communication).
- Communicate and assure that the accomplished results are publicly available for others to use and distributed to stakeholders (Dissemination).

By identifying groups of stakeholders that might be interested in the project findings and by customization of the communication messages towards them, based on their peculiarities in terms of content, style and information support, the REMARKABLE project group aims to maximise information usage.

This plan is envisioned as a functional framework for the project's daily communication activities. It is centred on identification of the desired outcomes for dissemination, identification of the main targeted audience and analysis of their particularities that will be exploited in the communication stage to maximise information usage, and on definition of the strategy to accomplish the craved outcomes. Naturally, if other opportunities for communication and dissemination appear throughout the duration project, the consortium will do its best to take advantage of them, even if these are not part of this document. Finally, it is worth mentioning that this plan will be assessed annually to ensure the effective flow of information among the project partners, as well as towards the general public.

1.1. Definitions

Communication and Dissemination activities have different goals and therefore their actions and targets may also differ. Hence, their main differences and the corresponding activities are summed up in the following, as indicated by the European IPR Helpdesk [2].

	Communication	Dissemination
Definition	"A strategically planned process that starts at the outset of the project and continues throughout its entire lifetime, aimed at promoting the project and its results."*	"The public disclosure of the results by any appropriate means including by scientific publications in any medium."*
Objective	"Reach out to society and demonstrate the impact and benefits of EU activities, e.g. by addressing and providing possible solutions to fundamental societal challenges."	"Transfer knowledge and results with the aim to enable others to use and take up results, thus maximising the impact of EU-funded research."
Focus	"Inform about and promote the project and its results/success."	"Describe and ensure results available for others to USE ➛ with a focus on results only!"
Target Audience	"Multiple audiences beyond the project's own community, including media and the broad public."	"Audiences that may take an interest in the (potential) USE of the results (e.g. scientific community, industrial partner, policymakers)."
Questions to ask	"Why is this project important? How is this project new/innovative? What are the possible impacts or benefits to society? What and whom was involved? What are the best ways to reach out with this information?"	"Where does this project fit in with other initiatives or research? How could this work be expanded upon? What are the best ways to reach out with this information?"
	*Source: EC Research & Innovation Participant Portal Glossary/Reference Terms	*Source: EC Research & Innovation Participant Portal Glossary/Reference Terms

Figure 1. Definitions of Communication and Dissemination H2020 [1].

The communication activities to promote the project's actions and results, together with the actions to disseminate the results and successfully exploit the results, are all crucial parts of the REMARKABLE project (Grant Agreement, Section 3, Articles 28 and 29 and Section 4, Article 38.1 [1]). Thus, these activities are constructed to clearly identify the overall strategy, target audiences, various media, materials, partners responsible for each activity, messages that will be communicated with the target audience, the means that will be used, and unambiguous metrics through which performances will be measured, with the end goal of achieving awareness across a multi-layered community.

To do so, this deliverable is based on the following five pillars:

1) **Define crucial messages and specify key objectives:** identify the desired outcomes and the ways to achieve them.
2) **Identify main stakeholders:** identify groups of stakeholders (such as farmers, veterinarians, tourists, and policy makers) that might be interested in the project findings such as general public vs. technical experts, internal audience vs. external audience.
3) **Personalise the information:** tailor the messages based on the interests and needs of the stakeholders. Depending on the particularities of the target audience, the message may vary in terms of content, style, and information support. Avoid dissemination of sensitive/confidential information.
4) **Identify, plan, and perform the communication, dissemination, and networking activities:** identify a clear and comprehensible strategy for the project communication and dissemination that considers the goals, the target and the appropriate means for each type of audience. This strategy will help the consortium in achieving the dissemination objectives and in assuring continuity and consistency in the communication.
5) **Assess the effect of Communication and Dissemination:** identify a set of indicators to keep track of the communication and dissemination activities performed within the project and to monitor their progress. These indicators will aid verifying if the communication and dissemination strategy is obtaining the expected results.

The Dissemination and Communication task extends throughout the project duration (48 months), continuously communicating the project progress and results in a reliable and distinctive manner, by also engaging and actively involving all groups of target audiences.

1.2. Applicable Reference Material

[1] Grant Agreement Number: 101086387 — REMARKABLE — HORIZON-MSCA-2021-SE-01.

[2] Making the Most of Your H2020 Project - Boosting the impact of your project through effective communication, dissemination and exploitation, The European IPR Helpdesk, available at: https://op.europa.eu/en/publication-detail/-/publication/3bb7278e-ebf3-11e9-9c4e-01aa75ed71a1/language-en/format-PDF/source-164620962

[3] Communication, dissemination & exploitation: what is the difference and why they all matter, European Research Executive Agency, 16 June 2023.

[4] REMARKABLE Kick off Meeting, January 31, 2023 – MSCA-SE Presentation.

[5] Opening speech by President Ursula von der Leyen at the 6th European Union - African Union Summit, Brussels, February 2022, https://ec.europa.eu/commission/presscorner/detail/en/speech_22_1142

[6] Ofcom's annual Connected Nations report, UK report, December 2020, https://www.ofcom.org.uk/__data/assets/pdf_file/0024/209373/connected-nations-2020.pdf

1.3. List of Acronyms

Acronym	Definition
AI	Artificial Intelligence
CN	Communications and Networking
FL	Federated Learning
HAP	High-altitude Platform
IoT	Internet of Things
ICT	Information and Communication Technologies
LoRa	Long Range
ML	Machine Learning
NB	Narrow Band
LEO	Low-Earth Orbit
NSS	Networked Sensing Systems
LP-WAN	Low-power Wide-area Network
LR-UWAN	Low-power Ultra-wide-area Network
LR-PAN	Low-rate Personal Area Network
TinyML	A kind of embedded ML
UAV	Unmanned Aerial Vehicle
UC	Use Case

Table 1. List of acronyms.

2. Project Introduction

2.1. The REMARKABLE project

Internet of Things (IoT) technology combined with complementary support for data analytics is the cornerstone of today's digital transformation. The societal and economic impact of IoT/machine learning (ML) systems in urban and suburban areas significantly outpaces the one in rural areas due to a limited reach of connectivity infrastructure. IoT technologies have a huge potential for improving the economy and quality of life in rural areas, both in developed and developing countries. For instance, about 30.6% of the EU population lives in rural areas, which cover over 83% of the total EU area. Nonetheless, the average GDP per capita in rural EU areas is only 75% of the EU average [5]. Moreover, even though mobile networks cover more than 99% of the population in some European countries (such as the UK), they cover only about 79% of their landmass, thus leaving more than 20% of deep rural country areas without signal coverage [6]. To reverse further widening of the urban-rural gap, one needs to bring efficient and affordable IoT/ML solutions to deep rural areas, reaching out to applications and use cases ranging from wildlife management, rural tourism, livestock monitoring, water and air pollution control, and others.

REMARKABLE is an interdisciplinary project comprising experts from computer science, communication engineering, life sciences, environment and management. These experts come from diverse organisations in the UK, Europe and Africa. The project's vision is to bring IoT/ML systems a step closer to seamless, energy efficient and secure deployment targeting use cases in deep rural areas. This will be done by identifying main gaps in connectivity and affordable data analytics and through interleaved research, development and validation in a real-world setting. The project is centred on an IoT/ML-based technological platform that will be adapted and demonstrated in the context of use cases applied in environmental monitoring, management, and conservation.

In short, the REMARKABLE project emphasises a necessity of bringing rural areas into the reach of IoT/ML technologies. Its ultimate goal is to facilitate a reduction of urban-rural gap which is currently increasing. Making advanced information and communication technologies (ICT) such as IoT/ML systems a rural commodity will play a crucial role in reversing the rural depopulation trends due to an expanded range of economic opportunities through empowering and modernising traditional rural ecosystems. The added value of deploying IoT/ML in deep rural areas is in reaching out to new streams of data sources that could prove invaluable in tackling and better understanding the growing environmental concerns, ranging from local and regional (such as pollution monitoring) to global ones (such as climate change).

REMARKABLE considers several objectives in terms of research and innovation that will also have a large environmental and societal impact, summarised in Table 2.

	Objective	Outcome	WP-M	Deliverable	Respons. Partner
Research and Innovation Objectives	Secure and Trustworthy Sensing, Localisation and Digital Twins	Design of robust, secure, trustworthy, and traceable IoT platform suitable for deep rural applications	M44	D.1.1-D.1.4	ULHT
	Connecting the Unconnected – Ultra Wide-Area IoT Networks	Provide a solution for connectivity of IoT devices deployed in deep rural areas beyond the reach of current wireless cellular network infrastructure	M44	D.2.1-D.2.4	UNS-FTN
	Secure and Frugal Distributed Data Analytics for Rural IoT	Develop a novel data analytics platform based on privacy-preserving distributed ML methods that are frugal secure and scalable	M44	D.3.1-D.3.4	MMU
	Demonstration, Validation and Assessment	Demonstrate, validate, and assess developed solutions in uses cases in real-life conditions, across European and African countries	M48	D.4.1-D.4.4	UA
Environmental and Societal Impact	Health and vitality monitoring of livestock in real-time	Enable quick animal treatment and prevent spreading illness, increase food production, track animals, identify grazing patterns, prevent desertification			
	Wildlife monitoring	Support tracking of endangered animals, reduce their poaching, improve tourist experiences in wildlife parks and reservations			
	Soil and agronomic management	Support automated irrigation and increase all-season production of food products			
	River pollution and air quality monitoring	Prevent health risk to humans, protect aquatic ecosystems from collapse and prevent the proliferation of phytoplankton			

Table 2. Summary of REMARKABLE project objectives.

2.2. Project key messages

REMARKABLE offers at least four main high-level messages that are foreseen for the principal findings produced by the projects, which are focused on the following concepts:

- The REMARKABLE project is centred on developing an IoT/ML-based technological platform that will be adapted and demonstrated in the context of use cases applied to environmental monitoring, management, and conservation.
- REMARKABLE uses and assesses innovative methodologies based on statistical data processing and decentralised federated learning methods specifically designed for different use case implementations and demonstrations.
- The REMARKABLE project places a specific focus on rural environments and, in particular, on the African continent due to the huge potential of the number of IoT applications in Africa and the lack of traditional connectivity options.
- REMARKABLE strives at developing various added-value services ranging from wildlife management, rural tourism, livestock monitoring, water and air pollution control and others.

2.3. Keywords

Distributed federated learning, Internet of Things, Rural environmental monitoring, Statistical data processing, Ultra-wide area networks.

2.4. Focal point for communications and dissemination

Name	Role	Contact
João Paolo Luís	Communication and Dissemination Officer	joao.luis@pdmfc.com
Rebeka Tomić	Social Media Manager	rebeka.tomic@ulusofona.pt
Luís Miguel Campos	Project Coordinator and WP6 leader	luis.campos@pdmfc.com
Dejan Vukobratović	Dissemination (via project organized events) Consultant	dejanv@uns.ac.rs
Pietro Manzoni	Dissemination (via conferences and journals) Consultant	pmanzoni@disca.upv.es

Table 3. REMARKABLE contacts for communications and dissemination.

3. Dissemination

The main objective of dissemination is to make the project results publicly available (free of charge) not only for other scientists to use, but also to all entities that can learn from the results. REMARKABLE's main findings will be published in scientific magazines, scientific and/or targeted conferences, databases, as well as any other means that will help make the results public at any time. In short, the main aim of this activity is to make our scientific results a common good.

3.1. Dissemination objectives and strategy

The REMARKABLE's dissemination plan will be considered and executed as an enduring activity to enable the reference community to mature their knowledge during the progression of the project. As the key steps for this activity, we identified the following:

- Study of the particularities and interests of the five major groups of intended stakeholders presented in Section 3.2, as well as identification of the main desirable reactions achieved with the project dissemination. Ideally, this will aid the Consortium in suiting the information to an adequate form in order to disseminate it according to the stakeholders' peculiarities and expectations, especially having in mind the fact that the audience is primarily composed of technical society, coming from diverse countries and cultures. Similarly, it is also required to arrange promotional material in various forms, to warrant that each distinct cluster of stakeholders can access it in the most appropriate format.
- Defining contents associated with the principal findings of the project to promote. This material will be under constant evolution throughout the course of the project, as will the methods supporting their dissemination. In the early phases of the project, the focus will be mainly on the project promotion over informative channels, like brochures, flyers, posters, social networks, and website, while the dissemination of technical results will be carried out through more specialised supports, such as scientific articles, presentation at conferences, workshops, and seminars.

Once these objectives have been achieved and the target audiences have been identified, the plan envisions precise matching between:

- Main characteristics of the target audience and their needs.
- Tailoring the information to be communicated (shaped based on the requirements of the target audience).
- Identification of the appropriate content, formats, means, and language style to maximise the probability of the desired outcomes from the target audiences.

Three types of dissemination actions are vital in the REMARKABLE project: the dissemination towards stakeholders' groups, the communication and networking with other EU-funded actions and the external dissemination towards the target audience.

Concrete elements of the dissemination plan are presented below.

- **Website and Information Sharing Platform:** The goal of the website and information sharing platform will be to reach out to the general public. This will be designed to attract young generations to the concepts of environmental monitoring and protection and the commercial possibilities of IoT/Cloud applications in rural domains. It will contain a high-level description of project activities in order to engage the public's attention to the rising importance of rural monitoring (e.g., using drones or LEO satellites) and how their applications are shaping the future of rural communities.
- **Dissemination in press and general media:** All partners have well-established press offices and communication structures for dissemination at both local and global scales. The project will exploit these available structures in order to establish effective communication channels at both local and global levels, targeting local newspapers and TV/radio stations and explaining how the results of the project become relevant to the ordinary European and African public. Priority will be given to media segments and spaces that are oriented towards science and technology. Participation in open events oriented towards the general public, such as Researcher's nights, will be encouraged.
- **Social Networks:** Frequent dissemination of project news and activities in social media, via e.g., LinkedIn and Twitter channels. Due to extensive demo activities numerous video-clips will be released both on the project website and via Youtube, that will include practical experiments, demos and showcases, and less formal recordings where researchers explain their main achievements in the project.
- **Project newsletter:** The objective of the newsletter is to convey the most relevant project information, new achievements, and related events to a wide audience. To be launched at the beginning of the project and regularly (2 per year) during project life. It will be sent to subscribed users and made available on the project website.
- **Organisation and participation in dissemination events targeted to the general audience:** In these events, the project research results will be promoted in an unspecialized environment and the non-expert public at various venues, such as the Researchers' Nights, and various Science Festivals, etc.
- **Project promotion in high schools and to undergraduate students:** Due to attractive topic of environmental monitoring, usage of drones in rural areas, integration of IoT and Cloud/AI, project researchers will give lectures and demos at schools, universities, community organisations, in order to promote the project to students and public audiences and promote the interest in science and Marie Curie programs.
- **Open days:** A series of REMARKABLE open days at different beneficiaries are organised in order to raise scientific awareness of the developed environmental monitoring and IoT/Cloud technology use cases. In these events, the general public will visit the premises/labs of a beneficiary and receive first-hand experience or lectures.
- **Industry-oriented congresses:** REMARKABLE findings will also be spread in relevant industrial-oriented fairs, shows and congresses, where the project results and demonstrations can be presented to a business-oriented target.

3.2. Target audiences

The paramount objective of dissemination activities is to diffuse knowledge and outcomes with the goal of empowering others to exploit and raise the REMARKABLE findings, maximising

in this way the effect of the project itself. These activities also aim at describing the project outcomes by communicating them according to certain requirements of the targeted audiences in order to make sure that these findings are available for others to use.

Table 4 considers the main groups of the audience for dissemination activities. These activities will aim at the different stakeholders described here with messages primarily concentrating on the REMARKABLE results, and not the general presentation as it was provided within the communication activities.

Target	Benefits	Objective & desired feedback
Rural communities and residents	Improved access to information and communication technologies. Enhancing agricultural and livestock management through IoT/ML. Economic upliftment due to modernised rural ecosystems. Better environmental awareness and pollution control mechanisms. All-season food production.	Understand the specific challenges and requirements of the rural population. Gauge the acceptance and usability of the introduced technology. Feedback on the real-world impact of IoT/ML solutions on their daily activities and quality of life.
Local Government and Policy Makers	Data-driven decision making to aid development of future regulations. Enhancing rural infrastructure through technology. Increased potential to attract investments in rural areas. Better monitoring and management of environmental factors. Reduced health risk to rural residents and enhanced protection to aquatic and terrestrial wildlife ecosystems. Creation of patents, spinoffs, and novel business models.	Understand policy constraints and areas of government support. Get insights into scalability and expansion strategies. Feedback on integration with existing government initiatives and infrastructure. Generate understanding, engage and ensure the impact.
Academic and research institutions	Access to a rich source of real-world data for research purposes. Opportunity for field studies and real-world validation of academic theories. Collaboration with an interdisciplinary team. Enhanced mobility and network expansion.	Analytical insights and evaluation of the effectiveness of deployed solutions. Recommendations for technological advancements and improvements. Feedback on the technological platform and suggestions for further research collaborations.

Environmental Organizations and NGOs:	Enhanced tools and data for monitoring and conservation. Collaboration opportunities for community outreach and education. Support in combating local environmental challenges. Opening up new rural grazing locations due to improved rural communication coverage.	Insights into the specific environmental challenges and concerns in rural areas. Feedback on the effectiveness of IoT/ML solutions in addressing environmental issues. Recommendations on further areas of collaboration and community engagement.
Educational groups, tourists, and wildlife agencies	Enhanced "national park experience" for educational groups and tourists. Provision of essential monitoring data for under-resourced wildlife agencies	Collection on habitat change through photos at set points. Discovering locations of individually identifiable animals and locations of specific invasive plant species. Essential support for future management decisions.

Table 4. Dissemination to target audiences.

3.3. Dissemination channels

In order to disseminate the main projects' findings, the WP6 leaders will exploit channels like peer-reviewed papers, presentations at scientific conferences and social events, to name a few. Moreover, in addition to these dissemination channels, other sources described in the communication activities, considered the most adequate to raise awareness and create understanding between different target audiences will be exploited as well.

3.3.1. Scientific publications

Principal objectives: to inform, engage, raise awareness, and ensure impact.

All partners will prepare and submit scientific works to leading international journals and conferences from the very beginning of the project, as soon as first findings are obtained. Additionally, these findings will also be published in open repositories (e.g., arxiv, TechRxiv and OpenAIRE) to make them publicly available at the earliest convenience. Besides these, publishing in high-level surveys, tutorials and dissemination articles in magazines are also foreseen. Partners are encouraged to present their findings in highly specialised media and to several selected scientific events, in order to discuss and produce understanding on the project activities, as well as to engage the stakeholders. A key dissemination channel (besides high-rank journal publications) is the presentation of research results at major IEEE and ACM international conferences and symposia, as well as visibility through demos and showcases. Environmental monitoring (e.g., air/water pollution) is very relevant for the wider community. Creating short videos that explain different rural environmental monitoring applications and use cases, along with video material showing the demos and experiments on test fields, will be a basis for approaching a wider community. Likewise, teams from different beneficiaries and associated partners will be encouraged to form cross-institutional teams and participate at

external competitions and challenges. Finally, the goal of the dissemination activities to such communities is to raise consciousness about the EC's determination to support our effort to bring IoT/ML solutions to rural communities and reduce the gap regarding the societal and economic impact that IoT/ML systems have established in urban and suburban areas compared with rural ones.

Generally, the target audiences of scientific dissemination activities can be categorised as principal and secondary targets.

1. Principal target domains:
    a. Computer Science & Informatics
    b. Applied life sciences & non-medical biotechnology
    c. Systems and communication engineering
    d. Environmental engineering
    e. IoT and ML scientific community and research institutions
2. Secondary target domains:
    a. Academic institutions working in IoT/ML
    b. Wildlife biology and animal health
    c. Wireless communication and the drone industry
    d. Ecology

Below we indicate a non-comprehensive list of scientific journals where we aim to publish the project's findings. Further adjustments will be carried out during the project's lifetime.

Scientific Journal	Website
Future Generation Computer Systems	https://www.sciencedirect.com/journal/future-generation-computer-systems
ACM Transactions on Internet Technology	https://dl.acm.org/journal/toit
ACM Transactions on Internet of Things	https://dl.acm.org/journal/tiot
IEEE Internet of Things Journal	https://ieee-iotj.org/
IEEE Access	https://ieeeaccess.ieee.org/
IEEE Transaction on Vehicular Technology	https://vtsociety.org/publication/ieee-transactions-vehicular-technology

Table 5. List of provisional scientific journals for REMARKABLE scientific dissemination.

A preliminary list of scientific conferences relevant for the REMARKABLE's dissemination activities are summarised in Table 6 below.

Scientific Conference	Website
IEEE Globecom	http://www.ieee-globecom.org/
IEEE CCNC	http://www.ieee-ccnc.org/
ACM SIGMOBILE International Conference on Mobile Systems, Applications and Services	https://www.sigmobile.org/mobisys/
IEEE ICC	http://www.ieee-icc.org/

ACM GoodIT	http://goodit.campusfc.unibo.it/

Table 6. List of provisional scientific conferences for REMARKABLE scientific dissemination.

In order to boost dissemination among the scientific community, the Consortium is committed to making every effort to fully adhere to Article 17 of the Grant Agreement [1], which in H2020 aims to ensure that the results of research funded by the EU are made widely available for free to the largest possible audience.

3.3.2. Dissemination towards the Advisory Board

Principal objectives: to inform, engage, raise awareness, and ensure impact.

As for any successful engineering endeavour systems, input collection from various stakeholders is crucial, and REMARKABLE is no exception. Actually, considering stakeholders from different domains allows us to better understand the proposed changes, alongside with the repercussions and effects from the stakeholders' corresponding perspective. In short, an active participation of stakeholders in the exploration of existing and elaboration of new solutions (and their integration in existing systems) is vital for a fruitful management of any complex system, such as affordable IoT/ML systems for deep rural environmental monitoring applications.

To this aim, an external Advisory Board will be established to scrutinise and evaluate the progress and plans of REMARKABLE and give independent and unbiased counsels on potential areas for improvement and new directions to explore. The external Advisory Board members are invited to participate in "ad-hoc" meeting reviews and provide feedback to (intermediate) project results thus steering the overall work of the project. These boards will participate in General Assembly meetings, or independently at their best convenience. The board will be enriched with the addition of relevant stakeholders such as IoT/ML researchers and environmental engineering, and also with more representatives from the industry domain.

3.3.3. Coordination and networking with other projects

Principal objectives: to inform, engage, raise awareness, and ensure impact.

Coordination and networking with other projects will ensure the collaboration with other similar initiatives/research projects. These networking activities pursue creating real synergies, exploring the opportunity to better coordinate the communication and dissemination activity or enhance organising the research. Besides, REMARKABLE will use such events to divulge the project findings to the research community, whenever these are available.

Table 7 summarises the relevant ongoing projects that have been already identified as relevant for REMARKABLE. The projects in the table partially address similar topics as the REMARKABLE project, e.g., their focus is on rural areas, animal, livestock, agriculture, water or air pollution monitoring, tourism, or range extension of IoT. Most of the projects are research and innovation actions, the last two are SME instruments, and only one belongs to Marie Curie project (EID).

Acronym	Full project name

WAZIUP	Open Innovation Platform for IoT-Big Data in Sub-Sahara Africa
CATTLECHAIN	Enhancing farm productivity and guaranteeing CATTLE traceability and welfare with blockCHAIN
iPOLLINATE	Intelligent Pollination for Sustainable Increases in Crop Yields and Global Food Security
IoT4Win	Internet of Thing for Smart Water Innovative Networks
GIoT	Nano-satellites based Global Infrastructure to Enable IoT/M2M Networks
NB4WASTE	Narrowband IoT for Waste Collection in Rural Areas
Clic&Fish	The platform for helping the rural development and its sustainability through the angling tourism
SMARTLAGOON	A project based on the importance of building a systemic understanding of the socio-environmental interrelationships that affect coastal lagoons and their ecosystem to increase local and citywide awareness of environmental impacts.

Table 7. List of potentially interesting research projects.

3.3.4. Workshops

Principal objectives: to inform, engage, raise awareness, and ensure impact.

Collaboration with relevant stakeholders is a key task for the success factor of REMARKABLE, since it assures that the developed solutions contemplate all pertinent information and perspectives. Ideally, all relevant stakeholders will be represented by the project Advisory Board that will meet regularly during the course of the project. Furthermore, REMARKABLE partners will tend to organise various and participate in other public workshops where the project outcomes will be shared and discussed with a technical audience in order to gather expert feedback on them.

3.3.5. Third party events and conferences

Principal objectives: to inform, engage, raise awareness, and ensure impact.

These events comprise conferences, other workshops, and invited speeches. Both national and international conferences, together with other dissemination events represent a central opportunity for the partners to both disseminate and enhance their project work: they will not only share information with experts in the field, collecting feedback from technically qualified spectators, but also have the opportunity to internally coordinate their work.

All partners will be encouraged to submit works to such events in order to promote the project and be proactive in generating opportunities for academic dissemination via publications and other relevant means.

Attendance at conferences is a good mean to promote the project and its goals, and conceivably to involve other projects that could be of interest for REMARKABLE topics. Having delivered preliminary concrete project results, scientific communication will become more active and relevant: the Consortium will then be required to keep a hands-on attitude, i.e., not simply

attending the conferences and presenting papers and/or posters, but actively organising workshops, seminars, or special sessions during the course conferences.

In Table 8, a preliminary schedule of third parties' events is delineated, presenting the envisioned calendarization of such scientific events. Naturally, further adjustments and updates will be carried out during the project's lifetime.

Event	Main area	Date	Place	Link
CIoT'23	Cloud IoT	March 20–22, 2023	Lisbon, Portugal	https://ciot.dnac.org/home/
Workshop on Widening Access to TinyML Network by Establishing Best Practices in Education	TinyML	July 3-7, 2023	Trieste, Italy	https://indico.ictp.it/event/10185
NET4us 2023 Workshop	NSS	October 6, 2023	Madrid, Spain	https://grc.webs.upv.es/events/net4us2023/
IEEE CCNC'24	ML, IoT, and CN	January 6–9, 2024	Las Vegas, NV, USA	https://ccnc2024.ieee-ccnc.org/

Table 8. List of interesting events for dissemination.

3.3.6. Final outreach event

Principal objectives: to inform, engage, raise awareness, and ensure impact.

The final event of REMARKABLE will be an industry outreach conference, ideally coinciding with a major international event. Industrial and public speakers will be invited to talk about market perspectives of IoT/Cloud/AI technologies for future development of rural domains. This will be an opportunity for researchers to present the findings of the project to the research community and public. Other related (EU) projects will be invited to showcase their work as well. The conference foresees three key notes given by eminent researchers and investors, oral, poster and panel sessions open to the public, industrial seminars and keynotes, public engagement sessions, and showcase of findings in the testbed site.

Channel	Link	Information to be shared
Website of the project	https://remarkable.ulusofona.pt/	• Project description • Products and Deliverables • News & Events • Communication tools, e.g., brochures, flyers, videos • Contacts • Consortium • Funding Acknowledgement • Related projects

		• Project timeline
LinkedIn, Facebook, Twitter	https://www.linkedin.com/company/remarkable.iot/ https://www.facebook.com/remarkable.iot/ https://twitter.com/remarkable_iot	• Project description • Updates • Product and Deliverable • Photography taken at project meetings • Brochures/flyers • Graphical Identity
Press releases	Each partner of REMARKABLE will distribute the press releases via their own channels	• Project description • Project goals • Expected findings • Project news
Presentations and posters	Stored in a repository page on the REMARKABLE website (to be created)	• Project's goals • Methodology • Expected results • Graphical identity • Link to the project website • Contacts
Brochures, flyers, factsheets	Stored in a repository page on the REMARKABLE webpage	• Projects goals • Methodology • Findings
Media outlets	Targeting interested general public	• Project description • Findings • Project timeline

Table 9. General dissemination channels.

3.4. Dissemination KPIs and success criteria

Monitoring the dissemination action results over the course of the project is a very important task. This permits us to identify the actual strengths and weaknesses of the applied strategy, to pinpoint and implement corrective actions, to quantify the effectiveness and report results. The REMARKABLE's main dissemination success criteria are summarised in Table 10 below.

Activity	KPIs and targets	
Publications	# of publication in scientific journals	5
	# of conference publications	10
	# of downloads on website publications page	20
Events	# of organised workshops/events (including final dissemination event)	3
	# of participants to the REMARKABLE workshops	60
	# of participants to the REMARKABLE dissemination events	80

Table 10. Dissemination KPIs and main success criteria.

3.5. Open access to scientific publications

REMARKABLE will follow the European guidelines on the large-scale availability of project findings and will adopt a Green Open Access standard. The project will fully promote open science practices by: (1) sharing research preprints at open repositories (e.g., TechRxiv, OpenAIRE, arXiv), (2) publishing in open-access journals, (3) producing data sets deposited in open access repositories (such as Zenodo). Furthermore, the project will encourage best practices in research by providing source codes for reproducibility of published results (e.g., through a dedicated GitHub page), following the disclosure agreement of all involved partners. The project core activities and work to be carried out in every use case scenario rely on extensive experimentation and collection of data sets to be used in conjunction with data-based machine learning methods. Thus, the project devotes a separate work package (WP4) that is devoted to specific use case scenarios and adequate experimentation and demo activities including systematic collection of data sets. Subject to approval of project partners, such data sets will be made publicly available.

4. Communication

The main objectives of this activity are to develop effective communication and public engagement, assure that the project findings reach all interested stakeholders and ensure effective management of the network and timely reporting to the EU.

4.1. Communication objectives and strategy

From the EC's perspective, the principal objective of communication activities in research projects is to demonstrate the impact and benefits of the research findings to the broad public. With this regard, REMARKABLE will invest a lot of effort to guarantee communication effectiveness to (and from) the general audience and other relevant stakeholders with respect to the project results.

The projects' central ideas will be conveyed to the target audience by appropriate means, with the final aim of accomplishing consciousness across a multi-layered community. To this end, customised communications and information are envisioned based on a multi-cultural approach by spreading promotional videos and messages. Because of this, communication (together with dissemination) is seen as a collective activity, within WP6 and managed by the entire consortium, together with a distinct set of actions conducted by an individual partner locally.

Hence, the main challenge is to not only guarantee that the desired information reaches all target audiences and stakeholders (raising awareness), but also ensure that they all fully understand the achieved project results by appropriate communication means (generate understanding). The success of these tasks is also related to the extent of these actions directed toward the widest possible audience of stakeholders, both in industry and academic domain.

From the start of the project and throughout its life span, the main goal of the communication activities will be to:

- **Raise awareness** of the project itself and its main objectives. The Consortium will promote the project throughout its entire duration, demonstrating its objectives, scope and impact it will bring to all stakeholders and the research community. This goal may be considered accomplished at the end of the project run, if a wide audience is aware about the project. The audience is expected to use the provided information in an intangible manner, meaning that the communication will impact not only levels of knowledge and understanding, but also attitude towards some topics of the project.
- **Generate understanding** by transferring crucial communications towards the target audience and certifying that these messages are properly received and that they resulted in the intended comprehension about the project. This action can be contemplated as an extension of the previous one. The REMARKABLE Consortium envisions to communicate occasionally about the progress and accomplishments of the project. This goal may be considered accomplished if the target audience shows interest for follow-up discussions, requests additional information or uses project materials (documents, reports, or dissemination material) for other research activities.
- **Engage** the target audience to exploit the project findings and results in further interactions among stakeholders, illustrating relevance of the work in their own

practices and by collecting feedback and comments. This activity can be seen as a part of the dissemination process. In this way, the targeted audience will help promote the project itself by using the project's results or promoting the project's contents, increasing in this way its impact and resonance.

- **Ensure long-term impact** of the project research on the targeted audience. This goal comprises conveying key messages to key decision-makers (such as regulatory agencies and funding organisations) and wider community so that the REMARKABLE findings and results are taken into consideration by decision-makers when designing future policies and practices, as well forthcoming projects. Long-term impact shows on stakeholders' and regulators' research plans and programs. The information is used in a strategic way and influences the definition of policies and broad research themes.

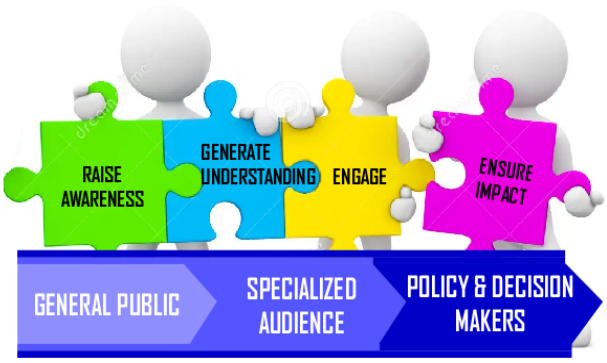

Figure 2. Mapping between communication goals and target audience.

4.2. Target audiences

The main communication activities of REMARKABLE will be based on identifying the target audience and then selecting the right media to transmit messages towards them. By applying a high-level conceptual classification of the target audience linked to REMARKABLE, it is possible to identify at least 3 main clusters:

- General audience (media, citizens, government's representatives, and others that might have interest).
- Specialised audience (drone providers, computing and environmental engineering, AI, etc.).
- Institutional and governmental decision-makers.

Table 11 provides an overview of the REMARKABLE target audiences, the benefits they can get from the project, and the communication-related objectives.

Target	Benefits	Objective & desired feedback
Local Communities in Deep Rural Areas	Improved connectivity and access to advanced technologies. Enhanced environmental monitoring and management to protect their surroundings and livelihoods.	Understand their current challenges and pain points in terms of connectivity and environmental issues. Assess their openness to adopting new technological solutions.

	Monitoring the health and vitality of livestock in real-time. Yield increase by monitoring and control soil nutrients.	Gather feedback on how the project impacts their daily lives.
Environmental Conservationists and NGOs	Access to real-time data on environmental metrics. Improved decision-making capability for conservation efforts.	Input on critical environmental metrics and factors to monitor. Feedback on the utility of the platform in aiding conservation efforts.
Policymakers and Government Entities	Data-driven insights to shape policy and regulations. Potential for infrastructure development in rural areas.	Understand regulatory barriers and compliance requirements. Gauge interest in collaboration or partnership for broader deployment.
Technology & Communication Companies	Potential collaboration and business opportunities. Insights into emerging technological solutions for rural deployment.	Explore partnership opportunities for technology integration. Gain insight into potential technological barriers and solutions. Obtain feedback regarding related practical problems of interest.
Academic Institutions & Research Communities	Access to real-world data for research. Collaboration opportunities for interdisciplinary studies. Novel interdisciplinary insights. Enhanced research mobility and networking.	Input on improving the robustness and scalability of the technological platform. Opportunities for joint research initiatives or publications.
Investors & Funding Agencies	Opportunity to invest in a cutting-edge, socially beneficial project. Potential for returns as the technology scales and expands.	Understand the perceived risks and rewards of the project. Gauge interest in continued or increased funding based on project milestones and results.

Table 11. Communications target audiences.

4.3. Communication channels

Once the relevant objectives and target stakeholders (respectively highlighted in Section 4.1 and 4.2) have been identified, several approaches can be taken for communication. REMARKABLE will exploit both conventional means, like conferences and papers, as well as unconventional means of communication (for instance, social networks) so as to reach the broader audience and anticipate the dissemination of the project outcomes.

The WP6 leaders will be in charge of identifying the most adequate and effective approach(es) to employ or will come up with new improvised materials depending on the event and the maturity of the project results. During the unfolding phase of the project where first results are expected to appear, some of the means used for the communication activities will also be exploited to disseminate the project's findings, making them publicly available. A summary of the general communication channels is given in Table 12 below.

Channel	Link	Information to be shared
Website of the project	https://remarkable.ulusofona.pt/	• Project description • Products and Deliverables • News & Events • Communication tools, e.g., brochures, flyers, videos • Contacts • Consortium • Funding Acknowledgement • Related projects • Project timeline
LinkedIn, Facebook, Twitter	https://www.linkedin.com/company/remarkable.iot/ https://www.facebook.com/remarkable.iot/ https://twitter.com/remarkable_iot	• Project description • Updates • Product and Deliverable • Photography taken at project meetings • Brochures/flyers • Graphical Identity
Press releases	Each partner of REMARKABLE will distribute the press releases via their own channels	• Project description • Project goals • Expected findings • Project news
Presentations and posters	Stored in a repository page on the REMARKABLE website (to be created)	• Project's goals • Methodology • Expected results • Graphical identity • Link to the project website • Contacts
Brochures, flyers, factsheets	Stored in a repository page on the REMARKABLE webpage	• Projects goals • Methodology • Findings
Media outlets	Targeting interested general public	• Project description • Findings • Project timeline

Table 12. General communication channels.

4.3.1. REMARKABLE website

Objectives: inform and raise awareness.

The REMARKABLE website[1] is one of the leading elements within the communication plan of the project. It exhibits overall information about the project and its objectives, activities, events, social networks, and results. Additionally, it provides a span of functionalities, including document download, information on news and events, and relevant external links.

[1] https://remarkable.ulusofona.pt/

The website will have a vital role in aiding the project to accomplish its objective to engage with key stakeholders and media, as well as the general public. Furthermore, it will simplify communication and interaction within the Consortium.

4.3.2. Social networks

Objectives: inform and raise awareness.

REMARKABLE resorts to social networks to expand its group of followers and maximise dissemination of its findings and results. Indeed, social media networks permit reaching out to a wide audience and facilitate the formation of an identifiable community, joining people interested in receiving and exchanging information on the topics addressed by the project. REMARKABLE will use these means to diffuse articles and news published on the website, to promote events, disseminate project findings and results, and to ensure constant connection with the related projects. REMARKABLE selected three social channels: Twitter[2], LinkedIn[3] and Facebook[4]. All three channels will permit the audience to follow the progress of the project. Nonetheless, LinkedIn will be mostly used for communication towards specialised audiences and institutional bodies, while Twitter and Facebook will be more focused on the general public, but specialised audiences can also follow these channels.

4.3.3. Presentation and posters

Objectives: inform and raise awareness.

Presentations and posters will be set up for the participation in conferences, workshops, and similar events. The presentations for external events will include a smaller amount of textual information and will have a dominant graphical aspect to attract the target audience. Moreover, they will include the main project references such as the link to the project website, social media, and the contacts.

Public presentations and posters will be made available on the project website and shared with general audience upon request.

4.3.4. Brochure and flyers

Objectives: inform and raise awareness.

Simultaneously with public events of interest, printed flyers, factsheets, and brochures will be created throughout the entire life span of the project and will reflect projects goals, methods and main findings. The structure and content of the brochures will be adapted to the type of event and, of course, according to the main objective of the communication. The written content will be discussed and agreed with the partner(s) attending the event, so that it is adapted as much as possible to the event and its public. The REMARKABLE brochures and flyers will be available for download on the website.

[2] https://twitter.com/remarkable_iot
[3] https://www.linkedin.com/company/remarkable.iot/
[4] https://www.facebook.com/remarkable.iot/

4.4. Project logo

The communication pack comprises a set of products associated with the project image, such as the logo and overall graphical identity. It is developed to give consistency to the project communication and to support awareness on the project. The logo and graphical identity will be a practical framework for all the REMARKABLE communication and dissemination activities and products and will grow together with the progression of the project.

The logo reflects an intangible interpretation of the project. For this purpose, it should be graphically appealing and adaptable. The logo is the foundation of the project visual identity: it establishes the choice of the colours and fonts adopted in the document templates and in product dissemination.

The graphical identity of the project has been conceived with the aim of visually highlighting the idea of IoT technology and Africa. The conceptualization and the creative process has been performed as a co-design activity via an iterative process, commencing from an early draft to the final logo, as illustrated in Figure 3 below.

Figure 3. Original draft (top left) and the final project logo (bottom right) and its evolution following the initial steps of the project.

From a technical point of view, the flexible design enables application of the logo across a variety of mediums and applications. It has been designed in a vector format, so as to ensure that it can be scaled to any size, maintaining its features and its legibility.

4.5. Communication key performance indicators (KPIs) and success criteria

To have an idea of the progress of the communication activities, among other, the following indicators have been established.

Media coverage & press publications. REMARKABLE will keep track of the number of press releases and articles published online or through traditional media. All partners will be encouraged to record and document the reached audience, as well as to provide evidence of discussions in media regarding the project and its topics.

Number count of publicity material. This measure is quantified by the count of the number of news, brochures, posters, and other communication means during the lifetime of the project.

Record of contacts. The Consortium will do its best to record contacts at the events and of the number of people inquiring feedback or additional information, keep track of the website access and subscribers to the mailing list, track the contacts on the social network and the people involved in the project discussions.

Website statistics & search engine performance. The Consortium will use Google Analytics to monitor the number of visitors on the website, the bounce rate, and the geographic properties on the search engine.

These criteria will be constantly monitored and periodically assessed in order to update the communication and dissemination plan, also including a polished list of concrete actions to communicate the project results and the validation of the impact of these results on the target users.

Table 13 below reports the expected targets for each quantitative indicator described above.

Action	KPIs and targets	
Website	# of visitors to the website	100
	# of posts in the website "News" section (per month)	20
	# of countries' visitors	45
	# of website backlinks	23
Social media	# of posts on social media platforms (per month)	2
	# of Followers (Twitter & LinkedIn)	100
	# of interactions on Twitter	100
	# of interactions on LinkedIn	25
Press and media	# of press releases & articles (online & printed)	10
Materials	# of brochure produced	5
	# of presentations and posters	5
Activities	# of presentations at public events/workshops	10

Table 13. Communication KPIs and main success criteria.

5. Schedule of communication and dissemination activities

Activity	Description	Target audience	Tools to support C&D	Provisional dates /frequency	Responsible	KPIs & targets
Short public secondment report with media content	Short individual secondment description with photos or other media for website and social networks	General audience, expert audience	Website, social network accounts	Upon each secondment, tens of individual reports per year (according to secondment plan)	Each individual secondee	Activity plan submitted to host institution up to 15 days before the secondment and the secondment report up to 30 days after the secondment
Short reports with media content of project events	Short report covering events organised by the project	General audience, expert audience	Website, social network accounts	After each project event is completed (including announcement of the event before the event)	Project partner responsible for event organisation	Up to 15 days after the secondment
Individual reports on dissemination and communication at external events	Short report and media content related to dissemination and communication at external events	General audience, expert audience	Website, social network accounts, open access repositories	After each external event where the project results were presented	Project partner involved in the external event	Individual report up to 30 days after the event

Table 14. Schedule of Communication and Dissemination Activities.